

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Lead Silver Content Non Conformance

72.48 Log No.: SE00054

D4-TC-5; 51/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135

Date: 11-26-97

Recommend

Recommend

Approval

Disapproval

Signature:

POSRC CHAIRMAN

Date 11-26-97

Approved

Disapproved

Signature:

PLANT GENERAL MANAGER

Date 12/1/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required?

Yes

No

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

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**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) lead identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the lead silver content non conformance. The subject non conformance (Sulzer Bingham NCR No. 109705) states that the measured silver content in the cask lead was less than 0.001%. ASTM B29, Chemical Grade requires silver content between 0.002% and 0.02%. The minimum reported lead content of 99.93% is greater than the 99.90% required by the specification. The shielding properties of the lead are not affected by the absence of trace silver. This deviation is therefore acceptable and has no impact on the cask design. ASTM B29 is the standard specification for pig lead, which is refined lead in pig form. Pig is defined in the specification as an oblong or square mass of metal that has been cast while still molten into a mold that gives the metal its particular shape. Based on the above information and review of design drawings, the subject non-conformance will not affect the form, fit or function of the TC, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform it's intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the lead silver content non conformance does not adversely affect the ability of the TC to perform it's intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the lead silver content non conformance, there will be no increase in the accident dose consequences already described in the USAR.

## ATTACHMENT 3, SAFETY EVALUATION FORM

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance states that the measured silver content in the cask lead was less than 0.001%. ASTM B29, Chemical Grade requires silver content between 0.002% and 0.02%. The minimum reported lead content of 99.93% is greater than the 99.90% required by the specification. The shielding properties of the lead are not affected by the absence of trace silver. This deviation is therefore acceptable and has no impact on the cask design.

Based on the above information and review of design drawings, the subject non-conformance will not affect the form, fit or function of the TC, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform it's intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a lead silver content non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The lead silver content non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Lead Silver Content Non Conformance			72.48 Log No.: SE00054	
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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) lead identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Shell O.D. Maximum Temperature Non Conformance

72.48 Log No.: SE00055

D4-TC-6; 52/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

For GS-DES, GS-TES, or PE-PDSU

MICHAEL J. GAHAN III

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135

Date: 11-26-97

Recommend

Recommend

Approval

Disapproval

Signature:

POSRC CHAIRMAN

Date 11-26-97

Approved

Disapproved

Signature:

PLANT GENERAL MANAGER

Date 12/1/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes

No X

Signature:

OSSRC SLS CHAIRMAN

Date:

1/30/98

If yes, OSSRC Meeting No.:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Shell O.D. Maximum Temperature Non Conformance			72.48 Log No.: SE00055	
D4-TC-6; 52/129;	ES199601368	Supplement 001	Revision 0000	Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) shell identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Shell O.D. Maximum Temperature Non Conformance 72.48 Log No.: SE00055

D4-TC-6; 52/129; ES199601368 Supplement 001 Revision 0000 Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the shell O.D. maximum temperature non conformance. The subject non conformance (Sulzer Bingham NCR No. 109731) identifies the temperature on the cask shell O.D. exceeding the maximum allowable of 725°F at several times during the lead pour operations. The maximum temperatures and durations are:

<u>Location</u>	<u>°F</u>	<u>Duration (hrs)</u>
1	750	5.00
2	760	5.00
3	765	5.00
4	760	1.17
5	740	1.17
6	730	1.25
7	733	1.50
8	730	1.00
9	730	1.00
10	730	1.00
11	730	1.00
12	730	1.92
13	740	3.75
14	780	1.75
15	750	5.00
16	740	1.08
17	735	1.75
18	740	1.00
19	730	1.00

The shell material that experienced the temperature excursion is ASME SA240, GR 304 with an actual carbon content of 0.058% on the lower shell and 0.039% on the upper shell. The times for which the cask temperatures exceeded the limits set by the procedure were insufficient to sensitize the material. Per the Committee of Stainless Steel Producers of AISI, for a worst case of 800°F for sixteen hours, with the given carbon content, there is no condition of sensitization of the material. The material is therefore acceptable for use. The cask design is not otherwise affected by the temperature excursion. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC shell O.D., is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Shell O.D. Maximum Temperature Non Conformance

72.48 Log No.: SE00055

D4-TC-6; 52/129;

ES199601368

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NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the shell O.D. maximum temperature non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the shell O.D. maximum temperature non conformance, there will be no increase in the accident dose consequences already described in the USAR.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the temperature on the cask shell O.D. exceeding the maximum allowable of 725°F at several times during the lead pour operations. The times for which the cask temperatures exceeded the limits set by the procedure were insufficient to sensitize the material. Per the Committee of Stainless Steel Producers of AISI, for a worst case of 800°F for sixteen hours, with the given carbon content, there is no condition of sensitization of the material. The material is therefore acceptable for use. The cask design is not otherwise affected by the temperature excursion. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC shell O.D., is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety, and does not create the possibility of a new malfunction.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Shell O.D. Maximum Temperature Non Conformance 72.48 Log No.: SE00055

D4-TC-6; 52/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Complete for 50.59 and 72.48:**

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

**Complete for 72.48:**

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a shell O.D. maximum temperature non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The shell O.D. maximum temperature non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) shell identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Inner Liner I.D. Maximum Temperature Non Conformance 72.48 Log No.: SE00056

D4-TC-7; 53/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>G. Tesfaye</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>C. J. Dobry</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>R. H. Beall</u> 11/11/97 SIGNATURE / DATE
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<u>Approved</u> Disapproved	<u>Approved</u> Disapproved
Signature: <u>Jon N. Woodfield</u> INDEPENDENT REVIEWER	Signature: <u>Michael J. Gahan</u> for GS-DES, ES-TES, or PE-PDSU MICHAEL J. GAHAN III
Date: <u>11/12/97</u>	Date: <u>11-13-97</u>

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97

Recommend Approval <input checked="" type="checkbox"/> Disapproval <input type="checkbox"/>	Recommend Disapproval <input type="checkbox"/>	Signature: <u>J. E. Remeniuk</u> POSRC CHAIRMAN	Date: <u>11-26-97</u>
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/>		Signature: <u>P. K. [unclear]</u> PLANT GENERAL MANAGER	Date: <u>12/1/97</u>

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature: J. B. Lemons Date: 11/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Inner Liner I.D. Maximum Temperature Non Conformance 72.48 Log No.: SE00056

D4-TC-7; 53/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) inner liner identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Inner Liner I.D. Maximum Temperature Non Conformance 72.48 Log No.: SE00056

D4-TC-7; 53/129; ES199601368 Supplement 001 Revision 0000 Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the inner liner I.D. maximum temperature non conformance. The subject non conformance (Sulzer Bingham NCR No. 109732) identifies the temperature on the inner liner I.D. exceeding the maximum allowable of 725°F at several times during the lead pour operations. The maximum temperatures and durations are:

<u>Location</u>	<u>°F</u>	<u>Duration (mins)</u>
1	770	10
2	770	25
3	750	5
4	825	10
5	860	5
6	810	20
7	800	10
8	780	10
9	770	30
10	790	30
11	760	30
12	750	25
13	740	30
14	740	30
15	810	15
16	740	75
17	770	15

The inner liner material that experienced the temperature excursion is ASME SA240, GR 304 with an actual carbon content of 0.058%. The times for which the cask temperatures exceeded the limits set by the procedure were insufficient to sensitize the material. Per the Committee of Stainless Steel Producers of AISI, for a worst case of 860°F for ninety minutes, with the given carbon content, there is no condition of sensitization of the material. The material is therefore acceptable for use. The cask design is not otherwise affected by the temperature excursion. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC inner liner I.D., is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Inner Liner I.D. Maximum Temperature Non Conformance 72.48 Log No.: SE00056

D4-TC-7; 53/129; ES199601368 Supplement 001 Revision 0000 Page 4 of 5

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the inner liner I.D. maximum temperature non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the inner liner I.D. maximum temperature non conformance, there will be no increase in the accident dose consequences already described in the USAR.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the temperature on the inner liner I.D. exceeding the maximum allowable of 725°F at several times during the lead pour operations. The times for which the cask temperatures exceeded the limits set by the procedure were insufficient to sensitize the material. Per the Committee of Stainless Steel Producers of AISI, for a worst case of 860°F for ninety minutes, with the given carbon content, there is no condition of sensitization of the material. The material is therefore acceptable for use. The cask design is not otherwise affected by the temperature excursion. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC inner liner I.D., is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety, and does not create the possibility of a new malfunction.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Inner Liner I.D. Maximum Temperature Non Conformance 72.48 Log No.: SE00056

D4-TC-7; 53/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Complete for 72.48:**

NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a inner liner I.D. maximum temperature non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The inner liner I.D. maximum temperature non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) inner liner identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Minimum Lead Thickness Non Conformance 72.48 Log No.: SE00057

D4-TC-8; 54/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM[Signature] 11/10/97  
SIGNATURE / DATE[Signature] 11/10/97  
SIGNATURE / DATE[Signature] 11/11/97  
SIGNATURE / DATEApproved

Disapproved

Approved

Disapproved

Signature: [Signature]  
INDEPENDENT REVIEWERSignature: [Signature]  
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN IIIDate: 11/12/97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135Date: 11-26-97Recommend Approval ✓ Recommend Disapproval \_\_\_\_\_Signature: [Signature] Date: 11-24-97  
POSRC CHAIRMANApproved ✓ Disapproved \_\_\_\_\_Signature: [Signature] Date: 12/1/97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No XSignature: [Signature]  
OSSRC SES CHAIRMANDate: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Minimum Lead Thickness Non Conformance 72.48 Log No.: SE00057

D4-TG-8; 54/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) shell identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.



**ATTACHMENT 3, SAFETY EVALUATION FORM**

<b>ISFSI - Transfer Cask Minimum Lead Thickness Non Conformance</b>		<b>72.48 Log No.: SE00057</b>	
<b>D4-TC-8; 54/129;</b>	<b>ES199601368</b>	<b>Supplement 001</b>	<b>Revision 0000 Page 3 of 5</b>

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the minimum lead thickness non conformance. The subject non conformance (Sulzer Bingham NCR No. 110603) identifies that the as-poured cask lead thickness is less than the allowable in some locations. The minimum measured lead thickness is 3.845", which is less than the minimum allowable thickness of 3.880". The effect of the below tolerance lead shielding is analyzed in calculation BGE001.0616, revision 0. This calculation determined that under worst case conditions the maximum cask surface dose rate in the localized areas where the lead thickness is below the minimum required is 106 mrem/hr., as opposed to the nominal 85 mrem/hr. for the remainder of the cask site surface. Since the surface area where the lead thickness is below the minimum required is less than 0.6% of the total cask surface area, this increase will not significantly increase occupational exposure. This deviation therefore has a minimal impact on the cask design and is acceptable. A review of calculation BGE001.0616 revealed that the cask was designed so that the cask surface dose rate was less than 100 mrem/hr. A computer model (ANISN) was used to compute the maximum cask surface dose rate. Several assumptions were made and documented in the calculation to help maximize the dose rate. It is very unlikely these assumptions would all come true at once, so that the realistic maximum cask surface dose rate will be less than 100 mrem/hr. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC lead shield, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the minimum lead thickness non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Minimum Lead Thickness Non Conformance 72.48 Log No.: SE00057

D4-TG-8; 54/129; ES199601368 Supplement 001 Revision 0000 Page 4 of 5

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the minimum lead thickness non conformance, there will be no increase in the accident dose consequences already described in the USAR.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies that the as-poured cask lead thickness is less than the allowable in some locations. The minimum measured lead thickness is 3.845", which is less than the minimum allowable thickness of 3.880". The effect of the below tolerance lead shielding is analyzed in calculation BGE001.0616, revision 0. This calculation determined that under worst case conditions the maximum cask surface dose rate in the localized areas where the lead thickness is below the minimum required is 106 mrem/hr., as opposed to the nominal 85 mrem/hr. for the remainder of the cask site surface. Since the surface area where the lead thickness is below the minimum required is less than 0.6% of the total cask surface area, this increase will not significantly increase occupational exposure. This deviation therefore has a minimal impact on the cask design and is acceptable. A review of calculation BGE001.0616 revealed that the cask was designed so that the cask surface dose rate was less than 100 mrem/hr. A computer model (ANISN) was used to compute the maximum cask surface dose rate. Several assumptions were made and documented in the calculation to help maximize the dose rate. It is very unlikely these assumptions would all come true at once, so that the realistic maximum cask surface dose rate will be less than 100 mrem/hr. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC lead shield, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety, and does not create the possibility of a new malfunction.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Minimum Lead Thickness Non Conformance 72.48 Log No.: SE00057

D4-TC-8; 54/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Complete for 72.48:**

NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a minimum lead thickness non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. A comparison was made between actual occupational dose received during decontaminating the outer surface of the cask (while located in the cask washdown pit), and the estimated occupational exposure (dose) in Table 7.4-1 of the ISFSI USAR. This comparison revealed that the estimated dose for this activity (as referenced in the SAR) was greater than the actual dose received during performance of this activity. This comparison indicates that the small decrease in the TC lead thickness in a few areas did not increase occupational dose above the exposure estimates established in Table 7.4-1. Therefore, it can be concluded that the minimum lead thickness non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) shell identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Upper Trunnion Outer Shoulder Diameter Non Conformance 72.48 Log No.: SE00058

D4-TC-9; 55/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Indv.: G. Tesfaye  
Work Group: LicensingResp. Indv.: C. J. Dobry  
Work Group: PESResp. Indv.: R. H. Beall  
Work Group: NFMNatasha Sedat 11/12/97  
SIGNATURE / DATEC. J. Dobry 11/10/97  
SIGNATURE / DATER. H. Beall 11/11/97  
SIGNATURE / DATEApproved

Disapproved

Approved

Disapproved

Signature: John N. Woodfield  
INDEPENDENT REVIEWERSignature: Michael J. Gahan  
For GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHANJILDate: 11/12/97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135Date: 11-26-97Recommend Approval ✓ Recommend Disapproval \_\_\_\_\_Signature: J. E. Remeniuk Date: 11-26-97  
POSRC CHAIRMANApproved ✓ Disapproved \_\_\_\_\_Signature: PK Date: 12/1/97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No XSignature: J. E. Remeniuk  
OSSRC SES CHAIRMANDate: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

**ISFSI - Upper Trunnion Outer Shoulder Diameter Non Conformance 72.48 Log No.: SE00058****D4-TC-9; 55/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) upper trunnion identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Upper Trunnion Outer Shoulder Diameter Non Conformance 72.48 Log No.: SE00058

D4-TC-9; 55/129; ES199601368 Supplement 001 Revision 0000 Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the upper trunnion outer shoulder diameter non conformance. The subject non conformance (Sulzer Bingham NCR No. 111333) identifies the TC upper trunnion outer shoulder diameter was reduced from 8.000" to 7.800" +/- 0.05". The trunnion outer shoulder diameter was changed to repair a false cut incurred during fabrication. Calculation BGE001.0217 revision 0 analyzed this condition and verified the structural adequacy of the upper lifting trunnion body. The supporting calculations are shown below.

Assuming outer and inner diameters of 7.75" and 4.00" respectively, the section properties of the upper trunnion body are:

$$\text{Area} = \pi \{ (7.75)^2 - (4.00)^2 \} / 4 = 34.6 \text{ in}^2$$

$$S = \pi \{ (7.75)^4 - (4.00)^4 \} / \{ (32)(7.75) \} = 42.5 \text{ in}^3$$

The maximum shear and moment handing loads, as shown in calculation BGE001.0202 revision 4, are 115 kips and 201 inch-kips respectively. The resulting stresses in the upper lifting trunnion body are:

$$\sigma_v = 115 / 34.6 = 3.3 \text{ ksi}$$

$$\sigma_b = 201 / 42.5 = 4.7 \text{ ksi}$$

The resulting stress intensity is therefore,

$$S.I. = (4.7 / 2) \pm [(4.7 / 2)^2 + (3.3)^2]^{1/2} = 6.4 \text{ ksi}$$

The calculated stress intensity increase from 5.9 ksi to 6.4 ksi is less than half of the ANSI N14.6 allowable stress intensity of 13.5 ksi. The upper trunnion shoulder are therefore adequate to perform their function. All other trunnion body stresses are unchanged. The section modulus above is validated by AISC, Ninth Edition. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC upper trunnion, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Upper Trunnion Outer Shoulder Diameter Non Conformance 72.48 Log No.: SE00058

D4-TC-9; 55/129; ES199601368 Supplement 001 Revision 0000 Page 4 of 5

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the upper trunnion outer shoulder diameter non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the upper trunnion outer shoulder diameter non conformance, there will be no increase in the accident dose consequences already described in the USAR.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the TC upper trunnion outer shoulder diameter was reduced to repair a false cut incurred during fabrication. Based on previous information, the subject non conformance will not affect the form, fit or function of the TC upper trunnion, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Upper Trunnion Outer Shoulder Diameter Non Conformance 72.48 Log No.: SE00058

D4-TC-9; 55/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Complete for 72.48:**

NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a upper trunnion outer shoulder diameter non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The upper trunnion outer shoulder diameter non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) upper trunnion identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Bottom Neutron Shield Cover Tolerance Non Conformance 72.48 Log No.: SE00059

D4-TC-10; 56/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>[Signature]</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>[Signature]</u> 11/11/97 SIGNATURE / DATE
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Approved

Disapproved

Approved

Disapproved

Signature: [Signature] INDEPENDENT REVIEWER  
 Date: 11/12/97

Signature: [Signature] for GS-DES, GS-TES, or PE-PDSU  
 Date: 11-13-97  
 MICHAEL J. GAHAN III

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97

Recommend Approval ☒ Disapproval ☐ Signature: [Signature] Date: 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐ Signature: [Signature] Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature: [Signature] Date: 11/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Bottom Neutron Shield Cover Tolerance Non Conformance		72.48 Log No.: SE00059
D4-TC-10; 56/129;	ES199601368	Supplement 001 Revision 0000 Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) bottom neutron shield identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.

**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - Bottom Neutron Shield Cover Tolerance Non Conformance 72.48 Log No.: SE00059****D4-TC-10; 56/129; ES199601368 Supplement 001 Revision 0000 Page 3 of 5****Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the bottom neutron shield cover tolerance non conformance. The subject non-conformance (Sulzer Bingham NCR No. 111338) identifies the gap between the bottom surface of the bottom forging and the bottom of the bottom neutron shield cover varies within the range of 0.04" and 0.19". The allowable gap is 0.12" +/- 0.05. The 0.75" thick cask bottom neutron shield cover plate is designed to be recessed below the bottom flange by 0.12". The purpose of this design is to force the cask to rest on the bottom flange, a rigid machined flat surface, rather than the relatively yielding and uneven bottom cover plate when set vertically. With the as-built configuration the recess is maintained, although it deviates from the design tolerances. Since the recess is specified for clearance only, these deviations do not affect any function of the cask. No analytical condition is affected. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC bottom neutron shield cover, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the bottom neutron shield cover tolerance non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Bottom Neutron Shield Cover Tolerance Non Conformance 72.48 Log No.: SE00059

D4-TC-10; 56/129; ES199601368 Supplement 001 Revision 0000 Page 4 of 5

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the bottom neutron shield cover tolerance non conformance, there will be no increase in the accident dose consequences already described in the USAR.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the gap between the bottom surface of the bottom forging and the bottom of the bottom neutron shield cover varies within the range of 0.04" and 0.19". The allowable gap is 0.12" +/- 0.05. The 0.75" thick cask bottom neutron shield cover plate is designed to be recessed below the bottom flange by 0.12". The purpose of this design is to force the cask to rest on the bottom flange, a rigid machined flat surface, rather than the relatively yielding and uneven bottom cover plate when set vertically. With the as-built configuration the recess is maintained, although it deviates from the design tolerances. Since the recess is specified for clearance only, these deviations do not affect any function of the cask. Based on previous information, the subject non conformance will not affect the form, fit or function of the bottom neutron shield cover, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

**Complete for 50.59 and 72.48:**

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

**Complete for 72.48:**

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a bottom neutron shield cover tolerance non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The bottom neutron shield cover tolerance non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Bottom Neutron Shield Cover Tolerance Non Conformance 72.48 Log No.: SE00059

D4-TC-10; 56/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) bottom neutron shield identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lower Trunnion Plug Diameter Non Conformance

72.48 Log No.: SE00060

D4-TC-11; 57/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11.7.97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135

Date: 11.26.97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 11-26-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12/1/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lower Trunnion Plug Diameter Non Conformance

72.48 Log No.: SE00060

D4-TC-11; 57/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) lower trunnion identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lower Trunnion Plug Diameter Non Conformance

72.48 Log No.: SE00060

D4-TC-11; 57/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the lower trunnion plug diameter non conformance. The subject non conformance identifies the diameter of the plug for the TC lower trunnions was changed from 2.00" to 2.25" to ease fabrication. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC lower trunnion, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the lower trunnion plug diameter non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the lower trunnion plug diameter non conformance, there will be no increase in the accident dose consequences already described in the USAR.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lower Trunnion Plug Diameter Non Conformance

72.48 Log No.: SE00060

D4-TG-11; 57/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the diameter of the plug for the TC lower trunnions was changed from 2.00" to 2.25" to ease fabrication. Based on previous information, the subject non conformance will not affect the form, fit or function of the TC lower trunnion, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a lower trunnion plug diameter non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The lower trunnion plug diameter non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lower Trunnion Plug Diameter Non Conformance

72.48 Log No.: SE00060

D4-TC-11; 57/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) lower trunnion identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Optical Plug Alignment Target Hole Oversize Non Conformance 72.48 Log No.: SE00061

D4-TC-12; 58/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk JER Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>G. Tesfaye</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>C. J. Dobry</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>R. H. Beall</u> 11/11/97 SIGNATURE / DATE
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Approved Signature: <u>Jon N. Woodfield</u> INDEPENDENT REVIEWER Date: <u>11/12/97</u>	Disapproved Signature: <u>Michael J. Gahan</u> For GS-DES, GS-TES, or PE-PDSU MICHAEL J. GAHAN JR. Date: <u>11-13-97</u>
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The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97

Recommend Approval ☒ Disapproval ☐ Signature: J. T. Call Date: 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐ Signature: P. Ketch Date: 11/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. B. Remoni Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Optical Plug Alignment Target Hole Oversize Non Conformance 72.48 Log No.: SE00061

D4-TC-12; 58/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) optical plug identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Optical Plug Alignment Target Hole Oversize Non Conformance 72.48 Log No.: SE00061

D4-TC-12; 58/129; ES199601368 Supplement 001 Revision 0000 Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the optical plug target alignment hole non conformance. The subject non conformance (Sulzer Bingham NCR No. 111861) identifies an optical plug target alignment hole on a trunnion is oversized. The hole I.D. is 0.2530" at the outside and 0.2506" at the inside. The allowable is 0.2500" + 0.001" - 0.000". The function of the alignment hole is to provide a base for insertion of an optical plug target which is specified to be within 0.01" of the true position of the cask centerline. Although the shape of the hole (slightly conical) results in part of the hole exceeding the specified diameter tolerance, the actual location of the hole, combined with the oversize diameter, will not result in a target position outside the required tolerance. No analytical condition is affected. Since the final location of the optical plug location will still fall within the 0.01" design tolerance, then the fact that the target holes are oversized per their very constraining tolerances is acceptable. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC optical plug, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the optical plug target alignment hole non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Optical Plug Alignment Target Hole Oversize Non Conformance 72.48 Log No.: SE00061

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NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the optical plug target alignment hole non conformance, there will be no increase in the accident dose consequences already described in the USAR.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies an optical plug target alignment hole on a trunnion is oversized. The function of the alignment hole is to provide a base for insertion of an optical plug target which is specified to be within 0.01" of the true position of the cask centerline. Although the shape of the hole (slightly conical) results in part of the hole exceeding the specified diameter tolerance, the actual location of the hole, combined with the oversize diameter, will not result in a target position outside the required tolerance. Since the final location of the optical plug location will still fall within the 0.01" design tolerance, then the fact that the target holes are oversized per their very constraining tolerances is acceptable. Based on previous information, the subject non conformance will not affect the form, fit or function of the TC optical plug, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a optical plug target alignment hole non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The optical plug target alignment hole non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Optical Plug Alignment Target Hole Oversize Non Conformance 72.48 Log No.: SE00061

D4-TC-12; 58/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) optical plug identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Nitronic Rail Minimum Width Non Conformance 72.48 Log No.: SE00062

D4-TC-13; 59/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>[Signature]</u> 11/10/97 SIGNATURE / DATE
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Approved

Disapproved

Approved

Disapproved

Signature: [Signature]  
INDEPENDENT REVIEWER

Date: 11/12/97

Signature: [Signature]  
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAM III  
11-13-97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date: 11-26-97  
POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 12/1/97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Nitronic Rail Minimum Width Non Conformance 72.48 Log No.: SE00062

D4-TC-13; 59/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) Nitronic 60 rail identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.



**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - Transfer Cask Nitronic Rail Minimum Width Non Conformance 72.48 Log No.: SE00062****D4-TC-13; 59/129; ES199601368 Supplement 001 Revision 0000 Page 3 of 5****Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the Nitronic 60 rail minimum width non conformance. The subject non conformance (Sulzer Bingham NCR No. 111908) identifies the width of the TC Nitronic 60 rails is below the minimum tolerance. The minimum width of the rails is 2.916", while the minimum allowable is 2.95". This is acceptable since the DSC bears on the center portion of the rails, and not on the edges. The amount of the undersize of the rail represents roughly a reduction in width of 1% and does not adversely affect the performance of the rails when the canister is slid out of or back into the cask. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC or Nitronic 60 rails, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. In addition, there is no detrimental operational impact associated with this activity, including the insertion and removal of the DSC. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the Nitronic 60 rail minimum width non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the Nitronic 60 rail minimum width non conformance, there will be no increase in the accident dose consequences already described in the USAR.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Nitronic Rail Minimum Width Non Conformance 72.48 Log No.: SE00062

D4-TC-13; 59/129;

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the width of the TC Nitronic 60 rails is below the minimum tolerance. This is acceptable since the DSC bears on the center portion of the rails, and not on the edges. The amount of the undersize of the rail represents roughly a reduction in width of 1% and does not adversely affect the performance of the rails when the canister is slid out of or back into the cask. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC or Nitronic 60 rails, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. In addition, there is no detrimental operational impact associated with this activity, including the insertion and removal of the DSC. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a Nitronic 60 rail minimum width non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The Nitronic 60 rail minimum width non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Transfer Cask Nitronic Rail Minimum Width Non Conformance 72.48 Log No.: SE00062

D4-TC-13; 59/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) Nitronic 60 rail identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Alignment Target Hole Oversize Non Conformance

72.48 Log No.: SE00063

D4-TC-14; 60/129;

ES199601368

Supplement 001

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] Tonk Woodfield Signature: [Signature] Michael J. Gahan  
 INDEPENDENT REVIEWER for GS-DES, GS-TES, or PE-PDSU  
 Date: 11/12/97 Date: 11-13-97  
 MICHAEL J. GAHAN III

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97

Recommend ☒ Approval ☒ Recommend ☐ Disapproval ☐

Signature: [Signature] Date: 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Alignment Target Hole Oversize Non Conformance

72.48 Log No.: SE00063

D4-TC-14; 60/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) alignment target hole identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Alignment Target Hole Oversize Non Conformance

72.48 Log No.: SE00063

D4-TC-14; 60/129;

ES199601368

Supplement 001

Revision 0000

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the TC alignment target hole non conformance. The subject non conformance (Sulzer Bingham NCR No. 111912) identifies an optical plug alignment target hole on a trunnion is oversized. The upper half of the target hole is oversized at 0.252". The allowable is  $0.2500" + 0.001" - 0.000"$ . The upper half of the target hole of 0.001" oversized at 0.252". The function of the alignment hole is to provide a base for insertion of an optical plug target which is specified to be within 0.01" of the true position of the cask centerline. The true position of the hole is 0.008" from its specified location and the oversized condition will therefore not exceed the 0.010" tolerance. The oversized condition will not cause excessive looseness in the fit of the alignment target. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC optical plug, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the TC alignment target hole non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the TC alignment target hole non conformance, there will be no increase in the accident dose consequences already described in the USAR.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Alignment Target Hole Oversize Non Conformance

72.48 Log No.: SE00063

D4-TC-14; 60/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies an optical plug alignment target hole on a trunnion is oversized. The function of the alignment hole is to provide a base for insertion of an optical plug target which is specified to be within 0.01" of the true position of the cask centerline. The true position of the hole is 0.008" from its specified location and the oversize condition will therefore not exceed the 0.010" tolerance. The oversize condition will not cause excessive looseness in the fit of the alignment target. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC optical plug, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a TC alignment target hole non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The TC alignment target hole non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Alignment Target Hole Oversize Non Conformance

72.48 Log No.: SE00063

D4-TC-14; 60/129;

ES199601368

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**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) alignment target hole identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom O-Ring Groove Maximum Depth Non Conformance 72.48 Log No.: SE00064

D4-TC-15; 61/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: Jon N. Woodfield  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: John T. Carr Date: 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: P. K. Katz Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. R. Remeniuk Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

**ISFSI - TC Bottom O-Ring Groove Maximum Depth Non Conformance 72.48 Log No.: SE00064****D4-TC-15; 61/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) bottom O-ring identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom O-Ring Groove Maximum Depth Non Conformance 72.48 Log No.: SE00064

D4-TC-15; 61/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the bottom O-ring non conformance. The subject non conformance (Sulzer Bingham NCR No. 111918) identifies the design depth of the TC bottom cover plate bottom O-ring groove of 0.183" was exceeded. The maximum measured depth is 0.185". The O-ring seal is designed for a nominal compression of about 0.025". An excess depth of 0.002" will not reduce the pressure retaining capacity of the seal according to the manufacturer. In addition, the function of the seal has been demonstrated by hydrostatic testing. The O-rings are Parker O-rings made of ethylene propylene with an inside diameter of 17.955" and a width of 0.21". The nominal compression expected by the manufacturer will meet the design needs. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC bottom O-ring, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the bottom O-ring non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the bottom O-ring non conformance, there will be no increase in the accident dose consequences already described in the USAR.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom O-Ring Groove Maximum Depth Non Conformance 72.48 Log No.: SE00064

D4-TC-15; 61/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the design depth of the TC bottom cover plate bottom O-ring groove of 0.183" was exceeded. The maximum measured depth is 0.185". The O-ring seal is designed for a nominal compression of about 0.025". An excess depth of 0.002" will not reduce the pressure retaining capacity of the seal according to the manufacturer. In addition, the function of the seal has been demonstrated by hydrostatic testing. The O-rings are Parker O-rings made of ethylene propylene with an inside diameter of 17.955" and a width of 0.21". The nominal compression expected by the manufacturer will meet the design needs. Based on previous information, the subject non conformance will not affect the form, fit or function of the TC bottom O-ring, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a bottom O-ring non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The bottom O-ring non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom O-Ring Groove Maximum Depth Non Conformance 72.48 Log No.: SE00064

D4-TC-15; 61/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) bottom O-ring identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom Forging Minimum Diameter Non Conformance 72.48 Log No.: SE00065

D4-TC-16; 62/129; ES199601368 Supplement 001 Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk JER Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>G. Tesfaye</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>C. J. Dobry</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>R. H. Beall</u> 11/11/97 SIGNATURE / DATE
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Approved

Disapproved

Approved

Disapproved

Signature: Tenn N. Woodfield  
INDEPENDENT REVIEWERSignature: Michael J. Gahan III  
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN IIIDate: 11/12/97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97Recommend ☒ Approval ☒ Recommend ☐ Disapproval ☐Signature: J. H. Gail Date: 11-26-97  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature: P. K. G. Date: 12/1/97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature: J. B. Lemon Date: 1/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom Forging Minimum Diameter Non Conformance 72.48 Log No.: SE00065

D4-TC-16; 62/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) bottom forging identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.5, 4.7, 5.1, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom Forging Minimum Diameter Non Conformance

72.48 Log No.: SE00065

D4-TC-16; 62/129;

ES199601368

Supplement 001

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of the bottom forging non conformance. The subject non conformance (Sulzer Bingham NCR No. 110210) identifies the outside of the TC bottom forging with a minimum I.D. of 71.875" while the minimum allowable is 71.950" (a difference of 0.075"). Flatness on the inside of the bottom forging was also not met. The design flatness is 0.060", while the maximum deviation is 0.125". The 2" thick cast bottom plate is specified to be flat within 0.060". The as-built plate is concave with a maximum deviation of 0.125" due, evidently, to distortion from the attachment weld to the flange. The cask cavity length is not reduced by this deviation. The as-built geometry will result in the DSC being supported by the rim of the bottom plate, under normal conditions, so that the DSC dead weight is transmitted to the cask directly through the shell of the DSC. This is consistent with the existing analytical assumptions. During fabrication, deviations are expected to occur. The tolerances are often conservative, thus when they are exceeded, the magnitude of variance must be evaluated. In this case, the deviation does not affect the structural design nor the functionality of the transfer cask. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC bottom forging, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the TC which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

NO May the consequences of an accident previously evaluated in the SAR be increased?

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The USAR states that an actual drop event is not credible, and the accident analysis concluded that fuel cladding integrity will be maintained for the postulated 80" transfer cask drop. Since the bottom forging non conformance does not adversely affect the ability of the TC to perform its intended design function, the structural integrity of the TC is not affected, and as such, the probability of occurrence of the transfer cask accident previously evaluated in the SAR will not be increased as a result of this activity.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom Forging Minimum Diameter Non Conformance

72.48 Log No.: SE00065

D4-TC-16; 62/129;

ES199601368

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Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the intended design function of the TC has not changed as a result of the bottom forging non conformance, there will be no increase in the accident dose consequences already described in the USAR.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance identifies the outside of the TC bottom forging with a minimum I.D. of 71.875" while the minimum allowable is 71.950" (a difference of 0.075"). Flatness on the inside of the bottom forging was also not met. The cask cavity length is not reduced by this deviation. The as-built geometry will result in the DSC being supported by the rim of the bottom plate, under normal conditions, so that the DSC dead weight is transmitted to the cask directly through the shell of the DSC. This is consistent with the existing analytical assumptions. During fabrication, deviations are expected to occur. The tolerances are often conservative, thus when they are exceeded, the magnitude of variance must be evaluated. In this case, the deviation does not affect the structural design nor the functionality of the transfer cask. Based on the above information, the subject non conformance will not affect the form, fit or function of the TC bottom forging, is not detrimental to the structural integrity of the TC, and will not adversely affect the ability of the TC to perform its intended design function. Therefore, this activity has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a bottom forging non conformance. BGE approved this non conformance for construction prior to the issuance of the ISFSI license in November, 1992. The bottom forging non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - TC Bottom Forging Minimum Diameter Non Conformance 72.48 Log No.: SE00065

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NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the TC (Transfer Cask) bottom forging identified during TC fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Classification

72.48 Log No.: SE00069

A-LY-11; 66/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, ES-TES, or PE-PDSU  
MICHAEL J. GAHAN III

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.:

Date:

Recommend  
 Approval

Recommend  
 Disapproval

Signature:

POSRC CHAIRMAN

Date

Approved

Disapproved

Signature:

PLANT GENERAL MANAGER

Date

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes

No

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Classification

72.48 Log No.: SE00069

A-LY-11; 66/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses the classification of the lifting yoke.

**Reason for Activity:** This safety evaluation addresses a discrepancy between the NRC SER and ISFSI USAR. The NRC SER identifies the TC (Transfer Cask) lifting yoke system as "not important to safety", whereas the ISFSI USAR states the yoke is a "safety-related component", which is the correct classification. The reason for this particular safety evaluation is to assure that the discrepancy between the NRC SER and ISFSI USAR regarding the safety classification of the TC yoke system has been analyzed to assure conformance with the ISFSI Technical Specifications and the ISFSI USAR.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Classification

72.48 Log No.: SE00069

A-LY-11; 66/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the USAR designating the lifting yoke as safety-related. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The NRC SER states in Section 2.2.4, that the yoke system is classified as equipment "not important to safety". The ISFSI USAR states in Section 4.7 that the lifting yoke is a special lifting device which provides the means for performing all cask handling operations in the plant's Auxiliary Building. It is designed to support a loaded transfer cask weighing up to 100 tons. A lifting pin connects the Spent Fuel Cask Handling Crane hook and the lifting yoke. The lifting yoke is designated safety-related since it is in the direct load path of the cask. The codes and standards used to design and fabricate the lifting yoke are presented in ISFSI USAR Section 4.7.4. The lifting yoke was designed, fabricated, and procured as a safety-related component for ISFSI operations. The SER and the SAR both correctly state that the TC yoke system is only used inside the spent fuel pool building and is controlled by 10CFR Part 50 regulations. This safety evaluation clarifies an existing condition, and does not change the approved safety-related design of the TC yoke system. This analysis assures the safety-related classification as described in the USAR. This clarification has no detrimental impact on equipment important to safety. Therefore, this discrepancy between the NRC SER and the ISFSI USAR will not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. There are no physical changes to the lifting yoke as a result of this proposed activity. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. There are no physical changes to the lifting yoke as a result of this proposed activity. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. There are no physical changes to the lifting yoke as a result of this proposed activity. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Classification

72.48 Log No.: SE00069

A-LY-11; 66/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this discrepancy between the NRC SER and the ISFSI USAR. The TC yoke system is safety-related as described in the ISFSI USAR. This safety evaluation clarifies an existing condition, and does not change the approved safety-related design of the TC yoke system. In regard to the subject clarification, no credible scenario can be postulated which would create a malfunction of a different type than any previously evaluated in the SAR. Therefore, this activity does not increase the possibility of a malfunction of a different type than any previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. There are no physical changes to the lifting yoke as a result of this proposed activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity involved a discrepancy between the NRC SER and ISFSI USAR. The SER identifies the TC (Transfer Cask) lifting yoke system as "not important to safety", whereas the USAR states the yoke is a "safety related component", which is the correct classification. There are no physical changes to the lifting yoke as a result of this proposed activity. This activity does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. There are no physical changes to the lifting yoke as a result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Classification

72.48 Log No.: SE00069

A-LY-11; 66/129;

ES199601368

Supplement 001

Revision 0000

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses the classification of the lifting yoke.

**Reason for Activity:** This safety evaluation addresses a discrepancy between the NRC SER and ISFSI USAR. The NRC SER identifies the TC (Transfer Cask) lifting yoke system as "not important to safety", whereas the ISFSI USAR states the yoke is a "safety-related component", which is the correct classification. The reason for this particular safety evaluation is to assure that the discrepancy between the NRC SER and ISFSI USAR regarding the safety classification of the TC yoke system has been analyzed to assure conformance with the ISFSI Technical Specifications and the ISFSI USAR.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Deletion of Loctite From Lifting Yoke Connection Bolts

72.48 Log No.: SE00070

D3-LY-1; 67/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: M. A. Carr  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan III  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135

Date: 11-26-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: J. L. Carr Date: 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: P. K. D. Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. B. Lemon  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: .:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Deletion of Loctite From Lifting Yoke Connection Bolts

72.48 Log No.: SE00070

D3-LY-1; 67/129;

ES199601368

Supplement 001

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change which removed the Loctite from the yoke connection bolts.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2, and Appendix A, Yoke System.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Deletion of Loctite From Lifting Yoke Connection Bolts

72.48 Log No.: SE00070

D3-LY-1; 67/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the lifting yoke connection bolts design change. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The subject activity removed the Loctite from the yoke connection bolts, which does not affect any design conditions of the yoke. The yoke connection has bolts, nuts, and washers which are acceptable for this application. The bolts are torqued to 500 ft-lbs after assembly, which eliminates the need for the Loctite. This activity has no impact on the fit, form, or function of the yoke connection bolts or the lifting yoke. Based on this information, eliminating the Loctite will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. There is no change in the performance of the connection bolts as a result of this proposed activity. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. There is no change in the performance of the connection bolts as a result of this proposed activity. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. There is no change in the performance of the connection bolts as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Deletion of Loctite From Lifting Yoke Connection Bolts			72.48 Log No.: SE00070	
D3-LY-1; 67/129;	ES199601368	Supplement 001	Revision 0000	Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity removed the Loctite from the yoke connection bolts, which does not affect any design conditions of the yoke. The yoke connection has bolts, nuts, and washers which are acceptable for this application. The bolts are torqued to 500 ft-lbs after assembly, which eliminates the need for the Loctite. This activity has no impact on the fit, form, or function of the yoke connection bolts or the lifting yoke. Based on this information, eliminating the Loctite will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. There is no change in the performance of the connection bolts as a result of this proposed activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a lifting yoke connection bolts design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. There is no change in the performance of the connection bolts or in the operation of the lifting yoke as a result of this proposed activity. The lifting yoke connection bolts design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. There is no change in the performance of the connection bolts or in the operation of the lifting yoke as a result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Deletion of Loctite From Lifting Yoke Connection Bolts			72.48 Log No.: SE00070	
D3-LY-1; 67/129;	ES199601368	Supplement 001	Revision 0000	Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change which removed the Loctite from the yoke connection bolts.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Profile Design Change

72.48 Log No.: SE00071

D3-LY-2; 68/129;

ES199601368

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Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

[Signature] 11/12/97  
 SIGNATURE / DATE

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M. A. OARR  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135Date: 11-26-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date: 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Profile Design Change

72.48 Log No.: SE00071

D3-LY-2; 68/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the lifting yoke bearing plate profile since the original profile of the bearing plate did not match that of the yoke hook.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2, and Appendix A, Yoke System.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Profile Design Change

72.48 Log No.: SE00071

D3-LY-2; 68/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the lifting yoke bearing plate profile design change. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The subject activity changed the profile of the bearing plate since the original profile of the bearing plate did not match that of the yoke hook. The change was made to ease installation of the bearing plate and does not affect the completed form of the lifting yoke. Therefore, the redesigned plate has no impact on the fit, form, or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. There is no change in the structural capability of the lifting yoke, and the ability of the lifting yoke to perform its intended design function is not affected as a result of this proposed activity. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. There is no change in the structural capability of the lifting yoke, and the ability of the lifting yoke to perform its intended design function is not affected as a result of this proposed activity. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. There is no change in the structural capability of the lifting yoke, and the ability of the lifting yoke to perform its intended design function is not affected as a result of this proposed activity. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Profile Design Change

72.48 Log No.: SE00071

D3-LY-2; 68/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed the profile of the bearing plate since the original profile of the bearing plate did not match that of the yoke hook. The change was made to ease installation of the bearing plate and does not affect the completed form of the lifting yoke. Based on this information, the redesigned plate will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. There is no change in the structural capability of the lifting yoke, and the ability of the lifting yoke to perform its intended design function is not affected as a result of this proposed activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a lifting yoke bearing plate profile design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. There is no change in the structural capability of the lifting yoke, and the ability of the lifting yoke to perform its intended design function is not affected as a result of this proposed activity. The lifting yoke bearing plate profile design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. There is no change in the structural capability of the lifting yoke, and the ability of the lifting yoke to perform its intended design function is not affected as a result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Profile Design Change

72.48 Log No.: SE00071

D3-LY-2; 68/129;

ES199601368

Supplement 001

Revision 0000

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the lifting yoke bearing plate profile since the original profile of the bearing plate did not match that of the yoke hook.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Pin Support / Cradle Design Change

72.48 Log No.: SE00072

D3-LY-3; 69/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk gca Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>G. Tesfaye</u> 11/12/97 SIGNATURE / DATE	<u>C. J. Dobry</u> 11/10/97 SIGNATURE / DATE	<u>R. H. Beall</u> 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: Malcolm M.A. Carr  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan  
 For GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date 11/12/97Date 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135Date: 11-26-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date 11/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Pin Support / Cradle Design Change

72.48 Log No.: SE00072

D3-LY-3; 69/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the lifting yoke which changed the pin support with a pin cradle.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2, and Appendix A, Yoke System.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Pin Support / Cradle Design Change

72.48 Log No.: SE00072

D3-LY-3; 69/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the lifting yoke pin support / cradle design change. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The subject activity replaces the lifting yoke pin support with a pin cradle. The pin support / cradle serves to hold the yoke pin when it is not engaged with the plant crane. The intent of this design change is to provide better full pin support and to ease the insertion and removal of the component without binding. The cradle is not safety-related and is not a structural component of the lifting yoke. This design change does not affect any analytical conditions. Based on this information, the lifting yoke pin support / cradle design change will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The cradle is not safety-related and is not a structural component of the lifting yoke, and therefore will not adversely affect the ability of the lifting yoke to perform its intended design function. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The cradle is not safety-related and is not a structural component of the lifting yoke, and therefore will not adversely affect the ability of the lifting yoke to perform its intended design function. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Pin Support / Cradle Design Change

72.48 Log No.: SE00072

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NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The cradle is not safety-related and is not a structural component of the lifting yoke, and therefore will not adversely affect the ability of the lifting yoke to perform its intended design function. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity replaces the lifting yoke pin support with a pin cradle. The pin support / cradle serves to hold the yoke pin when it is not engaged with the plant crane. The intent of this design change is to provide better full pin support and to ease the insertion and removal of the component without binding. The cradle is not safety-related and is not a structural component of the lifting yoke. This design change does not affect any analytical conditions. Based on this information, the lifting yoke pin support / cradle design change will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The cradle is not safety-related and is not a structural component of the lifting yoke, and therefore will not adversely affect the ability of the lifting yoke to perform its intended design function. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a lifting yoke pin support / cradle design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. There is no change in the performance of the pin cradle or in the operation of the lifting yoke as a result of this proposed activity. The lifting yoke pin support / cradle design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Pin Support / Cradle Design Change

72.48 Log No.: SE00072

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NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. There is no change in the performance of the pin cradle or in the operation of the lifting yoke as a result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the lifting yoke which changed the pin support with a pin cradle.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Cable Assemblies Design Change

72.48 Log No.: SE00073

D3-LY-4; 70/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>[Signature]</u> 11/12/97 SIGNATURE / DATE	<u>[Signature]</u> 11/10/97 SIGNATURE / DATE	<u>[Signature]</u> 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: Malcolm M.A. Carr  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan  
 For GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date 11/12/97Date 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135Date: 11-26-97

Recommend Approval ☒ Disapproval ☐

Signature: [Signature] Date 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Cable Assemblies Design Change

72.48 Log No.: SE00073

D3-LY-4; 70/129;

ES199601368

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change which upgraded the lifting yoke cable assemblies to comply with ANSI N14.6-1986.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2, and Appendix A, Yoke System.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Cable Assemblies Design Change

72.48 Log No.: SE00073

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the lifting yoke cable assemblies design change. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The subject activity upgraded the four cable assemblies to comply with ANSI N14.6-1986. This change moved the turnbuckles to the bottom of the assemblies, replaced the lower connector with a jaw, replaced the upper connector with a shackle, and increased the cable size to 1/2" diameter 6x19 cable. The result of this change was that the yoke cable assemblies load rating increased. The cable assemblies were redesigned as a dual load path system with a design load of 7,900 pounds. In addition, each of cables were factory load tested to 6,000 pounds with a working load rating of 4,550 pounds, with a safety factor of 5:1. The function of the cable assemblies is to lift and transfer the shield plug during the DSC transfer and closure operations. This design change was fully evaluated and approved via calculation BGE001.0209, Revision 5. This design change does not adversely affect any hardware and does not affect any analytical conditions. Based on this information, the lifting yoke cable assemblies design change will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Cable Assemblies Design Change

72.48 Log No.: SE00073

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity upgraded the four cable assemblies to comply with ANSI N14.6-1986. This change moved the turnbuckles to the bottom of the assemblies, replaced the lower connector with a jaw, replaced the upper connector with a shackle, and increased the cable size to 1/2" diameter 6x19 cable. The result of this change was that the yoke cable assemblies load rating increased. The cable assemblies were redesigned as a dual load path system with a design load of 7,900 pounds. In addition, each of cables were factory load tested to 6,000 pounds with a working load rating of 4,550 pounds, with a safety factor of 5:1. The function of the cable assemblies is to lift and transfer the shield plug during the DSC transfer and closure operations. This design change was fully evaluated and approved via calculation BGE001.0209, Revision 5. This design change does not adversely affect any hardware and does not affect any analytical conditions. Based on this information, the lifting yoke cable assemblies design change will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a lifting yoke cable assemblies design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The lifting yoke cable assemblies design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Cable Assemblies Design Change

72.48 Log No.: SE00073

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ES199601368

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change which upgraded the lifting yoke cable assemblies to comply with ANSI N14.6-1986.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Fab Plate Max Thickness Non Conformance		72.48 Log No.: SE00074
D4-LY-1; 71/129;	ES199601368 Supplement 001	Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>[Signature]</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>[Signature]</u> 11/11/97 SIGNATURE / DATE
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Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M.A. Carr  
 INDEPENDENT REVIEWER

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11/12/97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135 Date: 11-26-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date: 11-26-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Fab Plate Max Thickness Non Conformance			72.48 Log No.: SE00074	
D4-LY-1; 71/129;	ES199601368	Supplement 001	Revision 0000	Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the lifting yoke identified during fabrication in which the plate used to fabricate the lifting yoke hooks and beams was oversized by 0.02".

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2, and Appendix A, Yoke System.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Fab Plate Max Thickness Non Conformance 72.48 Log No.: SE00074

D4-LY-1; 71/129; ES199601368 Supplement 001 Revision 0000 Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the lifting yoke fab plate non conformance. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The subject non conformance (Sulzer Bingham NCR No. 111319) identified the plate used to fabricate the lifting yoke hooks and beams was oversized by 0.02". The maximum allowable was 3.03" and the actual plate used was 3.05". The calculated stresses were reduced slightly by the oversized plate and the fit-up of the yoke with the cask was assured by testing. This non conformance does not adversely affect any hardware. This non conformance does not affect any analytical conditions. Based on this information, the lifting yoke fab plate non conformance will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this non conformance has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Fab Plate Max Thickness Non Conformance		72.48 Log No.: SE00074
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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance (Sulzer Bingham NCR No. 111319) identified the plate used to fabricate the lifting yoke hooks and beams was oversized by 0.02". The maximum allowable was 3.03" and the actual plate used was 3.05". The calculated stresses were reduced slightly by the oversized plate and the fit-up of the yoke with the cask was assured by testing. This non conformance does not adversely affect any hardware. This non conformance does not affect any analytical conditions. Based on this information, the lifting yoke fab plate non conformance will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this non conformance has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the possibility of a new malfunction.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. This proposed activity will not adversely affect the ability of the lifting yoke to perform its intended design function. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a lifting yoke fab plate non conformance. BGE approved this non conformance prior to the issuance of the ISFSI license in November, 1992. There is no change in the performance or in the operation of the lifting yoke as a result of this proposed activity. The lifting yoke fab plate non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. There is no change in the performance or in the operation of the lifting yoke as a result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Fab Plate Max Thickness Non Conformance			72.48 Log No.: SE00074	
D4-LY-1; 71/129;	ES199601368	Supplement 001	Revision 0000	Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the lifting yoke identified during fabrication in which the plate used to fabricate the lifting yoke hooks and beams was oversized by 0.02".

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Material Non Conformance

72.48 Log No.: SE00075

D4-LY-2; 72/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Date

Signature:

JCS-DES, GS-TES, or PE-PDSU

MICHAEL J. GAHAN III

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-135

Date: 11-26-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 11-24-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12/1/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

1/30/98

If yes, OSSRC Meeting No.: :

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Material Non Conformance

72.48 Log No.: SE00075

D4-LY-2; 72/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the lifting yoke bearing plate material identified during fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2, and Appendix A, Yoke System.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Material Non Conformance

72.48 Log No.: SE00075

D4-LY-2; 72/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the lifting yoke bearing plate material non conformance. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The subject non conformance (Sulzer Bingham NCR No. 111339) involved the use of an aluminum bronze tube for the lifting yoke bearing plates with an 8% aluminum content, while the allowable aluminum range was  $9\% \pm 1/2\%$ . The yield strength of the material is 24.1 ksi, which is slightly less than the 25 ksi required by ASTM B148. The bearing plates are used as a bearing surface only and are not in tension. Any tensile strength in the general range of aluminum bronze properties is acceptable. The bearing function and galling resistance are not affected by this minor out-of-specification condition. This non conformance does not adversely affect any hardware. This non conformance does not affect any analytical conditions. Based on this information, the lifting yoke bearing plate material non conformance will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this non conformance has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Material Non Conformance

72.48 Log No.: SE00075

D4-LY-2; 72/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance involved the use of an aluminum bronze tube for the lifting yoke bearing plates with an 8% aluminum content, while the allowable aluminum range was  $9\% \pm 1/2\%$ . The yield strength of the material is 24.1 ksi, which is slightly less than the 25 ksi required by ASTM B148. The bearing plates are used as a bearing surface only and are not in tension. Any tensile strength in the general range of aluminum bronze properties is acceptable. The bearing function and galling resistance are not affected by this minor out of specification condition. This non conformance does not adversely affect any hardware. This non conformance does not affect any analytical conditions. Based on this information, the lifting yoke bearing plate material non conformance will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this non conformance has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the possibility of a new malfunction.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. This proposed activity will not adversely affect the ability of the lifting yoke to perform its intended design function. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a lifting yoke bearing plate material non conformance. BGE approved this non conformance prior to the issuance of the ISFSI license in November, 1992. There is no change in the performance or in the operation of the lifting yoke as a result of this proposed activity. The lifting yoke bearing plate material non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. There is no change in the performance or in the operation of the lifting yoke as a result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Bearing Plate Material Non Conformance

72.48 Log No.: SE00075

D4-LY-2; 72/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the lifting yoke bearing plate material identified during fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification.
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Beams Maximum Spacing Non Conformance

72.48 Log No.: SE00076

D4-LY-3; 73/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.:

Date:

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.: .:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Beams Maximum Spacing Non Conformance 72.48 Log No.: SE00076

D4-LY-3; 73/129; ES199601368 Supplement 001 Revision 0000 Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the lifting yoke beams maximum spacing identified during fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. Those four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Lifting Yoke (Yoke) - the lifting yoke is a special lifting device consisting of an open hook design with two thick, high strength parallel lifting beams which is compatible with the single-failure-proof Spent Fuel Cask Handling Crane. The function of the yoke is to provide a means for performing all cask handling operations within the Auxiliary Building. The yoke engages the outer shoulder of the transfer cask lifting trunnions. It is designed to support a loaded transfer cask weighing up to 100 tons, and factory tested at three times its design load, or 300 tons. The lifting yoke has bolted connections to facilitate ease of maintenance. In addition, the lifting yoke is controlled by NUREG-0612 and is designed in accordance with Section 7 of ANSI N14.6-1986, and there are no structural welds requiring periodic inspection.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.4, 4.7, 5.1, 5.2, 7.4, 8.1, and 8.2, and Appendix A, Yoke System.

**ATTACHMENT 3, SAFETY EVALUATION FORM**

<b>ISFSI - Lifting Yoke Beams Maximum Spacing Non Conformance</b>			<b>72.48 Log No.: SE00076</b>	
<b>D4-LY-3; 73/129;</b>	<b>ES199601368</b>	<b>Supplement 001</b>	<b>Revision 0000</b>	<b>Page 3 of 5</b>

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of the lifting yoke beams maximum spacing non conformance. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. The subject non conformance (Sulzer Bingham NCR No. 111663) involves the maximum spacing of the lifting beams. The maximum spacing is 7.84", while the allowable spacing is 7.81". The deviation in the beam spacing is due to the waviness in the lifting beam plate material which is not machined on the surfaces. The deviations are local and do not affect the fit-up of the lifting hook plates or of the crane hook pin with the lifting beams. Based on this information, the lifting yoke beams maximum spacing non conformance will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this non conformance has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible malfunctions of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. None of the accident scenarios address the use of the lifting yoke in the Auxiliary Building.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. The single-failure-proof Spent Fuel Cask Handling Crane is not affected by this proposed activity. As stated above, there are no possible accidents of the lifting yoke which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Lifting Yoke Beams Maximum Spacing Non Conformance			72.48 Log No.: SE00076	
D4-LY-3; 73/129;	ES199601368	Supplement 001	Revision 0000	Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject non conformance involves the maximum spacing of the lifting beams. The maximum spacing is 7.84", while the allowable spacing is 7.81". The deviation in the beam spacing is due to the waviness in the lifting beam plate material which is not machined on the surfaces. The deviations are local and do not affect the fit-up of the lifting hook plates or of the crane hook pin with the lifting beams. This non conformance does not affect any analytical conditions. Based on this information, the lifting yoke beams maximum spacing non conformance will not affect the form, fit or function of the lifting yoke, is not detrimental to the structural integrity of the lifting yoke, and will not adversely affect the ability of the lifting yoke to perform its intended design function. Therefore, this non conformance has no detrimental impact on equipment important to safety. Since this activity has no impact on the lifting yoke or any other SSC, this activity would not increase the possibility of a new malfunction.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. This proposed activity will not adversely affect the ability of the lifting yoke to perform its intended design function. No new accident scenarios are created as the result of this proposed activity.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a lifting yoke beams maximum spacing non conformance. BGE approved this non conformance prior to the issuance of the ISFSI license in November, 1992. There is no change in the performance or in the operation of the lifting yoke as a result of this proposed activity. The lifting yoke beams maximum spacing non conformance does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. There is no change in the performance or in the operation of the lifting yoke as a result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**ATTACHMENT 3, SAFETY EVALUATION FORM**

<b>ISFSI - Lifting Yoke Beams Maximum Spacing Non Conformance</b>			<b>72.48 Log No.: SE00076</b>	
<b>D4-LY-3; 73/129;</b>	<b>ES199601368</b>	<b>Supplement 001</b>	<b>Revision 0000</b>	<b>Page 5 of 5</b>

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI non conformance that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a non conformance with the lifting yoke beams maximum spacing identified during fabrication.

**Reason for Activity:** This non conformance was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification.
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Air Flow

72.48 Log No.: SE00077

A-HSM-6; 74/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk J. E. Remeniuk  
PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04 Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Indv.: C. J. Dobry  
Work Group: PESResp. Indv.: R. H. Beall  
Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Date

Signature:

for GS-DEB, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend  
Approval ☒Recommend  
Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 12-1-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12-4-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Air Flow

72.48 Log No.: SE00077

A-HSM-6; 74/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses the air flow openings for the HSM.

**Reason for Activity:** This safety evaluation addresses a difference between the NRC SER and the ISFSI USAR in regard to Horizontal Storage Module (HSM) air flow. The SER states that air enters each HSM through two inlets. This differs from the USAR description which states that air enters each HSM through one inlet.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Air Flow

72.48 Log No.: SE00077

A-HSM-6; 74/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the identified difference between the NRC SER and the ISFSI USAR with regard to HSM air flow. The NRC SER states in Section 2.2.6.1.2 that each HSM has two air inlets. The ISFSI USAR states in Section 4.3.1 that each HSM has one air inlet. Both documents are in agreement that each HSM has two outlets and rely on convective cooling by natural circulation. BGE Dwg. No. 84-081-E, Rev. 0, HSM Concrete Sections, clearly indicates that there is only one air inlet per HSM. In addition, a site tour confirmed that, as constructed, there are one inlet and two outlets for each HSM. The justification for one air inlet and two air outlets can be found in the Pacific Nuclear Fuel Services calculation BGE001.0407. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. This clarification has no detrimental impact on equipment important to safety. Therefore, this clarification will not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. One accident scenario involves the complete and total blockage of the one air inlet and two air outlets for one HSM for a period of 48 hours, which would result in increased heating of the DSC and HSM due to loss of natural convection cooling. The justification for one air inlet and two air outlets can be found in the Pacific Nuclear Fuel Services calculation BGE001.0407. In addition, each HSM is monitored by security cameras, which looks at the inlets and outlets for any blockage. Any detected debris is removed by qualified site personnel. Also, ISFSI TS 3/4.4.1 requires, as a minimum, an inspection of the inlets and outlets every 24 hours to ensure that are free of obstructions when there is fuel in the HSM. And finally, the ISFSI perimeter fence and the separation of the air inlet from the air outlets, in addition to the other design features mentioned above, will ensure that the probability of occurrence of this accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, the blockage of air inlets and outlets accident scenario is not affected by this activity, and as such, the consequences of the accident as described in ISFSI USAR Section 8.2.7.3 would not be increased.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Air Flow

72.48 Log No.: SE00077

A-HSM-6; 74/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. After a thorough and intense review, it was concluded that this activity will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases

Discussion of why the margin of safety is not reduced

3/4.4

This technical specification addresses the maximum allowable temperature rise from the HSM inlet to the HSM outlets. The USAR surveillance requirement requires that each HSM be visually inspected every 24 hours to verify that the air inlet and outlets are free from obstructions when there is fuel in the HSM. The technical specification also allows temporary forced ventilation should the maximum allowable temperature rise be exceeded. The blockage of the air inlet and outlets accident scenario is not affected by this activity. As such, this proposed activity will not reduce this margin of safety.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. This clarification has no detrimental impact on equipment important to safety, and does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Air Flow

72.48 Log No.: SE00077

A-HSM-6; 74/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses the air flow openings for the HSM.

**Reason for Activity:** This safety evaluation addresses a difference between the NRC SER and the ISFSI USAR in regard to Horizontal Storage Module (HSM) air flow. The SER states that air enters each HSM through two inlets. This differs from the USAR description which states that air enters each HSM through one inlet.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Contact Dose Rates

72.48 Log No.: SE00078

A-HSM-7; 75/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations


- NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM 11/12/97  
SIGNATURE / DATE 11/10/97  
SIGNATURE / DATE 11/11/97  
SIGNATURE / DATE☒ Approved☐ Disapproved☒ Approved☐ DisapprovedSignature:  M. A. Carr  
INDEPENDENT REVIEWERDate: 11/12/97Signature:   
For GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
11-13-97  
Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97Recommend Approval ☒ Recommend Disapproval ☐Signature:  Date: 12-1-97  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature:  Date: 12/2/97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature:  Date: 1/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Contact Dose Rates

72.48 Log No.: SE00078

A-HSM-7; 75/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses Horizontal Storage Module (HSM) contact dose rate.

**Reason for Activity:** This safety evaluation addresses a difference between the NRC SER and the ISFSI USAR in regard to Horizontal Storage Module (HSM) air flow. The SER states that the design criterion for the contact dose rate on the HSM exterior surfaces (those surfaces away from the door) are less than the design for the NUHOMS-24P Topical Report. This differs from the USAR which states that the design criteria is the same as the NUHOMS-24P Topical Report.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Contact Dose Rates

72.48 Log No.: SE00078

A-HSM-7; 75/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the identified difference between the NRC SER and the ISFSI USAR with regard to HSM contact dose rate. The NRC SER states in Section 2.2.8.1 that the design criteria for the contact dose rate on the HSM exterior surfaces away from the door or penetrations is 15 mrem/hr or less, which is less than the Topical Report which cited 20 mrem/hr. The ISFSI USAR states in Section 7.1.2 that the Topical Report contact dose rate is used. The justification for this difference is that this HSM design was used by BGE to ensure consistency with the NRC approved Topical Report. The Topical Report is the design basis used in preparation of the CCNPP site specific ISFSI USAR. This contact rate was selected to maintain ALARA exposure to the general public and to on-site personnel working around the HSM. There was no justification provided in the NRC SER for their more conservative 15 mrem/hr contact dose rate. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. This clarification has no detrimental impact on equipment important to safety. Therefore, this clarification will not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this difference between the NRC SER and the ISFSI USAR. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM, and as such, the consequences of an accident would not be increased.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Contact Dose Rates

72.48 Log No.: SE00078

A-HSM-7; 75/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. After a thorough and intense review, it was concluded that this activity will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

2.4 This technical specification states the contact dose rate on the surface of the HSM sides shall not exceed 20 mrem/hr. Since this activity is a clarification of the 20 mrem/hr contact dose rate and no physical changes will occur as a result of this activity, the margin of safety is not reduced.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. This clarification has no detrimental impact on equipment important to safety, and does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. This ISFSI change does not involve the ISFSI Updated Environmental Report or deal with any environmental issues.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Contact Dose Rates

72.48 Log No.: SE00078

A-HSM-7; 75/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses Horizontal Storage Module (HSM) contact dose rate.

**Reason for Activity:** This safety evaluation addresses a difference between the NRC SER and the ISFSI USAR in regard to Horizontal Storage Module (HSM) air flow. The SER states that the design criterion for the contact dose rate on the HSM exterior surfaces (those surfaces away from the door) are less than the design for the NUHOMS-24P Topical Report. This differs from the USAR which states that the design criteria is the same as the NUHOMS-24P Topical Report.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforced Concrete Load Combinations

72.48 Log No.: SE00079

A-HSM-9; 76/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>[Signature]</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>[Signature]</u> 11/11/97 SIGNATURE / DATE
--	---	---

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M. A. Carr  
 INDEPENDENT REVIEWER

Date 11/13/97

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
 11-14-97

Date 11-14-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforced Concrete Load Combinations

72.48 Log No.: SE00079

A-HSM-9; 76/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses Horizontal Storage Module (HSM) reinforced concrete load combinations.

**Reason for Activity:** This safety evaluation addresses a difference between the NRC SER and the ISFSI USAR in regard to Horizontal Storage Module (HSM) reinforced concrete load combinations.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforced Concrete Load Combinations

72.48 Log No.: SE00079

A-HSM-9; 76/129;

ES199601368

Supplement 001

Revision 0000

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the identified difference between the NRC SER and the ISFSI USAR with regard to HSM reinforced concrete load combinations. The NRC SER states in Table 2.2.3-1 omission of an ANSI 57.9 load combination is not acceptable unless tornado missile loadings and a drop of the HSM access door are acceptably analyzed. The omitted load combination of ANSI 57.9, Paragraph 6.17.3.1(f) is  $D+L+H+T+A$ , where  $D$ = Dead Weight  $\times 1.05$ ,  $L$ = Live Load,  $H$ = Lateral Soil Pressure Loads,  $T$ = Normal Condition Thermal Load,  $A$ = Accident (e.g. drop accident). The SER also states that the HSM load combinations shown in the SAR are considered to be acceptable, except that tornado missile forces are not included. These forces are of the nature of other "accident" forces and could therefore be treated by substituting the missile impact forces (with appropriate dynamic analysis) for the  $E$ , or earthquake, in load combination 5 and 6. Based on the following acceptable substitutions for current approved SAR load combination calculations,  $W$  (tornado wind loads) can be used as an accident load, or  $A$ . Currently, combination 3,4 of the ISFSI USAR (table 8.2-11) is:  $0.75(1.4D + 1.7L + 1.7H + 1.7T + 1.7W) = 1.05D + 1.275L + 1.275H + 1.275T + 1.275W$ . Substitute  $A$  for  $W$  and the result is:  $1.05D + 1.275L + 1.275H + 1.275T + 1.275A$ , which exceeds the load combination omitted in the ISFSI USAR of  $D + L + H + T + A$ . Also, substituting  $A$  (accident load) for  $E$  (earthquake load) in combination 5,6 (of ISFSI USAR table 8.2-11) will yield the omitted load combination as well. The SER also states that the SAR is very conservative in that combining forces, all forces are assumed to be positive and additive regardless of point and direction of occurrence in the structural component. The (NRC) staff does not consider that this method of load combination is necessary for the monolithic HSM since: (1) multiple concurrent missile strikes need not be assumed, and (2) the analysis of resistance capability does not include the capability of adjacent members to assume load on any initiation of yield in a single wall or roof panel. As a result, the treatment of the tornado missile forces is considered to be acceptable. Although the ISFSI USAR does not list the ANSI 57.9 Load Combination calculation for tornado missile loading, based on the above analysis, it can be seen that tornado missile loading is in fact analyzed in the ISFSI USAR. The omission of the load combination is covered by enveloping NRC approved allowable substitutions. Additionally, the HSM has been analyzed to withstand tornado wind loads and tornado generated missiles (reference ISFSI USAR section 8.2.2.2.A). Therefore, the HSM Enveloping Load Calculation Results found in the ISFSI USAR in Table 8.2-11 are acceptable for analyzing tornado missile loadings. The SER also states that the HSM structural design criteria, the load combinations, and the final design of the HSM as represented in the current docketed material is considered to be structurally acceptable.

The HSM access door was analyzed and documented in section 8.1.1.6 of the Topical Report, which is referenced in section 8.1.1.6 of the ISFSI USAR. This section of the Topical Report discusses that the door was designed for the worst normal operating load, which was assumed to be three times the dead weight of the door acting on the bottom angle section of the door frame. The normal operating loads on the door are much lower than the design allowables. Additionally, the HSM door is designed to withstand tornado wind loads and tornado generated missiles (reference ISFSI USAR section 8.2.2.2.C and Topical Report section 8.2.2.2.C). The above is an acceptable analysis for design of the HSM access door.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforced Concrete Load Combinations

72.48 Log No.: SE00079

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This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM. This clarification has no detrimental impact on equipment important to safety. Therefore, this clarification will not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this difference between the NRC SER and the ISFSI USAR. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. This safety evaluation clarifies an existing condition and does not change the original design or operation of the HSM, and as such, the consequences of the accident would not be increased.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforced Concrete Load Combinations

72.48 Log No.: SE00079

A-HSM-9; 76/129;

ES199601368

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**Complete for 72.48:**

NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

A significant increase in occupational dose will not occur as a result of this proposed activity. This Safety Evaluation clarifies an existing condition and does not change the original design or operation of the HSM. This clarification has no detrimental impact on equipment important to safety, and does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

A significant unreviewed environmental impact will not occur as the result of this proposed activity. This ISFSI change does not affect the ISFSI Updated Environmental Report or deal with any environmental issues.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To reconcile one identified difference between the NRC Safety Evaluation Report (SER) and the BGE Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). This particular safety evaluation addresses Horizontal Storage Module (HSM) reinforced concrete load combinations.

**Reason for Activity:** This safety evaluation addresses a difference between the NRC SER and the ISFSI USAR in regard to Horizontal Storage Module (HSM) reinforced concrete load combinations.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Shield Heat Bolts Design Change

72.48 Log No.: SE00080

D3-HSM-1; 77/129;

ES199601368

Supplement 001

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk JER  
PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04 Date: 11.7.97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFMNatasha Tesfaye 11/12/97  
SIGNATURE / DATEC. J. Dobry 11/10/97  
SIGNATURE / DATER. H. Beall 11/11/97  
SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: M. A. Carr  
INDEPENDENT REVIEWERSignature: Michael J. Gahan  
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
Date: 11-13-97

Date: 11/13/97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12.1.97

Recommend Approval / Recommend DisapprovalSignature: J. Carr Date: 12-1-97  
POSRC CHAIRMANApproved / DisapprovedSignature: P. K. E. D. Date: 12/4/97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No XSignature: J. R. Simon Date: 1/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Shield Heat Bolts Design Change

72.48 Log No.: SE00080

D3-HSM-1; 77/129;

ES199601368

Supplement 001

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) roof heat shield bolts.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Shield Heat Bolts Design Change

72.48 Log No.: SE00080

D3-HSM-1; 77/129;

ES199601368

Supplement 001

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the roof heat shield bolts design change. The subject activity changed the roof heat shield bolts from 48-1/2" diameter Maxibolts to 48-1/4" diameter Hilti Kwik bolts, which was documented in the heat shield details. The Hilti Kwik bolts are shown to be an acceptable substitution in calculation BGE001.0214. A review of that calculation shows that the maximum tensile load on the roof panels is only 49 lbs., and there are no calculated shear loads. Since the chosen Hilti Kwik bolts have an allowable tension of 520 lbs. and allowable shear of 470 lbs., there is adequate margin to support the total weight of the heat shield panels. The function of the heat shield panels is to reduce the HSM roof temperature to within acceptable limits for all conditions. Based on this information, the subject design change will not affect the form, fit or function of the HSM roof or roof shield, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. One accident scenario involves the loss of both air outlet shielding blocks from the top of one HSM. The Calvert Cliffs air outlet shielding blocks are designed to remain in place and withstand all design events including the effects of tornado missiles, and as such, this accident event is not applicable to Calvert Cliffs. This accident scenario is not affected by this design change, thus the probability of occurrence of this accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, the loss of both air outlet shielding blocks from the top of one HSM is not applicable to Calvert Cliffs, and as such, the consequences of the accident would not be increased.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Shield Heat Bolts Design Change

72.48 Log No.: SE00080

D3-HSM-1; 77/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed the roof heat shield bolts from 48-1/2" diameter Maxibolts to 48-1/4" diameter Hilti Kwik bolts, which was documented in the heat shield details. The Hilti Kwik bolts are shown to be an acceptable substitution in calculation BGE001.0214. A review of that calculation shows that the maximum tensile load on the roof panels is only 49 lbs., and there are no calculated shear loads. Since the chosen Hilti Kwik bolts have an allowable tension of 520 lbs. and allowable shear of 470 lbs., there is adequate margin to support the total weight of the heat shield panels. The function of the heat shield panels is to reduce the HSM roof temperature to within acceptable limits for all conditions. Based on this information, the subject design change will not affect the form, fit or function of the HSM roof or roof shield, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. The subject design change will not affect the form, fit or function of the HSM roof or roof shield, and as such, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a roof heat shield bolts design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The roof heat shield bolts design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Shield Heat Bolts Design Change		72.48 Log No.: SE00080	
D3-HSM-1; 77/129;	ES199601368	Supplement 001	Revision 0000 Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) roof heat shield bolts.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Temporary Hand Rails

72.48 Log No.: SE00081

D3-HSM-2; 78/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

FOR CS-DES, CS-TES, or PE-PDSU

MICHAEL J. GAHANT II

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.:

97-136

Date:

12-1-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 12-1-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12/4/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

1/30/98

If yes, OSSRC Meeting No.: .:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Temporary Hand Rails

72.48 Log No.: SE00081

D3-HSM-2; 78/129;

ES199601368

Supplement 001

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) temporary hand rails.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Temporary Hand Rails

72.48 Log No.: SE00081

D3-HSM-2; 78/129;

ES199601368

Supplement 001

Revision 0000

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no malfunctions of the HSM which are described or evaluated in the USAR as a result of the temporary hand rails design change. The subject activity added embedded angles for temporary hand rails. The temporary hand rails are non-safety related and have been added as an upgrade to the HSM for personnel safety. The hand rails are 8'-0" on center with each 6" x 6" x 3/4" angle embedment plate anchored with four 1/2" diameter x 3-1/8" long Nelson studs. The location of the 24 embedments is shown on drawings 84-080-E and 84-095-E. Passive additions to concrete are within ACI Code practices. The embedded angles were added as permanent fixtures during the construction phase, whereas the handrails are inserted at locations on a temporary basis whenever personnel safety is required (i.e. roof inspections, etc.). Based on this information, the subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. The subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no accidents to consider, and as such, the consequences of an accident would not be increased.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Temporary Hand Rails

72.48 Log No.: SE00081

D3-HSM-2; 78/129;

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Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added embedded angles for temporary hand rails. The temporary hand rails are non-safety related and have been added as an upgrade to the HSM for personnel safety. The hand rails are 8'-0" on center with each 6" x 6" x 3/4" angle embedment plate anchored with four 1/2" diameter x 3-1/8" long Nelson studs. The location of the 24 embedments is shown on drawings 84-080-E and 84-095-E. Passive additions to concrete are within ACI Code practices. The embedded angles were added as permanent fixtures during the construction phase, whereas the handrails are inserted at locations on a temporary basis whenever personnel safety is required (i.e. roof inspections, etc.). Based on this information, the subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a temporary hand rails design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The temporary hand rails design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Temporary Hand Rails

72.48 Log No.: SE00081

D3-HSM-2; 78/129;

ES199601368

Supplement 001

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**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) temporary hand rails.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Secondary Roof Slopes in Front of Outlet Vents

72.48 Log No.: SE00082

D3-HSM-3; 79/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHARTII

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 12-1-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12/4/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: .:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Secondary Roof Slopes in Front of Outlet Vents			72.48 Log No.: SE00082	
D3-HSM-3; 79/129;	ES199601368	Supplement 001	Revision 0000	Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) secondary roof slopes.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Secondary Roof Slopes in Front of Outlet Vents		72.48 Log No.: SE00082	
D3-HSM-3; 79/129;	ES199601368	Supplement 001	Revision 0000 Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the secondary roof slope design change. The subject activity removed the secondary roof slopes from the outlet vents. The original intent of the secondary slopes was to prevent water from entering the outlet vents. However, the outlet vents are nominally 5-1/2" above the primary roof surface. The elevation difference, along with the primary roof slope, prevents water from entering the vents. This design change simplified the roof construction by removing the unnecessary secondary roof slopes. Based on this information, the subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. One accident scenario involves the loss of both air outlet shielding blocks from the top of one HSM. The Calvert Cliffs air outlet shielding blocks are designed to remain in place and withstand all design events including the effects of tornado missiles, and as such, this accident event is not applicable to Calvert Cliffs. This accident scenario is not affected by this design change, thus the probability of occurrence of this accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, the loss of both air outlet shielding blocks from the top of one HSM is not applicable to Calvert Cliffs, and as such, the consequences of the accident would not be increased.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Secondary Roof Slopes in Front of Outlet Vents		72.48 Log No.: SE00082	
D3-HSM-3; 79/129;	ES199601368	Supplement 001	Revision 0000 Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity removed the secondary roof slopes from the outlet vents. The original intent of the secondary slopes was to prevent water from entering the outlet vents. However, the outlet vents are nominally 5-1/2" above the primary roof surface. The elevation difference, along with the primary roof slope, prevents water from entering the vents. This design change simplified the roof construction by removing the unnecessary secondary roof slopes. Based on this information, the subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. The subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a secondary roof slope design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The secondary roof slope design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Secondary Roof Slopes in Front of Outlet Vents			72.48 Log No.: SE00082	
D3-HSM-3; 79/129;	ES199601368	Supplement 001	Revision 0000	Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) secondary roof slopes.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Finish Requirements

72.48 Log No.: SE00083

D3-HSM-4; 80/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11.7.97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>[Signature]</u> 11/12/97 SIGNATURE / DATE	<u>[Signature]</u> 11/10/97 SIGNATURE / DATE	<u>[Signature]</u> 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: Malcolm M.A. Carr  
 INDEPENDENT REVIEWER

Date 11/13/97

Signature: Michael J. Gahan  
 for CS-DESIGS-TES, or PE-PDSU  
 MICHAEL J. GAHAN, III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12.1.97

Recommend ☒ Approval  
 Recommend ☐ Disapproval

Signature: [Signature] Date 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. R. Lemmon Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Finish Requirements

72.48 Log No.: SE00083

D3-HSM-4; 80/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) roof finish requirements.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Finish Requirements

72.48 Log No.: SE00083

D3-HSM-4; 80/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the roof finish requirements design change. The subject activity clarified the roof finish requirements and provided a non-slip finish for safety. The design change was made to reduce the injury potential of personnel working on the HSM roof. The roof's formed surfaces meet the requirements of ACI 301-84, section 10.2. The roof slab is float finished in accordance with the requirements of ACI 301-84, section 11.7.2. ACI 301-84 is the specification for structural concrete for buildings. Based on this information, the subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. One accident scenario involves the loss of both air outlet shielding blocks from the top of one HSM. The Calvert Cliffs air outlet shielding blocks are designed to remain in place and withstand all design events including the effects of tornado missiles, and as such, this accident event is not applicable to Calvert Cliffs. This accident scenario is not affected by this design change, thus the probability of occurrence of this accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, the loss of both air outlet shielding blocks from the top of one HSM is not applicable to Calvert Cliffs, and as such, the consequences of the accident would not be increased.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Finish Requirements

72.48 Log No.: SE00083

D3-HSM-4; 80/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity clarified the roof finish requirements and provided a non-slip finish for safety. The design change was made to reduce the injury potential of personnel working on the HSM roof. The roof's formed surfaces meet the requirements of ACI 301-84, section 10.2. The roof slab is float finished in accordance with the requirements of ACI 301-84, section 11.7.2. ACI 301-84 is the specification for structural concrete for buildings. Based on this information, the subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. The subject design change will not affect the form, fit or function of the HSM roof, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a roof finish requirements design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The roof finish requirements design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof Finish Requirements

72.48 Log No.: SE00083

D3-HSM-4; 80/129;

ES199601368

Supplement 001

Revision 0000

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) roof finish requirements.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Inlet &amp; Outlet Screens

72.48 Log No.: SE00084

D3-HSM-5; 81/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-14-97

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend  
 Approval

Recommend  
 Disapproval

Signature:

POSRC CHAIRMAN

Date 12-1-97

Approved

Disapproved

Signature:

PLANT GENERAL MANAGER

Date 12/4/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No X

Signature:

OSSRC SES CHAIRMAN

Date:

11/30/98

If yes, OSSRC Meeting No.: .:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Inlet &amp; Outlet Screens

72.48 Log No.: SE00084

D3-HSM-5; 81/129;

ES199601368

Supplement 001

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) inlet and outlet screens.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Inlet &amp; Outlet Screens

72.48 Log No.: SE00084

D3-HSM-5; 81/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the inlet and outlet screens design change. The subject activity added security/bird screens on the inlet and outlet vents. The intent of this design change is to reduce the amount of debris within the HSM and help maintain security within the ISFSI. The design change added angle frames, an intrusion screen, and an insect screen to the inlet and outlet openings. The security/bird screens include a 16 x 16 SS mesh insect screen separated from a 1" x 1/8" bar grating security/bird screen by at least 1/2". The effect of the screens on the air flow through the HSM is that the DSC shell temperature will increase slightly. As determined in calculation BGE001.0409, the increase will range from 0.3°F to 2.5°F for all ambient temperatures. The temperature increase will have negligible impact on the HSM concrete and fuel cladding temperatures (Concrete normal temperature will increase from 150°F to 153°F, and the off-normal temperature will increase from 194°F to 197°F. Per ACI 349-90, the normal allowable temperature is 200°F, and the off-normal allowable temperature is 350°F. For fuel cladding, normal temperature will increase from 618°F to 621°F, and the off-normal temperature will increase from 732°F to 735°F. Per calculation BGE001.0403, the normal allowable and the off-normal allowable temperature is 1058°F). Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. One accident scenario involves the complete and total blockage of the one air inlet and two air outlets for one HSM for a period of 48 hours, which would result in increased heating of the DSC and HSM due to loss of natural convection cooling. The justification for one air inlet and two air outlets can be found in the Pacific Nuclear Fuel Services calculation BGE001.0407. In addition, each HSM is monitored by security cameras, which looks at the inlets and outlets for any blockage. Any detected debris is removed by qualified site personnel. In addition, ISFSI TS 3/4.4.1 requires, as a minimum, an inspection of the inlets and outlets every 24 hours to ensure that are free of obstructions when there is fuel in the HSM. The addition of the screens will affect the air flow through the HSM in that the DSC shell temperature will increase slightly. As determined in calculation BGE001.0409, the increase will range from 0.3°F to 2.5°F for all ambient temperatures. The temperature increase will have negligible impact on the HSM concrete and fuel cladding temperatures. This will not increase the probability of complete and total blockage, however, in that the design features as mentioned above, in addition to an ISFSI perimeter fence and the separation of the air inlet from the



**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - HSM Inlet & Outlet Screens****72.48 Log No.: SE00084****D3-HSM-5; 81/129;****ES199601368****Supplement 001****Revision 0000****Page 4 of 5**

from the air outlets, will ensure that the probability of occurrence of this accident previously evaluated in the SAR will not be increased as a result of this activity.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, the blockage of air inlets and outlets accident scenario is not affected by this activity, and as such, the consequences of the accident as described in ISFSI USAR Section 8.2.7.3 would not be increased.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added security/bird screens on the inlet and outlet vents. The intent of this design change is to reduce the amount of debris within the HSM and help maintain security within the ISFSI. The design change added angle frames, an intrusion screen, and an insect screen to the inlet and outlet openings. The security/bird screens include a 16 x 16 SS mesh insect screen separated from a 1" x 1/8" bar grating security/bird screen by at least 1/2". The effect of the screens on the air flow through the HSM is that the DSC shell temperature will increase slightly. As determined in calculation BGE001.0409, the increase will range from 0.3°F to 2.5°F for all ambient temperatures. The temperature increase will have negligible impact on the HSM concrete and fuel cladding temperatures. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

<u>Bases</u>	<u>Discussion of why the margin of safety is not reduced</u>
--------------	--

3/4.4	This technical specification addresses the maximum allowable temperature rise from the HSM inlet to the HSM outlets. The USAR surveillance requirement requires that each HSM be visually inspected every 24 hours to verify that the air inlet and outlets are free from obstructions when there is fuel in the HSM. The technical specification also allows temporary forced ventilation should the maximum allowable temperature rise be exceeded. The blockage of the air inlet and outlets accident scenario is not affected by this activity. As such, this proposed activity will not reduce this margin of safety.
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After a thorough review, it was concluded that this activity would reduce the margin of safety as defined in the basis for any ISFSI Technical Specification.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Inlet &amp; Outlet Screens

72.48 Log No.: SE00084

D3-HSM-5; 81/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Complete for 72.48:**

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a inlet and outlet screens design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The inlet and outlet screens design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) inlet and outlet screens.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Cask Restraint Design Change

72.48 Log No.: SE00085

D3-HSM-6; 82/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

[Signature] 11/14/97  
 SIGNATURE / DATE

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M. A. CARR  
 INDEPENDENT REVIEWER

Date: 11/14/97

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-14-97

Date: 11-14-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend  
 Approval ✓

Recommend  
 Disapproval \_\_\_\_\_

Signature: [Signature] Date: 12-1-97  
 POSRC CHAIRMAN

Approved ✓ Disapproved \_\_\_\_\_

Signature: [Signature] Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No X

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: : \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Cask Restraint Design Change

72.48 Log No.: SE00085

D3-HSM-6; 82/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) cask restraint.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Cask Restraint Design Change

72.48 Log No.: SE00085

D3-HSM-6; 82/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the cask restraint design change. The subject activity replaced the cask restraint eyebolt and modified the HSM block out for the TC restraint. The block outs were changed from 9" tall trapezoids to 7-7/8" tall triangles. The eyebolts were changed from 2" diameter ASTM A-489 with a rated capacity of 26,000 lbs. to a 1-1/2" diameter turnbuckle eye with a jam nut with a safe working load of 21,400 lbs. and a safety factor of 5 to the ultimate load. The length of the embedded rod was reduced from 36" to 23" (This change in embedment length met the requirements of ACI 349-90, Appendix B - Steel Embedments). In addition, Calculation BGE001.0220, HSM Cask Restraint, confirmed the adequacy of this design change. The intent of the design change was to correct a clearance problem with the TC / HSM restraint. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios involve the HSM cask restraint.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Cask Restraint Design Change

72.48 Log No.: SE00085

D3-HSM-6; 82/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity replaced the cask restraint eyebolt and modified the HSM block out for the TC restraint. The block outs were changed from 9" tall trapezoids to 7-7/8" tall triangles. The eyebolts were changed from 2" diameter ASTM A-489 with a rated capacity of 26,000 lbs. to a 1-1/2" diameter turnbuckle eye with a jam nut with a safe working load of 21,400 lbs. and a safety factor of 5 to the ultimate load. The length of the embedded rod was reduced from 36" to 23" (This change in embedment length met the requirements of ACI 349-90, Appendix B - Steel Embedments). In addition, Calculation BGE001.0220, HSM Cask Restraint, confirmed the adequacy of this design change. The intent of the design change was to correct a clearance problem with the TC / HSM restraint. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a cask restraint design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The cask restraint design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Cask Restraint Design Change

72.48 Log No.: SE00085

D3-HSM-6; 82/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) cask restraint.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Slab Edge Bars

72.48 Log No.: SE00086

D3-HSM-7; 83/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk JER Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

G. Tesfaye 11/10/97  
 SIGNATURE / DATE

C. J. Dobry 11/10/97  
 SIGNATURE / DATE

R. H. Beall 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: M. A. Carr  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11/13/97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: J. E. Remeniuk Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: P. K. ... Date: 11/14/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: M. J. Lemone Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Slab Edge Bars

72.48 Log No.: SE00086

D3-HSM-7; 83/129;

ES199601368

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) slab edge bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Slab Edge Bars

72.48 Log No.: SE00086

D3-HSM-7; 83/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no malfunctions of the HSM which are described or evaluated in the USAR as a result of the slab edge bars design change. The subject activity allowed the slab edge bars to be placed on either side of the #10 main bars to maintain 2" minimum cover. This design change simplified the construction of the HSM. It meets the minimum concrete slab cover requirements of ACI 318-89, section 7.7.1, which states that reinforcing bars No. 6 through No. 18 that reinforce concrete exposed to the earth or weather require a minimum concrete cover of 2 inches. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Slab Edge Bars

72.48 Log No.: SE00086

D3-HSM-7; 83/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity allowed the slab edge bars to be placed on either side of the #10 main bars to maintain 2" minimum cover. This design change simplified the construction of the HSM. It meets the minimum concrete slab cover requirements of ACI 318-89, section 7.7.1, which states that reinforcing bars No. 6 through No. 18 that reinforce concrete exposed to the earth or weather require a minimum concrete cover of 2 inches. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a slab edge bars design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The slab edge bars design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Slab Edge Bars

72.48 Log No.: SE00086

D3-HSM-7; 83/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) slab edge bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Welded Wire Fabric Design Change

72.48 Log No.: SE00087

D3-HSM-8; 84/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk JER Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>G. Tesfaye 11/12/97</u> SIGNATURE / DATE	<u>C. J. Dobry 11/10/97</u> SIGNATURE / DATE	<u>R. H. Beall 11/11/97</u> SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: M. A. Carr  
 INDEPENDENT REVIEWER

Date 11/13/97

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III

Date 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend Approval / Recommend Disapproval

Signature: J. E. Remeniuk Date 12-1-97  
 POSRC CHAIRMAN

Approved ✓ Disapproved

Signature: P. K. D. Date 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No X

Signature: J. E. Remeniuk Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Welded Wire Fabric Design Change

72.48 Log No.: SE00087

D3-HSM-8; 84/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) welded wire fabric.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Welded Wire Fabric Design Change

72.48 Log No.: SE00087

D3-HSM-8; 84/129;

ES199601368

Supplement 001

Revision 0000

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no malfunctions of the HSM which are described or evaluated in the USAR as a result of the welded wire fabric design change. The subject activity allowed the use of an alternate wire mesh (WWF 6x6-D10xD10 deformed bar) instead of the original mesh wire (WWF 6x6-W10xW10) called out in the plan views of the roof vent cover. This design change was incorporated because the alternate wire mesh has better bend characteristics and is more easily obtained. Per ACI 439.4R (Steel Reinforcement - Physical Properties and U.S. Availability), both wire meshes have the same reinforcing characteristics for the concrete. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Welded Wire Fabric Design Change

72.48 Log No.: SE00087

D3-HSM-8; 84/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity allowed the use of an alternate wire mesh (WWF 6x6-D10xD10 deformed bar) instead of the original mesh wire (WWF 6x6-W10xW10) called out in the plan views of the roof vent cover. This design change was incorporated because the alternate wire mesh has better bend characteristics and is more easily obtained. Per ACI 439.4R (Steel Reinforcement - Physical Properties and U.S. Availability), both wire meshes have the same reinforcing characteristics for the concrete. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a welded wire fabric design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The welded wire fabric design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Welded Wire Fabric Design Change			72.48 Log No.: SE00087	
D3-HSM-B; 84/129;	ES199601368	Supplement 001	Revision 0000	Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) welded wire fabric.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Rotation

72.48 Log No.: SE00088

D3-HSM-9; 85/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Date

Signature:

For GS-DES, GS-TES, or PE-PDSU

MICHAEL J. GAHAN III

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend  
ApprovalRecommend  
Disapproval

Signature:

POSRC CHAIRMAN

Date 12-1-97

Approved

Disapproval

Signature:

PLANT GENERAL MANAGER

Date 12/4/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes No X

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Rotation

72.48 Log No.: SE00088

D3-HSM-9; 85/129;

ES199601368

Supplement 001

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Rotation

72.48 Log No.: SE00088

D3-HSM-9; 85/129;

ES199601368

Supplement 001

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC46 bar rotation design change. The subject activity allows an alternative 180 degree rotation of the 10CC46 reinforcing bar so that the 45 degree bends are located over the wall concrete sections. The change made to simplify construction, and the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. The design change made to simplify construction, and the area of steel reinforcement remains the same. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Rotation

72.48 Log No.: SE00088

D3-HSM-9; 85/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity allows an alternative 180 degree rotation of the 10CC46 reinforcing bar so that the 45 degree bends are located over the wall concrete sections. The change made to simplify construction, and the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC46 bar rotation design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC46 bar rotation design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Rotation

72.48 Log No.: SE00088

D3-HSM-9; 85/129;

ES199601368

Supplement 001

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Splice Length

72.48 Log No.: SE00089

D3-HSM-10; 86/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

[Signature] 11/12/97  
 SIGNATURE / DATE

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M. A. CARP  
 INDEPENDENT REVIEWER

Date: 11/14/97

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU

MICHAEL J. GAHAN III  
11-14-97

Date: 11-14-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Splice Length

72.48 Log No.: SE00089

D3-HSM-10; 86/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - HSM 10CC47 Bar Splice Length****72.48 Log No.: SE00089****D3-HSM-10; 86/129;****ES199601368****Supplement 001****Revision 0000****Page 3 of 5****Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC47 bar splice length design change. The subject activity allowed the 10CC47 splice length to be reduced by 12", if required, to provide the 2" minimum concrete cover. In addition, the excess length of the bar splices were removed to ease construction congestion. It meets the minimum concrete slab cover requirements of ACI 318-89, which states that reinforcing bars No. 6 through No. 18 that reinforce concrete exposed to the earth or weather require a minimum concrete cover of 2 inches. It also meets the ACI 318-89 splice requirements for reinforcing steel. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Splice Length

72.48 Log No.: SE00089

D3-HSM-10; 86/129;

ES199601368

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Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity allowed the 10CC47 splice length to be reduced by 12", if required, to provide the 2" minimum concrete cover. In addition, the excess length of the bar splices were removed to ease construction congestion. It meets the minimum concrete slab cover requirements of ACI 318-89, which states that reinforcing bars No. 6 through No. 18 that reinforce concrete exposed to the earth or weather require a minimum concrete cover of 2 inches. It also meets the ACI 318-89 splice requirements for reinforcing steel. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC47 bar splice length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC47 bar splice length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Splice Length			72.48 Log No.: SE00089	
D3-HSM-10; 86/129;	ES199601368	Supplement 001	Revision 0000	Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Rotation

72.48 Log No.: SE00090

D3-HSM-11; 87/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 12-1-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12-1-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Rotation

72.48 Log No.: SE00090

D3-HSM-11; 87/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Rotation

72.48 Log No.: SE00090

D3-HSM-11; 87/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC47 bar rotation design change. The subject activity allows an alternative 90 degree rotation of the 10CC47 reinforcing bar to simplify construction, while the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Rotation

72.48 Log No.: SE00090

D3-HSM-11; 87/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity allows an alternative 90 degree rotation of the 10CC47 reinforcing bar to simplify construction, while the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC47 bar rotation design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC47 bar rotation design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 Bar Rotation

72.48 Log No.: SE00090

D3-HSM-11; 87/129;

ES199601368

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**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Bend

72.48 Log No.: SE00091

D3-HSM-12; 88/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>[Signature]</u> 11/12/97 SIGNATURE / DATE	<u>[Signature]</u> 11/10/97 SIGNATURE / DATE	<u>[Signature]</u> 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M.A. CACE  
 INDEPENDENT REVIEWER

Date: 11/14/97

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHANE III  
 11-14-97

Date: 11-14-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Bend

72.48 Log No.: SE00091

D3-HSM-12; 88/129;

ES199601368

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Bend

72.48 Log No.: SE00091

D3-HSM-12; 88/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC46 bar bend design change. The subject activity allows the 10CC46 reinforcing bar to be bent to clear 10CC7 dowels or cut and spliced to 10CC7 dowels, if required for installation. It meets the ACI 318-89 bend and splice requirements for reinforcing steel. The change was made to simplify construction, and the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Bend

72.48 Log No.: SE00091

D3-HSM-12; 88/129;

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity allows the 10CC46 reinforcing bar to be bent to clear 10CC7 dowels or cut and spliced to 10CC7 dowels, if required for installation. It meets the ACI 318-89 bend and splice requirements for reinforcing steel. The change was made to simplify construction, and the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC46 bar bend design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC46 bar bend design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC46 Bar Bend

72.48 Log No.: SE00091

D3-HSM-12; 88/129;

ES199601368

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**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Location Change

72.48 Log No.: SE00092

D3-HSM-13; 89/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU

MICHAEL J. GATIANI

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 12-1-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12/4/97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

11/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Location Change

72.48 Log No.: SE00092

D3-HSM-13; 89/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Location Change

72.48 Log No.: SE00092

D3-HSM-13; 89/129;

ES199601368

Supplement 001

Revision 0000

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC7 bar location design change. The subject activity revised the location of the 10CC7 reinforcing bars in corners at elevation 114'-0". This change made to simplify HSM construction and does not affect the HSM design. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Location Change

72.48 Log No.: SE00092

D3-HSM-13; 89/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity revised the location of the 10CC7 reinforcing bars in corners at elevation 114'-0". This change made to simplify HSM construction and does not affect the HSM design. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC7 bar location design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC7 bar location design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Location Change

72.48 Log No.: SE00092

D3-HSM-13; 89/129;

ES199601368

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Dowel Length

72.48 Log No.: SE00093

D3-HSM-14; 90/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>[Signature]</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>[Signature]</u> 11/11/97 SIGNATURE / DATE
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<input checked="" type="radio"/> Approved Signature: <u>[Signature]</u> m.a. cace INDEPENDENT REVIEWER Date: <u>11/13/97</u>	<input type="radio"/> Disapproved Signature: <u>[Signature]</u> for CS-DES, CS-TES, or PE-PDSU MICHAEL J. GAHAN III Date: <u>11-13-97</u>
---	---

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136 Date: 12-1-97

Recommend Approval <input checked="" type="checkbox"/> Disapproval <input type="checkbox"/> Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/>	Signature: <u>[Signature]</u> POSRC CHAIRMAN Signature: <u>[Signature]</u> PLANT GENERAL MANAGER	Date: <u>12-1-97</u> Date: <u>12/4/97</u>
--	---	--

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Dowel Length

72.48 Log No.: SE00093

D3-HSM-14; 90/129;

ES199601368

Supplement 001

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Dowel Length

72.48 Log No.: SE00093

D3-HSM-14; 90/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC7 dowel length design change. The subject activity allowed the 10CC7 dowel to be cut 5'  $\pm$  6" above elevation 114'-0" to provide clearance for cask restraint and door frame embedments. The excess length of the dowel was removed to ease construction congestion in the front wall. The 10CC46 bar splices will provide the required load transfer mechanism to prevent cracking in the front face and satisfactorily transfer all loads. These changes meet the requirements of ACI 349-90 as described in Sections 7 and 12. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Dowel Length

72.48 Log No.: SE00093

D3-HSM-14; 90/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity allowed the 10CC7 dowel to be cut  $5' \pm 6"$  above elevation 114'-0" to provide clearance for cask restraint and door frame embedments. The excess length of the dowel was removed to ease construction congestion in the front wall. The 10CC46 bar splices will provide the required load transfer mechanism to prevent cracking in the front face and satisfactorily transfer all loads. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC7 dowel length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC7 dowel length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Dowel Length

72.48 Log No.: SE00093

D3-HSM-14; 90/129;

ES199601368

Supplement 001

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof 8CC13 Bar Replacement

72.48 Log No.: SE00094

D3-HSM-15; 91/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk JER Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Indv.: G. Tesfaye  
 Work Group: Licensing

Resp. Indv.: C. J. Dobry  
 Work Group: PES

Resp. Indv.: R. H. Beall  
 Work Group: NFM

G. Tesfaye 11/12/97  
 SIGNATURE / DATE

C. J. Dobry 11/10/97  
 SIGNATURE / DATE

R. H. Beall 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: Michael J. Gahan MIA. CARR  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III

Date: 11/13/97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: J. T. ... Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: P. K. ... Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: M. Lemmon Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof 8CC13 Bar Replacement

72.48 Log No.: SE00094

D3-HSM-15; 91/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof 8CC13 Bar Replacement

72.48 Log No.: SE00094

D3-HSM-15; 91/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 8CC13 bar replacement design change. The subject activity changed the location of the reinforcing bars for the roof plan at elevation 129'+0 for the phase 1A north side only, and the 8CC13 bars on top were replaced with 8CC113 and 8CC213 bars. The design of reinforcement placement is typically flexible so that field construction changes can be accommodated. This design change was necessary to clarify the bar placement requirements. The steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof 8CC13 Bar Replacement

72.48 Log No.: SE00094

D3-HSM-15; 91/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed the location of the reinforcing bars for the roof plan at elevation 129'+0 for the phase 1A north side only, and the 8CC13 bars on top were replaced with 8CC113 and 8CC213 bars. The design of reinforcement placement is typically flexible so that field construction changes can be accommodated. This design change was necessary to clarify the bar placement requirements. The steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 8CC13 bar replacement design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 8CC13 bar replacement design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Roof 8CC13 Bar Replacement

72.48 Log No.: SE00094

D3-HSM-15; 91/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional #7 Bars To Front Edge Roof

72.48 Log No.: SE00095

D3-HSM-16; 92/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>[Signature]</u> SIGNATURE / DATE	<u>[Signature]</u> SIGNATURE / DATE	<u>[Signature]</u> SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M. A. Carr  
 INDEPENDENT REVIEWER

Date: 11/13/97

Signature: [Signature]  
 For GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
 Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature]  
 OSSRC SES CHAIRMAN

Date: 1/30/98If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional #7 Bars To Front Edge Roof

72.48 Log No.: SE00095

D3-HSM-16; 92/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional #7 Bars To Front Edge Roof

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the additional #7 bars design change. The subject activity added additional #7 U-bars to the front edge of the roof. It was incorporated to satisfy the required steel reinforcing ratio of the concrete, since the original design had an inadequate number of bars in this area. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional #7 Bars To Front Edge Roof

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added additional #7 U-bars to the front edge of the roof. It was incorporated to satisfy the required steel reinforcing ratio of the concrete, since the original design had an inadequate number of bars. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a additional #7 bars design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The additional #7 bars design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional #7 Bars To Front Edge Roof

72.48 Log No.: SE00095

D3-HSM-16; 92/129;

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Minimum Concrete Cover of Vertical Outlet Vent Rebar 72.48 Log No.: SE00096

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk Department: NED-CEU 42-01-04 Date: 12-15-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>[Signature]</u> 12/15/97 SIGNATURE / DATE	<u>[Signature]</u> 12/15/97 SIGNATURE / DATE	<u>[Signature]</u> 12/15/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M.A. CARR  
 INDEPENDENT REVIEWER

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU

Date: 12/17/97Date: 12-22-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 98-006 Date: 1-14-98

Recommend Approval ☒ Disapproval ☐

Signature: [Signature] Date: 1-14-98  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date: 1/14/98  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 4/15/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Minimum Concrete Cover of Vertical Outlet Vent Rebar 72.48 Log No.: SE00096

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the minimum concrete cover for the HSM (Horizontal Storage Module) vertical outlet vent rebar. The subject activity provided an allowance for the minimum concrete cover for the vertical outlet vent rebar to be reduced from 2" to 1", if necessary. This design change was incorporated due to the tight bend required for the 8CC13 rebar at each outlet vent.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 6**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Minimum Concrete Cover of Vertical Outlet Vent Rebar 72.48 Log No.: SE00096

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the minimum concrete cover of the vertical outlet vent rebar design change. The subject activity provided an allowance for the minimum concrete cover for the vertical outlet vent rebar to be reduced from 2" to 1", if necessary. This design change was incorporated due to the tight bend required for the 8CC13 rebar at each outlet vent. The closed loop rebar details originally specified a minimum concrete cover of 2" on all outlet vent surfaces. The reduced concrete cover applies only to the roof vertical side of each outlet vent, which is not exposed to the weather. The details of this rebar configuration can be found in Section F-F of BGE Drawing No. 84-087-E. This clearly shows the vertical configuration of the rebar and the protection provided by the outlet vent overhang (18", as shown in Section B-B of BGE Drawing No. 84-081-E). Additional protection is provided via the intrusion and insect screens at the outlet. Per ACI 318-89, section 7.7.1(c), concrete for walls and slabs not exposed to weather or in contact with the ground will require a minimum concrete cover of 3/4" for rebar size no. 11 and smaller (8CC13 is rebar size no. 8, which is in this category). Therefore, this design change to reduce the minimum concrete cover for the vertical outlet vent rebar only from 2" to 1" does meet the minimum concrete cover requirements of ACI 318-89. In addition, the area of steel reinforcement remains the same, and all ACI requirements are met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Minimum Concrete Cover of Vertical Outlet Vent Rebar 72.48 Log No.: SE00096

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity provided an allowance for the minimum concrete cover for the vertical outlet vent rebar to be reduced from 2" to 1", if necessary. This design change was incorporated due to the tight bend required for the 8CC13 rebar at each outlet vent. The closed loop rebar details originally specified a minimum concrete cover of 2" on all outlet vent surfaces. The reduced concrete cover applies only to the roof vertical side of each outlet vent, which is not exposed to the weather. The details of this rebar configuration can be found in Section F-F of BGE Drawing No. 84-087-E. This clearly shows the vertical configuration of the rebar and the protection provided by the outlet vent overhang (18", as shown in Section B-B of BGE Drawing No. 84-081-E). Additional protection is provided via the intrusion and insect screens at the outlet. Per ACI 318-89, section 7.7.1(c), concrete for walls and slabs not exposed to weather or in contact with the ground will require a minimum concrete cover of 3/4" for rebar size no. 11 and smaller (8CC13 is rebar size no. 8, which is in this category). Therefore, this design change to reduce the minimum concrete cover for the vertical outlet vent rebar only from 2" to 1" does meet the minimum concrete cover requirements of ACI 318-89. In addition, the area of steel reinforcement remains the same, and all ACI requirements are met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a minimum concrete cover of the vertical outlet vent rebar design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The minimum concrete cover of the vertical outlet vent rebar design change does not adversely affect the operation or the associated occupational exposures as described in USAR Table 7.4-1.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Minimum Concrete Cover of Vertical Outlet Vent Rebar 72.48 Log No.: SE00096

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NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

Summary: (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the minimum concrete cover for the HSM (Horizontal Storage Module) vertical outlet vent rebar. The subject activity provided an allowance for the minimum concrete cover for the vertical outlet vent rebar to be reduced from 2" to 1", if necessary. This design change was incorporated due to the tight bend required for the 8CC13 rebar at each outlet vent.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC1 Carriage Bar Addition

72.48 Log No.: SE00097

D3-HSM-18; 94/129;

ES199601368

Supplement 001

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: Malan M.A. Carr  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan III  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11/13/97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: J. E. Remeniuk Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: P. K. ... Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. R. ... Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC1 Carriage Bar Addition

72.48 Log No.: SE00097

D3-HSM-18; 94/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC1 Carriage Bar Addition

72.48 Log No.: SE00097

D3-HSM-18; 94/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC1 carriage bar addition design change. The subject activity adds 10CC1 bars to act as carriage bars under the 8CC13 temperature steel in the roof slab. The sole purpose of these carriage bars is to support the reinforcing bars that will be used to help minimize the shrinkage of the roof concrete. The carriage bars help ensure that the temperature steel concrete cover will be consistently met throughout the roof. The steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC1 Carriage Bar Addition

72.48 Log No.: SE00097

D3-HSM-18; 94/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity adds 10CC1 bars to act as carriage bars under the 8CC13 temperature steel in the roof slab. The sole purpose of these carriage bars is to support the reinforcing bars that will be used to help minimize the shrinkage of the roof concrete. The carriage bars help ensure that the temperature steel concrete cover will be consistently met throughout the roof. The steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC1 carriage bar addition design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC1 carriage bar addition design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC1 Carriage Bar Addition

72.48 Log No.: SE00097

D3-HSM-18; 94/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Dimensional Changes

72.48 Log No.: SE00098

D3-HSM-19; 95/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Signature:

for GS-DES, GS-TES, or PE-PDSU

MICHAEL J. GAHAN III

Date

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.:

97-136

Date:

12-1-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Dimensional Changes

72.48 Log No.: SE00098

D3-HSM-19; 95/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Dimensional Changes

72.48 Log No.: SE00098

D3-HSM-19; 95/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC7 bar dimensional design change. The subject activity deleted the 3" and 9" location dimensions for dowels 10CC7 for phases 1A and 1B only. This change was made to assure the correct reinforcing bar spacing is met. The location of the construction joint is permitted to float +/- 6" and dimensioning the bars from the joint does not ensure the required bar spacing of 12". Deleting the 3" and 9" dimensions clarifies the drawing requirements. This change made to simplify HSM construction and does not affect the HSM design. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Dimensional Changes

72.48 Log No.: SE00098

D3-HSM-19; 95/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity deleted the 3" and 9" location dimensions for dowels 10CC7 for phases 1A and 1B only. This change was made to assure the correct reinforcing bar spacing is met. The location of the construction joint is permitted to float +/- 6" and dimensioning the bars from the joint does not ensure the required bar spacing of 12". Deleting the 3" and 9" dimensions clarifies the drawing requirements. This change made to simplify HSM construction and does not affect the HSM design. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC7 bar dimensional design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC7 bar dimensional design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC7 Bar Dimensional Changes

72.48 Log No.: SE00098

D3-HSM-19; 95/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional Reinforcing Steel

72.48 Log No.: SE00099

D3-HSM-20; 96/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>[Signature]</u> 11/14/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>[Signature]</u> 11/11/97 SIGNATURE / DATE
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Approved Disapproved  
 Signature: [Signature] M. J. Carr  
 INDEPENDENT REVIEWER  
 Date: 11/13/97

Approved Disapproved  
 Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GRAHAM III  
 Date: 11-14-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136 Date: 12-1-97

Recommend Approval ☒ Disapproval ☐ Signature: [Signature] Date: 12-1-97  
 POSRC CHAIRMAN  
 Approved ☒ Disapproved ☐ Signature: [Signature] Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional Reinforcing Steel

72.48 Log No.: SE00099

D3-HSM-20; 96/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, 8.2, and Appendix A - Drawings.

**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - HSM Additional Reinforcing Steel****72.48 Log No.: SE00099****D3-HSM-20; 96/129;****ES199601368****Supplement 001****Revision 0000****Page 3 of 5****Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the additional reinforcing steel design change. The subject activity added reinforcing steel to the roof at exposed edges and adjacent to vents to meet maximum spacing requirements as defined in ACI-349, Nuclear Safety Structures Code. The original design had an inadequate number of bars as discovered during the NRC review of the original SAR submittal. This design change ensured the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional Reinforcing Steel

72.48 Log No.: SE00099

D3-HSM-20; 96/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added reinforcing steel to the roof at exposed edges and adjacent to vents to meet maximum spacing requirements as defined in ACI-349, Nuclear Safety Structures Code. The original design had an inadequate number of bars as discovered during the NRC review of the original SAR submittal. This design change ensured the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a additional reinforcing steel design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The additional reinforcing steel design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Additional Reinforcing Steel

72.48 Log No.: SE00099

D3-HSM-20; 96/129;

ES199601368

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforcing Steel Installation

72.48 Log No.: SE00100

D3-HSM-21; 97/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk JER Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>G. Tesfaye</u> 11/12/97 SIGNATURE / DATE	<u>C. J. Dobry</u> 11/10/97 SIGNATURE / DATE	<u>R. H. Beall</u> 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: M. A. Carr  
 INDEPENDENT REVIEWER

Date: 11/13/97

Signature: Michael J. Gahan  
 J. GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: R. H. Beall Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: P. K. ... Date: 12/1/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. E. Remeniuk Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforcing Steel Installation

72.48 Log No.: SE00100

D3-HSM-21; 97/129;

ES199601368

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - HSM Reinforcing Steel Installation****72.48 Log No.: SE00100****D3-HSM-21; 97/129;****ES199601368****Supplement 001****Revision 0000****Page 3 of 5****Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the reinforcing steel installation design change. The subject activity ensured the front face of the HSM's were adequately reinforced by placing the reinforcing at the minimum concrete cover location. This change was made to simplify HSM construction, in that the design of reinforcement placement is typically flexible and most field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforcing Steel Installation

72.48 Log No.: SE00100

D3-HSM-21; 97/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity ensured the front face of the HSM's were adequately reinforced by placing the reinforcing at the minimum concrete cover location. This change was made to simplify HSM construction, in that the design of reinforcement placement is typically flexible and most field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a reinforcing steel installation design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The reinforcing steel installation design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Reinforcing Steel Installation

72.48 Log No.: SE00100

D3-HSM-21; 97/129;

ES199601368

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM #8 Bar Added For Crack Control

72.48 Log No.: SE00101

D3-HSM-22; 98/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

*G. Tesfaye* 11/12/97  
 SIGNATURE / DATE

*C. J. Dobry* 11/10/97  
 SIGNATURE / DATE

*R. H. Beall* 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: *Malcolm M. A. Carr*  
 INDEPENDENT REVIEWER

Date: 11/13/97

Signature: *Michael J. Gahan*  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: *J. E. Remeniuk* Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: *P. Kelly* Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: *J. E. Remeniuk*  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM #8 Bar Added For Crack Control

72.48 Log No.: SE00101

D3-HSM-22; 98/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM #8 Bar Added For Crack Control

72.48 Log No.: SE00101

D3-HSM-22; 98/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the #8 bar added for crack control design change. The subject activity added an additional #8 bar to reinforce the corner between the top of the foundation mat and underside of access sleeve for the 1A unit only. This change was made to provide required crack control since the 10CC47 installed with a 45 degree bend turned outward did not provide the required crack control. The #8 bar was therefore added to reinforce the corner. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM #8 Bar Added For Crack Control

72.48 Log No.: SE00101

D3-HSM-22; 98/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added an additional #8 bar to reinforce the corner between the top of the foundation mat and underside of access sleeve for the 1A unit only. This change was made to provide required crack control since the 10CC47 installed with a 45 degree bend turned outward did not provide the required crack control. The #8 bar was therefore added to reinforce the corner. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a #8 bar added for crack control design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The #8 bar added for crack control design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM #8 Bar Added For Crack Control

72.48 Log No.: SE00101

D3-HSM-22; 98/129;

ES199601368

Supplement 001

Revision 0000

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM SCC69 Bars Added For Crack Control

72.48 Log No.: SE00102

D3-HSM-23; 99/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11.7.97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Date

Signature:

for GS-DES, PS-TES, or PE-PDSU  
MICHAEL J. GAHAN III

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.:

97-136

Date:

12.1.97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

11/30/98

If yes, OSSRC Meeting No.:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM SCC69 Bars Added For Crack Control

72.48 Log No.: SE00102

D3-HSM-23; 99/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 5CC69 Bars Added For Crack Control

72.48 Log No.: SE00102

D3-HSM-23; 99/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the #5 bars added for crack control design change. The subject activity added additional #5 reinforcing bars 5CC69 to the HSM face to provide the required crack control. Although cracking can not be expected to be eliminated, it is generally more desirable to have many fine hair cracks than a few wide cracks. Thus crack control is a matter of controlling the distribution and size of cracks rather than eliminating them. To control cracking, it is better to use several smaller bars at moderate spacing than larger bars of equivalent area. This change added 48 #5 bars, which should provide good crack control. ACI 318-89, section 10.6 provides crack control provisions for beams and one way slabs. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 5CC69 Bars Added For Crack Control

72.48 Log No.: SE00102

D3-HSM-23; 99/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added additional #5 reinforcing bars 5CC69 to the HSM face to provide the required crack control. Although cracking can not be expected to be eliminated, it is generally more desirable to have many fine hair cracks than a few wide cracks. Thus crack control is a matter of controlling the distribution and size of cracks rather than eliminating them. To control cracking, it is better to use several smaller bars at moderate spacing than larger bars of equivalent area. This change added 48 #5 bars, which should provide good crack control. ACI 318-89, section 10.6 provides crack control provisions for beams and one way slabs. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a #5 bars added for crack control design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The #5 bars added for crack control design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 5CC69 Bars Added For Crack Control

72.48 Log No.: SE00102

D3-HSM-23; 99/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 7CC64 Through 7CC68 Bar Locations Clarification		72.48 Log No.: SE00103	
D3-HSM-24; 100/129;	ES199601368	Supplement 001	Revision 0000 Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11.7.97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>[Signature]</u> 11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>[Signature]</u> 11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>[Signature]</u> 11/11/97 SIGNATURE / DATE
--	---	---

Approved

Disapproved

Approved

Disapproved

Signature: [Signature] M. A. CASE  
 INDEPENDENT REVIEWER

Date 11/13/97

Signature: [Signature]  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136 Date: 12.1.97

Recommend Approval ✓ Recommend Disapproval \_\_\_\_\_

Signature: [Signature] Date 12-1-97  
 POSRC CHAIRMAN

Approved ✓ Disapproved \_\_\_\_\_

Signature: [Signature] Date 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No X

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 7CC64 Through 7CC68 Bar Locations Clarification

72.48 Log No.: SE00103

D3-HSM-24; 100/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 7CC64 Through 7CC68 Bar Locations Clarification

72.48 Log No.: SE00103

D3-HSM-24; 100/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 7CC64 through 7C68 bar locations design change. The subject activity defined the location of bars 7CC64 through 7CC68 since the bar locations were not completely specified on the design drawings. The change was made to simplify construction, and the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 7CC64 Through 7CC68 Bar Locations Clarification

72.48 Log No.: SE00103

D3-HSM-24; 100/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity defined the location of bars 7CC64 through 7CC68 since the bar locations were not completely specified on the design drawings. The change was made to simplify construction, and the area of steel reinforcement remains the same. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 7CC64 through 7C68 bar locations design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 7CC64 through 7C68 bar locations design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 7CC64 Through 7CC68 Bar Locations Clarification 72.48 Log No.: SE00103

D3-HSM-24; 100/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 8CC13 Bar Clearance Distance Change

72.48 Log No.: SE00104

D3-HSM-25; 101/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: Malcolm M. A. Carr  
 INDEPENDENT REVIEWER

Date: 11/13/97

Signature: Michael J. Gahan III  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-136

Date: 12-1-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: R. H. Beall Date: 12-1-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: P. K. ... Date: 12/4/97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. E. Remeniuk  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 8CC13 Bar Clearance Distance Change

72.48 Log No.: SE00104

D3-HSM-25; 101/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 8CC13 Bar Clearance Distance Change

72.48 Log No.: SE00104

D3-HSM-25; 101/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 8CC13 bar clearance distance design change. The subject activity reduced the clear distance between 8CC13 bars and the vent structure from 2" (typ) to 1" (min). The minimum clear distance was invoked to allow for bar fabrication cut and bend tolerance. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 8CC13 Bar Clearance Distance Change

72.48 Log No.: SE00104

D3-HSM-25; 101/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity reduced the clear distance between 8CC13 bars and the vent structure from 2" (typ) to 1" (min). The minimum clear distance was invoked to allow for bar fabrication cut and bend tolerance. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 8CC13 bar clearance distance design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 8CC13 bar clearance distance design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 8CC13 Bar Clearance Distance Change

72.48 Log No.: SE00104

D3-HSM-25; 101/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 6CC55 Through 10CC55 Bar Size Change

72.48 Log No.: SE00105

D3-HSM-26; 102/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5


Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations


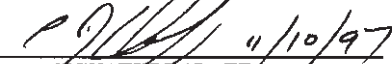
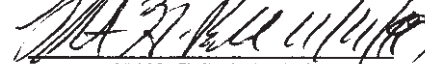
- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?


Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
 11/12/97 SIGNATURE / DATE	 11/10/97 SIGNATURE / DATE	 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON   
INDEPENDENT REVIEWERDate: 11/12/97Signature: Michael J. Gahan   
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97Recommend ☒ Approval ☒ Recommend ☐ Disapproval ☐Signature:  Date: 12-3-97  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature:  Date: 12-3-97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature:  Date: 1/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 6CC55 Through 10CC55 Bar Size Change

72.48 Log No.: SE00105

D3-HSM-26; 102/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 6CC55 Through 10CC55 Bar Size Change

72.48 Log No.: SE00105

D3-HSM-26; 102/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 6CC55 through 10CC55 bar size design change. The subject activity changes the bar size from 6CC55 to 10CC55 on the cut sheets only (bill of materials). This corrected an error on the bar cut and bend listing. The bar size was correctly specified on the layout drawing. (Note: Although this safety evaluation addresses the change of rebar from 6CC55 to 10CC55, another safety evaluation SE00106 addresses the deletion of 10CC55 from the cut sheets.) Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 6CC55 Through 10CC55 Bar Size Change			72.48 Log No.: SE00105	
D3-HSM-26; 102/129;	ES199601368	Supplement 001	Revision 0000	Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changes the bar size from 6CC55 to 10CC55 on the cut sheets only (bill of materials). This corrected an error on the bar cut and bend listing. The bar size was correctly specified on the layout drawing. (Note: Although this safety evaluation addresses the change of rebar from 6CC55 to 10CC55, another safety evaluation SE00106 addresses the deletion of 10CC55 from the cut sheets.) Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 6CC55 through 10CC55 bar size design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 6CC55 through 10CC55 bar size design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 6CC55 Through 10CC55 Bar Size Change

72.48 Log No.: SE00105

D3-HSM-26; 102/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Bars 9CC34 &amp; 10CC55 Deleted

72.48 Log No.: SE00106

D3-HSM-27; 103/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

INDEPENDENT REVIEWER

Date

Signature:

MICHAEL J. GAHAN III

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend  
ApprovalRecommend  
Disapproval

Signature:

POSRC CHAIRMAN

Date

Approved

Disapproved

Signature:

PLANT GENERAL MANAGER

Date

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes No X

Signature:

OSSRC SES CHAIRMAN

Date:

If yes, OSSRC Meeting No.:



### ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Bars 9CC34 & 10CC55 Deleted

72.48 Log No.: SE00106

D3-HSM-27; 103/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Bars 9CC34 &amp; 10CC55 Deleted

72.48 Log No.: SE00106

D3-HSM-27; 103/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the bars 9CC34 and 10CC55 deletion design change. The subject activity deleted rebar 9CC34 and 10CC55 on the cut sheets only (bill of materials). The deletion of the rebar occurred during the design review stage, thus the final detail drawings were accurate. This design change was made to make the rebar cut and bend lists consistent with the detail drawings. It was determined during the design review stage that this reinforcement was not required. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Bars 9CC34 &amp; 10CC55 Deleted

72.48 Log No.: SE00106

D3-HSM-27; 103/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity deleted rebar 9CC34 and 10CC55 on the cut sheets only (bill of materials). The deletion of the rebar occurred during the design review stage, thus the final detail drawings were accurate. This design change was made to make the rebar cut and bend lists consistent with the detail drawings. It was determined during the design review stage that this reinforcement was not required. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a bars 9CC34 and 10CC55 deletion design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The bars 9CC34 and 10CC55 deletion design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Bars 9CC34 &amp; 10CC55 Deleted

72.48 Log No.: SE00106

D3-HSM-27; 103/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC31 Bar Quantity Change

72.48 Log No.: SE00107

D3-HSM-28; 104/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11.7.97

PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

[Signature] 11/12/97  
 SIGNATURE / DATE

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: JA Crunkleton JA Crunkleton  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11/12/97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97

Recommend Approval ☒ Disapproval ☐

Signature: [Signature] Date 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC31 Bar Quantity Change

72.48 Log No.: SE00107

D3-HSM-28; 104/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC31 Bar Quantity Change

72.48 Log No.: SE00107

D3-HSM-28; 104/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 9CC31 bar quantity design change. The subject activity changed the quantity of rebar 9CC31 from 50 to 130, and changed the length from 15'-10" to 37'-0". This additional amount of reinforcing steel was offset by replacing large quantities of the same size but shorter reinforcing steel (see safety evaluations SE00108 and SE00109). The longer bars are easier to handle and place and therefore simplify construction. Due to the offset, this design change does not change the amount of rebar in the walls. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC31 Bar Quantity Change

72.48 Log No.: SE00107

D3-HSM-28; 104/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed the quantity of rebar 9CC31 from 50 to 130, and changed the length from 15'-10" to 37'-0". This additional amount of reinforcing steel was offset by replacing large quantities of the same size but shorter reinforcing steel (see safety evaluations SE00108 and SE00109). The longer bars are easier to handle and place and therefore simplify construction. Due to the offset, this design change does not change the amount of rebar in the walls. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 9CC31 bar quantity design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 9CC31 bar quantity design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC31 Bar Quantity Change

72.48 Log No.: SE00107

D3-HSM-28; 104/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC32 To 6CC32 Bar Size Change

72.48 Log No.: SE00108

D3-HSM-29; 105/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations




NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?


Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing  11/12/97 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES  11/10/97 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM  11/11/97 SIGNATURE / DATE
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☒ Approved☐ Disapproved☒ Approved☐ DisapprovedSignature: J.A. CRUNKLETON   
INDEPENDENT REVIEWERDate: 11/12/97Signature: Michael J. Gahan   
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
11-13-97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97Recommend Approval ☒ Recommend Disapproval ☐Signature:  Date: 12-3-97  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature:  Date: 12-3-97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature:  Date: 1/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC32 To 6CC32 Bar Size Change

72.48 Log No.: SE00108

D3-HSM-29; 105/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC32 To 6CC32 Bar Size Change

72.48 Log No.: SE00108

D3-HSM-29; 105/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 9CC32 to 6CC32 bar size design change. The subject activity changed reinforcing bar from 9CC32 to 6CC32 and the quantity was changed from 80 to 140. The length was changed from 17'-5" to 4'-7", and changed the type from 2 to 17. Dimension "A" was deleted, dimension "B" was changed from 15'-10" to 1'-6", changed dimension "C" to 1'-7" and added dimension "D" as 1'-6". The use of 9CC31 as described in safety evaluation SE00107 eliminated the need for the 9CC32. This net effect resulted in the addition of the 6CC32 reinforcing steel, which was used to provide better rebar distribution in the walls. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC32 To 6CC32 Bar Size Change

72.48 Log No.: SE00108

D3-HSM-29; 105/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed reinforcing bar from 9CC32 to 6CC32 and the quantity was changed from 80 to 140. The length was changed from 17'-5" to 4'-7", and changed the type from 2 to 17. Dimension "A" was deleted, dimension "B" was changed from 15'-10" to 1'-6", changed dimension "C" to 1'-7" and added dimension "D" as 1'-6". The use of 9CC31 as described in safety evaluation SE00107 eliminated the need for the 9CC32. This net effect resulted in the addition of the 6CC32 reinforcing steel, which was used to provide better rebar distribution in the walls. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 9CC32 to 6CC32 bar size design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 9CC32 to 6CC32 bar size design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC32 To 6CC32 Bar Size Change

72.48 Log No.: SE00108

D3-HSM-29; 105/129;

ES199601368

Supplement 001

Revision 0000

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC33 To 6CC33 Bar Size Change

72.48 Log No.: SE00109

D3-HSM-30; 106/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. Crunkleton  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend Approval ☒ Disapproval ☐

Signature:

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒ Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J.B. Lemmon  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC33 To 6CC33 Bar Size Change

72.48 Log No.: SE00109

D3-HSM-30; 106/129;

ES199601368

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC33 To 6CC33 Bar Size Change

72.48 Log No.: SE00109

D3-HSM-30; 106/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 9CC33 to 6CC33 bar size design change. The subject activity changed reinforcing bar from 9CC33 to 6CC33 and the quantity was changed from 50 to 10. The length was changed from 28'-8" to 5'-4", and changed the type from straight to 17. Added dimension "B" as 1'-6", dimension "C" as 2'-4" and added dimension "D" as 1'-6". The use of 9CC31 as described in safety evaluation SE00107 eliminated the need for the 9CC33. This net effect resulted in the addition of the 6CC33 reinforcing steel, which was used to provide better rebar distribution in the walls. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC33 To 6CC33 Bar Size Change

72.48 Log No.: SE00109

D3-HSM-30; 106/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed reinforcing bar from 9CC33 to 6CC33 and the quantity was changed from 50 to 10. The length was changed from 28'-8" to 5'-4", and changed the type from straight to 17. Added dimension "B" as 1'-6", dimension "C" as 2'-4" and added dimension "D" as 1'-6". The use of 9CC31 as described in safety evaluation SE00107 eliminated the need for the 9CC33. This net effect resulted in the addition of the 6CC33 reinforcing steel, which was used to provide better rebar distribution in the walls. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 9CC33 to 6CC33 bar size design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 9CC33 to 6CC33 bar size design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 9CC33 To 6CC33 Bar Size Change

72.48 Log No.: SE00109

D3-HSM-30; 106/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC37 Length Change

72.48 Log No.: SE00110

D3-HSM-31; 107/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. Crunkleton  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU

Date 11/12/97

Date 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: J.H. Beall  
 POSRC CHAIRMAN Date 12-3-97

Approved ☒ Disapproved ☐

Signature: J.H. Beall  
 PLANT GENERAL MANAGER Date 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J.B. Lemons  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC37 Length Change

72.48 Log No.: SE00110

D3-HSM-31; 107/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC37 Length Change

72.48 Log No.: SE00110

D3-HSM-31; 107/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC37 length design change. The subject activity shortened the length of reinforcing bar 10CC37 from 7'-10" to 7'-8", and shortened dimension "B" from 4'-0" to 3'-10". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC37 Length Change

72.48 Log No.: SE00110

D3-HSM-31; 107/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC37 from 7'-10" to 7'-8", and shortened dimension "B" from 4'-0" to 3'-10". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC37 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC37 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC37 Length Change

72.48 Log No.: SE00110

D3-HSM-31; 107/129;

ES199601368

Supplement 001

Revision 0000

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC38 Length Change

72.48 Log No.: SE00111

D3-HSM-32; 108/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>[Signature]</u> 11/12/97 SIGNATURE / DATE	<u>[Signature]</u> 11/10/97 SIGNATURE / DATE	<u>[Signature]</u> 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON [Signature]  
 INDEPENDENT REVIEWER

Date 11/12/97

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC38 Length Change

72.48 Log No.: SE00111

D3-HSM-32; 108/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC38 Length Change

72.48 Log No.: SE00111

D3-HSM-32; 108/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC38 length design change. The subject activity shortened the length of reinforcing bar 10CC38 from 7'-7" to 7'-5", and shortened dimension "B" from 3'-9" to 3'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC38 Length Change

72.48 Log No.: SE00111

D3-HSM-32; 108/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC38 from 7'-7" to 7'-5", and shortened dimension "B" from 3'-9" to 3'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC38 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC38 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC38 Length Change

72.48 Log No.: SE00111

D3-HSM-32; 108/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC39 Length Change

72.48 Log No.: SE00112

D3-HSM-33; 109/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/10/97  
 SIGNATURE / DATE

[Signature] 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON [Signature]  
 INDEPENDENT REVIEWER

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date 11/12/97Date 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: [Signature] Date 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: [Signature] Date 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC39 Length Change

72.48 Log No.: SE00112

D3-HSM-33; 109/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC39 Length Change

72.48 Log No.: SE00112

D3-HSM-33; 109/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC39 length design change. The subject activity shortened the length of reinforcing bar 10CC39 from 7'-10" to 7'-8", and shortened dimension "B" from 4'-0" to 3'-10". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC39 Length Change

72.48 Log No.: SE00112

D3-HSM-33; 109/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC39 from 7'-10" to 7'-8", and shortened dimension "B" from 4'-0" to 3'-10". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC39 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC39 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC39 Length Change

72.48 Log No.: SE00112

D3-HSM-33; 109/129; ES199601368 Supplement 001 Revision 0000 Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC41 Length Change

72.48 Log No.: SE00113

D3-HSM-34; 110/129;

ES199601368

Supplement 001

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. Crunkleton  
INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend Approval ☒ Disapproval ☐

Signature:

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒ Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature: J.B. Lemon  
OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC41 Length Change

72.48 Log No.: SE00113

D3-HSM-34; 110/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC41 Length Change

72.48 Log No.: SE00113

D3-HSM-34; 110/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC41 length design change. The subject activity shortened the length of reinforcing bar 10CC41 from 8'-8" to 8'-4", and shortened dimensions "B" and "D" from 3'-1" to 2'-11". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC41 Length Change

72.48 Log No.: SE00113

D3-HSM-34; 110/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC41 from 8'-8" to 8'-4", and shortened dimensions "B" and "D" from 3'-1" to 2'-11". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC41 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC41 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC41 Length Change

72.48 Log No.: SE00113

D3-HSM-34; 110/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC42 Length Change

72.48 Log No.: SE00114

D3-HSM-35; 111/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON  
INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN/JL  
11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend  
Approval ☒Recommend  
Disapproval ☐

Signature:

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC42 Length Change

72.48 Log No.: SE00114

D3-HSM-35; 111/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC42 Length Change

72.48 Log No.: SE00114

D3-HSM-35; 111/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC42 length design change. The subject activity shortened the length of reinforcing bar 10CC42 from 8'-1" to 7'-5", shortened dimensions "B" and "D" from 3'-1" to 2'-11", and shortened dimension "C" from 1'-11" to 1'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC42 Length Change

72.48 Log No.: SE00114

D3-HSM-35; 111/129;

ES199601368

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Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC42 from 8'-1" to 7'-5", shortened dimensions "B" and "D" from 3'-1" to 2'-11", and shortened dimension "C" from 1'-11" to 1'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC42 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC42 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC42 Length Change

72.48 Log No.: SE00114

D3-HSM-35; 111/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC43 Length Change

72.48 Log No.: SE00115

D3-HSM-36; 112/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

J.A. CRUNKLETON  
INDEPENDENT REVIEWER

Signature:

MICHAEL J. GAHAN III  
for GS-DES, GS-TES, or PE-PDSU  
11-13-97

Date

11/12/97

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.:

97-137

Date:

12-3-97

Recommend

Recommend

Approval

Disapproval

Signature:

POSRC CHAIRMAN

Date 12-3-97

Approved

Disapproved

Signature:

PLANT GENERAL MANAGER

Date 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes

No X

Signature:

OSSRC SES CHAIRMAN

Date:

11/30/98

If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC43 Length Change

72.48 Log No.: SE00115

D3-HSM-36; 112/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC43 Length Change

72.48 Log No.: SE00115

D3-HSM-36; 112/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC43 length design change. The subject activity shortened the length of reinforcing bar 10CC43 from 7'-10" to 7'-5", shortened dimensions "B" and "D" from 3'-1" to 2'-11", and shortened dimension "C" from 1'-8" to 1'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC43 Length Change

72.48 Log No.: SE00115

D3-HSM-36; 112/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC43 from 7'-10" to 7'-5", shortened dimensions "B" and "D" from 3'-1" to 2'-11", and shortened dimension "C" from 1'-8" to 1'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC43 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC43 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC43 Length Change

72.48 Log No.: SE00115

D3-HSM-36; 112/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC44 Length Change

72.48 Log No.: SE00116

D3-HSM-37; 113/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

Department: NED-CEU 42-01-04

Date: 11-7-97

PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
 For GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature:

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒ Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC44 Length Change

72.48 Log No.: SE00116

D3-HSM-37; 113/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC44 Length Change

72.48 Log No.: SE00116

D3-HSM-37; 113/129;

ES199601368

Supplement 001

Revision 0000

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC44 length design change. The subject activity shortened the length of reinforcing bar 10CC44 from 8'-1" to 7'-5", shortened dimensions "B" and "D" from 3'-1" to 2'-11", and shortened dimension "C" from 1'-11" to 1'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC44 Length Change

72.48 Log No.: SE00116

D3-HSM-37; 113/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC44 from 8'-1" to 7'-5", shortened dimensions "B" and "D" from 3'-1" to 2'-11", and shortened dimension "C" from 1'-11" to 1'-7". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC44 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC44 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC44 Length Change

72.48 Log No.: SE00116

D3-HSM-37; 113/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC45 Length Change

72.48 Log No.: SE00117

D3-HSM-38; 114/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

*[Signature]* 11/12/97  
 SIGNATURE / DATE

*[Signature]* 11/10/97  
 SIGNATURE / DATE

*[Signature]* 11/11/97  
 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahant  
 LOGS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHANT  
 11-13-97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend ☒ Approval  
 Recommend ☐ Disapproval

Signature: *[Signature]* Date: 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: *[Signature]* Date: 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: *[Signature]*  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC45 Length Change

72.48 Log No.: SE00117

D3-HSM-38; 114/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC45 Length Change

72.48 Log No.: SE00117

D3-HSM-38; 114/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC45 length design change. The subject activity shortened the length of reinforcing bar 10CC45 from 8'-8" to 8'-4", and shortened dimensions "B" and "D" from 3'-1" to 2'-11". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC45 Length Change

72.48 Log No.: SE00117

D3-HSM-38; 114/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC45 from 8'-8" to 8'-4", and shortened dimensions "B" and "D" from 3'-1" to 2'-11". The bar sizes were adjusted to clear contractor installed form supports which interfere with the bars as detailed. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC45 length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC45 length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC45 Length Change

72.48 Log No.: SE00117

D3-HSM-38; 114/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 45° Bend Length Change

72.48 Log No.: SE00118

D3-HSM-39; 115/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature:

J.A. CRUNKLETON JACrunkleton

INDEPENDENT REVIEWER

Date

11/12/97

Signature:

Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date 12-3-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:

OSSRC SES CHAIRMAN

Date:

1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 45° Bend Length Change

72.48 Log No.: SE00118

D3-HSM-39; 115/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

Reinforcing Steel (Rebar) - steel bars (deformed or smooth) placed in forms which interact with the wet concrete mix. The final solidified mass becomes reinforced concrete. Since concrete is conservatively assumed to be incapable of resisting tension, reinforcing steel is used. The rebar is also placed in areas of flexure and shear. Some of the rebar may be bent up, angled, or oriented to resist diagonal shear. Stirrups, which are U-shaped and pass underneath the bottom steel, are used to resist diagonal tension and shear. Rebar is also used for crack control, which is typically placed near the face of the concrete. Rebar is available in a number of sizes, as well as in the form of wire for spiral wrapping, and wire mesh for shrinkage and thermal expansion control. The minimum length of rebar needed to provide a sufficient bond to keep the rebar from being pulled or pushed through the concrete is called the development length. Bar splices are used when the bar lengths required exceed the lengths available and are typically located away from points of maximum tension. The reinforcement ratio is the percentage of steel in a beam or slab that resists the tensile and shear stresses in the concrete.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 45° Bend Length Change

72.48 Log No.: SE00118

D3-HSM-39; 115/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the 10CC47 45° bend length design change. The subject activity shortened the length of reinforcing bar 10CC47 by 8". The bar length was shortened to simplify bar installation. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the reinforcement of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 45° Bend Length Change

72.48 Log No.: SE00118

D3-HSM-39; 115/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity shortened the length of reinforcing bar 10CC47 by 8". The bar length was shortened to simplify bar installation. The revised bar provides code required embedment and development lengths. The design of reinforcement placement is typically flexible, in that field construction changes can usually be accommodated. The important element in reinforcement design is to ensure the steel reinforcement ratio is satisfied and all ACI requirements are met. In this case, the steel reinforcement ratio was satisfied and all ACI requirements were met. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a 10CC47 45° bend length design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The 10CC47 45° bend length design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM 10CC47 45° Bend Length Change

72.48 Log No.: SE00118

D3-HSM-39; 115/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) reinforcing bars.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Access Sleeve Nelson Studs

72.48 Log No.: SE00119

D3-HSM-41; 116/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. Crunkleton  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
 For GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN  
 11-14-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature:

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. A. Lemons  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Access Sleeve Nelson Studs

72.48 Log No.: SE00119

D3-HSM-41; 116/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) access sleeve.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Access Sleeve Nelson Studs

72.48 Log No.: SE00119

D3-HSM-41; 116/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the access sleeve design change. The subject activity deleted the requirement that the Nelson studs shown on the HSM access sleeve be attached after delivery of the sleeves. Nelson studs may be fixed to sleeve at the fabrication shop or construction site. The quality of work is typically better when fabrication can occur at the shop in a controlled environment. This change does not affect the completed HSM and therefore has no impact on the HSM design or analysis. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the access sleeve of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Access Sleeve Nelson Studs

72.48 Log No.: SE00119

D3-HSM-41; 116/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. Deleted the requirement that the Nelson studs shown on the HSM access sleeve be attached after delivery of the sleeves. Nelson studs may be fixed to sleeve at the fabrication shop or construction site. The quality of work is typically better when fabrication can occur at the shop in a controlled environment. This change does not affect the completed HSM and therefore has no impact on the HSM design or analysis. The subject activity Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a access sleeve design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The access sleeve design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Access Sleeve Nelson Studs

72.48 Log No.: SE00119

D3-HSM-41; 116/129;

ES199601368

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) access sleeve.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Lubricant Change

72.48 Log No.: SE00120

D3-HSM-42; 117/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON J.A. Crunkleton  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend  
 Approval ☒

Recommend  
 Disapproval ☐

Signature: J. T. Beall

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒Disapproved ☐

Signature: J. T. Beall

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. E. Remeniuk  
 OSSRC SES CHAIRMAN

Date: 11/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Lubricant Change

72.48 Log No.: SE00120

D3-HSM-42; 117/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) rail lubricant.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Lubricant Change

72.48 Log No.: SE00120

D3-HSM-42; 117/129;

ES199601368

Supplement 001

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the rail lubricant design change. The subject activity changed the rail lubricant from Everlube 823 to Permaslik RN. The lubricant change was made as an improvement to the HSM design. The Permaslik RN has superior tribological properties to the Everlube 823 while containing no molybdenum disulfide (which is not allowed in the fuel pool). Tribological properties refers to the friction, lubrication, and wear of interacting surfaces that are in relative motion. The change to eliminate a chemical not allowed in the spent fuel pool was necessary and is an improvement which does not adversely affect the HSM design or analysis. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the rails and lubricants of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Lubricant Change

72.48 Log No.: SE00120

D3-HSM-42; 117/129;

ES199601368

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed the rail lubricant from Everlube 823 to Permaslik RN. The lubricant change was made as an improvement to the HSM design. The Permaslik RN has superior tribological properties to the Everlube 823 while containing no molybdenum disulfide (which is not allowed in the fuel pool). Tribological properties refers to the friction, lubrication, and wear of interacting surfaces that are in relative motion. The change to eliminate a chemical not allowed in the spent fuel pool was necessary and is an improvement which does not adversely affect the HSM design or analysis. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform it's intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a rail lubricant design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The rail lubricant design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Lubricant Change

72.48 Log No.: SE00120

D3-HSM-42; 117/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) rail lubricant.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Alignment Tolerance Requirements

72.48 Log No.: SE00121

D3-HSM-43; 118/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations



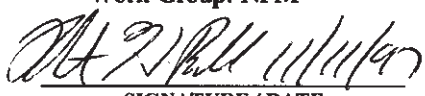
- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
 11/14/97 SIGNATURE / DATE	 11/10/97 SIGNATURE / DATE	 11/11/97 SIGNATURE / DATE

Approved


Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON   
 INDEPENDENT REVIEWER

Date 11/12/97

Signature: Michael J. Gahawill   
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAWILL  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97

Recommend Approval  Recommend  
 Disapproval Disapproval

Signature: J.H. Call  Date 12-3-97  
 POSRC CHAIRMAN

Approved Approved  Disapproved Disapproved

Signature: J.H. Call  Date 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No X

Signature: J.R. Lemon  Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Alignment Tolerance Requirements

72.48 Log No.: SE00121

D3-HSM-43; 118/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) rail alignment tolerance requirements.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Alignment Tolerance Requirements

72.48 Log No.: SE00121

D3-HSM-43; 118/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the rail alignment tolerance requirements design change. The subject activity clarifies the HSM-DSC rail alignment requirements. The rails shall be level within 1/16" between the front and rear of each module. Additionally, the two rails in each module shall not deviate by more than 1/16" in elevation when measured across the rails. Tightening the installation tolerances improves the rail alignment and overall safety of the system, as well as provide for a smooth transfer of the DSC. This design change is an improvement to the HSM which does not adversely affect the HSM design or analysis. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the rails of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Alignment Tolerance Requirements

72.48 Log No.: SE00121

D3-HSM-43; 118/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity clarifies the HSM-DSC rail alignment requirements. The rails shall be level within 1/16" between the front and rear of each module. Additionally, the two rails in each module shall not deviate by more than 1/16" in elevation when measured across the rails. Tightening the installation tolerances improves the rail alignment and overall safety of the system, as well as provide for a smooth transfer of the DSC. This design change is an improvement to the HSM which does not adversely affect the HSM design or analysis. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a rail alignment tolerance requirements design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The rail alignment tolerance requirements design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Rail Alignment Tolerance Requirements

72.48 Log No.: SE00121

D3-HSM-43; 118/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) rail alignment tolerance requirements.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Orientation

72.48 Log No.: SE00122

D3-HSM-44; 119/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
<u>[Signature]</u> 11/12/97 SIGNATURE / DATE	<u>[Signature]</u> 11/10/97 SIGNATURE / DATE	<u>[Signature]</u> 11/11/97 SIGNATURE / DATE

<p><u>Approved</u> Disapproved</p> <p>Signature: <u>J.A. Crunkleton</u> <u>[Signature]</u>          INDEPENDENT REVIEWER</p> <p>Date: <u>11/12/97</u></p>	<p><u>Approved</u> Disapproved</p> <p>Signature: <u>Michael J. Gahan</u> <u>[Signature]</u>          For AGS-DES, GS-TES, or PE-PDSU          MICHAEL J. GAHAN          11-14-97</p> <p>Date: <u>11-14-97</u></p>
---	---

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137 Date: 12-3-97

Recommend Approval ☒ Disapproval ☐ Signature: [Signature] Date: 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐ Signature: [Signature] Date: 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: [Signature] Date: 11/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.:



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Orientation

72.48 Log No.: SE00122

D3-HSM-44; 119/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams orientation.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Orientation

72.48 Log No.: SE00122

D3-HSM-44; 119/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the W8x48 beam orientation design change. The subject activity provided an allowance for the orientation of the W8x48 beams to be reversed (180° in the horizontal plane) to match the as-built centerline of the HSM access sleeve. It also allowed the length of the slots to be increased if required to match the as-built location of the rails. This design change did not affect the structural adequacy of the beams in any way, in that the strong axis remained in the vertical plane. The intent of this design change was to give the field personnel additional flexibility in the construction of the DSC support structure. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the support beams of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Orientation

72.48 Log No.: SE00122

D3-HSM-44; 119/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity provided an allowance for the orientation of the W8x48 beams to be reversed (180° in the horizontal plane) to match the as-built centerline of the HSM access sleeve. It also allowed the length of the slots to be increased if required to match the as-built location of the rails. This design change did not affect the structural adequacy of the beams in any way, in that the strong axis remained in the vertical plane. The intent of this design change was to give the field personnel additional flexibility in the construction of the DSC support structure. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a W8x48 beam orientation design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The W8x48 beam orientation design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Orientation

72.48 Log No.: SE00122

D3-HSM-44; 119/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams orientation.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Lifting Lugs Hole Diameter Design Change

72.48 Log No.: SE00123

D3-HSM-45; 120/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFMG. Tesfaye 11/12/97  
SIGNATURE / DATEC. J. Dobry 11/10/97  
SIGNATURE / DATER. H. Beall 11/11/97  
SIGNATURE / DATEApproved

Disapproved

Approved

Disapproved

Signature: J. A. Crunkleton  
INDEPENDENT REVIEWERDate: 11/12/97Signature: Michael J. Gahan  
For GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN  
11-13-97  
Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97Recommend Approval ☒ Recommend Disapproval ☐Signature: J. T. Gail Date: 12-3-97  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature: J. T. Gail Date: 12-3-97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature: J. E. Remeniuk Date: 11/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Lifting Lugs Hole Diameter Design Change			72.48 Log No.: SE00123	
D3-HSM-45; 120/129;	ES199601368	Supplement 001	Revision 0000	Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door lifting lugs.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Lifting Lugs Hole Diameter Design Change

72.48 Log No.: SE00123

D3-HSM-45; 120/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the door lifting lug hole diameter design change. The subject activity revised the hole diameter in the HSM door lifting lugs from 1 1/16" to 1.0" to allow the use of 3/4" shackle pins. Per the AISC Eight Edition, Section 1.16.5, the minimum edge distance from the center of a 1.0" hole to a rolled edge is 1-1/4", and that distance requirement was still met through this design change. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the door of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Lifting Lugs Hole Diameter Design Change			72.48 Log No.: SE00123	
D3-HSM-45; 120/129;	ES199601368	Supplement 001	Revision 0000	Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity revised the hole diameter in the HSM door lifting lugs from 11/16" to 1.0" to allow the use of 3/4" shackle pins. Per the AISC Eight Edition, Section 1.16.5, the minimum edge distance from the center of a 1.0" hole to a rolled edge is 1-1/4", and that distance requirement was still met through this design change. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a door lifting lug hole diameter design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The door lifting lug hole diameter design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Lifting Lugs Hole Diameter Design Change			72.48 Log No.: SE00123	
D3-HSM-45; 120/129;	ES199601368	Supplement 001	Revision 0000	Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door lifting lugs.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Weld Requirements

72.48 Log No.: SE00124

D3-HSM-46; 121/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations



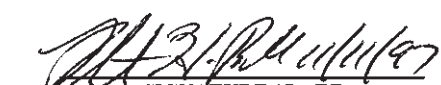
NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?


Resp. Ind.: G. Tesfaye Work Group: Licensing	Resp. Ind.: C. J. Dobry Work Group: PES	Resp. Ind.: R. H. Beall Work Group: NFM
 11/12/97 SIGNATURE / DATE	 11/10/97 SIGNATURE / DATE	 11/11/97 SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON   
INDEPENDENT REVIEWERDate: 11/12/97Signature: Michael J. Gahan   
For GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
11-13-97Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97Recommend Approval ☒ Recommend Disapproval ☐Signature:  Date: 12-3-97  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature:  Date: 12-3-97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature:  Date: 1/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Weld Requirements

72.48 Log No.: SE00124

D3-HSM-46; 121/129;

ES199601368

Supplement 001

Revision 0000

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame weld requirements.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Weld Requirements

72.48 Log No.: SE00124

D3-HSM-46; 121/129;

ES199601368

Supplement 001

Revision 0000

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the door frame weld requirements design change. The subject activity added a requirement for a seal weld between structural stitch welds between the door frame support angles and the HSM embed plates. This change was made to prevent water seepage between the angle and the embed plate of the door frame. Seal welds are considered non-structural and are added to improve the seal of affected areas. This change is an improvement and does not affect the HSM design or analysis. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the door of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Weld Requirements

72.48 Log No.: SE00124

D3-HSM-46; 121/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added a requirement for a seal weld between structural stitch welds between the door frame support angles and the HSM embed plates. This change was made to prevent water seepage between the angle and the embed plate of the door frame. Seal welds are considered non-structural and are added to improve the seal of affected areas. This change is an improvement and does not affect the HSM design or analysis. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a door frame weld requirements design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The door frame weld requirements design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Weld Requirements

72.48 Log No.: SE00124

D3-HSM-46; 121/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame weld requirements.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM DSC Seismic Restraint Design Change

72.48 Log No.: SE00125

D3-HSM-47; 122/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved


Disapproved

Approved

Disapproved

Signature:  J.A. CRUNKLETON  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature:  MICHAEL J. GAHAN  
 GS-DESIGN-TEST, or PE-PDSU  
 11-13-97

Date: 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature:  Date: 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature:  Date: 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:  OSSRC SES CHAIRMAN

Date: 1/30/98If yes, OSSRC Meeting No.:

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM DSC Seismic Restraint Design Change

72.48 Log No.: SE00125

D3-HSM-47; 122/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) seismic restraint.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM DSC Seismic Restraint Design Change

72.48 Log No.: SE00125

D3-HSM-47; 122/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the seismic restraint design change. The subject activity revised the DSC seismic restraint to minimize its weight and to add a handle for remote installation. These changes will result in reduced occupational exposure during the installation of the restraint. The structural adequacy of the revised restraint is verified in calculation BGE001.0218, "Revised DSC Seismic Restraint". Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the seismic restraint of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM DSC Seismic Restraint Design Change

72.48 Log No.: SE00125

D3-HSM-47; 122/129;

ES199601368

Supplement 001

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity revised the DSC seismic restraint to minimize its weight and to add a handle for remote installation. These changes will result in reduced occupational exposure during the installation of the restraint. The structural adequacy of the revised restraint is verified in calculation BGE001.0218, "Revised DSC Seismic Restraint". Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a seismic restraint design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The seismic restraint design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM DSC Seismic Restraint Design Change

72.48 Log No.: SE00125

D3-HSM-47; 122/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) seismic restraint.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Connection Design Change

72.48 Log No.: SE00126

D3-HSM-48; 123/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk [Signature] Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM[Signature] 11/12/97  
SIGNATURE / DATE[Signature] 11/10/97  
SIGNATURE / DATE[Signature] 11/11/97  
SIGNATURE / DATEApproved

Disapproved

Approved

Disapproved

Signature: J.A. Crunkleton  
INDEPENDENT REVIEWERSignature: Michael J. Stahar  
For GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. STAHAR  
11-13-97Date 11/12/97Date 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97Recommend ✓ Approval  
DisapprovalSignature: [Signature] Date 12-3-97  
POSRC CHAIRMANApproved ✓ DisapprovedSignature: [Signature] Date 12-3-97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes \_\_\_\_\_ No XSignature: [Signature] Date: 11/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Connection Design Change

72.48 Log No.: SE00126

D3-HSM-48; 123/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams connections.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Connection Design Change

72.48 Log No.: SE00126

D3-HSM-48; 123/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the W8x48 beam connection design change. The subject activity added slots to the W8x48 cross-beam supports to provide more flexibility in the installation of the support steel. In addition, the rail support steel was mounted on 10-1/2" x 9" x 3/4" plates and attached to the cross beams by 4 - 5/8" diameter bolts. The bolts were used to add flexibility to the joints to eliminate thermal stresses due to differential movement of the beams. The mounting bolts provide an equivalent shear resistance to the welds which were previously designed. This change also simplifies the installation and alignment of the DSC rails. The intent of this design change was to give the field personnel additional flexibility in the construction of the DSC support structure and to eliminate the thermal stresses. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the beams of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Connection Design Change 72.48 Log No.: SE00126

D3-HSM-48; 123/129; ES199601368 Supplement 001 Revision 0000 Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity added slots to the W8x48 cross-beam supports to provide more flexibility in the installation of the support steel. In addition, the rail support steel was mounted on 10-1/2" x 9" x 3/4" plates and attached to the cross beams by 4 - 5/8" diameter bolts. The bolts were used to add flexibility to the joints to eliminate thermal stresses due to differential movement of the beams. The mounting bolts provide an equivalent shear resistance to the welds which were previously designed. This change also simplifies the installation and alignment of the DSC rails. The intent of this design change was to give the field personnel additional flexibility in the construction of the DSC support structure and to eliminate the thermal stresses. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a W8x48 beam connection design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The W8x48 beam connection design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM W8x48 Beam Connection Design Change

72.48 Log No.: SE00126

D3-HSM-48; 123/129;

ES199601368

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams connections.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Angle Change

72.48 Log No.: SE00127

D3-HSM-49; 124/129;

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRAWKLETON  
INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend  
Approval ☒Recommend  
Disapproval ☐

Signature:

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature: J.R. Lemons  
OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Angle Change

72.48 Log No.: SE00127

D3-HSM-49; 124/129;

ES199601368

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams support angles.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Angle Change

72.48 Log No.: SE00127

D3-HSM-49; 124/129;

ES199601368

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the W8x48 beam support angle design change. The subject activity increased the size of the support angles for the cross beam supports from L4X3 to L4X4. This design change was made to meet the AISC requirement to provide minimum edge distances for the attachment bolts. The slightly larger angle provides a leg length of 4" in lieu of 3", which increased the edge distance from 1/2" to 1-1/2". The AISC required edge distance for a 5/8" bolt is 7/8". Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the beams of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Angle Change

72.48 Log No.: SE00127

D3-HSM-49; 124/129;

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity increased the size of the support angles for the cross beam supports from L4X3 to L4X4. This design change was made to meet the AISC requirement to provide minimum edge distances for the attachment bolts. The slightly larger angle provides a leg length of 4" in lieu of 3", which increased the edge distance from 1/2" to 1-1/2". The AISC required edge distance for a 5/8" bolt is 7/8". Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a W8x48 beam support angle design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The W8x48 beam support angle design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Angle Change

72.48 Log No.: SE00127

D3-HSM-49; 124/129;

ES199601368

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**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams support angles.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Steel Weld Changes

72.48 Log No.: SE00128

D3-HSM-50; 125/129;

ES199601368

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Indv.: C. J. Dobry  
 Work Group: PES

Resp. Indv.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON J.A. Crunkleton  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan  
 For GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature: J.H. Call Date: 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature: J.H. Call Date: 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J.R. Lemons  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Steel Weld Changes

72.48 Log No.: SE00128

D3-HSM-50; 125/129;

ES199601368

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**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams support steel welds.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Steel Weld Changes

72.48 Log No.: SE00128

D3-HSM-50; 125/129;

ES199601368

Supplement 001

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the W8x48 beam support steel weld design change. The subject activity changed the welds attaching the rail support steel to the cross beams mounting plates to change from one 1/2" and one 1/4" groove weld to two 3/8" groove welds. The new weld configuration has an identical 3/4" total throat as the original design, and as such, the allowable shear resistance for welds will remain the same. Since 1993, all fuel moves have resulted in a smooth transfer of the DSC from the TC into the HSM without any damage to the sliding surfaces. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

The subject design change allows the"

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the beams of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Steel Weld Changes

72.48 Log No.: SE00128

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed the welds attaching the rail support steel to the cross beams mounting plates to change from one 1/2" and one 1/4" groove weld to two 3/8" groove welds. The new weld configuration has an identical 3/4" total throat as the original design, and as such, the allowable shear resistance for welds will remain the same. Since ISFSI loading operations began in November of 1993, all fifteen fuel moves to date have resulted in a smooth transfer of the DSC from the TC into the HSM. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a W8x48 beam support steel weld design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The W8x48 beam support steel weld design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Beam Support Steel Weld Changes			72.48 Log No.: SE00128	
D3-HSM-50; 125/129;	ES199601368	Supplement 001	Revision 0000	Page 5 of 5

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) W8x48 beams support steel welds.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 1

72.48 Log No.: SE00129

D3-HSM-51; 126/129;

ES199601368

Supplement 001

Revision 0000

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J.A. CRUNKLETON   
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature:   
 GS-DES, GS-TES, or PE-PDSU

MICHAEL J. GAHAN, III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature:  Date: 12-3-97  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐

Signature:  Date: 12-3-97  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature:  Date: 1/30/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 1

72.48 Log No.: SE00129

D3-HSM-51; 126/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame angles.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 1

72.48 Log No.: SE00129

D3-HSM-51; 126/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the door frame angle design change number 1. The subject activity changed the four door guide angles from L7x4x $\frac{3}{4}$  with L9x4x $\frac{5}{8}$ . This design change is analyzed in calculation BGE001.0213 Revision 2, HSM Door Analysis. The reason for the change was to provide an angle with a longer leg (9" in lieu of 7") which would provide the required angle overlap and length to serve as a guide for the HSM door, which is 12 $\frac{3}{4}$ " thick. This angle, combined with a L7x4x $\frac{3}{4}$  and the required angle overlap, results in a guide spacing of 13-1/8". The calculation verified that the stresses associated with the angle change were safely below the allowables. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the door of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 1

72.48 Log No.: SE00129

D3-HSM-51; 126/129;

ES199601368

Supplement 001

Revision 0000

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity changed the four door guide angles from L7x4x3/4 with L9x4x5/8. This design change is analyzed in calculation BGE001.0213 Revision 2, HSM Door Analysis. The reason for the change was to provide an angle with a longer leg (9" in lieu of 7") which would provide the required angle overlap and length to serve as a guide for the HSM door, which is 12 3/4" thick. This angle, combined with a L7x4x3/4 and the required angle overlap, results in a guide spacing of 13-1/8". The calculation verified that the stresses associated with the angle change were safely below the allowables. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a door frame angle design change number 1. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The door frame angle design change number 1 does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 1

72.48 Log No.: SE00129

D3-HSM-51; 126/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame angles.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 2

72.48 Log No.: SE00130

D3-HSM-52; 127/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5


Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
NO Involve a change in the Technical Specifications/License Conditions or Bases?  
NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk  Department: NED-CEU 42-01-04 Date: 11-7-97  
PRINTED NAME AND SIGNATURE


YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
Work Group: PESResp. Ind.: R. H. Beall  
Work Group: NFM 11/12/97  
SIGNATURE / DATE 11/10/97  
SIGNATURE / DATE 11/11/97  
SIGNATURE / DATEApproved

Disapproved

Approved

Disapproved

Signature: J.A. Crunkleton   
INDEPENDENT REVIEWERDate 11/12/97Signature: Michael J. Gahan   
for GS-DES, GS-TES, or PE-PDSU  
MICHAEL J. GAHAN III  
Date 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137Date: 12-3-97Recommend Approval ☒ Recommend Disapproval ☐Signature:  Date 12-3-97  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature:  Date 12-3-97  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature:  Date: 1/30/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 2

72.48 Log No.: SE00130

D3-HSM-52; 127/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame angles.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.:** 5

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 2

72.48 Log No.: SE00130

D3-HSM-52; 127/129;

ES199601368

Supplement 001

Revision 0000

Page 3 of 5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction:

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the door frame angle design change number 2. The subject activity provided a construction alternative to substitute L8x4x3/4 angles for all L7x4x3/4 and L9x4x5/8 door frame angles. This design change is analyzed in calculation BGE001.0213 Revision 2, HSM Door Analysis. The reason for the change was to provide the constructor with one angle size for an order in lieu of two, and to eliminate the possibility of incorrectly constructing the frame by mixing the angles. This alternative design is equivalent to the original design, which was discussed in ISFSI Safety Evaluation SE00129. The use of this angle, along with the required angle overlap, results in a guide spacing of 13-1/8", which provides the spacing necessary for the 12 3/4" thick HSM door. The calculation verified that the stresses associated with the angle change were safely below the allowables. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction:

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident:

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the door of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident:

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 2

72.48 Log No.: SE00130

D3-HSM-52; 127/129;

ES199601368

Supplement 001

Revision 0000

Page 4 of 5

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity provided a construction alternative to substitute L8x4x3/4 angles for all L7x4x3/4 and L9x4x5/8 door frame angles. This design change is analyzed in calculation BGE001.0213 Revision 2, HSM Door Analysis. The reason for the change was to provide the constructor with one angle size for an order in lieu of two, and to eliminate the possibility of incorrectly constructing the frame by mixing the angles. This alternative design is equivalent to the original design, which was discussed in ISFSI Safety Evaluation SE00129. The use of this angle, along with the required angle overlap, results in a guide spacing of 13-1/8", which provides the spacing necessary for the 12 3/4" thick HSM door. The calculation verified that the stresses associated with the angle change were safely below the allowables. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases      Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a door frame angle design change number 2. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The door frame angle design change number 2 does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Design Change No. 2

72.48 Log No.: SE00130

D3-HSM-52; 127/129;

ES199601368

Supplement 001

Revision 0000

Page 5 of 5

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame angles.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Welds Design Changes

72.48 Log No.: SE00131

D3-HSM-53; 128/129;

ES199601368

Supplement 001

Revision 0000

Page 1 of 5

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

NO Involve an unreviewed safety question (USQ)?  
 NO Involve a change in the Technical Specifications/License Conditions or Bases?  
 NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

NO Involve a Significant Increase in Occupational Dose?  
 NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: J. E. Remeniuk

PRINTED NAME AND SIGNATURE

Department: NED-CEU 42-01-04

Date: 11-7-97

YES

Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye  
 Work Group: Licensing

Resp. Ind.: C. J. Dobry  
 Work Group: PES

Resp. Ind.: R. H. Beall  
 Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved

Disapproved

Approved

Disapproved

Signature: J. A. CRUNKLETON  
 INDEPENDENT REVIEWER

Date: 11/12/97

Signature: Michael J. Gahan III  
 for GS-DES, GS-TES, or PE-PDSU  
 MICHAEL J. GAHAN III  
 11-13-97

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 97-137

Date: 12-3-97

Recommend Approval ☒ Recommend Disapproval ☐

Signature:

POSRC CHAIRMAN

Date: 12-3-97

Approved ☒ Disapproved ☐

Signature:

PLANT GENERAL MANAGER

Date: 12-3-97

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. R. Leman  
 OSSRC SES CHAIRMAN

Date: 1/30/98

If yes, OSSRC Meeting No.: \_\_\_\_\_

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Welds Design Changes

72.48 Log No.: SE00131

D3-HSM-53; 128/129;

ES199601368

Supplement 001

Revision 0000

Page 2 of 5

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame angle welds.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Function(s) of affected SSC:** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (PNFS) (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are four major components of the NUHOMS-24P system. The four components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); 3) Lifting Yoke (Yoke); and 4) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those component(s) related to this evaluation.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2004. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**ISFSI USAR Revision No.: 5**

**ISFSI USAR Sections reviewed:** The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.3, 3.4, 3.6, 4.2, 4.3, 5.1, 7.3, 7.4, 8.1, and 8.2.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Welds Design Changes

72.48 Log No.: SE00131

D3-HSM-53; 128/129;

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**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of the door frame angle weld design change. The subject activity reduced the amount of weld used to attach the door frame angles to the embedded steel. This change was made to reduce the heat input to the concrete and lower the potential for concrete cracking. This design change is analyzed in calculation BGE001.0213, Revision 2, HSM Door Analysis. As shown in this calculation, the revised weld design meets the code allowables. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety.

The subject design change

NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of the activity. None of the accident scenarios address the door of the HSM.

NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. As stated above, there are no possible accidents of the HSM which are described or evaluated in the USAR as a result of this proposed activity. As such, there are no consequences to consider.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Welds Design Changes

72.48 Log No.: SE00131

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction:

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. The subject activity reduced the amount of weld used to attach the door frame angles to the embedded steel. This change was made to reduce the heat input to the concrete and lower the potential for concrete cracking. This design change is analyzed in calculation BGE001.0213, Revision 2, HSM Door Analysis. As shown in this calculation, the revised weld design meets the code allowables. Based on this information, the subject design change will not affect the form, fit or function of the HSM, is not detrimental to the structural integrity of the HSM, and will not adversely affect the ability of the HSM to perform its intended design function. Therefore, this design change has no detrimental impact on equipment important to safety, and will not create the possibility of a new malfunction not previously evaluated in the SAR.

NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident:

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. After a thorough and intense review, it was concluded that this activity would not create the possibility of a new accident not previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any ISFSI Technical Specification is not reduced.

NO Will the margin of safety as defined in the basis for any ISFSI Technical Specification be reduced?

Bases Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48:

NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

A significant increase in occupational dose will not occur as a result of this proposed activity. The activity provided a door frame angle weld design change. BGE approved this design change for construction prior to the issuance of the ISFSI license in November, 1992. The door frame angle weld design change does not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.



## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - HSM Door Frame Angle Welds Design Changes

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** To evaluate an ISFSI design change that occurred prior to the issuance of the ISFSI license in November, 1992. This particular safety evaluation addresses a design change to the HSM (Horizontal Storage Module) door frame angle welds.

**Reason for Activity:** This design change was fully evaluated and justified by Pacific Nuclear Fuel Services and approved by BGE for construction prior to the issuance of the ISFSI license in November, 1992. This design change was included in a document which was submitted to the NRC on July 16, 1992, which provided the first revision to the original SAR and provided changes made to ISFSI design documents during fabrication that had not been previously reviewed by the NRC. This safety evaluation was performed because the NRC has not reviewed that submittal.

**Activity Summary:** After a thorough and intense review, it has been concluded that the ISFSI documentation reviewed:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR
- Does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the SAR
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Analysis of DSC under Postulated Cask Drop Accident

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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions or Bases?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: David A. Scheetz DAScheetz Department: Duke Engineering & Services Date: 2-16-98  
PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <u>G. Tesfaye</u> 2/16/98 SIGNATURE / DATE	Resp. Ind.: C. J. Dobry Work Group: PES <u>C. J. Dobry</u> 2/16/98 SIGNATURE / DATE	Resp. Ind.: R. H. Beall Work Group: NFM <u>R. H. Beall</u> 2/16/98 SIGNATURE / DATE
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Approved

Disapproved

Approved

Disapproved

Signature: J. Reeves 2/16/98  
INDEPENDENT REVIEWERSignature: Michael J. Gahen  
GS-DES, GS-TES, or PE-PDSUDate: 2/16/98Date: 2.17.98

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 98-018 Date: 2.17.98Recommend Approval ☒ Recommend Disapproval ☐Signature: J. H. Gahen Date: 2-17-98  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature: P. E. Kof Date: 2/17/98  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒Signature: J. R. Simon Date: 5/15/98  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - Analysis of DSC under Postulated Cask Drop Accident****72.48 Log No.:SE00133****ES199601368 Supplement 002 Revision 0000****Page 2 of 8**

**Proposed Activity:** This safety evaluation is prepared to clarify and correct the licensing basis for the NUHOMS system in use at the Calvert Cliffs Independent Spent Fuel Storage Installation (ISFSI) with respect to the postulated transfer cask drop accident. The USAR will be changed to properly account for the behavior of DSC components, and to correct the stress values and deflections that might be expected in the unlikely event of a cask vertical drop accident. This activity applies to canisters R008, R009, and R018-R024.

**Change the Calvert Cliffs ISFSI USAR as follows:**

- 1) USAR Section 8.2.5.2 qualifies the transfer cask for a cask drop accident by reference to "...the analytical methods presented in Section 8.2.5.2 of (the Topical Report)..." The USAR will be revised here to add a reference to, and a brief description of, BGE analyses which correct the analysis of the postulated transfer cask vertical drop accident in the Topical Report. These new analyses acknowledge that the connection between the DSC guide sleeves and the bottom spacer disk may fail at a higher vertical acceleration than the design previously anticipated, and the bottom spacer disk behavior has consequently been re-analyzed for this loading due to the guide sleeves. The support rods have also been reanalyzed for the effects of this new loading, including the use of ASME Appendix F in determining support rod allowable stress. No change to the USAR is anticipated for any other drop events.
- 2) USAR Tables 8.2-6 and 8.2-10 will be modified to show the new stress levels in the DSC components resulting from the transfer cask vertical drop.
- 3) USAR Section 8.2.5.2 specifies the maximum spacer disk deflection which might be expected under a cask drop accident of any orientation. This section will be updated.
- 4) USAR Sections 8.1.1, 8.1.2, and 8.2 will have a reference to the re-analysis added.

**Reason for Activity:**

An independent design review and assessment of TN-West (formerly known as Vectra Technologies, Inc., Pacific Nuclear, and NUTECH), performed by LES and commissioned by GPU Nuclear, Inc., identified a design issue with the generic NUHOMS-24P DSC system. The Calvert Cliffs ISFSI uses a similar NUHOMS-24P model, and is affected by this issue.

The issue involves the postulated transfer cask drop event, which is described in the ISFSI USAR Section 8.2.5. The ISFSI USAR concludes that a vertical, horizontal, or corner drop would:

- not affect the ability to retrieve fuel from the DSC stored inside the transfer cask
- not affect fuel cladding integrity
- not affect DSC structural integrity

The transfer cask drop analysis (which is not described in the ISFSI USAR, but is found in the DSC Structural Calculation C-91-076, Rev. 001, and the Topical Report for NUHOMS-24P) assumed, during a postulated vertical cask drop event, that the welds, which attach angle clips from the DSC bottom spacer disk to the DSC guide sleeves, will fail at 35 g's (SER p. 2-48). At that point, the guide sleeves would cease to exert any force on the bottom spacer disk. The independent design review and assessment concluded that the approach used to calculate the weld failure point was not conservative, and that the possibility exists that the welds may not fail until a higher acceleration level (> 35 g's) is reached. If the welds and angle clips were to remain intact at higher g levels during a vertical cask drop event, then more of the load associated with the deceleration of the DSC guide sleeves would be transferred to the DSC bottom spacer disk and four DSC support rods. As a result, the behavior of these components will change, and the stresses associated with the ISFSI USAR transfer cask drop event will slightly increase.

These concerns have been documented in BGE Issue Report IR1-011-183.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Analysis of DSC under Postulated Cask Drop Accident

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Function(s) of affected SSC: Summarizing information provided in Chapter 4 of the USAR and ANSI-57.9, the dry shielded canister has containment, shielding, criticality control, configuration control related to fuel retrievability, and thermal safety functions. The primary function of the DSC is to provide containment for the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further assure containment integrity. These are integral with the shield plugs. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC to HSM loading operations and at the HSM door during storage.

Criticality and configuration control is provided by the DSC's internal basket assembly. A series of nine spacer discs and four axial support rods maintain the fuel assemblies in known positions under all normal and accident conditions. The thickness and location of the spacer discs, plus the relative location of the fuel assemblies and the DSC basket material achieve the criticality and configuration control functions. The DSC maintains the helium cover gas which is required for heat rejection and corrosion control. Heat is transferred via thermal radiation and conduction from the fuel through the spacer discs and cover gas to the DSC shell, where it is convectively cooled during HSM interim storage. The presence of helium and spacer discs achieves the heat transfer function.

The on-site transfer cask provides shielding during the DSC closure and transfer operations. The transfer cask also provides structural protection for the DSC against natural and operation hazards during the transfer operations and loading of the DSC into the HSM for interim storage.

ISFSI USAR Revision No.: 6

ISFSI USAR Sections Reviewed: The main chapters reviewed were 3, 4, 5, 7, and 8. The key sections reviewed were 3.6, 4.2, 4.7, 5.1, 7.4, 7.5, 7.6, 8.1, and 8.2.

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction: The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity.

Critical functions that must be maintained are containment, shielding, criticality control, configuration control related to fuel retrievability, and thermal safety functions. The cask drop scenario imposes limiting stresses on the transfer cask and the DSC components. Stresses beyond code allowables or unacceptable deflections of safety related DSC and transfer cask equipment/materials define the malfunctions needing to be considered when evaluating this activity involving the drop scenario. The activity in no way degrades the reliability of components important to safety since the design of the DSC is unchanged by this activity. There is no change to the design or operation of the NUHOMS system caused by this activity. While there are slight increases in stress levels of components of the DSC, the stresses are still below allowable values. Hence, there is no increase in the probability of malfunctions resulting from the accident.



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☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction: The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity.

The potential malfunctions that could result from this change are the excessive stresses and permanent deformation of the bottom spacer disk, support rods, and/or guide sleeves which could adversely affect canister containment capability. Any breach in this containment capability could have direct radiological consequences, in the form of increased dose rates. Analyses using elastic-plastic methods consistent with the original bilinear elastic-plastic model (SER p. 2-48) have determined that increases in stress and strain levels in the subject components will occur. However, the stress levels are still below the allowable values and will not affect this containment capability (Ref. 6). Deformations are addressed below. For the case of the support rods, introduction of combined applied compression and bending loads from the bottom spacer disk, which was not previously adequately considered, introduces a new load case for the support rods. Again, analysis has shown this load case to be acceptable, with stresses below allowable values (Ref. 6). All other structural elements of the canister have been considered in the analysis, and the analysis conservatively envelopes the use of both stainless and carbon steel materials for the spacer disks. The stress levels indicate that there is no effect on the containment or structural integrity of the DSC. Hence, the radiological consequences of any component malfunction associated with the top cask drop are not increased.

In a cask bottom drop accident scenario, the gap between the bottom of the guide sleeves (connected to the bottom spacer disk), and the bottom cover plate would close well before the connection would fail. This is consistent with existing Topical Report p. 8.2-35.

Criticality control is assured as part of the existing design basis and technical specifications by the physical properties and history of the fuel, by mechanical control of the assemblies' locations in the DSC basket, by neutron absorption of the materials of the basket, by Calvert Cliffs administrative controls over fuel identification and handling, and by the presence of soluble boron in the fuel pool for wet operations (Ref. 1). The maintenance of continued positive control over criticality has been examined as part of this evaluation. In the event of a cask end drop, section 3.3.4 of the USAR has shown that introduction of a moderator would be necessary to cause a criticality concern. The violation of DSC structural integrity that would be necessary to allow the introduction of that moderator has been shown to be incredible above. None the less, a criticality analysis of the effects of spacer disk in-plane deformations on guide sleeve center-to-center spacing has been performed, and has determined that criticality control is still maintained over the fuel in the DSC in the event of a cask end drop (Ref. 13).

The Technical Specification requires retrievability of fuel from the DSC for any drop greater than 15". Analyses have determined the maximum guide sleeve deflection which might be expected from the cask vertical drop accident in the plane of the bottom spacer disk at the guide sleeve connection point. The permanent in-plane deflection is predominantly due to local deformation at the clip connection point to the guide sleeve (Ref. 6), and can directly impact retrievability. This deformation typically does not exceed the gap between the guide sleeve and the lower spacer grid of the fuel assembly, which is nominally computed to be one-half of 0.52 inches (Ref. 14), or 0.26 inches on each side, at this location. However, under certain circumstances this deformation may exceed the gap and "pinch" the fuel assembly. A small nominal force has been computed to be necessary (Ref. 6) to extract the fuel assembly from the DSC if this "pinched" condition should occur. The effects on the lower spacer grid, on the stresses in the fuel assembly guide tubes and upper end fitting posts, and on the fuel handling machine hoist during retrieval have been examined. The force on the lower spacer grid is comparable to the self weight that a spacer grid normally supports in the horizontal orientation, and hence is not a concern; The fuel assembly components are so rigid in the axial direction that any stress increases are inconsequential; Finally, the overload

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setting of the spent fuel handling machine hoist is procedurally verified to be much greater than the assembly weight plus the extraction force required (Ref. 15). The effects of the 75 g force acting on the spacer disk itself, together with any effect on other spacer disks, have been considered (Ref. 6), and do not impact the above-described "dimpling" determination or cause guide sleeve deflections which permanently close the guide sleeve-fuel assembly gap at spacer disks other than the bottom spacer disk. Hence, retrievability is assured.

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident: The probability of occurrence of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity.

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. Of those accidents discussed in the SAR, only the cask drop scenario is affected. The probability of occurrence is only dependent on the drop initiating event frequency. There is no change to the design or operation of the NUHOMS system caused by this activity, or to the drop initiating event frequency. Therefore, the probability of occurrence of the cask drop is not changed. The SER (p. 2-43) states that the seismic analyses of certain components of the DSC were based upon scaling the results of the vertical cask drop analysis. However, examination of the design basis reveals that the seismic analyses of those components whose behavior will differ because of this activity, the bottom spacer disk and support rods, did not utilize any of the results of the drop analysis, instead relying for their design on the deadweight analysis. Therefore, there is no change in the probability of occurrence of any analyzed accident.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident: The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity.

The USAR reports that an accidental cask drop results in the maintenance of continued structural and containment integrity. However, the computation of dose rates resulting from the cask drop is conservatively based on a total loss of solid neutron shielding in the USAR. Increases in consequences can only occur when doses to the public are increased beyond those described in Chapter 8 of the USAR. Since stress levels are below allowables, and increases in the stress and strain levels of the bottom spacer disk and support rods do not affect the ability of the transfer cask to maintain its structural integrity, the containment and shielding integrity of the DSC is maintained.

Criticality control has been previously discussed. It has been concluded that criticality control is still maintained over the fuel in the DSC in the event of a cask end drop.

Therefore, the consequences of a cask drop accident previously evaluated in the USAR are not increased.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

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Possibility of New Malfunction: The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity.

The critical functions and cask drop scenarios associated with this change have been discussed previously. No new components, procedures, or tests are being introduced. While the acceleration at which the guide sleeves plastically deform and cease to load the bottom spacer plate increases, all components still perform their functions within the parameters of the licensing basis, that is, with acceptable stress levels computed considering "spacer disk elastic plus plastic deflections" (USAR p. 8.2-12), and analyzing "the vertical top end drop using a bi-linear elastic-plastic model" (SER p.2-48)

Retrievability of fuel has been discussed previously. All spacer disk permanent deflections which could adversely affect the ability of the fuel to be removed from the DSC guide sleeves have been examined and determined to be acceptable.

☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity.

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in section 8.2 of the USAR, and have been discussed previously. Since there is no change to the design or operation of the NUHOMS system caused by this activity, the possibility of an accident of a different type than any previously evaluated in the SAR will not be created.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO Will the margin of safety as defined in the basis for any Technical Specification be reduced?

BasesDiscussion of why the margin of safety is not reduced

2.3

The transfer cask is allowed to be lifted up to 80" in height with a non-single-failure-proof lifting device. The 75 g acceleration envelopes this specification. In the event of a cask drop of 15 inches or more, the DSC is required to be removed from service and inspected, which in turn requires that the fuel be removed from the DSC.

Analyses of cask vertical drops performed for this safety evaluation demonstrate that drops of up to 80" can be sustained without unacceptable damage to the cask or DSC, and without decreasing margins of safety. The margin of safety is the difference between the appropriate ASME allowable stress value and the material equivalent failure stress. Table 2.2.3-14 of the SER indicates that the allowable stresses for the DSC components under Combined Accident Loads (Service Level D) are 43.2 ksi (Pri Membrane) and 64.0 ksi (Membrane+Bending). These are provided by ASME for components subject to an elastic analysis. All elastically-computed stresses (Ref. 6) are below these allowable stresses and all margins of safety associated with these allowable stresses remain unchanged. In addition, all plastically-computed stresses (Ref. 6)



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remain below the allowable stresses recommended by ASME for plastically analyzed components. Table 2.2.3-13, Drop Accident Loads (Service Level D), of the SER lists the same allowables (as appear in Table 2.2.3-14) for the spacer disk, but lists the allowable stress for the support rods as 28.0 ksi (Primary). This value, which corresponds to the allowable provided by ASME for primary membrane stresses for certain component supports, is inconsistent with the statement of allowable stresses in BGE calculation C-91-076, Rev. 001, and in Table 2.2.3-14 of the SER. We do not consider this to be an appropriate allowable stress for the support rods because all other technical bases have used component allowable values for the support rods, rather than component support allowable values. (The ASME assigns one set of allowable stresses to components such as vessels, concrete containments, piping, pumps, valves, and storage tanks, and another set to component supports, which are metal elements transmitting component loads to building structures. We believe that the support rods are properly classified as components.) Nonetheless, the computed stress level (Ref. 6) ensures that the margin of safety associated with this allowable stress remains unchanged.

Complete for 72.48:

☐ YES ☒ NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose: A significant increase in occupational dose will not occur as a result of this proposed activity.

The design and operation of the NUHOMS system outside the reactor building is not changed by this proposed activity. Integrity of the DSC or transfer cask is not impacted by this activity. Retrieval of fuel following a design basis 80 inch drop accident is not impacted by this activity. Shielding functions of the DSC and the transfer cask are not impacted by this activity. Because none of these attributes are changed, the occupational doses summarized in USAR Table 7.4-1 are not affected by this activity. Therefore no occupational doses are increased.

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: A significant unreviewed environmental impact will not occur as a result of this proposed activity.

Integrity of the DSC or transfer cask is not impacted by this activity. Shielding functions of the DSC and the transfer cask are not impacted by this activity. The proposed activity does not affect any area of the plant site previously undisturbed for the ISFSI, and does not cause any reason for revision to the ISFSI Updated Environmental Report. The proposed activity does not affect the environmental conditions associated with the ISFSI.

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** This safety evaluation is prepared to clarify and correct the licensing basis for the NUHOMS-24P system in use at the Calvert Cliffs ISFSI with respect to the postulated transfer cask drop accident.

**Proposed changes to the Calvert Cliffs ISFSI USAR include:**

- addition of a description of BGE analyses which correct the vertical drop accident analyses in the Topical Report, specifically, of the behavior of the DSC guide sleeves, bottom spacer disk, and support rods.



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ISFSI - Analysis of DSC under Postulated Cask Drop Accident

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- modification of reported stresses in the DSC components resulting from the transfer cask vertical drop.
- updating the reported spacer disk deflection to be expected for a cask drop accident.

**Reason for Activity:** The transfer cask drop analysis (which is not described in the ISFSI USAR, but is found in the DSC Structural Calculation C-91-076, Rev. 001, and the Topical Report for NUHOMS-24P) assumed, during a vertical cask drop event, that the welds (which attach angle clips from the DSC bottom spacer disk to the DSC guide sleeves) will fail at 35 g's. The independent design review and assessment originally conducted for GPU Nuclear concluded that the approach used to calculate the weld failure point was not conservative, and that the possibility exists that the welds would not fail until a higher acceleration level ( $> 35g$ 's) is reached. If the welds and angle clips were to remain intact at higher g levels during a vertical cask drop event, then more of the load associated with the deceleration of the DSC guide sleeves would be transferred to the DSC bottom spacer disk and four DSC support rods. As a result, the behavior of these components will change, and the stresses associated with the ISFSI USAR transfer cask drop event will slightly increase.

**Activity Summary:** Correction of the licensing basis for the NUHOMS-24P system in use at Calvert Cliffs to properly account for the behavior of DSC components, and to correct the stress values that might be expected, in the unlikely event of a cask vertical drop accident, does not constitute an Unreviewed Safety Question (USQ). Increases in stresses and deflections which could occur under these scenarios have been examined and do not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR. Nor is the possibility for an accident or malfunction of a different type created. The increased stresses do not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification, and, because of the maintenance of DSC structural integrity, criticality control, and retrievability, do not result in any increase in occupational dose. Finally, this activity does not constitute an Unreviewed Environmental Impact.

**References:**

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 6
2. SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992
3. Topical Report for the Nutech Horizontal Module Storage System for Irradiated Nuclear Fuel NUHOMS-24P, April 1991 (NUH-002, Rev. 1A)
4. BGE Calculation C-91-076, Rev. 001 (Vendor Calc. BGE001.0203, Rev. 004)
5. BGE Calculation C-91-076, Rev. 002 (Vectra Calculation BGE001.0203A, Rev. 0)
6. BGE Calculation CA04132, Rev. 000
7. BGE Issue Report IR1-011-183
8. BGE Drawing 84-001, Rev. 0
9. BGE Drawing 84-019, Rev. 0
10. Reformatted Technical Specifications for Calvert Cliffs ISFSI, May 19, 1992
11. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1
12. ANSI/ANS-57.9-1992, Design Criteria for an Independent Spent Fuel Storage Installation
13. BGE Memo NEU 98-021, G. E. Gryczkowski to M. J. Gahan, 2/16/98, Subject: Criticality of a Compressed and Flooded Dry Storage Canister (ES199800192-000, Rev. 0000)
14. BGE Memo NFM 98-026, R. H. Beall to M. J. Gahan, 1/23/98, Subject: DSC Guide Sleeve to Fuel Assembly Gap Size
15. BGE IMP I-19, Rev. 6, Spent Fuel Handling Machine Load Weighing System Alignment Test/Adjustment
16. American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section III, 1983.

## ATTACHMENT 3, SAFETY EVALUATION FORM

ISFSI - Analysis of DSC under Blowdown/Reflood Internal Pressure	72.48 Log No. SE00136
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Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions or Bases?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: David A. Scheetz *Dash* Department: Duke Engineering & Services Date: 2-19-98  
 PRINTED NAME AND SIGNATURE

YES Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye Work Group: Licensing <i>G. Tesfaye</i> SIGNATURE / DATE 2-19-98	Resp. Ind.: C. J. Dobry Work Group: PES <i>C. J. Dobry</i> SIGNATURE / DATE 2/19/98	Resp. Ind.: R. H. Beall Work Group: NFM <i>R. H. Beall</i> SIGNATURE / DATE 2/19/98
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*Carl S. Lerner*  
 Approved Disapproved 2/19/98

Approved Disapproved

Signature: Rick for John Reeves / 2-19-98  
 INDEPENDENT REVIEWER

Signature: [Signature]  
 GS-DES, GS-TES, or PE-PDSU

Date 2-19-98

Date 2/20/98

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 98-020 Date: 2-26-98

Recommend Approval ☒ Disapproval ☐ Signature: [Signature] Date 2-20-98  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐ Signature: [Signature] Date 2/20/98  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? Yes ☐ No ☒

Signature: J. R. Lemmon Date: 5/15/98  
 OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_

**ATTACHMENT 3, SAFETY EVALUATION FORM**

<b>ISFSI - Analysis of DSC under Blowdown/Reflood Internal Pressure</b>	<b>72.48 Log No.: SE00136</b>
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**Proposed Activity:** This safety evaluation is prepared to clarify and correct a non-conforming condition for the NUHOMS system in use at the Calvert Cliffs Independent Spent Fuel Storage Installation (ISFSI) with respect to the Dry Shielded Canister (DSC) internal pressure during blowdown and reflood conditions. The USAR will be changed to revise the pressures and the associated stress values that are expected under blowdown and reflood internal pressures.

**Change the Calvert Cliffs ISFSI USAR as follows:**

- 1) USAR Tables 3.6-2 and 3.6-3 will be updated to show that the DSC internal pressures under Service Level B and Service Level D conditions (ref. ASME B&PV Code) include pressures due to blowdown and reflood activities, respectively (40.0 psig for each).
- 2) USAR Section 8.1.1.1.B will be revised to add a statement that the DSC internal pressure loads include a consideration of pressures due to blowdown and reflood conditions, and that reflood is a Service Level D condition. A re-analysis which includes the effects of these loadings has been conducted, and concludes that these conditions are adequately addressed by the design.
- 3) USAR Table 8.1-4 will be updated to show the new off-normal stress levels in the DSC components resulting from the blowdown internal pressure load case.
- 4) USAR Table 8.2-8 will be updated to show the new enveloped stress levels in the DSC components resulting from the blowdown internal pressure.

**Reason for Activity:**

It was discovered during a calculation review that, while Calvert Cliffs subjects the DSCs to internal pressures of up to 35 psig during blowdown and reflood activities (ref. 12, 13 and 15), the USAR and SER do not mention that these activities cause internal pressure loads. The USAR only describes normal and off-normal internal pressures of 10 psig, and accident internal pressures of 50 psig. This safety evaluation will show, conservatively, that blowdown and reflood pressures up to 40 psig are acceptable.

The blowdown activity occurs after loading fuel into the DSC/transfer cask, moving it to the washdown pit, and welding the shield plug in place. It involves the introduction of filtered, regulated air and/or helium through the vent line into the DSC while borated water discharges through the siphon port. The reflood activity occurs only if the sealed DSC is required to be opened in the washdown pit. It involves the controlled introduction of borated water from the spent fuel pool into the siphon port of the DSC while the monitored helium backfill vents through the DSC vent port.

Blowdown pressure has been determined to be a Service Level B load condition, and reflood pressure a Service Level D load condition (ref. 7 and 11).

These concerns have been documented in BGE Issue Report IR3-005-170.

**Function(s) of affected SSC:** Summarizing information provided in Chapter 4 of the USAR and ANSI-57.9, the dry shielded canister has containment, shielding, criticality control, configuration control related to fuel retrievability, and thermal safety functions. The primary function of the DSC is to provide containment for the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further assure containment integrity. These are integral with the shield plugs. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC to HSM loading operations and at the HSM door during storage.

Criticality and configuration control is provided by the DSC's internal basket assembly. A series of nine spacer discs and four axial support rods maintain the fuel assemblies in known positions under all normal and accident conditions. The thickness and location of the spacer discs, plus the relative location of the fuel assemblies and the DSC basket

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material achieve the criticality and configuration control functions. The DSC maintains the helium cover gas which is required for heat rejection and corrosion control. Heat is transferred via thermal radiation and conduction from the fuel through the spacer discs and cover gas to the DSC shell, where it is convectively cooled during HSM interim storage. The presence of helium and spacer discs achieves the heat transfer function.

The on-site transfer cask provides shielding during the DSC closure and transfer operations. The transfer cask also provides structural protection for the DSC against natural and operation hazards during the transfer operations and loading of the DSC into the HSM for interim storage.

ISFSI USAR Revision No.: 6

ISFSI USAR Sections Reviewed: The main chapters reviewed were 3, 4, 5, 7, and 8. The key sections reviewed were 3.6, 4.2, 4.7, 5.1, 7.4, 7.6, 8.1, and 8.2.

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction: The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity.

Functions that must be maintained are containment, shielding, criticality control, configuration control related to fuel retrievability, and thermal safety functions. The internal pressurization scenarios impose limiting stresses on some DSC components. Stresses beyond code allowables or unacceptable deflections of safety related DSC equipment/materials define the malfunctions needing to be considered when evaluating this activity involving the internal pressures. The activity in no way degrades the reliability of components important to safety since the design of the DSC is unchanged by this activity. There is no change to the design or operation of the NUHOMS system caused by this activity. While there are increases in stress levels of components of the DSC (ref. 6), the stresses are still below allowable values, and all functions are capable of being performed. Hence, there is no increase in the probability of malfunctions resulting from the accident.

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction: The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity.

The potential malfunctions that could result from this change are the excessive stresses and permanent deformation of the DSC shell and cover plates which could adversely affect canister containment capability. Any breach in this containment capability could have direct radiological consequences, in the form of increased dose rates. The analysis conservatively envelopes the use of both stainless and carbon steel materials for the spacer disks.



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Blowdown pressure has been determined to be a Service Level B load condition, and reflood pressure a Service Level D load condition (ref. 7 and 11). Since the existing design includes a 50 psig accident pressurization, the reflood condition is enveloped by the existing Service Level D analysis. Analysis has shown that DSC shell stresses associated with the blowdown and reflood pressures will increase, but that all stresses are below allowable values (Ref. 6). The stress levels indicate that there is no effect on the containment or structural integrity of the DSC. Hence, the radiological consequences of any component malfunction associated with the blowdown and reflood activities are not increased.

Criticality control is assured as part of the existing design basis and technical specifications by the physical properties and history of the fuel, by mechanical control of the assemblies' locations in the DSC basket, by neutron absorption of the materials of the basket, by Calvert Cliffs administrative controls over fuel identification and handling, and by the presence of soluble boron in the fuel pool for wet operations (Ref. 1). The maintenance of continued positive control over criticality has been examined as part of this evaluation, and has been determined not to be at risk because there is no permanent deformation of any component which could cause changes in any of the criticality control attributes listed above.

The Technical Specification requires retrievability of fuel from the DSC for any drop greater than 15". Since the cask drop is a Service Level D load case and the Service Level D accident pressure envelopes the reflood pressure (refs. 4 and 6), these pressures do not directly affect retrievability. This scenario also envelopes any other scenario for canister unloading.

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident: The probability of occurrence of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity.

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR and in the SER. Of those accidents discussed in the SAR, only HSM air inlet blockage and accidental DSC pressurization scenarios are considered. Since these accidents are caused by wind-blown debris at the HSM and by fuel cladding failure, respectively, their causes are not related to blowdown or reflood activities. There is no change to the design or operation of the NUHOMS system caused by this activity which affects those accidents. Therefore, there is no change in the probability of occurrence of any analyzed accident.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident: The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity.

Increases in consequences can only occur when doses to the public are increased beyond those described in Chapter 8 of the USAR. Since no changes will occur to any accidents currently described in the USAR, no increases in the consequences of an accident previously evaluated in the USAR will occur.

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ISFSI - Analysis of DSC under Blowdown/Reflood Internal Pressure	72.48 Log No.: SE00136
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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity.

The critical functions associated with this change have been discussed previously. No new components, procedures, or tests are being introduced. While the DSC stresses will increase, they will still be less than allowable values for the appropriate Service Levels, and will not cause the DSC to plastically deform in a manner which inhibits performance of any safety functions. Hence, a malfunction of a different type than any previously evaluated in the USAR will not be created.

☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity.

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in section 8.2 of the USAR, and have been discussed previously. The only change to the operation of the system as described in the USAR is the inclusion of reflood and blowdown pressures up to 40 psig. As discussed previously, the only effective change is the increase in the pressure used for Service Level B conditions to 40 psig and this change has been fully accounted for in reference 6. Since all resulting stresses are below allowable values, these pressures do not introduce any behavior of the DSC or components which could cause any component to behave in a manner that impedes its functioning. Furthermore, there is no other change to the design or operation of the NUHOMS system caused by this activity, and the possibility of an accident of a different type than any previously evaluated in the SAR will not be created.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Bases

Discussion of why the margin of safety is not reduced

The Technical Specifications do not specifically mention the pressures to which the DSC will be exposed during blowdown and reflood conditions. Nonetheless, there is a basis for determining a margin of safety in the design of the DSC components due to design basis pressure loading for ASME Service Levels A, B, C, and D. (Since we earlier identified that only Service Level B pressure loads should change, this discussion only includes Service Level B stresses.) The margin of safety is the difference between the appropriate ASME allowable stress value and the material equivalent failure stress. The specific DSC components which are affected by internal pressures are the DSC shell, the top cover plate, and the bottom cover plate. The SER indicates that the allowable stresses for these components under Service Level B and Combined Service Levels A & B are 18.7 ksi (Primary Membrane),

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28.0 ksi (Membrane + Bending), and 56.1 ksi (Primary + Secondary). These are provided by ASME for components subject to an elastic analysis. All computed stresses (Ref. 6) are below these allowable stresses and all margins of safety associated with these allowable stresses remain unchanged. In addition, Service Level B Primary + Secondary stresses (Ref. 6) for the DSC shell comply with the requirements of ASME III Subsection NB-3653.6, which allows primary plus secondary stresses to exceed  $3S_m$  when fatigue is not a factor. The blowdown and reflood loadings occur far too infrequently, for each canister, to make fatigue a factor. Hence, since the allowable stress is not exceeded, the margin of safety remains unchanged.

Complete for 72.48:

☐ YES ☒ NO Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose: A significant increase in occupational dose will not occur as a result of this proposed activity.

The design and operation of the NUHOMS system is not changed by this proposed activity. Integrity of the DSC or transfer cask is not impacted by this activity. Operational blowdown activities and retrievability of fuel following a drop accident is not impacted by this activity. Shielding functions of the DSC and the transfer cask are not impacted by this activity. Because none of these attributes are changed, the occupational doses summarized in USAR Table 7.4-1 are not affected by this activity. Therefore no occupational doses are increased.

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: A significant unreviewed environmental impact will not occur as a result of this proposed activity.

Integrity of the DSC or transfer cask is not impacted by this activity. Shielding functions of the DSC and the transfer cask are not impacted by this activity. The proposed activity does not affect any area of the plant site previously undisturbed for the ISFSI, and does not cause any reason for revision to the ISFSI Updated Environmental Report. The proposed activity does not affect the environmental conditions associated with the ISFSI.

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** This safety evaluation is prepared to clarify and correct the licensing basis for the NUHOMS-24P system in use at the Calvert Cliffs ISFSI with respect to the DSC internal pressure during blowdown and reflood conditions.

Proposed changes to the Calvert Cliffs ISFSI USAR include:

- addition of statements which state that DSC internal pressure under Service Level B and D load cases include pressures due to blowdown and reflood conditions.
- modification of reported stresses in the DSC components resulting from the blowdown and reflood pressures.

**Reason for Activity:** It was discovered, during a calculation review, that DSCs may be subject to up to 40 psig internal pressure during blowdown and reflood activities at Calvert Cliffs, but the USAR and SER describe only normal and off-normal pressure loads of 10 psig, and accident loads of 50 psig.

**ATTACHMENT 3, SAFETY EVALUATION FORM****ISFSI - Analysis of DSC under Blowdown/Reflood Internal Pressure 72.48 Log No.:SE00136****ES199601368 Supplement 003 Revision 0000****Page 7 of 7**

**Activity Summary:** Correction of the non-conforming condition for the NUHOMS-24P system in use at Calvert Cliffs to revise the stress values that might be expected under DSC blowdown and reflood conditions does not constitute an Unreviewed Safety Question (USQ). Increases in stresses which could occur under these scenarios have been examined and do not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR. Nor is the possibility for an accident or malfunction of a different type created. The increased stresses do not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification, and, because of the maintenance of DSC structural integrity, criticality control, and retrievability, do not result in any increase in occupational dose. Finally, this activity does not constitute an Unreviewed Environmental Impact.

**References:**

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 6
2. SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992
3. Topical Report for the Nutech Horizontal Module Storage System for Irradiated Nuclear Fuel NUHOMS-24P, April 1991 (NUH-002, Rev. 1A)
4. BGE Calculation C-91-076, Rev. 001 (Vendor Calc. BGE001.0203, Rev. 004)
5. BGE Calculation C-91-076, Rev. 002 (Vectra Calculation BGE001.0203A, Rev. 0)
6. BGE Calculation CA04132, Rev. 000
7. BGE Issue Report IR3-005-170
8. Reformatted Technical Specifications for Calvert Cliffs ISFSI, May 19, 1992
9. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1
10. ANSI/ANS-57.9-1992, Design Criteria for an Independent Spent Fuel Storage Installation
11. American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section III, 1983.
12. CCNPP Technical Procedure ISFSI-01, ISFSI Loading, Rev. 3
13. CCNPP Technical Procedure ISFSI-02, ISFSI Unloading, Rev. 3
14. Vectra Calculation BGE001.0224, Rev. 2
15. Vectra Calculation BGE001.0225, Rev. 0



## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 1 of 4)

Page 1 of 5ACTIVITY: Procedure Change 50.59 Log No.: SE 00283 72.48 Log No.: SE 00139

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?
- ☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions or Technical Specification Bases?
- ☒ YES ☐ NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?
- ☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: Michael Cox M Cox Department: 47 Date: 4-8-98

PRINTED NAME AND SIGNATURE

- ☐ YES ☒ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: _____ PRINTED NAME	Resp. Ind.: _____ PRINTED NAME	Resp. Ind.: _____ PRINTED NAME
SIGNATURE Work _____ Group: _____ Date: _____	SIGNATURE Work _____ Group: _____ Date: _____	SIGNATURE Work _____ Group: _____ Date: _____

Approved ☒ Disapproved ☐Signature B.C. Rudell  
INDEPENDENT REVIEWERDate 4/10/98Approved ☒ Disapproved ☐Signature 47  
GS-DES, GS-TSES, or PE-PDSUDate 4/14/98

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 98-049 Date: 4-20-98Recommend ☒ Disapproval ☐Signature J. G. Cull Date 4/20/98  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature P. H. J. Date 4/20/98  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ Yes ☒ NoSignature: J. H. L. Date: 7/16/98  
OSSRC SES Chairman

If yes, OSSRC Meeting No. \_\_\_\_\_

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ACTIVITY: Procedure Change 50.59 Log No.: SE 00283 72.48 Log No.: SE 00139

Proposed Activity: The proposed activity relocates the Life Cycle Management Unit from the Technical Services Engineering Section (Nuclear Engineering Dept) to the Nuclear Project Management DeptReason for Activity: The purpose of the change is to achieve better organizational alignment and recognize the important project management aspects of Calvert Cliffs License Renewal efforts.Function(s) of affected SSC: This proposed organizational change has no direct impact on any SSCs at Calvert Cliffs.SAR Revision No.: 21SAR Sections Reviewed: UFSAR Chapter 12Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ Yes ☒ No May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction: Relocating the Life Cycle Management Unit to the Nuclear Project Management Dept helps achieve organizational alignment and has no direct impact on SSCs. The Life Cycle Management Unit will continue to perform the necessary functions and analyses needed to pursue License Renewal. Since the functions of the (Cont)

☐ Yes ☒ No May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction: Relocating the Life Cycle Management Unit to the Nuclear Project Management Dept helps achieve organizational alignment and has no direct impact on SSCs. The Life Cycle Management Unit will continue to perform the necessary functions and analyses needed to pursue License Renewal. Since the functions of the organization (Cont)

☐ Yes ☒ No May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident: Relocating the Life Cycle Management Unit to the Nuclear Project Management Dept helps achieve organizational alignment and has no direct impact on SSCs. The Life Cycle Management Unit will continue to perform the necessary functions and analyses needed to pursue License Renewal. Since the functions of the organization (Cont)

☐ Yes ☒ No May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident: Relocating the Life Cycle Management Unit to the Nuclear Project Management Dept helps achieve organizational alignment and has no direct impact on SSCs. The Life Cycle Management Unit will continue to perform the necessary functions and analyses needed to pursue License Renewal. Since the functions of the organization (Cont)

**ATTACHMENT 3, SAFETY EVALUATION FORM (Page 3 of 4)**Page 3 of 5ACTIVITY: Procedure Change 50.59 Log No.: SE 00283 72.48 Log No.: SE 00139

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ Yes ☒ No May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: Relocating the Life Cycle Management Unit to the Nuclear Project Management Dept helps achieve organizational alignment and has no direct impact on SSCs. The Life Cycle Management Unit will continue to perform the necessary functions and analyses needed to pursue License Renewal. Since the functions  
(Cont.)

☐ Yes ☒ No May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: Relocating the Life Cycle Management Unit to the Nuclear Project Management Dept helps achieve organizational alignment and has no direct impact on SSCs. The Life Cycle Management Unit will continue to perform the necessary functions and analyses needed to pursue License Renewal. Since the functions of the organization are not changing, and those functions are administrative, there is no  
(Cont.)

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ Yes ☒ No Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Bases

Discussion of why the margin of safety is not reduced

The functions of the Life Cycle Management Unit are not discussed  
in the Tech Specs.

## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 4 of 4)

Page 4 of 5ACTIVITY: Procedure Change 50.59 Log No.: SE 00283 72.48 Log No.: SE 00139Complete for 72.48:☐ Yes ☒ No Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose: Relocating the Life Cycle Management Unit to another department is an organizational change that has no direct impact on ISFSI operations. The functions associated with Life Cycle Management remain the same.

☐ Yes ☒ No Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: Relocating the Life Cycle Management Unit to another department is an organizational change that has no direct impact on ISFSI operations. The functions associated with Life Cycle Management remain the same.

Summary: (For NRC Report, provide a brief overview)

The purpose of this Safety Evaluation is to document our conclusion that relocating the Life Cycle Management Unit from the Nuclear Engineering Dept to the Nuclear Project Management Dept will not require the Tech Specs to be changed nor will it introduce a USQ. This Safety Evaluation is written to recognize that the above described organizational change is different than the current UFSAR description of our organization (see chapter 12.1.5)



## Page 5 of 5

~~Comments Continued from Attachment No.:~~

Section.

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Signature: \_\_\_\_\_

Date: 4-9-98

## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 1 of 4)

Page 1 of 4

ACTIVITY: Org Change 50.59 Log No.: SE00289 72.48 Log No.: SE00140

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?
- ☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions or Technical Specification Bases?
- ☒ YES ☐ NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?
- ☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: Michael Cox M. Cox Department: 47 Date: 5-5-98  
PRINTED NAME AND SIGNATURE

- ☐ YES ☒ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: _____ PRINTED NAME	Resp. Ind.: _____ PRINTED NAME	Resp. Ind.: _____ PRINTED NAME
SIGNATURE Work Group: _____ Date: _____	SIGNATURE Work Group: _____ Date: _____	SIGNATURE Work Group: _____ Date: _____

Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <u>J.C. KILPATRICK</u> INDEPENDENT REVIEWER Date <u>5/18/98</u>	Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <u>[Signature]</u> GS-DES, GS-TSES, or PE-PDSU Date <u>5/18/98</u>
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The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 98-064 Date: 5-27-98

Recommend Approval ☒ Recommend Disapproval ☐ Signature [Signature] Date 5-27-98  
POSRC CHAIRMAN

Approved ☒ Disapproved ☐ Signature [Signature] Date 5/27/98  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ Yes ☒ No

Signature: [Signature] Date: 7/16/98  
OSSRC SES Chairman

If yes, OSSRC Meeting No. \_\_\_\_\_

**ATTACHMENT 3, SAFETY EVALUATION FORM (Page 2 of 4)**Page 2 of 4ACTIVITY: Org Change 50.59 Log No.: SE00289 72.48 Log No.: SE00140Proposed Activity: The proposed activity re-establishes the position of Superintendent - Technical Support. This position is not currently recognized in the UFSAR and will be described in Chap 12.1.1.Reason for Activity: To increase management oversight in Plant Engineering, Radiation Safety and Chemistry.Function(s) of affected SSC: N/ASAR Revision No.: 21SAR Sections Reviewed: UFSAR Chapter 12, and search on various affected org titles.  
ISFSL SAR Chapter 9**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ Yes ☒ No May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. The functions performed by these organizations will remain the same. As such, the probability of occurrence of a malfunction of equipment important to safety will not change.

☐ Yes ☒ No May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. Increasing management oversight in these areas will have no direct impact on the consequences of a malfunction of equipment important to safety.

☐ Yes ☒ No May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. The functions performed by these organizations will remain the same. As such, the probability of occurrence of an accident previously evaluated in the SAR will not change.

☐ Yes ☒ No May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. Increasing management oversight in these areas will have no direct impact on the consequences of an accident previously evaluated in the SAR.

## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 3 of 4)

Page 3 of 4ACTIVITY: Org Change 50.59 Log No.: SE00289 72.48 Log No.: SE00140

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ Yes ☒ No May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. Increasing management oversight in these areas will have no direct impact on the possibility of a malfunction of a different type than any previously evaluated in

☐ Yes ☒ No May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. Increasing management oversight in these areas will not create the possibility of an accident of a different type than any previously evaluated in the SAR.

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ Yes ☒ No Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Bases

Discussion of why the margin of safety is not reduced

The position of Superintendent - Technical Support is not

described or mentioned in the Tech Specs.



## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 4 of 4)

Page 4 of 4

ACTIVITY: Org Change 50.59 Log No.: SE00289 72.48 Log No.: SE00140

Complete for 72.48:☐ Yes ☒ No Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. Increasing management oversight in these areas will hopefully result in improved performance in Radiation Safety which will not involve a significant increase in occupational dose.

☐ Yes ☒ No Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: The proposed activity is an organizational change that will increase management oversight in Plant Engineering, Radiation Safety, and Chemistry. Increasing management oversight in these areas will not involve a significant unreviewed environmental impact.

## Summary: (For NRC Report, provide a brief overview)

We are making many improvements to our Radiation Safety Program. To increase management oversight and focus in this area, we are creating the position of Superintendent - Technical Support. The following three functional areas will report to the Superintendent - Technical Support through their respective General Supervisors:

- o Plant Engineering
- o Radiation Safety
- o Chemistry

## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 1 of 4)

<b>Page 1 of 4</b>		
<b>ACTIVITY: ES199801725-000 Rev 0</b>	<b>50.59 Log No.:</b>	
<b>72.48 Log No.: SE 00144</b>		
Based on the attached discussion, does this activity:		
<u>Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations</u>		
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
Involve an unreviewed safety question (USQ)?		
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
Involve a change in the Technical Specifications/License Conditions?		
<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	
Require a change or addition to the UFSAR/USAR/Technical Specification Bases?		
<u>Applicable to 10 CFR 72.48 Safety Evaluations</u>		
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
Involve a Significant Increase in Occupational Dose?		
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
Involve a Significant Unreviewed Environmental Impact?		
Prepared by: <u>WILLIAM F. LANG</u> Department: <u>42, NED/PDSU</u> Date: <u>1/28/99</u> <u>William F. Lang</u> PRINTED NAME AND SIGNATURE		
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Is a special review required by groups other than the group to which the Preparer belongs?		
Resp Ind.: Gregory K. Barley PRINTED NAME <u>G.K. Barley</u> SIGNATURE Work <u>Radiation/Chemistry</u> Group: <u>Technical Services</u> Date: <u>1/29/99</u>	Resp Ind.: <u>ROBERT BEALL</u> PRINTED NAME <u>Robt H. Beall</u> SIGNATURE Work <u>Nuclear Fuel Management</u> Group: Date: <u>2/2/99</u>	Resp Ind.: PRINTED NAME SIGNATURE Work Group: Date
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <u>J.E. REMENIUK</u> INDEPENDENT REVIEWER Date <u>2-2-99</u>	Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <u>M. G. POLAK</u> GS-DES, GS-TES, or PE-PDSU Date <u>2/9/99</u>	
The POSRC has reviewed this evaluation according to NS-2-101. POSRC Meeting No.: <u>99-011</u> Date: <u>2/17/99</u>		
Recommend Approval <input checked="" type="checkbox"/>	Recommend Disapproval <input type="checkbox"/>	Signature <u>J.T. Cadd</u> Date <u>2/10/99</u> POSRC CHAIRMAN
Approved <input checked="" type="checkbox"/>	Disapproved <input type="checkbox"/>	Signature <u>J.T. Cadd</u> Date <u>2/12/98</u> PLANT GENERAL MANAGER
The OSSRC has reviewed this evaluation according to NS-2-100. Full OSSRC Committee review required? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Signature: <u>[Signature]</u> OSSRC SES Chairman If yes, OSSRC Meeting No.		Date: <u>5/13/99</u>

## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 2 of 4)

Page 2 of 4

ACTIVITY: ES199801725-000 Rev 0000 50.59 Log No.:

72.48 Log No.: SE 00144

**Proposed Activity:** Revise wording in ISFSI USAR Volume I, Appendix A Environmental Report, Response to NRC question ER-11 item a. The item currently reads that sixteen thermoluminescent dosimeters (TLDs) placed around the ISFSI facility will be read monthly. Change the word "monthly" to "at least quarterly".

**Reason for Activity:** To resolve a conflict which exists between regulatory documents. The ISFSI TLDs are currently read quarterly. This is per requirements in our Off-site Dose Calculation Manual Attachment 14 which state that the TLDs will be analyzed for gamma dose at least quarterly. The ISFSI Updated Environmental Report (UER), sect. 6.2 states that the ongoing environmental monitoring programs will be expanded and serve as the operational monitoring program for the Calvert Cliffs ISFSI. This is captured in the ISFSI Tech Specs under 6.2 : "The licensee shall include the Calvert Cliffs ISFSI in the environmental monitoring for Calvert Cliffs Nuclear Power Plant. An environmental monitoring program is pursuant to 10 CFR 72.44(d)(2)". From U1 & U2 Tech Specs., Appendix A, 5.5.1.a says: "The Off-site Dose Calculation Manual (ODCM) shall contain the methodology and parameters used in the .... conduct of the radiological environmental monitoring program". Based on prior NRC reviews of CCNPP's ODCM and License amendments, analyzing the ISFSI TLDs on a quarterly frequency is consistent with regulatory requirements and guidance. See attachment A which summarizes the progression of regulatory action in this area and supports a quarterly reading and analyses of TLDs.

At the time that the NRC posed question ER-11., the TLDs around the site and those at the ISFSI were being read monthly. Our radiological environmental monitoring program was being administered by an off-site department at the time. They elected to collect data from the TLDs monthly which was in excess of our regulatory commitment at the time. The answer to question ER-11 merely reflected monitoring practices in practice at that time.

**Function(s) of affected SSC:** 16 TLDs placed around the ISFSI provide direct radiation monitoring which is part of the ISFSI radiological environmental monitoring program. The TLDs record dose exposure continuously for documentation of compliance with regulatory dose limits. These TLDs are not listed as part of the Calvert Cliffs ISFSI Major Systems, Subsystems and Component listing on Table 1. 3-1 in the ISFSI USAR Volume I.

ISFSI SAR Revision No.: 7

Tech Spec Bases Rev. No: 1

SAR Sections Reviewed: Volume I, Sects. 1, 7, 8, and Appendix A Environmental Report Question ER-11  
Volume III (UER) Sects. 5, 6, 7

**Tech Spec Bases Reviewed:**  
ISFSI Tech Specs: 6.0 Admin. Controls  
U1 & U2 Tech Specs. 5.0 Admin. Controls and License  
Amendments #100 and 217 for U1, #82 and 194 for U2

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:** This activity constitutes a change in administrative controls involving the radiological environmental monitoring program(REMP). It does not involve the operation, either active or passive of any ISFSI evaluated system, subsystem or component and therefore can not increase the probability of occurrence of a malfunction.

## ATTACHMENT 3 SAFETY EVALUATION FORM

ACTIVITY: ES199801725-000 REV. 0000

72.48 Log No. SE 00144

pg 3 of 4

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:** Similar reason as that provided for Probability of Malfunction. Also see discussion under Consequences of Accident which follows.

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:** TLDs monitor radiological dose. The only accident evaluated in the SAR involving radiological consequences is an incredible scenario which assumes that a dry shielded canister (DSC) leaks at the same time that all fuel rods in 24 fuel assemblies rupture due to an event of unspecified origin. Fission gases mainly Kr-85 contained in all the fuel rods of the 24 assemblies are released simultaneously to the environment. The ISFSI TLDs have no relation whatsoever with the probability of this accident occurring.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:** In the above described accident involving leakage of fission gases to the environment, the resulting calculated doses are 31 mrem and 148 mrem for the maximum controlled area boundary whole body and thyroid doses, respectively \*. These accident doses are well with-in the 10 CFR 72.106 limit of 5000 mrem. Whether the ISFSI TLDs are read monthly or quarterly has no bearing on these accident consequences. The TLDs record dose exposure continuously, so the radiological impact to the environment during the event will still be recorded.

\* Source of dose data: NRC Environmental Assessment Report of Calvert Cliff's ISFSI dated 3/22/91

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

**Possibility of New Malfunction:** As discussed previously, TLDs are instruments for monitoring radioactive dose and do not interact with any ISFSI systems, subsystems or components described in the SAR.

☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

**Possibility of New Accident:** ISFSI systems, subsystems or components operate in a passive mode and do not interact with the environmental monitoring TLDs.



**ATTACHMENT 3 SAFETY EVALUATION FORM****ACTIVITY: ES199801725-000 REV. 0000****72.48 Log No. SE 00144****pg 4 of 4****Complete for 50.59 and 72.48:****3. The margin of safety as defined in the basis for any Technical Specification is not reduced.**☐ YES ☒ NO Will the margin of safety as defined in the basis for any Technical Specification be reduced?**Bases****Discussion of why the margin of safety is not reduced**

The portion of the Technical Specifications involved, ISFSI Tech Specs Section 6.2 which discusses the requirement of having ISFSI environmental monitoring involves administrative controls. The bases for these admin controls do not involve margins of safety.

**Complete for 72.48:**☐ YES ☒ NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:** This activity does not affect the fuel storage structure shielding nor the manner in which fuel bundles are selected for loading. Therefore inputs into the calculation of the maximally exposed member of the public are unaffected and there can not be an increase in occupational dose. Also the environmental monitoring TLDs are not relied upon to provide direct monitoring for workers involved with loading fuel into the DSCs, transporting the transfer cask or inserting the DSCs into the ISFSI horizontal storage modules. The ISFSI TLDs are used as part of a monitoring program which also includes air samplers, and vegetation and soil sampling to assure public and employee safety during spent fuel storage. The TLDs are considered a continuously monitoring device so it should not matter whether dose data is retrieved monthly or quarterly. An informal test in 1997 compared combined monthly TLD readings over 3 months to quarterly TLD readings at 9 different monitoring locations. The difference in data collected by the 2 methods was small; avg. 6.0% difference.

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:** Quarterly TLD reading to provide data and support gamma dose analysis for Direct Radiation pathway monitoring complies with CCNPP's ODCM requirements. Refer to page 2 of this evaluation under "Reason for this Activity" on the correlation between the CCNPP ODCM and the ISFSI Environmental Report. This shows there is no significant unreviewed environmental impact.

**Summary: (For NRC Report, provide a brief overview)****Safety Evaluation 72.48 Log No. SE 00144**

Change wording in ISFSI USAR Volume I, Appendix A Environmental Report, Response to NRC question ER-11 item a. Change the word "monthly" to "at least quarterly" in the following sentence: *TLDs will be read monthly.* This change resolves a conflict between the ISFSI USAR and ISFSI radiological environmental monitoring program requirements in the Calvert Cliffs Offsite Dose Calculation Manual (ODCM). This activity does not involve an unreviewed safety question, nor a significant increase in occupational dose, nor a significant unreviewed environmental impact.

**PROGRESSION OF RADIOLOGICAL ENVIRONMENTAL MONITORING REGULATION AND HOW IT RELATES TO CCNPP's ODCM AND FREQUENCY OF OBTAINING AND ANALYZING DIRECT RADIATION MONITORING DATA**

Pre-Licensing Period	10 CFR parts 20 & 50 require environmental monitoring programs be established
DEC 1975	Reg. Guide 4.8, Environmental Tech Specs for Nuclear Power Plants This provided a standard format and principal content of radiological and non-radiological environmental tech specs and surveillances
OCT 1978	NUREG-0133 Preparation of Radiological Effluent Tech Specs for Nuclear Power Plants. This included guidance on preparing the Off-site Dose Calculation Manual(ODCM).
OCT 1978	NUREG-0472 Rev. 1 Draft Radiological Effluent Tech Specs(RETS) for Pressurized Water Reactors Included was a draft Radiological Monitoring Program in table form. Program is based on 26 sampling locations, some on-site, some off-site involving the following exposure pathways and/or sample: Airborne, Direct Radiation, Waterborne, Ingestion. Direct Radiation monitoring involves the use of 2 or more dosimeters or at least 1 instrument continuously measuring and recording dose rate. Monitoring at 8 locations. Sampling, collection and associated gamma dose analysis frequency is at least once per 31 days or at least once per 92 days. Frequency selected is determined by type of dosimeters used.
NOV 1979	The NRC's Radiological Assessment Branch reviewed comments on Reg. Guide 4.8 and issued a Branch Technical Position on the radiological portion of the environmental monitoring program in March 1978. Rev. 1 of the Branch Position paper was issued Nov. 1979 and incorporated lessons learned from the Three Mile Island Accident. This position sets forth an example of an acceptable minimum radiological monitoring program. The most significant difference from the prior NUREGs is that the number of direct radiation monitoring locations expands from 8 to 40. Sampling, collection and analysis frequency is monthly or quarterly. There is a table in this technical position which forms the basis for the format of CCNPP's annual Radiological Environmental Operating Report.
FEB 1985	CCNPP License Amendments #100 (U1) & #82 (U2) are incorporated. Changes were made to the RETS to comply with NRC requirements and intent of NUREG-0133 and NUREG 0472. All requirements of regulation related to RETS were fulfilled. Made reference to our Off-site Dose Calculation Manual (ODCM). The NRC reviewed this and said it was an acceptable reference in that it complied with the methodology and guidelines in NUREG 0133.

DEC 1989	Initial License Application for the Calvert Cliff's ISFSI submitted. Included in the application is the ISFSI Environmental Report. ISFSI environmental monitoring required by 10 CFR 72.44(d)(2) will be fulfilled by an expansion of the site's Radiological Environmental Monitoring Program(REMP).
JUNE - 1990 NOV	Question and answer period for ISFSI Environmental Report issues. Details on how the site's REMP will be expanded to cover the ISFSI are provided. Use of TLDs is discussed.
MAR 1991	NRC Environmental Assessment Report issued for the ISFSI with finding of no significant impact.
APRIL 1991	NUREG-1301. This issued Generic Letter 89-01, Suppl. 1. Off-site Dose Calculation Manual Guidance: Standard Radiological Effluent Control for Pressurized Water Reactors. In summary this document provides guidance for use by licensees to implement the provision of GL 89-01 which allows them to remove their RETS from the main body of their Tech Specs and place them in the ODCM. It recasted the RETS from the "LCO" format into the "Controls" format of an ODCM entry. Is heavily based on the previous NUREGs and uses the Nov. 1979 Branch technical Position Rev.1 as the basis for a standardized Radiological Environmental Monitoring Program. With respect to Direct Radiation monitoring, sampling, collection and gamma dose analysis frequency is listed as quarterly; with a notation that says: " The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading".
NOV 1992	NRC approves and issues ISFSI License.
OCT 1996	License Amendment #217 (U1) and #194 (U2) issued. These amendments implemented changes to RETS in accordance with Generic Letter 89-01 as described above.

## ATTACHMENT 3, SAFETY EVALUATION FORM

NUHOMS-24P DSC Modifications

50.59 Log No.: N/A

72.48 Log No.: SE00145

ES199900153 Supplement 001 Revision 000

Page 1 of 32

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions or Bases?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR?

Applicable to 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: RS for Eric Skowran Department: Sargent & LundyDate: 3/26/99

PRINTED NAME AND SIGNATURE

☒ YES ☐ NO Is a special review required by groups other than the group to which the Preparer belongs?Resp. Ind.: G. Tesfaye  
Work Group: LicensingResp. Ind.: C. J. Dobry  
~~Work Group: PES~~ 3/26/99Resp. Ind.: R. H. Beall  
Work Group: NFM

SIGNATURE / DATE

SIGNATURE / DATE

SIGNATURE / DATE

Approved ☒ Disapproved ☐Signature: RJ Stakenborg  
INDEPENDENT REVIEWER SALDate 3/26/99Approved ☒ Disapproved ☐Signature: For RS-DES, GS-TES, or PE-PDSUDate 3/28/99

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 99-022Date: 3-31-99Recommend Approval ☒ Disapproval ☐Signature: [Signature] Date: 3-31-99  
POSRC CHAIRMANApproved ☒ Disapproved ☐Signature: [Signature] Date: 4/1/99  
PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ Yes ☒ NoSignature: [Signature] Date: 5/13/99  
OSSRC SES CHAIRMAN

If yes, OSSRC Meeting No.: \_\_\_\_\_



## ATTACHMENT 3, SAFETY EVALUATION FORM

NUHOMS-24P DSC Modifications	50.59 Log No.: N/A	72.48 Log No.: SE00145
ES199900153 Supplement 001 Revision 000		Page 2 of 32

**Proposed Activity:**

This safety evaluation is prepared to address proposed modifications to the Calvert Cliffs Independent Spent Fuel Storage Installation (ISFSI) Dry Shielded Canister (DSC). The DSC is a major component of the Nutech Horizontal Module System (NUHOMS) spent fuel storage system. Each DSC holds 24 spent fuel assemblies, and provides physical protection and structural support of the spent fuel during loading operations and during storage.

The proposed modifications to the DSC Internal Basket Assembly are being implemented in accordance with Transnuclear West (TNW) Engineering Change Notice (ECN) 98-0516. (The patent for the NUHOMS-24P System design is currently owned by Transnuclear West, Inc.). This activity applies to Calvert Cliffs ISFSI DSCs R025 through R040. The changes that are proposed for the DSC Internal Basket Assembly are intended to ensure that the worst case postulated cask drop accident will not result in deformation of the DSC Internal Basket Assembly to such a degree that post-accident removal of intact fuel assemblies is prohibited. The modifications to the Internal Basket Assembly are identified as follows:

- Change No. 1. - Removal of Guide Sleeve Clip Angles ✓
- Change No. 2. - Increase the length of the Guide Sleeves
- Change No. 3. - Add notched openings to the bottom ends of the Guide Sleeves
- Change No. 4. - Add Guide Sleeve Extraction Stops
- Change No. 5. - Use continuous (rather than intermittent) longitudinal Guide Sleeve weld seams ✓
- Change No. 6. - Increase the dimensional tolerance on the Guide Sleeve envelope ✓
- Change No. 7. - Relax the tolerance for the Top Spacer Disk key way dimensions ✓
- Change No. 8. - Use a tighter tolerance for the DSC Support Rod diameter ✓

In addition to the DSC Internal Basket Assembly modifications listed above, TNW ECN 98-0516 provides for numerous other changes to the DSC fabrication drawings. The changes are generally categorized as follows:

- Change No. 9. - Editorial changes, name changes, and relocation of information within the same document or to another document, and addition of clarifying information without changing intent or technical content ✓
- Change No. 10. - Revise DSC component and assembly tolerances, and add true minimum thickness dimensions ✓
- Change No. 11. - Revise DSC welding details ✓
- Change No. 12. - Provide new component information (Siphon Tube material, Thread Tape & Lubricant)
- Change No. 13. - Add leak test requirements for the Top Shield Plug assembly weld
- Change No. 14. - Revise the Top Shield Plug lifting post detail
- Change No. 15. - Revise the aluminum coating specification for coating carbon steel DSC components

This activity does not affect the design length or tolerance of the DSC internal cavity, nor does it permit storage of spent fuel assemblies that exceed current ISFSI Technical specification requirements.

It is noted that the supporting calculations for this activity are based on a fuel assembly weight of 1450 lbs. ISFSI Technical Specification 3.1.1.(7) prohibits storage of spent fuel assemblies that weigh more than 1300 lbs. Use of a 1450 lb. fuel assembly weight is conservative for the purposes of performing engineering analysis on the DSC. The actual weight of the spent fuel assemblies to be stored for this activity will not exceed the existing Technical Specification weight limit. Future storage of spent fuel assemblies weighing over 1300 lbs. will be handled under a separate licensing action, as appropriate.

**ATTACHMENT 3, SAFETY EVALUATION FORM**

<b>NUHOMS-24P DSC Modifications</b>	<b>50.59 Log No.: N/A</b>	<b>72.48 Log No.: SE00145</b>
<b>ES199900153 Supplement 001 Revision 000</b>	<b>Page 3 of 32</b>	

The ISFSI USAR will be updated to describe the modified DSC design starting with DSC R025. All drawing changes per TNW ECN 98-0516 are considered to be changes to the ISFSI SAR. Other changes to the USAR are summarized as follows:

- 1) USAR Section 4.2.3.2 describes the Dry Shielded Canister. The description will be updated to identify the modified DSC design that will be used starting with DSC R025.
- 2) USAR Sections 8.1.1.2, 8.1.1.3, and 8.2.5.2, and Tables 8.1-3, 8.1-4, 8.2-6, 8.2-8, 8.2-9 and 8.2-10 will be amended to add a reference to the modified DSC design. Reference to the BGE supporting analyses will also be added, as appropriate.
- 3) USAR Section 8.2.5.2 specifies the maximum spacer disk deflection that might be expected under a cask drop accident. This section will be updated to identify the design characteristics of the modified DSC that will ensure the capability to retrieve an intact spent fuel storage assembly following a worst case postulated cask drop accident.
- 4) USAR Sections 1.1, 1.4, and 9.1.1.3 will be updated to identify Transnuclear West Inc. as the owner of the NUHOMS-24P spent fuel storage cask design.
- 5) USAR Table 1.3-1 will be updated to provide consistent terminology for the DSC Siphon and Vent Ports components.

## ATTACHMENT 3, SAFETY EVALUATION FORM

NUHOMS-24P DSC Modifications	50.59 Log No.: N/A	72.48 Log No.: SE00145
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**Reason for Activity:**Change No.'s 1 through 4:

An independent assessment of Transnuclear West (formerly Nutech Engineers, Pacific Nuclear and Vectra Technologies) was commissioned by GPU Nuclear, Inc., in 1997. The assessment included review of the NUHOMS-24P Topical Report design. During this assessment an issue was raised regarding the behavior of the DSC Internal Basket Assembly during a postulated Transfer Cask (TC) drop accident (reference 25).

The NUHOMS-24P Topical Report DSC design was changed to include removal of Guide Sleeve Clip Angles, increase the length of the Guide Sleeves, add of notched openings to the bottom ends of the Guide Sleeves, and add Guide Sleeve Extraction Stops. The changes are being made in response to a concern regarding the Internal Basket Assembly following a design basis cask drop accident. The geometry of the DSC Internal Basket Assembly following the drop accident must not prohibit retrieval of intact fuel assemblies from the DSC. While the original design was shown to be acceptable, there is limited design margin. The Calvert Cliffs ISFSI uses a NUHOMS-24P site-specific license DSC which is based on the Topical Report, and is affected by this issue.

To understand the DSC design concern, the following description of the existing DSC Internal Basket Assembly is given (also refer to USAR Figure 1.3-1): The major DSC Internal Basket Assembly components include twenty-four stainless steel Guide Sleeves (one for each spent fuel assembly), Nine @ 1.5" thick by 65.5" diameter perforated carbon steel Spacer Disks, and Four @ 3" diameter stainless steel Support Rods. The 9 Spacer Disks are spaced out along the length of the DSC at locations that roughly coincide with the spent fuel assembly spacer grids. The Spacer Disks are not structurally attached to the DSC Shell walls or to the Inner Cover Plates. The 24 Guide Sleeves traverse the length of the DSC cavity through openings in the 9 Spacer Disks. The 4 Support Rods are used to maintain the Spacer Disk locations. The Support Rods traverse the length of the DSC cavity through the 9 Spacer Disks, and are structurally welded to the Spacer Disks at the Support Rod penetration locations. (The Support Rods are not structurally attached to either of the Inner Closure Plates. In the existing design, the Guide Sleeves are fastened to the Bottom Support Disk by welded metal clip angle attachments. Therefore, when the DSC is in the vertical orientation the load path from the Guide Sleeves to the Bottom Inner Cover Plate is as follows: The Guide Sleeves bear upon the Bottom Spacer Disk through the clip angle attachments, the Bottom Spacer Disk (and all of the other 8 Spacer Disks) bear upon the 4 Support Rods, and the Support Rods bear upon the Bottom Inner Closure Plate.

Recent analysis of design basis cask drop accidents revealed that the clip angles that connect the Guide Sleeves to the Bottom Spacer Disk will fail in bending, and will push against the walls of the Guide Sleeve causing the Guide Sleeve to deform (that is, dimpling will occur). In some cases this deformation will cause the clearance between the Guide Sleeve and the spent nuclear fuel assembly to be eliminated. The Guide Sleeve deformation will not cause a rupture of the fuel cladding, but it will take additional force to extract the pinched fuel assemblies during recovery operations. This condition, although tolerable, is undesirable (reference 21). After extensive re-analysis and testing of the DSC components for operating and accident conditions, design changes were advanced for the DSC Internal Basket Assembly design that will preclude Guide Sleeve pinching of the spent fuel assembly as a direct result of a cask drop accident.

The modified DSC Internal Basket Assembly involves the removal of the clip angle attachments between the Guide Sleeves and the Bottom Spacer Disk, thereby eliminating the Guide Sleeve dimpling mechanism. Elimination of the clip angle attachments will allow the Guide Sleeves to slide through the Spacer Disk openings until bearing occurs against either the top or bottom DSC Inner Cover Plate. The Guide Sleeves will bear directly on the DSC Bottom Cover Plate when the DSC is in the vertical orientation. (In the existing design, the Guide Sleeves are supported approximately 1/2" above the Bottom Cover Plate by the welded clip angle attachments.) The modified

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DSC increases the overall length of the Guide Sleeves to account for the fact that the Guide Sleeves now rest on the bottom of the DSC. The modified DSC then adds a detail to notch out the bottom of each face of each Guide Sleeve to provide an opening that will facilitate DSC draining and drying.

In order to prevent removal of a Guide Sleeve from the basket in the event a spent fuel assembly becomes stuck during removal, the modified DSC adds new "Extraction Stop" attachments to the Guide Sleeves. The Extraction Stops are nominally 0.75" wide, 2.5" long, 0.06" thick bent metal tabs. Two Extraction Stops will be plug welded to each Guide Sleeve. The Extraction Stops will be positioned on the Guide Sleeve so that they will be located between the 1<sup>st</sup> and 2<sup>nd</sup> Spacer Disks from the top of the basket when the Guide Sleeve is installed. The Extraction Stops are not engaged when the DSC is loaded and the DSC Cover Plates are installed. A Guide Sleeve must actually travel upward out of the basket approximately 8" before the Extraction Stop will contact the bottom of the 1<sup>st</sup> Spacer Disk.

Change No. 5:

The independent assessment of the Transnuclear West NUHOMS-24P Topical Report design identified limited margin in Guide Sleeve longitudinal seam welds (reference 22). The Calvert Cliffs ISFSI site specific license DSC is based on the Topical Report, and is affected by this issue. The Guide Sleeve corner weld that is used to fabricate a Guide Sleeve from plate material was revised from an intermittent weld to a continuous weld, and a minimum effective throat is specified now to ensure adequate weld strength.

Change No.'s 6, 7 and 8:

TNW ECN 98-0516 modifies the following tolerances in order to ease and improve fabrication of the DSC:

Change No. 6 - The Guides Sleeves are formed from a piece (or pieces) of sheet metal that is approximately 22 gauge metal thickness and approximately 155" long. The tolerance on the Guide Sleeve width dimension that is specified in the DSC fabrication drawing will be relaxed from 8.70" (+0.03/-0.03) to 8.70" (+0.06/-0.03) (reference 35). This will allow greater flexibility in fabrication of the Guide Sleeves, but will still be compatible with the DSC Spacer Disk opening dimensions.

Change No. 7 - The Top Spacer Disk Key Way dimensional tolerances were originally specified in accordance with the fabrication drawing default tolerances per ASME Y14.5M-1994. The tolerances on the keyway dimensions are being relaxed to permit a larger opening to ease in fabrication. The new tolerance will allow appropriate clearance following coating the Spacer Disk Key Way surfaces with aluminum thermal spray. The change Spacer to the Disk Key Way tolerance is based on TNW Issues and Lessons learned.

Change No. 8 - The DSC Support Rods are nominally 3" in diameter, and are approximately 158.13" long. The DSC Support Rod diameter tolerance will be "tightened" from 3.00" (+0.05/-0.05) to 3.00" (+0.03/-0.00). Assurance that a minimum 3.00" diameter is maintained is based on TNW Issues and Lessons learned.



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Change No. 9:

Change category No. 9 includes changes that do not affect the physical design, testing or operation of ISFSI structures, systems or components (SSCs) important to safety. They are not considered to be factual changes that are subject to the 10 CFR 72.48 safety evaluation process. The proposed changes are identified in this safety evaluation for information only:

- Revise the DSC fabrication specification number and the DSC fabrication drawing numbers referenced in the DSC fabrication drawings. The document number changes are meant to distinguish the modified DSC design to be used for DSCs R25 through R040 from all other DSCs that were previously manufactured for the Calvert Cliffs ISFSI.
- Update the USAR and DSC fabrication drawings to identify Transnuclear West Inc. as the new owner of the NUHOMS-24P spent fuel storage cask design.
- Relocate information and delete redundant information on the DSC fabrication drawings to improve presentation, and to be consistent with Transnuclear West Inc. drawing standards.
- Apply consistent nomenclature for DSC component parts (e.g., use "Siphon Port" in favor of "Drain Port").
- Clarify seal weld inspection requirements by explicitly defining the two liquid penetrant examination levels as "root" and "cover."

Change No. 10:

DSC component tolerances are being revised as summarized in Exhibit E of this safety evaluation. DSC fabrication drawing default block tolerances per ANSI Y14.5M otherwise are still applicable. Reasons for the tolerance revisions are as follows:

- Certain DSC component thickness tolerances are being revised to reflect Transnuclear West Inc. tolerances in favor of ASME and ASTM tolerances. (e.g., Lead Plug Side Casing Plate, Siphon and Vent Port Cover Plates, and the DSC Spacer Disks).
- The DSC Shell Plate, Bottom Cover Plate and the Top Shield Plug Inner Cover Plate tolerances are being changed based on structural engineering evaluation (reference 8).
- The Grapple Ring Plate thickness tolerance will be changed to be consistent with the NUHOMS-24P Topical Report DSC design requirements.
- The Top and Bottom Shield Plug assembly component thickness dimensions and tolerances will be clarified to ensure that minimum design shielding requirements will be maintained.

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Change No. 11:

Revise DSC welding details for the following reasons:

Weld Location	Change	Reason
Top Cover Plate to DSC Shell weld	<ul style="list-style-type: none"> <li>– Reduce weld effective throat</li> <li>– Reduce weld prep and relax weld prep V-angle tolerances</li> </ul>	<ul style="list-style-type: none"> <li>– Minimize base metal distortion</li> <li>– Improve ALARA exposure during field welding</li> <li>– Provide required weld throat under extreme joint fit-up conditions</li> <li>– Dimension and tolerance changes were revised to reflect Transnuclear West Inc. tolerances.</li> </ul>
<ul style="list-style-type: none"> <li>– Top Shield Plug to DSC Shell weld</li> <li>– Top Shield Plug to Siphon and Vent Block weld</li> </ul>	– Reduce weld effective throat	<ul style="list-style-type: none"> <li>– Minimize base metal distortion</li> <li>– Improve ALARA exposure during field welding</li> <li>– Provide required weld throat under extreme joint fit-up conditions</li> </ul>
Grapple Ring Plate to Lead Casing Plate weld	Provide alternate detail	Fabrication flexibility
Siphon and Vent Block	Add optional non-structural weld	Fabrication flexibility
<ul style="list-style-type: none"> <li>– Bottom Cover Plate to DSC Shell weld</li> <li>– DSC Shell Longitudinal and Circumferential welds</li> <li>– Top Shield Plug bent plate built-up weld</li> <li>– Top Shield Plug to DSC Shell weld</li> </ul>	Provide weld reinforcement and minimum base metal thickness information, as applicable.	TNW Issues and Lessons Learned relative to weld grinding issues

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Change No. 12:

New component information is added for the following reasons:

- The DSC Siphon Tube optional material specification is added for fabrication flexibility.
- The use of Anti-Seize Lubricant in the lifting eyebolt holes is to prevent galling of the threads.
- The Pipe Thread Tape QA classification is added to the fabrication drawing for clarity. The Pipe Thread Tape "non-safety related" classification is consistent with the classification of the components that it will be used on: Swagelock Fittings, and Siphon and Vent Block Ports.

Change No. 13:

Leak test requirements for the Top Shield Plug assembly weld are added to the DSC fabrication drawing to ensure integrity of the pressure boundary. The added leak testing requirements are consistent with USAR 5.1.1.3 leak testing requirements (reference 33).

Change No. 14:

The Top Shield Plug lifting post detail was revised to improve fabrication of the Top Shield Plug.

Change No. 15:

The description of the coating method for coating DSC Internal Basket Assembly carbon steel surfaces with aluminum is being changed from "flame sprayed aluminum" to a generic description of "aluminum thermal spray." This change will allow flexibility for the method of application. The coating material (i.e., aluminum), application location and material thickness requirements are not affected by this change.

**Function(s) of affected SSCs:**

The DSC and the DSC Internal Basket Assembly are classified as safety-related per 10 CFR 50. The safety-related components of these assemblies include the Spacer Disks, Support Rods, Guide Sleeves, Shield Plugs, and End Closure Plates. The functions of the DSC and the various DSC components are described as follows:

Dry Shielded Canister:

The NUHOMS-24P DSC provides physical protection and structural support of the spent fuel during loading operations, transfer operations, and during storage. It is designed to remain intact under all normal, off-normal and accident conditions identified in the ISFSI USAR. The DSC is designed to perform the following critical functions:

1. **Confinement** - The DSC design provides mechanical confinement of the stored fuel assemblies to prevent the dispersion of particulate or gaseous radionuclides from the fuel, and to maintain a barrier of helium around the fuel. The primary function of the DSC is to provide confinement of the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further assure

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containment integrity. These are integral with the shield plugs. The DSC confinement boundary also is designed to retain the helium cover gas inside the DSC in order to mitigate corrosion of the fuel cladding and prevent expansive oxides from forming in the fuel itself during storage.

2. **Criticality Control** - The DSC design provides for criticality safety during the wet loading operations, DSC drying operations, and interim storage. This is accomplished by a combination of mechanical separation of the fuel assemblies by the DSC basket assembly, by neutron absorption in the steel guide sleeve material, and administrative controls during the fuel selection process.
3. **Fuel Support and Configuration Control** - The DSC Internal Basket Assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accident, a cask drop accident, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that post-accident removal of intact fuel assemblies is prohibited. The DSC and TC together are designed to limit the deceleration loads on the fuel rods so that their integrity is assured in the worst-case drop accident.
4. **Shielding** - The DSC materials provide gamma radiation shielding. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC to HSM loading operations and at the HSM door during storage.
5. **Thermal** - Decay heat is removed by thermal radiation and conduction from the DSC to the TC, and by thermal radiation and conduction and convection from the DSC to Horizontal Storage Module (HSM). The DSC maintains the helium cover gas which is required for corrosion control. This cover gas improves the thermal performance of the DSC.

**Internal Basket Assembly:**

The functions of the Internal Basket Assembly structures, systems and components are as follows:

1. **Guide Sleeves** – The Guide Sleeves establish the 24 spent fuel assembly storage compartments within the DSC. The tops of the Guide Sleeves are flared to assist Fuel Handling Operators in guiding the spent fuel assemblies into the sleeves. The inherent neutron absorption capability of the stainless steel guide sleeves provides a measure against criticality. The Guide Sleeves in the existing DSC design are suspended approximately ½” above the Bottom Inner Cover Plate by the Guide Sleeve Attachment Clips. This ½” gap allows for DSC blowdown and drying via the DSC Siphon Port. The proposed modified DSC Guide Sleeves will not be supported by Guide Sleeve Attachment Clips. Therefore the modified DSC Guide Sleeves will have notches cut out at the bottom of each face of each Guide Sleeve to provide an opening that will facilitate DSC draining and drying.
2. **Spacer Disks** – The Spacer Disks work together with the Guide Sleeves to maintain geometric separation of the fuel assemblies. The Spacer Disks support the weight of the Guide Sleeves, Support Rods and the spent nuclear fuel when the DSC is in a horizontal orientation. The Bottom Spacer Disk in the existing DSC design supports the weight of the 24 Guide Sleeves when the DSC is in a vertical orientation. For the modified DSC design, the only load on the Bottom Spacer Disk when the DSC is in a vertical orientation is due to self weight.



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3. **Spacer Disk Key Way (old)** – The purpose of the Spacer Disk Key Way is to maintain the DSC Internal Basket Assembly orientation during DSC movement. The Key Way doesn't support any safety function.
4. **Guide Sleeve Clip Angles** - The existing design of the DSC Internal Basket Assembly includes welded metal clip angle attachments between the Guide Sleeves and is attached to the Bottom Spacer Disk. The clip angles were originally designed as a fabrication convenience to restrain the Guide Sleeves during unloaded DSC transport, and during loading and unloading operations (fuel assembly insertion / extraction). The Guide Sleeve Clip Angle attachments would also counteract withdrawal forces in the event of a stuck fuel assembly. The proposed modified DSC Internal Basket Assembly eliminates the use of Guide Sleeve Clip Angle attachments.
5. **Support Rods** – The Support Rods maintain the Spacer Disk location along the length of the DSC. In the existing DSC design the Support Rods carry the weight of the Guide Sleeves, the Guide Sleeve Clip Angle attachments, and the Spacer Disks when the DSC is in a vertical orientation. In the proposed modified DSC, the Support Rods carry only the weight of the Spacer Disks.
6. **Guide Sleeve Extraction Stops (New)** – The Guide Sleeves in the modified DSC will have two Extraction Stops (metal tabs) that are mounted to the outside walls of each Guide Sleeve. The extraction stops are intended to prevent Guide Sleeve withdrawal in the event any incidental binding should occur during withdrawal of a spent fuel assembly.

**Top Shield Plug Lifting Post:**

The Top Shield Plug Lifting Post detail is the interface point between the DSC Top Shield Plug and the Auxiliary Building Spent Fuel Cask Handling Crane. The Top Shield Plug weighs approximately 6,320 lbs. (USAR Table 8.1-1), and therefore, is defined as a "heavy load" per NUREG-0612 (reference 28). During normal DSC fuel loading operations the Top Shield Plug is lifted over spent fuel assemblies in the Transfer Cask while the Transfer Cask is in the spent fuel pool. The Top Shield Plug Lifting Posts are designed to meet the specific heavy load handling design requirements per the Calvert Cliffs Nuclear Power Plant facility operating licenses and associated Technical Specifications pursuant to ISFSI License No. SNM-2505, License Condition No. 18.

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**SAR Revision No.: 7****SAR Sections Reviewed:**

The main chapters reviewed were 3, 4, 5, 7, and 8. The key sections reviewed are listed as follows:

3.3.4.1	Control Methods for Prevention of Criticality
4.2.1.2	Dry Shielded Canister Structural Specifications
4.2.3.2	Dry Shielded Canister Description
5.1.1.9	Removal of Fuel from the Dry Shielded Canister
8.1.1.2	Dry Shielded Canister Analysis
8.1.1.3	Dry Shielded Canister Internal Basket Analysis
8.2.3.2	Accident Analysis
8.2.5	Cask Drop
8.2.12	Load Combinations
Table 1.3-1	Major Systems, Subsystems and Components of the Calvert Cliffs ISFSI
Table 3.6-3	Summary of Design Criteria for Accident Conditions
Table 8.1-3	Maximum Dry Shielded Canister Stresses for Normal Loads
Table 8.1-4	Maximum Dry Shielded Canister Stresses for Off-Normal Loads
Table 8.2-1	NUHOMS-24P Accident Loading Identification
Table 8.2-6	Maximum Dry Shielded Canister Stresses for Drop Accident Loads
Table 8.2-8	Dry Shielded Canister Enveloping Load Combination Results for Normal and Off-Normal Loads
Table 8.2-9	Dry Shielded Canister Enveloping Load Combination Results for Accident Loads, ASME Service Level C
Table 8.2-10	Dry Shielded Canister Enveloping Load Combination Results for Accident Loads, ASME Service Level D
Appendix A	Q:3.0-2, Load Combination and Design Criteria
Appendix A	Q:BGE001.0203 and Computer Run BPLRWZ, Spacer Disk Analysis

The Calvert Cliffs ISFSI design approval was based upon review of specific design drawings. Drawings listed in Section 1.5 of the Calvert Cliffs ISFSI SER (reference 2) are a part of the ISFSI licensing basis. The DSC design drawing series reviewed for this activity include the following:

BGE-02-1002	(formerly 84-003-E)
BGE-02-1003	(formerly 84-004-E and 84-005-E)
BGE-02-1004	(formerly 84-006-E, 84-007-E and 84-009-E)
BGE-02-1007	(formerly 84-006-E, 84-007-E and 84-009-E)

Although not specifically listed in ISFSI SER Section 1.5, the following drawing series was also reviewed:

BGE-02-1006	(formerly 84-019-E and 84-020-E)
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**Tech Spec Bases Amendment/Rev No.:**

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Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License No. SNM-2505, Amendment 1, July 21, 1995 / (Note: No revision number exists for the ISFSI Tech Spec Bases.)

**Tech Spec Bases Reviewed:**

- 2.3 Transfer Cask (TC)
- 3/4.1 Fuel to be Stored at ISFSI
- 5.0 Design Features

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#### Complete for 50.59 and 72.48:

1. **The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.**

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:** The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity.

Critical functions that must be maintained by the DSC are shielding, thermal safety, confinement, criticality control, and configuration control related to fuel retrievability. The failure of DSC structures, systems and components (SSCs) important to safety that could inhibit performance of DSC critical functions has been previously evaluated in USAR Chapter 8. Malfunction of DSC SSCs important to safety will be evaluated relative to the DSC critical functions as follows:

#### Shielding:

The critical function related to shielding is not impacted by this activity. The DSC Shell and the DSC Internal Basket Assembly are not credited with augmenting the radiation shielding properties of the DSC (USAR Section 3.3.5.2 and Table 3.3-1). The modified DSC design ensures that the minimum design lead thickness will be maintained in the Top and Bottom Shield Plug assemblies. Therefore, there is no increase in the probability of a malfunction of the DSC shielding due to this activity.

#### Thermal Control:

The critical function related to thermal safety is not affected by this activity because only minor changes are being made to the DSC Shell and the DSC Internal Basket Assembly geometry and mass. Examples of such changes include increase in the +/- tolerance for the DSC Shell thickness, removal of the Guide Sleeve Clip Angles, addition of 1/2" tall notched openings at the bottom ends of the Guide Sleeves, increase in length of the Guide Sleeves by 1/4", etc. The net effect of these changes on the thermal analysis is negligible in terms of the precision of the engineering analyses. Therefore, there is no increase in the probability of a malfunction of the DSC thermal controls due to this activity.

#### Confinement, Criticality Control & Configuration Control:

Critical functions related to confinement, criticality control and configuration control are predicated on the DSC being able to remain intact under all accident conditions identified in Chapter 8 of the USAR with no loss of function. In order to meet this requirement the DSC is designed for the appropriate loading conditions per the design criteria in USAR Section 3.6, and in accordance with USAR Section 4.2.1.2 structural specifications.



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Hopper and Associates performed structural calculations to address the proposed changes to the DSC and the DSC Internal Basket Assembly SSCs (references 7, 8 and 27). The scope of the analysis was comprehensive, and covered all safety related DSC and DSC Internal Basket Assembly SSCs. The following components are addressed in the calculations:

- |                  |                            |                                 |
|------------------|----------------------------|---------------------------------|
| • DSC Shell      | • Top Inner Cover Plate    | • Top Outer Cover Plate         |
| • Top Lead Liner | • Bottom Inner Cover Plate | • Bottom Inner Liner            |
| • Grapple Ring   | • Welds                    | • Spacer Disks                  |
| • Support Rods   | • Guide Sleeves            | • Guide Sleeve Extraction Stops |

The DSC design was evaluated in conjunction with ASME B&PVC Section III Subsection NB. ASME Service Levels A, B, C and D for normal, off-normal, emergency and accident level loading conditions and load combinations were imposed on the DSC and the DSC Internal Basket Assembly SSCs. The following is a summary of the significant analyses and results:

- The DSC and DSC Internal Basket Assembly SSCs were evaluated for cask drop, seismic, thermal, pressure, and cask handling loading conditions. The modified DSC dimensions and tolerances were addressed in the analysis where appropriate. The structural analytical methods used for the DSC evaluation are either consistent with or are more conservative than the methods identified in the USAR Chapter 8. The design basis cask drop, thermal and pressure accident level events were found to impose the most limiting structural stresses on the DSC and on the DSC Internal Basket Assembly components. All DSC SSCs were qualified considering stresses due to individual loading conditions added in combination according to Table 3.2-5a of the NUHOMS-24P Topical Report (reference 3). The ASME allowable stresses were determined subject to NRC SER imposed temperature conditions (reference 2). All calculated stresses and stress combinations for the DSC and the DSC Internal Basket Assembly components were determined to be within ASME Section III allowable stress limits (see reference 32 for discussion of exception to this statement). The results of the ASME service level load combination stress analyses are tabulated in Exhibits A through D to this safety evaluation.
- In the existing DSC design there are 24 Guide Sleeves that are connected to the Bottom Spacer Disk through welded Guide Sleeve Clip Angles. The Guide Sleeve loading due to the vertical cask drop event imposes severe stresses on the Bottom Spacer Disk. Because of this, the analytical stress evaluation of the Bottom Spacer Disk for the existing DSC design is performed using a bi-linear elastic-plastic finite element model to determine stresses and plastic deflections (USAR 8.2.5.2 and NRC SER 2-47). This sophisticated modeling technique wasn't required for evaluation of the modified DSC design. The modified DSC design uncouples the Guide Sleeves from the Bottom Spacer Disk (i.e., the Guide Sleeve Clip Angle attachments are removed). This significantly reduces the Bottom Spacer Disk stresses due to the vertical cask drop event. Stresses remain in the elastic range, and a linear elastic finite element analysis is performed. The Spacer Disk stress intensities determined in the Hopper and Associates analysis are within than the ASME code allowable values. More importantly, the removal of the Guide Sleeve Clip Angles eliminates the issues related to Guide Sleeve deformations.
- The Support Rods were evaluated for axial and bending stress, and for critical buckling. The design basis vertical cask drop event imposes the most severe loading condition on the Support Rods. Because the modified DSC uncouples the Guide Sleeves from the Bottom Spacer Disk, the Support Rod stresses are significantly reduced, and stresses are well within ASME allowable limits. The modified DSC design provides greater margin to Support Rod buckling than what is provided by the existing design.

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- Evaluation of axial thermal expansion of the DSC Internal Basket Assembly components relative to the DSC Shell and inner and upper plates was performed by Hopper and Associates, and Transnuclear West Inc. (references 7 and 15). A thermal expansion interference check was also performed to ensure that there is adequate clearance between the Guide Sleeve and the Spacer Disk at the location where the Guide Sleeve passes through the Spacer Disk (reference 27). The evaluations conclude that the proposed modifications to the DSC Internal Basket Assembly will not cause ASME allowable stresses to be exceeded due to differential thermal expansion of components, and that the Guide Sleeves will not subject the Spacer Disks to any out of plane loading due to interference friction (reference 33).
- The Guide Sleeve corner weld seam that is used to fabricate a Guide Sleeve from plate material was revised from an intermittent weld to a continuous weld. This weld detail was evaluated for postulated worst case accident loads, and the weld stresses were found to be within ASME Section III Division 1 Subsection NB allowable stresses.

The design effective throat for the DSC confinement boundary final closure welds has been reduced in order to improve ALARA exposure, and to ensure the minimum required throat can be developed under the extreme joint fit-up conditions. The affected welds include the Top Cover Plate to DSC Shell weld, the Top Shield Plug to DSC Shell weld and the Top Shield Plug to the Siphon and Vent Block weld. These welds were evaluated with respect to the appropriate allowable stresses, and were found to be acceptable (reference 27). One drawing discrepancy was noted and will be corrected (reference 33).

In conclusion, it was found that the proposed changes to the DSC have been fully analyzed in a manner consistent with USAR design criteria, and the results of the analyses were found to comply with the applicable USAR structural specifications and NRC SER acceptance conditions. Therefore, the probability of occurrence of a malfunction of equipment important to safety will not increase.

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:** The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity.

Evaluation of the consequences of malfunctions of equipment important to safety focuses on the DSC critical functions of reactivity control, and configuration control as follows:

Reactivity Control:

Criticality safety during wet loading operations is maintained through the geometric separation of the fuel assemblies within the internal basket assembly, the inherent neutron absorption capability of the stainless steel guide sleeves, the proper selection of sufficiently depleted fuel assemblies and taking credit for the soluble boron in the spent fuel pool. Furthermore, the off-normal reactivity analysis is performed in accordance ANSI/ANS-57.2-1983. This standard imposes conservative assumptions in the analysis for an additional level of safety.

Transnuclear West Inc. has evaluated the proposed changes to the Guide Sleeve and DSC Shell dimensional tolerances for their effect on reactivity (reference 15). The change in the DSC Shell minimum thickness will have the effect of replacing a small thickness of the shell inner diameter with water. The change in the Guide Sleeve inside envelope will have the effect of moving the Guide Sleeve envelope farther away from the fuel, thus

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increasing the thickness of the water between the fuel and the Guide Sleeve, and increasing the total amount of stainless steel material between the fuel assemblies. The effects of these changes were considered with respect to the design parameters, uncertainties and biases for criticality analysis required per USAR Section 3.3.4. Transnuclear West Inc. determined that the changes will have a negligible effect on criticality, and that the USAR criticality limits will not be exceeded (reference 33).

Section 3.3.4 of the USAR indicates that introduction of a moderator would be necessary to cause a criticality concern during cask handling and storage. Integrity of the confinement boundary was discussed in the preceding question, and it was shown that integrity is assured for the modified DSC design for postulated credible worst case accidents. Nevertheless, criticality analyses have been performed to determine the effects of introduction of moderator into the DSC cavity space (reference 14). Conservativisms in the analysis impose certain deformations on Guide Sleeve wall spacing. The analyses demonstrate that criticality control will be maintained under the most severe accident conditions.

Configuration Control:

There is no change in the normal operation of the NUHOMS-24P system caused by this activity. In the case of performing recovery procedures following the postulated worst case handling accident, the modified DSC Internal Basket Assembly has been evaluated to ensure that a workable geometry will exist so that removal of intact fuel assemblies will not be prohibited. Specifically, there are no unacceptable deflections of the safety related Guide Sleeves, Spacer Disks or Support Rods. Retrieval of intact fuel from the DSC is assured, even following the maximum credible accident.

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:** The probability of occurrence of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity.

Credible accident scenarios that are analyzed for the Calvert Cliffs ISFSI are discussed in Section 8 of the USAR.

The proposed changes to the DSC Internal Basket Assembly have no bearing on the frequency, or on the probability of occurrence of design basis external natural events such as tornado, earthquake, or flood. Similarly, the proposed changes have no bearing on the frequency, or on probability of occurrence of design basis external man-induced events that could affect the ISFSI such as fires, or a Liquid Natural Gas (LNG) plant or pipeline spill or explosion.

The proposed changes to the DSC Internal Basket Assembly do not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected. Therefore, the probability of occurrence of an accident involving loss of HSM air outlet shielding, or blockage of HSM air inlets and outlets will not increase.

Pressurization of the DSC due to fuel cladding failure is an accident scenario identified in USAR Section 8.2.9. The limiting DSC pressurization accident event is a rupture of fuel cladding together with blockage of the HSM vents. As stated in the preceding paragraph, the probability of occurrence of an accident involving blockage of HSM air inlets and outlets will not increase due to the DSC design changes. The USAR does not identify any initiating event for the breach of the fuel cladding for the DSC pressurization accident.



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The modified DSC Internal Basket Assembly will not increase the probability of fuel cladding failure. The Internal Basket Assembly modifications are designed to minimize deformation of the Guide Sleeves to increase retrievability margin in the event of a cask drop accident. There is adequate space to allow for thermal expansion of the DSC Internal Basket Assembly components so that the fuel assemblies will not be subject to any undue stress. In addition, the TC and the DSC were originally designed to limit the deceleration loads on the fuel rods so that their integrity is assured in the worst-case drop accident. The DSC Internal Basket Assembly modifications, in particular, removal of the Guide Sleeve Clip Angles, will have the effect of reducing the overall stiffness of the Internal Basket Assembly. This will work to further reduce the deceleration loads on the fuel assemblies. As a result, the probability of fuel cladding failure due to a cask drop accident will not be increased.

DSC confinement boundary leakage is an accident scenario described in USAR Section 8.2.8. The USAR indicates that there are no credible events that would initiate this type of accident. Despite that, the effects of a failure of all of the fuel rod cladding with a concurrent loss of the DSC confinement boundary is analyzed. As stated in the preceding paragraphs, the probability of an accident that would lead to cladding failure is not increased by the DSC Internal Basket Assembly design changes. The elimination of the Guide Sleeve Clip Angle attachments will have the effect of distributing the weight of the Guide Sleeves more uniformly over the Inner Closure Plate when the DSC is in a vertical orientation thereby reducing the stress concentration on the confinement boundary imposed by the four Support Rods. The confinement boundary plates, structural welds and seal welds have been evaluated in accordance with ISFSI USAR design criteria and structural specifications, and were found to be within ASME code and NRC SER stress limits. Therefore, the modified DSC will not increase probability of DSC confinement boundary leakage.

A cask handling accident involving a drop of the TC is described in USAR Section 8.2.5. There are no heavy load handling system attachment points for the TC that are affected by the DSC modifications. Therefore, the probability of occurrence of a cask drop will not increase due to this activity.

In conclusion, the proposed DSC modifications will not increase the probability of occurrence of any analyzed accident.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:** The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity.

The relevant ISFSI design basis accidents that are considered for this activity are the cask drop accident event, and the design basis earthquake event.



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Cask Drop Accident:

The USAR reports that the TC, DSC, the DSC Internal Basket Assembly and the contained fuel rods will maintain their structural integrity through a cask drop. The USAR conservatively bases the radiological consequences of a cask drop accident on the assumption that the entire TC neutron shield is lost. The change in weight of the modified DSC Internal Basket Assembly will be negligible in terms of the precision of the engineering analysis, and will not contribute to any failure of the TC neutron shielding.

The modified DSC and DSC Internal Basket Assembly have been evaluated to ensure that the worst case postulated cask drop accident will not cause any SSC important to safety to exceed the ASME allowable stresses (subject to NRC SER temperature conditions). The DSC and DSC Internal Basket Assembly have also been evaluated to ensure the design basis cask drop accident will not result in deformation of the DSC, or the DSC Internal Basket Assembly to such a degree that post-accident removal of intact fuel assemblies is prohibited.

The existing DSC Internal Basket Assembly has a condition where Guide Sleeve Clip Angle deformation may cause the Guide Sleeves to "pinch" the fuel assemblies. Although acceptable for certain clip angle sizes, this condition is undesirable. The modified DSC Internal Basket Assembly design will eliminate this potential and increase margin.

The USAR indicates that the structural characteristics of the TC and DSC limit the deceleration loads on the fuel assemblies so that their integrity is assured for the worst case drop accident. The proposed modifications to the DSC Internal Basket Assembly, in particular, removal of the Guide Sleeve Clip Angles, will have the effect of reducing the overall stiffness of the Internal Basket Assembly. This will further reduce the deceleration loads on the stored spent fuel assemblies. Because the geometry of the DSC Internal Basket Assembly will be maintained through the cask drop event, and the structural characteristics of the TC and DSC which limit the deceleration loads on the fuel assemblies will not be negatively affected by the proposed modifications, both criticality control and fuel rod integrity remain assured.

Design Basis Earthquake:

The DSC SSCs important to safety have been designed and evaluated to withstand the forces generated by the design basis earthquake. The analyses use 1.0g vertical seismic acceleration, and 1.5g horizontal seismic acceleration. The forces generated are significantly less than the deceleration forces used in the evaluation of the design basis cask drop event (75g horizontal and 75g vertical deceleration). Hence, the dose consequences due to the design basis earthquake are enveloped by the design basis cask drop accident event.

In conclusion, because the Transfer Cask neutron shielding will remain intact, criticality control is assured, fuel rod integrity is assured, and the retrieval capability of an intact fuel assembly is assured, the on-site and off-site dose consequences will not be increased.

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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

**Possibility of New Malfunction:** The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity.

The proposed modifications to the DSC and DSC Internal Basket Assembly will add new components, and modify the behavior of existing components under normal operating and accident level conditions. These changes may affect critical functions related to confinement, criticality control and configuration control. These critical functions will be examined to determine if a malfunction of a different type is created.

Confinement:

- Nominal changes in the dimensions of the Guide Sleeves and the Top Spacer Disk Key Way will have no impact on DSC confinement integrity. Thermal interference behavior between the DSC and DSC Internal Basket Assembly components has been checked, and it has been found that ASME allowable stresses will not be exceeded due to differential thermal expansion of components (references 7, 15 and 27). Spacer Disk Key Way stresses have been reviewed and found to be acceptable by Hopper and Associates (reference 7).
- Removal of the Guide Sleeve Clip Angles will allow the Guide Sleeves to rest directly on the Inner Cover Plate when the DSC is in the vertical orientation. With the existing design, the Support Rods support the weight of the Guide Sleeves. The proposed change will reduce punching shear from the Support Rods, and will distribute load on the Inner Closure Plate more uniformly. This change will reduce confinement boundary plate element stresses under normal and accident conditions, and is clearly beneficial.

Criticality Control:

- Removal of the Guide Sleeve Clip Angle attachments will allow the Guide Sleeves to sit flush on the Bottom Inner Cover Plate. Because of this, the modified DSC design adds 1/2" tall notched openings to the bottoms of each Guide Sleeve in order to provide a flow path that will facilitate DSC draining and drying. In the existing design the Guide Sleeves are suspended approximately 1/2" above the Bottom Cover Plate by the welded clip angle attachments, thus allowing a flow path to permit draining and drying. The difference in flow area between these two configurations will have little impact on the draining and drying times since the controlling parameter is the inner diameter of the Siphon Tube (reference 15). Nevertheless, even if the time to drain the DSC were to increase, there would be no impact on criticality safety. According to USAR Section 5.1.1.3 subcriticality is demonstrated by analysis for all conditions including optimum moderator conditions. (Optimum moderator conditions will be approached if boiling were to occur due to an extended drain down time.)
- USAR Section 3.3.4.1 credits the stainless steel Guide Sleeves with providing some level of criticality control due to their inherent ability to absorb neutrons. Increasing the length of the Guide Sleeves will serve to add negative reactivity to the DSC cavity, and is clearly beneficial.

Configuration Control:

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- The proposed modified DSC Internal Basket Assembly removes the Guide Sleeve Clip Angle attachments from the Bottom Spacer Disk. This will allow the Guide Sleeves to sit flush on the Bottom Inner Cover Plate. The modified DSC design adds 1/2" tall notched openings, or scallops, to the bottoms of each Guide Sleeve. Because the bottoms of the Guide Sleeves are scalloped, attention was given to possible buckling failure of the scalloped ends which could result in the Guide Sleeve "pinching" the bottom of a spent fuel assembly. Evaluation of this condition for the most limiting loading condition, the vertical cask drop accident load case, determined that local buckling of the scalloped ends will not occur. The Euler critical buckling load ( $P_{cr}$ ) for each scalloped section (there are 2 sections at each corner of the Guide Sleeve) was calculated to be 14,000 lbs. This provides a factor of safety greater than 8 against the calculated load of 1,700 lb. for each section under the vertical cask drop loading condition (reference 15 and 27).

In addition to the Guide Sleeve local buckling concern, overall Guide Sleeve buckling was checked to ensure that column buckling will not "pinch" a fuel assembly. Hopper and Associates calculated that the maximum axial load in the Guide Sleeve due to a vertical cask drop design basis accident event is 12,450 lbs. This load is substantially less than the calculated critical buckling load ( $P_{cr}$ ) of 48,400 lb. (reference 7, p 209 et. seq.).

- The Guide Sleeve corner weld that is used to fabricate a Guide Sleeve from plate material was revised from an intermittent weld to a continuous weld. This will increase rigidity and improve guide sleeve protection of the spent fuel assembly under normal handling and accident conditions. Because the spent fuel assembly Spacer Grids coincide with the DSC Spacer Disk locations, the additional rigidity will not impact the structural characteristics of the DSC that limit the deceleration loads on the fuel assemblies.
- Two Extraction Stops (metal tabs) are to be plug welded onto each Guide Sleeve. The only intended use for these new components is to prevent removal of a Guide Sleeve from the DSC in the event a spent fuel assembly becomes stuck during withdrawal. Addition of these metal tabs will not alter the behavior of the Guide Sleeves during normal operating and accident conditions. The location of the Extraction Stops has been designed so that they will not cause any additional forces on the Spacer Disks during a vertical cask drop (reference 7).

Elimination of the clip angles through implementation of the proposed DSC Internal Basket Assembly modifications will ensure that the gap between the Guide Sleeve and the fuel assembly will be maintained following a design basis cask drop accident. Nevertheless, in the event that a fuel assembly becomes stuck, the Guide Sleeve will withdraw along with the fuel assembly for approximately 8" until the Extraction Stop contacts the bottom of the 1<sup>st</sup> Spacer Disk. Additional extraction force could then be used to free the fuel assembly from the Guide Sleeve.

Hopper and Associates Engineers performed an extensive evaluation of the effects of the withdrawal forces on the Extraction Stops and on the Guide Sleeves (reference 7). The Extraction Stop welds have been analyzed in accordance with ASME Section III Subsection NF requirements. Extraction loads as high as 800 lbs. will cause only very minor elastic "dimples" in the Guide Sleeves (ANSYS finite element analysis calculated deflection less than or equal to 0.021"). This extraction load cannot be reached as overload protection for the fuel handling machine limits the extraction force on the fuel assembly to 350 lbs. (Ref. 36).

- The Extraction Stops are being added in favor of use of the welded Guide Sleeve Clip Angle attachments. Addition of the Extraction Stops and removal of the Guide Sleeve Clip Angle attachments is clearly beneficial, and the change will not result in a malfunction of a different type.

In conclusion, the addition of new components and changes in the behavior of the existing components will not adversely impact the critical functions of the DSC, and will not result in a malfunction of a different type.



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☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

**Possibility of New Accident:** The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity.

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8 of the USAR, and have been discussed previously. Since the operation and performance of the NUHOMS-24P system remain substantially unchanged by this activity, the possibility of an accident of a different type than any previously evaluated in the SAR will not be created.

**Complete for 50.59 and 72.48:**

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO Will the margin of safety as defined in the basis for any Technical Specification be reduced?

**Bases:** 2.3 and 3/4.1

**Discussion of why the margin of safety is not reduced:**

**NRC Acceptance Limit - Definition:**

In order to determine whether there is a reduction in the margin of safety, the NRC acceptance limits that were used in the basis for this Technical Specification must be known. An NRC acceptance limit is the value that is proposed by the licensee in the original SAR, and as modified by the NRC SER. If the NRC SER did not explicitly modify or address the SAR value, then the original SAR value itself is the acceptance limit. The margin may be implicit rather than explicitly expressed as a numerical value. If a specific methodology for computing bounding limits was submitted to the NRC in support of the Calvert Cliffs ISFSI licensing action, reduction in any margin associated with that methodology (i.e., reduction in any specific NRC acceptance condition) would constitute a reduction in the margin of safety (reference 26).

**DSC Deceleration - NRC Acceptance Limits:**

The method used for predicting the deceleration of a dropped cask is based on EPRI NP-4830 (reference 2 and 30). This method predicts maximum cask deceleration as a function of cask drop height, target hardness, cask orientation and cask weight. The Calvert Cliffs ISFSI bases the maximum deceleration on lifting a loaded Transfer Cask no higher than 80" above a hard concrete surface. The DSC is assumed to be loaded with 24 spent fuel assemblies weighing not more than 1300 lbs. each. Calvert Cliffs ISFSI site specific cask drop analyses were performed to determine the maximum deceleration values for postulated 80" vertical and horizontal drops of the loaded Transfer Cask. USAR Section 8.2.5.2 indicates that the Calvert Cliffs site specific maximum decelerations were determined to be 51 g for the vertical drop case, and 31 g for the horizontal drop case. In spite of these site specific deceleration values, the Calvert Cliffs ISFSI USAR design criteria conservatively uses 75 g for both the vertical and horizontal drop cases, and 25 g for the corner drop case. These conservative deceleration values are



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based on the NUHOMS-24P Topical Report, and are the basis for NRC SER acceptance of the Calvert Cliffs ISFSI SAR cask drop analyses.<sup>(SER 2-46)</sup> These deceleration values are provided in USAR Table 3.6-3, Summary of Design Criteria for Accident Conditions.

Therefore, the NRC acceptance limits for cask drop accident deceleration are 75 g horizontal drop, 75 g vertical drop and 25 g corner drop. Use of any lower deceleration values for analysis of Calvert Cliffs ISFSI cask drops would result in a reduction of the margin of safety.

It is noted that maximum fuel assembly weight and the Transfer Cask maximum lift height are regulated by the ISFSI Technical Specifications. As such, these parameters will be monitored and complied with as a part of ISFSI fuel loading operations. These Technical Specification limits are not affected by this design activity.

DSC Permissible Stress – NRC Acceptance Limit:

Detailed stress analyses were performed for a series of design basis cask drop accidents for the Calvert Cliffs ISFSI, and were submitted for NRC review and acceptance during initial licensing of the ISFSI facility. The Calvert Cliffs ISFSI SAR employs ASME Section III Division 1 Subsection NB Class 1 Service Level D for determining accident case material allowable stresses for the DSC.<sup>(SER 2-49)</sup> The NRC acceptance of this methodology was based on use of the worst thermal condition reported in the Topical Report.

Therefore, the NRC acceptance limit for DSC accident case permissible stress is as provided by ASME Section III Division 1 Subsection NB Class 1 Service Level D subject to the specific NRC acceptance condition that the worst thermal conditions (as reported in the Topical Report) must be used in calculating the allowable values. Use of any lower temperatures to compute accident case allowable values, or use of another code or standard that would yield higher allowables for the same conditions would result in a reduction of the margin of safety.

It is noted that the NRC SER imposes similar restrictions on computation of ASME allowable values for emergency conditions, i.e., ASME Service Level C.

DSC Fuel Inspection – NRC Acceptance Limit:

The Calvert Cliffs NUHOMS-24P DSC is designed to meet the requirements of ASME Section III Division 1 Subsection NB Class 1. In the event of a Transfer Cask Drop from a height greater than 15", the fuel must be returned to the spent fuel pool and visually inspected for damage. The basis for this inspection requirement is that permanent deformation of the DSC confinement boundary and DSC internals are permitted under ASME Service Level D loading conditions. Additional basis for this inspection is that the Guide Sleeve Clip Angle welds are predicted to fail at a deceleration of only 35g. The cask drop required fuel inspection height of 15" was deemed to be acceptable based on the due to the robustness of DSC based on the ASME code requirements, and the distance from the postulated worst case cask drop accident drop height. The likelihood that there would be no significant consequence due to a drop from 15" is based on engineering judgement.

Therefore, the NRC acceptance limits for the requirement to inspect fuel following a cask drop of 15 inches is based on compliance with ASME Section III Division 1 Subsection NB Class 1 Service Level D permissible stress limits, and the failure point of DSC Internal Basket Assembly components at 35 g.

Evaluation of the Margin of Safety:

Hopper and Associates performed an extensive re-evaluation of the DSC and the DSC Internal Basket Assembly for the design basis cask drop accident loads (reference 7). All design basis cask drop analyses performed for this

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activity used deceleration values of 75g for both the horizontal and vertical cask drop cases. The analytical methods used for the evaluation of the effects of those deceleration values on the DSC are either consistent with or are more conservative than the methods identified in the USAR Section 8.2.5. Therefore, the NRC acceptance limits for horizontal, vertical and corner cask drop deceleration are met.

The ISFSI generic and site specific USAR's both maintain that the DSC stresses resulting from a corner drop accident are bounded by the vertical and horizontal drop scenarios. Discussions between BGE and Hopper (reference 31) confirm the rationale why these scenarios bound the corner drop case. The NRC site specific SER lists DSC stress values for the corner drop case which are excerpted from the Transfer Cask load drop case. However, based on the USAR and the Hopper confirmation, BGE has taken the position that it is acceptable to not provide a new DSC Corner Drop analysis.

The scope of the Hopper and Associates structural analyses was comprehensive, and included all safety related confinement boundary and fuel basket assembly components. As stated above, the analytical methods used for the evaluation of cask drops are either consistent with or are more conservative than the methods identified in the USAR Section 8.2.5. Because the proposed modifications to the DSC Internal Basket Assembly uncouple the Guide Sleeves from the Bottom Spacer Disk, additional calculations were performed as required. For example, local and overall buckling of the Guide Sleeve columns was checked as part of the analysis. All calculated stresses for the DSC, and the DSC Internal Basket Assembly components were determined within ASME Section III Division 1 Subsection NB Class 1 Service Level D allowable stress limits when using temperatures for the worst thermal conditions as reported in the Topical Report. The results of the ASME Service Level D load combination stress analyses compared to NRC SER allowable values are tabulated in Exhibit D to this safety evaluation.

The modified DSC Internal Basket Assembly removes the Guide Sleeve Clip Angle attachments. The Clip Angles are considered to be the weakest structural component in the existing DSC design. All safety related Internal Basket Assembly SSCs in the modified design will remain elastic up through the design basis cask drop accidents. Furthermore, as stated in the preceding paragraph, all calculated stresses for the DSC, and the DSC Internal Basket Assembly components were determined to be within ASME Section III Division 1 Subsection NB Class 1 Service Level D allowable stress limits.

In conclusion, because the NRC acceptance limits for the design basis cask drop deceleration values are met, the NRC acceptance limits for DSC material stresses are met, and the NRC acceptance limits identified for fuel inspection are met, the overall margin of safety is not reduced due to this activity.

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**Complete for 72.48:**

☐ YES ☒ NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:** A significant increase in occupational dose will not occur as a result of this proposed activity.

The operation of the NUHOMS-24P dry cask storage system is not changed by this proposed activity. The proposed changes to the DSC dimensions and tolerances do not reduce the integrity of the confinement boundary, and the DSC radioactive shielding elements (i.e., the shield plugs) are not negatively affected. Changes to the DSC Shell and Guide Sleeve dimensional tolerances will not cause criticality control limits to be exceeded. The DSC changes are designed to ensure Guide Sleeve deflections will remain elastic, and that any deflection due to postulated worst case accident events will not result in any Guide Sleeve pinching a spent fuel assembly. Reduced weld sizes for the Top Cover Plate to DSC Shell weld, the Top Shield Plug to DSC Shell weld, and the Top Shield Plug to Siphon and Vent Block weld will serve to reduce occupational exposure during DSC final closure activities.

In conclusion, the proposed changes to the DSC Internal Basket Assembly do not adversely impact the occupational doses summarized in USAR Table 7.4-1. Therefore, the proposed activity will not significantly increase occupational dose.

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:** A significant unreviewed environmental impact will not occur as a result of this proposed activity.

The NUHOMS-24P dry cask storage system confinement and radiological shielding functions remain assured under this proposed activity. The proposed modifications to the DSC and DSC Internal Basket Assembly have been evaluated to ensure confinement boundary stresses will remain within allowable limits under the most severe postulated accident conditions. The changes will ensure that the DSC lead shield plug lead thicknesses will meet design requirements.

The proposed activity does not affect any area of the plant site previously undisturbed for the ISFSI. The proposed activity does not affect any environmental conditions associated with the Calvert Cliffs ISFSI or the Calvert Cliffs Nuclear Power Plant. No new chemicals are being introduced to the ISFSI or the CCNPP as a result of the proposed changes. There are no changes needed for the Calvert Cliffs ISFSI Updated Environmental Report.

Therefore, the proposed activity does not involve an unreviewed environmental impact.

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## References:

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 7
2. SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992
3. Topical Report for the Nutech Horizontal Module Storage System for Irradiated Nuclear Fuel NUHOMS-24P, NUH-002, Revision 1A, July 1989, and NUH-001, Revision 1A, June 1986
4. Calvert Cliffs Independent Spent Fuel Storage Installation Materials License No. SNM-2505, Amendment 1, July 21, 1995
5. Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License No. SNM-2505, Amendment 1, July 21, 1995
6. Transnuclear West Engineering Change Notice ECN No. 98-0516, Project Title: BGE-02 (DSC), Rev. 0, January 15, 1999
7. Hopper Associates Calculation, Transmittal HABGE-01/99-0745, January 29, 1999
8. Hopper Associates Calculation, Transmittal HABGE-06/98-0655, June 29, 1998
9. BGE Calculation C-91-076, Rev. 001 (Vendor Calc. BGE001.0203, Rev. 004) - Superseded by Ref.11
10. BGE Calculation C-91-076, Rev. 002 (Vectra Calculation BGE001.0203A, Rev. 0) - Superseded by Ref.11
11. BGE Calculation CA04132, Rev. 000 and Rev. 001
12. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1
13. ANSI/ANS-57.9-1992, Design Criteria for an Independent Spent Fuel Storage Installation
14. BGE Memo NEU 98-021, G. E. Gryczkowski to M. J. Gahan, 2/16/98, Subject: Criticality of a Compressed and Flooded Dry Storage Canister (ES199800192-000, Rev. 0000)
15. Letter from Usama Farradj, Transnuclear Inc., to Robert Beall, BGE, Correction / Clarification of TNW Resolutions of BGE DSC Drawing, Specification and RANOR Procedure Comments, March 16, 1999, BGE02-99-017
16. BGE Memo NFM 98-026, R. H. Beall to M. J. Gahan, 1/23/98, Subject: DSC Guide Sleeve to Fuel Assembly Gap Size
17. American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section III, 1983.
18. Not Used
19. BGE Issue Report IR3-005-206, ISFSI DSC Guide Sleeve Attachments, February 16, 1998
20. BGE Issue Report IR3-007-611, Fuel Assembly Spacer Grids Misaligned with DSC Spacer Disks
21. Hopper Associates Calculation, HABGE-02/98-0610, July 17, 1998
22. Transnuclear Inc. CAR.98.003, Guide Sleeve Undersized Sleeve Weld
23. Not Used
24. BGE Issue Report IR1-011-183
25. Transnuclear Inc. CAR.98.050, DSC Buckling
26. ES-17, Revision 1, 10 CFR 50.59/72.48 Safety Evaluation Screenings/Safety Evaluations (RE: NEI 96-07 p3-6,7,8 &11; NUREG-1606)
27. Letter from K.L. Saunders, Hopper and Associates, to J.T. Conner, BG&E, New DSC Design Review Comments Response, March 22, 1999, HABGE-03/99-0766
28. NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, July 1980
29. Transnuclear West Safety Review Screening SR 98-0516 for ECN 98-0516, January 15, 1999
30. Electric Power Research Institute, NP-4830, The Effects of Target Hardness on the Structural Design of Concrete Storage Pads for Spent Fuel Casks, October 1986
31. Telecon, Todd Conner (BGE) to Philip Hasrouni (Hopper & Associates), 3/24/99.
32. Letter from K.L. Saunders, dated March 25, 1999, HABGE-03/99-0767.
33. Letter from Usama Farradj (Transnuclear West) to Robert Beall (BGE), dated March 16, 1999, Resolutions to BGE Comments on DSC Drawings, 9 pages.
34. Letter from Kenneth Saunders (Hopper & Associates) to J. Todd Conner (BGE), dated March 22, 1999, New DSC Design Review Comments Response, 6 pages.
35. Letter from Usama Farradj (Transnuclear West) to Robert Beall (BGE), dated March 23, 1999, Response to BGE Comments on DSC Drawings, 1 page.
36. Setpoint Change Transmittal Sheet, 0-WS-100, Fuel Handling Machine Normal Overload Setpoint Module



## ATTACHMENT 3, SAFETY EVALUATION FORM

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**Exhibit A****DSC Load Combination Results - ASME Service Level A**

Stress (ksi)

DSC Component	Stress Type	Hopper and Associates Service Level A Load Case Combinations <sup>(a)</sup>			ASME Service Level A Allowable <sup>(f)</sup>
		A2 <sup>(b)</sup>	A3 <sup>(c)</sup>	A4 <sup>(d)</sup>	
DSC Shell	Pri Memb	1.41	1.74	3.53	18.7
	Memb + Bend	9.24	9.67	13.3	28.0
	Memb + Bend+ Thermal	39.2	39.7	43.3	56.1
Bottom Cover Plate	Pri Memb	0.26	1.23	1.53	18.7
	Memb + Bend	1.22	4.78	8.53	28.0
	Memb + Bend+ Thermal	15.2	18.8	22.5	56.1
Top Pressure (Top Cover) Plate	Pri Memb	1.12	1.47	1.13	18.7
	Memb + Bend	1.88	2.26	1.19	28.0
	Memb + Bend+ Thermal	21.8	22.2	21.1	56.1
Top Structural (Top Inner Cover) Plate	Pri Memb	0.19	1.54	2.59	18.7
	Memb + Bend	0.35	2.84	7.31	28.0
	Memb + Bend+ Thermal	22.6	25.0	29.5	56.1
Spacer Disk	Pri Memb	0.57	1.71	1.71	18.7 <sup>(f)</sup>
	Memb + Bend	1.24	3.72	3.72	28.0 <sup>(f)</sup>
	Memb + Bend+ Thermal	33.0	35.5	35.5	56.1 <sup>(f)</sup>
Support Rods	Pri Memb	0.23	0.69	0.69	18.7
	Memb + Bend	--	--	--	28.0
	Memb + Bend+ Thermal	--	--	--	56.1

(a) See Hopper and Associates Calculation, Transmittal HABGE-01/99-0745, January 29, 1999, Table 5.2 – Load Combinations Level A; Load combination A1 is bounded by load combinations A2, A3 and A4.

(b) Combination A2 = DW<sub>2</sub> (DSC with water) + T<sub>nc</sub> (Inside Cask normal) + P<sub>h</sub> (Hydrostatic)

(c) Combination A3 = DW<sub>3</sub> (DSC with fuel) + T<sub>nc</sub> (Inside Cask normal) + P<sub>a</sub> (Normal operating) + L<sub>n</sub> (Normal DSC transfer)

(d) Combination A4 = DW<sub>3</sub> (DSC with fuel) + T<sub>nh</sub> (Inside HSM normal) + P<sub>b</sub> (Off –normal blowdown) + L<sub>n</sub> (Normal DSC transfer)

(e) See SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992, Table 2.2.3-10; Allowable values taken for SA 204 Type 304 material at 400 degrees F.

(f) Allowables are for stainless steel material. Carbon steel material allowables are higher.

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**Exhibit B****DSC Load Combination Results - ASME Service Level B**

Stress (ksi)

DSC Component	Stress Type	Hopper and Associates Service Level B Load Case Combinations <sup>(a)</sup>		ASME Service Level B Allowable <sup>(e)</sup>
		B1 <sup>(b)</sup>	B2 <sup>(c)</sup>	
DSC Shell	Pri Memb	2.54	4.33	18.7
	Memb + Bend	20.1	23.7	28.0
	Memb + Bend+ Thermal	50.1	53.7	56.1
Bottom Cover Plate	Pri Memb	0.23	0.53	18.7
	Memb + Bend	8.08	11.8	28.0
	Memb + Bend+ Thermal	22.1	25.8	56.1
Top Pressure (Top Cover) Plate	Pri Memb	0.47	0.13	18.7
	Memb + Bend	1.26	0.19	28.0
	Memb + Bend+ Thermal	21.2	20.1	56.1
Top Structural (Top Inner Cover) Plate	Pri Memb	0.54	1.59	18.7
	Memb + Bend	1.84	6.31	28.0
	Memb + Bend+ Thermal	24.0	28.5	56.1
Spacer Disk	Pri Memb	0.57	0.57	18.7 <sup>(e)</sup>
	Memb + Bend	1.24	1.24	28.0 <sup>(e)</sup>
	Memb + Bend+ Thermal	33.0	33.0	56.1 <sup>(e)</sup>
Support Rods	Pri Memb	0.23	0.23	18.7
	Memb + Bend	--	--	28.0
	Memb + Bend+ Thermal	--	--	56.1

(a) See Hopper and Associates Calculation, Transmittal HABGE-01/99-0745, January 29, 1999, Table 5.3 – Load Combinations Level B; Load combinations B3 and B4 are bounded by load combination B1.

(b) Combination B1 = DW<sub>3</sub> (DSC with fuel) + T<sub>nc</sub> (Inside Cask normal) + P<sub>a</sub> (Normal operating) + L<sub>o</sub> (Off-normal - Jammed DSC)

(c) Combination B2 = DW<sub>3</sub> (DSC with fuel) + T<sub>∞</sub> (Inside Cask – off normal) + P<sub>b</sub> (Off –normal blowdown) + L<sub>o</sub> (Off-normal - Jammed DSC)

(d) See SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992, Table 2.2.3-10; Allowable values taken for SA 204 Type 304 material at 400 degrees F.

(e) Allowables are for stainless steel material. Carbon steel material allowables are higher.

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**Exhibit C****DSC Load Combination Results - ASME Service Level C**

Stress (ksi)

DSC Component	Stress Type	Hopper and Associates Service Level C Load Case Combinations <sup>(a)</sup>			ASME Service Level C Allowable <sup>(e)</sup>
		C1 <sup>(b)</sup>	C2 <sup>(c)</sup>	C5 <sup>(d)</sup>	
DSC Shell	Pri Memb	4.23	4.23	5.03	21.6
	Memb + Bend	33.8 <sup>(g)</sup>	14.6	25.0	32.4
Top Pressure (Top Cover) Plate	Pri Memb	2.16	2.83	1.83	21.6
	Memb + Bend	6.26	6.54	5.54	32.4
Top Structural (Top Inner Cover) Plate	Pri Memb	2.47	2.99	1.99	21.6
	Memb + Bend	8.9	8.80	7.80	32.4
Bottom Cover Plate	Pri Memb	0.96	1.63	0.63	21.6
	Memb + Bend	7.55	9.78	13.1	32.4
Spacer Disk	Pri Memb	2.00	1.71	0.57	21.6 <sup>(f)</sup>
	Memb + Bend	4.87	3.72	1.24	32.4 <sup>(f)</sup>
Support Rods	Pri Memb	0.69	0.69	0.23	21.6
	Memb + Bend	--	--	--	31.0

- (a) See Hopper and Associates Calculation, Transmittal HABGE-01/99-0745, January 29, 1999, Table 5.4 – Load Combinations Level C; Load combinations C3, C4, and C6 are bounded by load combination C5; Secondary stresses (i.e., Q, thermal stresses) are not required for Service Level C.
- (b) Combination C1 =  $DW_3$  (DSC with fuel) +  $T_{nh}$  (Inside HSM normal) +  $P_{a1}$  (Accident – Inner boundary) + E (Seismic)
- (c) Combination C2 =  $DW_3$  (DSC with fuel) +  $T_{nh}$  (Inside HSM normal) +  $P_{a1}$  (Accident – Inner boundary) +  $L_n$  (Normal DSC transfer)
- (d) Combination C5 =  $DW_3$  (DSC with fuel) +  $T_{nh}$  (Inside HSM normal) +  $P_{a1}$  (Accident – Inner boundary) +  $L_o$  (Off-normal – Jammed DSC)
- (e) See SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992, Table 2.2.3-12; Allowable values taken at worst case temperatures per the SER, T= 460 degrees F.
- (f) Allowables are for stainless steel material. Carbon steel material allowables are higher.
- (g) See reference 34 for discussion on the acceptability of this value. Future calculation revision will reduce this value below the SER allowable.

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**Exhibit D****DSC Load Combination Results - ASME Service Level D**

Stress (ksi)

DSC Component	Stress Type	Hopper & Associates D2 <sup>(a)</sup>	ASME Service Level D Allowable <sup>(e)</sup>
DSC Shell	Pri Memb	12.9	43.2
	Memb + Bend	63.9	64.0
Top Structural Plate (Top Inner Cover Plate)	Pri Memb	14.2	43.2
	Memb + Bend	26.5	64.0
Top Pressure Plate (Top Cover Plate)	Pri Memb	25.4	43.2
	Memb + Bend	63.2	64.0
Bottom Cover Plate	Pri Memb	10.7	43.2
	Memb + Bend	31.6	64.0
Spacer Disk	Pri Memb	41.1	43.2 <sup>(e)</sup>
	Memb + Bend	41.1	64.0 <sup>(e)</sup>
Support Rods	Pri Memb	17.0	43.2
	Memb + Bend	42.0	64.0
Top End Structural Weld	Primary (Shear)	13.5 <sup>(b)</sup>	21.6
Bottom End Structural Weld	Primary (Shear)	2.64 <sup>(b)</sup>	21.6

- (a) See Hopper Associates Calculation, Transmittal HABGE-01/99-0745, January 29, 1999, Table 5.5 – Load Combinations Level D; Load Combination D2 bounds Combination D1, therefore D2 values are listed; Combination D2 =  $DW_3$  (DSC with fuel) +  $T_{nc}$  (Inside Cask normal) +  $P_{a2}$  (Accident – Outer boundary) + DL (Cask Drop)
- (b) See Hopper Associates Calculation, Transmittal HABGE-01/99-0745, January 29, 1999, Section 4.6, Weld Analysis
- (c) See SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992, Table 2.2.3-14; NUTECH and NRC calculated stress values are presented for comparison, and are for information only.
- (d) See SER for the BGE Safety Analysis Report for an ISFSI at Calvert Cliffs, November 1992, Table 2.2.3-14; Allowable values taken at worst case temperatures per the SER,  $T = 460$  degrees F.
- (e) Allowables are for stainless steel material. Carbon steel material allowables are higher.



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**Exhibit E****NUHOMS-24P Dry Shielded Canister Component Tolerances****Tolerance (inches)**

Component Description	Existing Tolerance	Code Tolerance <sup>(a)</sup>	TNW ECN 98-0516 Tolerance	Comments
DSC Shell Plate, 5/8" Thk.	+0.05/-0.05 <sup>(a)</sup>	+0.060/-0.010	+0.060/-0.060	Structural evaluation of the DSC Shell was conservatively based on an overall shell thickness of 0.55" (reference 8). The Shell thickness is not credited for DSC Shielding (USAR Section 3.3.5.2 and Table 3.3-1). Tolerance effect on criticality was evaluated by Transnuclear West Inc. (reference 15).
Bottom Cover Plate, 1 <sup>3</sup> / <sub>4</sub> " Thk.	+0.07/-0.38	+0.075/-0.010	+0.070/-0.125	The tolerance change is enveloped by the existing tolerance. The tolerance change was structurally evaluated (reference 8).
Grapple Ring Plate, 1 <sup>1</sup> / <sub>2</sub> " Thk.	+0.05/-0.01	+0.065/-0.010	+0.05/-0.00	The tolerance change is enveloped by the existing tolerance.
Lead Casing Shell Plate, 1/2" Thk.	+0.05/-0.05 <sup>(a)</sup>	+0.060/-0.010	+0.12/-0.12	Tolerances change was structurally evaluated (reference 29).
Inner Cover Plate, 1 <sup>1</sup> / <sub>2</sub> " Thk.	+0.07/-0.38	+0.075/-0.010	+0.070/-0.125	The tolerance change is enveloped by the existing tolerance. Tolerance change was structurally evaluated (reference 8).
Siphon and Vent Cover Plates, 1/4" Thk.	+0.05/-0.05 <sup>(a)</sup>	+0.050/-0.010	+0.05/-0.01	The tolerance change is enveloped by the existing tolerance.
Lead Plug Side Casing Plate, 1/2" Thk.	+0.05/-0.05 <sup>(a)</sup>	+0.060/-0.010	+0.12/-0.01	The minimum tolerance change is more restrictive than the existing tolerance. Tolerances change was structurally evaluated (reference 29).
Spacer Disk Plate, 1 <sup>1</sup> / <sub>2</sub> " Thk.	+0.05/-0.05 <sup>(a)</sup>	+0.080/-0.010	+0.07/-0.01	The minimum tolerance change is more restrictive than the existing tolerance. Tolerances change was structurally evaluated (reference 29).
Support Rod, 3.00" Dia.	+0.05/-0.05 <sup>(a)</sup>	+0.003/-0.003	+0.03/-0.00	The tolerance change is enveloped by the existing tolerance.

(a) DSC fabrication drawing default block tolerance.  
(b) ASTM A480

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**Summary:****Proposed Activity:**

This safety evaluation addresses modifications to the Calvert Cliffs NUHOMS-24P Dry Shielded Canister (DSC). The modifications generally affect the functional design of the DSC Internal Basket Assembly, and affect fabrication details associated with DSC confinement boundary and shield plug components. The design changes to the DSC Internal Basket Assembly include removal of Guide Sleeve Clip Angle welded attachments to the Bottom Spacer Disk, addition of Guide Sleeve Extraction Stops and addition of notched openings to the bottom ends of the Guide Sleeves. There are numerous other changes being made to the DSC fabrication details, including changes to the confinement boundary welding details, changes to various DSC component dimensions and tolerances, designation of consumable materials to be used during DSC fabrication, changes to the shield plug lifting post detail, and identification of certain leak testing requirements. The DSC design documents are also being updated to identify Transnuclear West Inc. as the new patent holder of the NUHOMS-24P system design, and to clarify certain DSC component names. The DSC modifications and document changes are to be implemented beginning with Calvert Cliffs DSC No. R025.

Proposed changes to the Calvert Cliffs ISFSI USAR include the following:

- Addition of a description of the modified DSC Internal Basket Assembly design. The USAR change will specifically describe the elimination of the Guide Sleeve Clip Angle to Bottom Spacer Disk welded attachments, addition of the Guide Sleeve Extraction Stops, and addition of notched openings to the bottom ends of the Guide Sleeve.
- The licensing basis allowable stress criteria for the design of the DSC will be added to the USAR for completeness. The licensing basis allowable stresses are based on ASME Section III Division 1 permissible stresses using the worst thermal conditions reported in the Topical Report.
- Clarify that the existing DSC component stress tables are not applicable for modified DSCs beginning with R025, the tabulated stresses are for information only, and that any calculated DSC stresses must remain within the licensing basis allowable stress criteria.
- Reference to the modified DSC supporting analyses will be added.
- Transnuclear West Inc. will be identified as the new owner of the NUHOMS-24P patent.
- Consistent terminology for the DSC Siphon and Vent Port components will be provided.
- The Calvert Cliffs NUHOMS-24P DSC design drawings will be revised to reflect the modified DSC design.

**Reason For Activity:**

An independent assessment of the NUHOMS-24P system design determined that the DSC Internal Basket Assembly may not perform as intended during a design basis cask drop accident. Specifically, the clip angle attachments between the Guide Sleeves and the Bottom Spacer Disk could fail in bending and push against the wall of the Guide Sleeves. In some cases the resulting Guide Sleeve deformation could eliminate the clearance between the Guide Sleeve and the spent nuclear fuel assembly. This interference would necessitate the use of additional force to extract the fuel assembly during post accident recovery operations. This condition, although tolerable, is undesirable. The modified DSC Internal Basket Assembly eliminates use of the Guide Sleeve Clip Angle attachments in order to alleviate this type of local Guide Sleeve deformation. Guide Sleeve Extraction Stops are to be added so that in the unlikely event that a fuel assembly does become stuck, the Guide Sleeve will not be withdrawn together with the fuel assembly. The removal of the Guide Sleeve Clip Angles will allow the Guide Sleeves to rest flush on the DSC Bottom Inner Cover Plate. Therefore, the bottoms of the Guide Sleeves will be notched out in order to facilitate DSC draining and drying operations.

Other DSC design changes are deemed to be improvements based on Transnuclear West Inc. design review issues and lessons learned. The changes to the DSC confinement boundary welds are intended to minimize base metal distortion, ease fabrication, and improve ALARA exposure during field welding operations. DSC dimension and tolerance changes are

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being implemented to reflect Transnuclear West Inc. tolerance standards, to ensure consistency with the Topical Report design, to ensure that minimum design shielding requirements will be maintained, and to fulfill structural engineering evaluation recommendations. The Top Shield Plug Lifting Post detail is being revised to improve fabrication. Incorporation of material and testing information in the DSC fabrication drawings is for clarification of fabrication requirements.

**Activity Summary:**

The modifications to the Calvert Cliffs NUHOMS-24P DSC Internal Basket Assembly that are intended to alleviate local Guide Sleeve deformation during a design basis cask drop accident, and the various other DSC design and fabrication detail improvements, implemented under this activity, do not result in an Unreviewed Safety Question (USQ). The probability of occurrence of a malfunction of equipment important to safety will not be increased by this activity because the DSC modifications have been fully analyzed in a manner consistent with USAR design criteria, and the results of the analyses were determined to comply with the applicable USAR structural specifications and SER acceptance conditions. The DSC modifications will not increase the probability of occurrence of any analyzed accident. The consequences of an accident will not be increased because radiological shielding is not adversely affected by this modification, criticality control is assured, fuel rod integrity is assured, and the retrieval capability of an intact fuel assembly is assured. The new Guide Sleeve Extraction Stops and the change in the behavior of existing DSC components have been evaluated, and it has been determined that the changes are clearly beneficial, the critical functions of the DSC will not be adversely impacted, and that an accident or malfunction of a different type than any evaluated previously in the SAR is not created by the changes. The DSC modifications do not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification. The DSC modifications do not involve a change in DSC loading operations, and do not adversely impact DSC confinement integrity, shielding features, criticality control, or fuel retrievability, and therefore, will not result in any increase in occupational dose. Finally, this activity does not involve an Unreviewed Environmental Impact.

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ACTIVITY: ESI99800308

50.59 Log No.: N/A

72.48 Log No.: SE00146

ISFSI - Evaluation of Loaded DSCs With Unanalyzed Clips

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by:

  
 Jim Remeniuk/ Mohammed Kaiseruddin  
 PRINTED NAME AND SIGNATURE

Department: CEU/ Sargent &amp; Lundy

8-25-00

☒ YES ☐ NO

Is a special review required by groups other than the group to which the Preparer belongs?

Resp Ind: G. Tesfaye

PRINTED NAME

  
 SIGNATURE

Work Group: Licensing

Date:

9/12/00

Resp Ind: C. J. Dobry

PRINTED NAME

SIGNATURE

Work Group: PES

Date:

9/12/00

Resp Ind: R. H. Beall

PRINTED NAME

SIGNATURE

Work Group: NFM

Date:

9/12/00

Approved ☒Disapproved ☐

Signature

  
 INDEPENDENT REVIEWER

Date

8-23-00

9/13/00

Approved ☒Disapproved ☐

Signature

  
 GS-DES, GS-TSES, or PE-PDSU

Date

9/14/00

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 00-081

Date: 9/25/00

Recommend ☒  
ApprovalRecommend ☐  
Disapproval

Signature

  
 POSRC CHAIRMAN

Date 9/25/00

Approved ☒Disapproved ☐

Signature

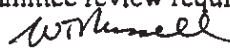
  
 PLANT GENERAL MANAGER

Date 9/25/00

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES☒ NO

Signature:

  
 OSSRC SES Chairman

Date:

11/9/00

If yes, OSSRC Meeting No. \_\_\_\_\_



ACTIVITY: ES199800308	50.59 Log No.: N/A	72.48 Log No.: SE00146
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## ISFSI – Evaluation of Loaded DSCs With Unanalyzed Clips

**Proposed Activity:**

The proposed activity consists of making changes to the ISFSI USAR [Ref. 1]. The changes are based on revision to Calculation CA04132 [Ref. 2], which was prepared to evaluate the impact of alternate configurations of clip angle attachments employed in the internal basket assembly of Dry Shielded Canisters (DSCs) R001 through R007, and R010 through R017. (The balance of DSCs R001 through R024 were evaluated in revision 0 of the calculation, and were the subject of SE00133 [Ref. 6]). The subject DSCs are already loaded with fuel assemblies, and are not available for direct measurement of clip angle attachments.

This proposed activity addresses only the DSCs listed above. DSCs R025 and beyond are not affected by this activity due to their new design configuration.

Clip angle attachment arrangements for the subject assemblies are documented in Reference 3, and consist of the following unanalyzed configurations:

- DSCs R001 and R002 utilize tab style clips, in lieu of using clip angles, which were cut from the guide sleeve walls.
- DSCs R003, R004, and R005 have no QA documentation available for the clip angle size measurement.
- DSC R010 utilizes clip angles that are 0.59 inch wide, as opposed to the 0.56 inch that was analyzed previously in revision 0 of Calculation CA04132.
- DSCs R006, R007, and R011 through R017 utilize clip angles with a maximum documented size of 0.56 inch, which was previously analyzed and found to be acceptable.

Appendix L of Reference 2 analyzes the previously unanalyzed configurations. It evaluates the tab style clips of R001 and R002, and a clip angle with a maximum size of 0.625 inch, which is slightly larger than the nominal clip angle size of 0.5 inch plus the maximum tolerance of 0.12 inch [Ref. 4]. This size should envelop clip angle sizes of DSCs R003, R004, R005, and R010, as evident from the tolerances allowed in their design.

The changes being made to the ISFSI USAR consist of the following:

1. Section 8.2.5.2 is being revised to add a note referring to the revised calculation.
2. Tables 8.2-6 and 8.2-10 are being revised to incorporate the new stress values.
3. Section 8.4 is being revised to update Reference 8.23.

**Background**

The Independent Spent Fuel Storage Installation (ISFSI) at the Calvert Cliffs Nuclear Power Plant (CCNPP) stores DSCs, each of which hold twenty-four old spent fuel assemblies. Each DSC contains an internal basket assembly, which includes twenty-four stainless steel guide sleeves (one for each spent fuel assembly), nine perforated carbon or stainless steel spacer discs, and four stainless steel support rods. The nine spacer discs are spaced out along the length of the DSC at locations that approximately coincide with the spent fuel assembly's eight spacer grids and single lower retention grid. The spacer discs are not structurally attached to the DSC shell walls or inner cover plates. The guide sleeves traverse the length of the DSC cavity through openings in the nine spacer discs. The support rods are used to maintain the spacer disc locations. The support rods traverse the length of the DSC cavity through the nine spacer discs, and are structurally welded to the spacer discs. The guide sleeves are attached only to the bottom

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ACTIVITY: ES199800308

50.59 Log No.: N/A

72.48 Log No.: SE00146

**ISFSI – Evaluation of Loaded DSCs With Unanalyzed Clips**

spacer disc by four metal clips each, which are welded to the guide sleeves and the bottom side of the bottom spacer disc. These metal clips are the subject of this evaluation. The purpose of the clips is to restrain the guide sleeves, which house the fuel assembly, during DSC transport, and during loading and unloading operations. The clip angle attachments also counteract withdrawal forces in the event of a stuck fuel assembly.

Metal clips for DSCs R008, R009, and R018 through R024 were evaluated earlier in revision 0 of Reference 2, and Reference 6. The evaluation was based on a maximum clip angle size of 0.56-inch (both width and each of the sides). It was determined that, in a vertical top-end drop, the clips would break at a deceleration of 58g (worst case). The clip angles would flatten out before yielding, and would thus pinch the guide sleeves and the fuel assemblies. The fuel assemblies would still be retrievable intact, but would require a pull of 300 lbs. in addition to their weight.

The behavior of clip angles after a vertical drop of the DSC was determined through a test [Ref. 7]. The test verified that the clip angles bend and pinch the guide sleeves and fuel assemblies. The additional pull needed to retrieve a fuel assembly was determined to be 100 lbs. Therefore, the calculated value of the pull force is conservative.

**New Analysis**

The tab style clips and larger size clip angles analyzed might not break at the previously analyzed deceleration of 58g. Conservatively, it was assumed that they would not break even up to the licensing basis deceleration of 75g. This would exert higher loads on the internal basket assembly components. In addition, the larger size clips would result in a deeper pinching of the fuel assemblies. The behavior of the tab style clips under drop conditions was also analyzed separately.

It was determined for a vertical top-end drop, with the larger size clip angles, that the stresses developed in spacer discs, support rods, and the welds between them would increase but would remain below the allowable values. The fuel assemblies would be pinched deeper, but the fuel rods would not be affected because they are not located in the area where the pinching would occur. The fuel assemblies would remain retrievable intact, with the additional pull needed to be at 297.6 lbs.

(Note: The additional pull needed to retrieve a fuel assembly was determined to be smaller with a larger clip angle size. This is due to the larger cantilever effect that the longer clip angle offered to the force required to bend it back. It would appear then that the conservative assumption on clip angle size would be to make it the smallest necessary to cause pinching. Therefore, the most conservative clip angle size would be equal to the minimum gap between the guide sleeve and the fuel assembly, which is 0.26 inch (1/2 of 0.521) [Ref. 10]. For this clip angle size the additional pull needed to retrieve a fuel assembly is determined by ratioing to be 311.1 lbs.)

The maximum weight of a spent fuel assembly under water is 1188 lbs. [Ref. 15]. Therefore the total maximum force required to pull out the pinched assembly will be (1188+311.1) 1499.1 lbs. Per Reference 13, the Fuel Handling Machine overload setpoint is 1400 lbs., which will not be sufficient to retrieve the heaviest pinched assembly. However, the 1400 lbs. setpoint is based on the maximum safe force that could be applied to fuel assembly spacer grids. In case of a pinched assembly within a guide sleeve, no load will be applied to the spacer grids. Per Reference 16, the limiting force in this case could be as high as 3000 lbs., but should be applied in increments of 500 lbs. as necessary. Therefore, even though the Fuel Handling Machine setpoint may be exceeded, the machine can be cranked manually to retrieve the pinched assembly. ~~(Procedure OI-25A [Ref. 17] needs to be revised to incorporate steps required for this scenario.)~~

JCA 9.25.00

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The tab type clip angle arrangement was also analyzed for a vertical drop load of 75g. The tab failure mechanism was bulging of the tabs inwards towards the fuel assemblies. The amount of bulging was calculated to be 0.01 inch, which is less than the gap size of 0.26 inch. Therefore, no fuel assembly pinching would occur. The stresses developed in the inner basket assembly components were also calculated to be within the allowables.

### Reason for Activity:

This activity is being carried out in part to resolve Issue Report IR3-005-206 [Ref. 5]. The Issue Report was written to address the alternate clip angle arrangements found in DSCs R001 through R007, and R010 through R017, as described above.

The design of the DSC is intended to ensure that the worst case postulated cask drop accident will not result in deformation of the DSC Internal Basket Assembly to such a degree that post-accident retrieval of intact fuel assemblies is not assured or that fuel rod integrity is compromised.

Technical Specifications Section 2.3, "Transfer Cask", states that the transfer cask lifting height, with a non-single-failure-proof lifting device, shall not exceed 80 inches. The Technical Specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected. Therefore, retrievability of fuel from the DSC needs to be demonstrated.

### Function(s) of affected SSC:

The affected systems, structures and components (SSCs) are DSCs R001 through R007 and R010 through R017, and spent fuel assemblies. The DSCs consist of the outer canister and the internal basket assembly, which are classified as important-to-safety per 10 CFR 72. The sub-components of the internal basket assemblies include the Spacer Discs, Support Rods, Guide Sleeves, and clip angle attachments. Changes in the clip angle attachments impact only the internal basket assembly, and not the outer canister of the DSC, because none of the internal basket assembly components are structurally attached to the outer canister.

The DSC provides containment, shielding, criticality control, configuration control related to fuel retrievability, structural support, and thermal safety functions during loading operations, transfer operations, and storage. It is designed to remain intact under all accident conditions identified in the ISFSI USAR with no loss of function. Specific design functions of the DSC include the following:

1. Confinement - The DSC design provides mechanical confinement of the stored fuel assemblies to prevent the dispersion of particulate or gaseous radionuclides from the fuel, and to maintain an inert atmosphere of helium around the fuel. The primary function of the DSC is to provide confinement of the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further assure containment integrity. The DCS confinement boundary also is designed to retain helium cover gas inside the DSC in order to prevent corrosion of the fuel cladding and formation of expansive oxides in the fuel itself during storage. The confinement function is achieved by the outer canister portion of the DSC only, and hence is not affected by changes in the clip angle attachments.
2. Criticality Control - The DSC design provides for sub-criticality during the wet loading, DSC drying, and interim storage operations. This is accomplished by a combination of mechanical separation of the fuel assemblies by the internal basket assembly and neutron absorption in the steel guide sleeve material.



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3. Fuel Support and Configuration Control - The DSC internal basket assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accidents, including a cask drop, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that retrieval of intact fuel assemblies is not assured. The structural characteristics of the Transfer Cask (TC) and the DSC limit the deceleration loads on the fuel assemblies so that their integrity is assured in the worst-case drop accident.
4. Shielding - The DSC materials provide gamma radiation shielding. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC loading into the Horizontal Storage Module (HSM) and at the HSM door during storage. The shielding function is achieved by the outer canister portion of the DSC only, and hence is not affected by changes in the clip angle attachments.
5. Thermal - Decay heat is removed by thermal radiation and conduction from the DSC to the TC, and by thermal radiation and conduction and convection from the DSC to the HSM. The DSC maintains the helium cover gas, which is required for corrosion control. This cover gas improves the thermal performance of the DSC. The decay heat removal function is achieved by the outer canister portion of the DSC only, and hence is not affected by changes in the clip angle attachments.

Internal Basket Assembly - The functions of the internal basket assembly structures, systems and components are as follows:

1. Guide Sleeves - The guide sleeves establish storage compartments for 24 spent fuel assemblies within the DSC. The tops of the guide sleeves are flared to assist fuel handling operators in guiding the spent fuel assemblies into the sleeves. The guide sleeves are suspended approximately 1/2 inch by the clip angle attachments. This allows for DSC blowdown and drying via the DSC siphon port.
2. Spacer Discs - The spacer discs work together with the guide sleeves to maintain geometric separation of the fuel assemblies. The spacer discs support the weight of the guide sleeves, support rods and the spent nuclear fuel when the DSC is in a horizontal orientation.
3. Clip Angle Attachments (Angles / Tabs) - The DSC internal basket assembly includes metal clip angle attachments or tab style clips, which are welded to the guide sleeves and the bottom spacer disc. The clips are designed as a fabrication convenience to restrain the guide sleeves during unloaded DSC transport, and during loading and unloading operations (fuel assembly insertion / extraction). The clip angle attachments also counteract withdrawal forces in the event of a stuck fuel assembly.
4. Support Rods - The support rods maintain the spacer disk location along the length of the DSC. They carry the weight of the guide sleeves, the clip angle attachments, and the spacer discs when the DSC is in a vertical orientation.
5. Fuel Assembly - The fuel assembly consists of 176 fuel and poison rods, 5 guide tubes, 5 guide tube sleeves, 8 fuel rod spacer grids, upper and lower end fittings, lower retention grid, and a hold-down device. The guide tubes, spacer grids, and end fittings form the structural frame of the assembly. The fuel rod spacer grids maintain the fuel rod pitch over the length of the assembly. The grid provides positive side restraint to the fuel rod but only frictional restraint axially. The spacer grids are the widest part on a fuel assembly. The four outer guide tubes are mechanically attached to the end fittings and the spacer grids are welded to all five guide tubes. The upper end fitting attaches to the guide tubes to serve as an aligning and lifting device for each fuel assembly. The resistance force



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is developed by the pinching of the guide sleeve on the lower end fitting. The force to overcome the resistance is transmitted from the upper end fitting through the guide tubes and then to the lower end fitting. No stress is applied to the fuel rods and therefore, pinching of the fuel assembly will not cause rupture of the fuel cladding.

### **ISFSI USAR Revision No.: 8**

#### **ISFSI USAR Sections Reviewed:**

The main chapters reviewed were 3, 4, 5, 7, and 8. The key Sections reviewed are listed as follows:

3.3.4.1	Control Methods for Prevention of Criticality
4.2.1.2	Dry Shielded Canister (Structural Specifications)
4.2.3.2	Dry Shielded Canister Description
4.7.3	Individual Unit Description
5.1.1.2	Fuel Loading
5.1.1.9	Removal of Fuel from the Dry Shielded Canister
8.1.1.2	Dry Shielded Canister Analysis
8.1.1.3	Dry Shielded Canister Internal Basket Analysis
8.2.3.2	Accident Analysis
8.2.5	Cask Drop
8.2.12	Load Combinations
Table 3.6-3	Summary of Design Criteria for Accident Conditions
Table 8.1-3	Maximum Dry Shielded Canister Stresses for Normal Loads
Table 8.1-4	Maximum Dry Shielded Canister Stresses for Off-Normal Loads
Table 8.2-1	NUHOMS-24P Accident Loading Identification
Table 8.2-6	Maximum Dry Shielded Canister Stresses for Drop Accident Loads
Table 8.2-8	Dry Shielded Canister Enveloping Load Combination Results for Normal and Off-Normal Loads
Table 8.2-9	Dry Shielded Canister Enveloping Load Combination Results for Accident Loads, ASME Service Level C
Table 8.2-10	Dry Shielded Canister Enveloping Load Combination Results for Accident Loads, ASME Service Level D
Appendix A	Q: 3.0-2, Load Combination and Design Criteria
Appendix A	Q: BGE001.0203 and Computer Run BPLRWZ, Spacer Disk Analysis

### **Tech Spec Bases Amendment/Rev No.: 2**

Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License No. SNM-2505, Amendment 2, June 30, 2000

#### **Tech Spec Bases Reviewed:**

2.3	Transfer Cask (TC)
3/4.1	Fuel to be Stored at ISFSI
5.0	Design Features

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The proposed activity consists of evaluating alternate clip angle attachments found in DSCs R001 through R007, and R010 through R017, and revising the stress values applicable to these arrangements. The alternate clip angle attachments consist of clip angles that are larger than those previously analyzed, or tab style attachments that were cut from the guide sleeve walls. The SSCs affected by this activity consist of DSCs and spent fuel assemblies. In the DSCs, the affected sub-components consist of those that belong to the internal basket assembly, namely the guide sleeves, spacer discs, support rods and the clip angle attachment themselves.

The alternate clip angle arrangements were analyzed for drop accident at the licensing basis value of 75g. The larger clip angles caused pinching of the fuel assemblies, and led to larger stresses in the internal basket assembly sub-components. The pinching was found not to impact the fuel rods, because the pinching would occur at the bottom grid, below where the fuel rods are located. Further, the pull force required to retrieve the fuel assemblies was found to be such that the fuel handling machine would be able to handle it within its operating setpoint. The stress values in the spacer discs and the support rods were found to remain within the code allowables. Analysis of neither the tab style clip angle attachments showed that neither pinching of the fuel assemblies occurred nor the stresses increased.

Therefore, the probability of malfunction of equipment important to safety will not be increased.

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The proposed activity will not lead to breaching of the DSC barrier, or the loss of shielding, so that consequences of malfunction of equipment important to safety, namely the radiation dose to operators or radiation releases from ISFSI will not increase.

USAR Section 3.3.4.1 states that criticality control is assured by the physical properties and history of the fuel, mechanical control of the assembly locations in the DSC basket, neutron absorption of the materials of the basket, Calvert Cliffs administrative controls over fuel identification and handling, and the presence of soluble boron in the fuel pool for wet operations. USAR Section 3.3.4.1 concludes that in the event of a cask end drop, introduction of a moderator would be necessary to cause a criticality concern. A loss of DSC structural integrity would be necessary to allow the introduction of a moderator. Analysis has determined that tabs and nominal and larger size clip angles will not affect DSC structural integrity. Therefore, this activity will not affect criticality control.

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☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. They consist of loss of shielding, external missiles, earthquake, flood, cask drop, lightning, blockage of air inlets and outlets, DSC leakage, DSC overpressurization, and forest fire. Of these accidents, only the cask drop accident and earthquake incidents are impacted by this activity. The earthquake scenario is bounded by the cask drop accident, as the acceleration postulated in a design basis earthquake is 1.5g, which is much smaller than the acceleration in the drop accident of 75g. However, the probability of occurrence of cask drop, or any other accident is not increased by the use of alternate clip angle attachments.

There is no change to the design or operation of the NUHOMS system caused by this activity. This activity does not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected. Therefore, the probability of occurrence of an accident involving loss of HSM air outlet shielding, or blockage of HSM air inlets and outlets will not increase.

Pressurization of the DSC due to fuel cladding failure is an accident scenario identified in USAR Section 8.2.9. The limiting DSC pressurization accident event is a rupture of fuel cladding together with blockage of the HSM vents. As stated above, the probability of occurrence of an accident involving blockage of HSM air inlets and outlets will not increase due to this activity. The compression of the fuel assembly occurs at the lower end fitting. The lower retention grid, which houses the fuel rods next to the lower end fitting, is smaller than the lower end fitting. Therefore, the fuel cladding is not impacted and fuel rod integrity is maintained.

DSC leakage is an accident scenario described in USAR Section 8.2.8. The USAR indicates that there are no credible events that would initiate this type of accident. As stated in the preceding paragraphs, the probability of an accident that would lead to cladding failure is not increased by this activity. This activity does not affect the design of the DSC pressure boundary and therefore does not increase the probability of DSC leakage.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The proposed activity, namely analysis and validation of as-built clip angle configurations, will impact the cask drop accident and earthquake incident, as stated above.

The consequences of the cask drop accident with the as-built clip angle configuration were evaluated in Appendix L of Reference 2. The impact on critical safety functions is discussed below. The critical functions affected will be configuration and criticality controls, and confinement. Other critical functions such as shielding and thermal safety are not affected by the clip angle configuration.

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**Criticality Control:** The structural integrity of the fuel assembly was evaluated in Reference 9. The deceleration value used for a drop was 75g, which covers the deceleration imposed on the fuel assembly because of the alternate clip angle configuration. The fuel integrity evaluation is the subject of another safety evaluation, SE00154 [Ref. 18].

**Configuration Control:** Configuration of fuel assemblies within the DSC needs to be maintained such that the assemblies remain retrievable. The larger size clip angles would bend and pinch the fuel assembly, in the event of a cask top drop accident. It would cause an increase in the extraction force needed to retrieve the fuel assembly. The Fuel Handling Machine is capable of exerting the extra force, although its setpoint would have to be exceeded per the procedure. With the tab style clips, a gap would remain between the guide sleeve and the fuel assembly after a cask drop accident, and hence the fuel assembly retrievability is not affected.

**Confinement:** The larger size clip angles are anticipated to bend and pinch the fuel assembly at the lower end fitting. The pinching, therefore, will not cause rupture of the fuel cladding. Therefore, the fuel rods would not be damaged, and the radioactive fission products would remain confined.

**Shielding:** The DSC Internal Basket Assembly is not credited with augmenting the radiation shielding properties of the DSC, and there is no direct interface between the Internal Basket Assembly Components, and the DSC shielding materials. Therefore, there is no impact on the DSC shielding due to this activity.

**Thermal Control:** The parameters affecting the thermal analysis, such as heat generation or transfer capabilities are not impacted by the proposed activity. Therefore, there is no impact on the DSC thermal control due to this activity.

2. **The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.**

☐ YES ☒ NO **May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?**

**Possibility of New Malfunction:**

The proposed activity examines the malfunction of DSC clip angle attachments following a vertical drop. The malfunction consists of bending of the clips, leading to the pinching of the fuel assemblies as discussed earlier. This malfunction was addressed in Revision 8 of the USAR, and safety evaluation SE00133 [Ref. 6]. The difference in this activity is that the clips are assumed not to break up to 75g, whereas the earlier evaluation established that the clips would fail at about 58g. This difference, however, does not cause a different type of malfunction. The clip angles/tabs bend or deform so as to close the gap between the guide sleeves and the spent fuel assemblies. The clip angles pinch the fuel assemblies at the bottom grid location. Fuel rods are not damaged, however, because they are not located there.

The other impacted SSCs, namely the spacer discs and support rods continue to function as per their design. They continue to provide the structural support to maintain the fuel assembly configuration within the DSC, and keep the fuel assemblies retrievable. The possibility of a malfunction of a different type than any previously evaluated is not created.



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☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

**Possibility of New Accident:**

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the USAR, and have been discussed previously. Reanalysis of the clips' interaction with the guide sleeve showed slight increases in the stress level in the DSC during a top drop accident. However, since there is no change to the design or operation of the NUHOMS system caused by this activity, the possibility of an accident of a different type than any previously evaluated in the SAR will not be created.

**Complete for 50.59 and 72.48:**

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Tech Spec Bases: 2.3

**Discussion of why the margin of safety is not reduced:**

Technical Specification Section 2.3, "Transfer Cask", states that the transfer cask lifting height with a non-single-failure-proof lifting device shall not exceed 80 inches, since analyses performed for the DSC and transfer cask confirm that drops of 80 inches could be sustained without unacceptable damage or without decreasing margins of safety. In addition, the technical specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected, therefore, requiring retrievability of fuel from the DSC for any drop.

Analysis has demonstrated that the clip angles will deform during a top drop accident and cause the guide sleeve to become deformed, reducing the gap between the guide sleeve and the fuel assembly to the point that the guide sleeve pinches the fuel assembly lower end fitting. However, the extraction force calculated to retrieve the fuel assembly is within the capacity of the spent fuel handling equipment, therefore, fuel retrievability can still be assured.

The compression of the guide sleeve on the fuel occurs on the lower end fitting and does not come in contact with the fuel rods, therefore, fuel cladding is unaffected. Stresses to pull the fuel assembly are transmitted through the fuel assembly structure and not the fuel rods.

The results of Calculation CA04132 for the tab style clips showed stresses that are below the allowables. Also, a gap remained between the guide sleeve and the fuel assembly. Therefore, no pinched condition exists between the fuel assembly and the guide sleeve during a top drop accident in DSCs with tab style clips.

The margin of safety is the difference between the appropriate allowable stress value and the material equivalent failure stress. Reference 2 concluded that the computed stress levels are below the allowable stress. The analysis demonstrated that there would be no unacceptable damage to the DSC.

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Therefore, since the fuel assembly can still be retrieved after a top drop accident, computed stresses remain below the allowables, and there is no impact to the integrity of the fuel rods, the margin of safety is not reduced.

**Complete for 72.48:**

☐ YES ☒ NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

The radiation protection design and operation of the NUHOMS-24P dry cask storage system is not changed by this proposed activity. The reanalysis of the clips in the DSC Internal Basket Assembly does not reduce the integrity of the confinement boundary, and the radioactive shielding elements (i.e., the shield plugs) are not affected. Retrieval of fuel following a drop is still assured. The larger size clip angles would pinch the fuel assembly, but the fuel rods would not be damaged. Occupational dose associated with post DSC accident recovery is not addressed in the Calvert Cliffs ISFSI USAR. Because none of these attributes are changed, the occupational doses summarized in USAR Table 7.4-1 are not affected by this activity. Therefore, no occupational doses are increased.

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

The NUHOMS-24P dry cask storage system confinement and radiological shielding functions are not reduced by this activity. The DSCs containing the tabs and clip angles, both nominal and larger, have been evaluated to ensure stresses will remain within allowable limits under the most severe postulated drop accident conditions.

This activity does not affect any area of the plant site previously undisturbed for the ISFSI, and does not cause any reason for revision to the ISFSI Updated Environmental Report. This activity does not affect the environmental conditions associated with the ISFSI. Therefore, this activity does not involve an unreviewed environmental impact.

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## References:

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 8
2. BGE Calculation CA04132, Rev. 0002, Nutech Horizontal Module System (NUHOMS) 24P ISFSI Dry Shielded Canister Structural Analysis for DSC Assemblies R001-R024
3. Transnuclear Inc. Letter No.113-114-98-018, from Usama Farradj to W. J. Lippold of BGE, 01/29/1998
4. Drawing 84-002-E, NUHOMS-24P ISFSI DSC Basket Assembly, Rev. 0, 11/08/1993
5. BGE Issue Report IR3-005-206, 02/15/1998
6. 10CFR72.48 Safety Evaluation No. SE00133, ISFSI – Analysis of DSC Under Postulated Cask Drop Accident
7. Test Report for the BGE DSC Guidesleeve Standard Clip Design Test, Prepared by J. E. Remeniuk, 02/12/1998
8. Technical Specifications for Calvert Cliffs ISFSI, Amendment 2
9. BGE Calculation CA04678, Rev. 00, BGE (Calvert Cliffs Units 1 & 2) ISFSI Dry Storage Cask Drop Analysis
10. BGE Memo NFM 98-026, R. H. Beall to M. J. Gahan, 1/23/98, Subject: DSC Guide Sleeve to Fuel Assembly Gap Size
11. BGE IMP I-19, Rev. 7, Spent Fuel Handling Machine Load Weighing System Alignment Test/Adjustment
12. UFSAR/USAR/TSB Change Request, UCR No. 00038, for ESP ES199800308-000
13. Setpoint Change Transmittal, 0-WS-100, Fuel Handling Machine Overload Setpoint
14. BGE Drawing 84-019-E, NUOHMS-24P ISFSI DSC Carbon Steel Basket Assembly, Rev. 1, 4/15/1998
15. BGE Memorandum NEU 99-164, from T. A. Schearer to G. V. Patel, et al., 7/7/1999
16. Combustion Engineering Letter from J. E. Baum to J. A. Mihalcik of BG&E, Allowable Lifting Force for a Stuck Fuel Assembly, June 28, 1989
17. Calvert Cliffs Nuclear Power Plant Procedure OI-25A, Spent Fuel Handling Machine, Revision 22, 8/14/00
18. 10CFR72.48 Safety Evaluation No. SE00154, ISFSI – Evaluation of Fuel Assembly Integrity
19. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1

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## ISFSI – Evaluation of Loaded DSCs With Unanalyzed Clips

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** The proposed activity consists of making changes to the ISFSI USAR, in order to account for the impact of alternate configurations of clip angle attachments. The alternate configurations were employed in Dry Shielded Canisters (DSCs) R001 through R007, and R010 through R017. These configurations consisted of tab style clips that were cut from the guide sleeve walls (in lieu of clip angles), and clip angles of sizes larger than those previously analyzed.

The changes being made to the ISFSI USAR consist of providing reference to the new analysis, and incorporating its results.

**Reason for Activity:** This activity is being carried out in part to address the alternate clip angle attachments found in DSCs, as described above in the Proposed Activity.

One of the functions of the clip angle attachment is to break on a vertical top-end cask drop to prevent overstressing of internal basket of the DSCs. The concern with the alternate clip angle attachment arrangements is that the attachments may not break at the deceleration value previously determined, thereby transmitting larger loads to the DSC components. In addition, the larger size clips would result in a deeper pinching of the fuel assemblies, which may affect the fuel assembly retrievability.

Technical Specification Section 2.3, "Transfer Cask", states that the transfer cask lifting height with a non-single-failure-proof lifting device shall not exceed 80 inches. The technical specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected. Therefore, retrievability of fuel from the DSC following a drop needs to be demonstrated

**Activity Summary:** A new analysis was performed assuming that the clip angle attachments would not break up to the licensing basis deceleration of 75g. This would exert higher loads on the internal basket assembly components. The behavior of the tab style clips under drop conditions was also analyzed separately.

It was determined for a vertical top-end drop that, with the larger size clip angles the stresses developed in spacer discs, support rods, and the welds between them would increase but would remain below the allowable values. The fuel assemblies would be pinched deeper, but the fuel rods would not be affected because they are not located in the area where the pinching would occur, namely the lower end fitting. The fuel assemblies intact retrievable would require an additional pull force of approximately 300 lbs., which the Fuel Handling Machine is capable of exerting.

The tab type clip arrangement was also analyzed for a vertical top-end drop load of 75g. The tab failure mechanism was bulging of the tabs inwards towards the fuel assemblies. The amount of bulging was calculated to be less than the gap between the guide sleeve and the fuel assembly. Therefore, no fuel assembly pinching would occur. The stresses developed in the inner basket assembly components were also calculated to be within the allowables.

**USQ Determination:** This activity was evaluated against the criteria of 10CFR72.48(a)(2), such as the probability of occurrence or the consequences of an accident or the malfunction of equipment important to safety, and it was concluded that it does not involve an unreviewed safety question (USQ).



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ACTIVITY: ES199800466

50.59 Log No.: N/A

72.48 Log No.: SE00148

ISFSI DSC Grid Misalignment

Based on the attached discussion, does this activity

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

 Prepared by: Jim Remenuk/ Mohammed Kaiseruddin

Department: CEU/ Sargent &amp; Lundy Date: 7/28/00

8.25.00

PRINTED NAME AND SIGNATURE

- ☒ YES ☐ NO Is a special review required by groups other than the group to which the Preparer belongs?

 Resp. Ind.: G. Tesfaye  
 PRINTED NAME

SIGNATURE

Work Group: Licensing

Date: 9/12/00

 Resp. Ind.: C. I. Dobry  
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Work Group: PES

Date: 9/13/00

 Resp. Ind.: R. H. Beall  
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Work Group: NFM

Date: 9/10/00

 Approved ☒ Disapproved ☐

Signature

INDEPENDENT REVIEWER

Date

8-23-00 9/13/00

 Approved ☒ Disapproved ☐

Signature

P. D. PATEL GS-DES, GS-TSES, or PE-PDSU

Date

9/14/00

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 00-081

Date: 9/25/00

 Recommend ☒  
 Approval Disapproval

 Recommend ☐  
 Disapproval

Signature

POSRC CHAIRMAN

Date: 9/25/00

Approved ☒Disapproved ☐

Signature

PLANT GENERAL MANAGER

Date: 9/26/00

The OSSRC has reviewed this evaluation according to NS-2-100

Full OSSRC Committee review required?

☐ YES☒ NO

Signature

W. M. M. M. M.

Date

11/9/00

OSSRC SES Chairman

If yes, OSSRC Meeting No.

## SAFETY EVALUATION FORM

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ACTIVITY: ES199800466	50.59 Log No.: N/A	72.48 Log No.: SE00148
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**ISFSI DSC Grid Misalignment**

### Proposed Activity:

The proposed activity consists of making changes to the ISFSI USAR [Refs. 1 and 2]. The changes are based on Calculation CA04132 [Ref. 3], which was prepared, in part, to evaluate the misalignment of some of the fuel assembly spacer grids in relation to the spacer discs provided within the Dry Shielded Canisters (DSCs) R001 through R024. The USAR Section 1.3.1.1 states that the DSC spacer disks are "at intervals corresponding to the fuel assembly spacer grids". This was found not to be the case for a few of the spacer grids of fuel assemblies from batches 1/2 D/E/F/G/H, 1J, 2A, 2B and 2C.

Misalignment was found in fuel assembly lower end fittings (LEFs) and the DSC bottom spacer discs; and in fuel assembly eighth zircalloy grids and the DSC eighth spacer discs. The worst case misalignment consisted of

- the mid-plane of the LEF flow plate (load bearing surface) being 0.9742 inch lower than the bottom surface of the bottom spacer disc, and
- the bottom of eighth zircalloy grid being 1.1017 inches lower than the DSC eighth spacer disc.

Section 4.7 of Reference 3 evaluated the consequences of misalignment of grids. Horizontal drop of the transfer cask (TC) was considered a limiting case because of the geometry. Because of misalignment, the most vulnerable DSC component would be the guide sleeve.

The changes being made to the ISFSI UFSAR consist of revisions to Sections 1.3.1.1 and 8.2.5.2 to add statements regarding the misalignment of grids of fuel assemblies and DSCs, and its analysis.

Stress values reported in Tables 8.2-6 and 8.2-10 envelope the stresses from misalignment configuration, therefore no changes are necessary.

### Background

The Independent Spent Fuel Storage Installation (ISFSI) at the Calvert Cliffs Nuclear Power Plant (CCNPP) stores DSCs, each of which hold twenty-four old spent fuel assemblies. Each DSC contains an internal basket assembly, which includes twenty-four stainless steel guide sleeves (one for each spent fuel assembly), nine perforated carbon or stainless steel spacer discs, and four stainless steel support rods. The nine spacer discs are spaced out along the length of the DSC at locations that approximately coincide with the spent fuel assembly's eight spacer grids and single lower retention grid. The spacer discs are not structurally attached to the DSC shell walls or inner cover plates. The guide sleeves traverse the length of the DSC cavity through openings in the nine spacer discs. The support rods are used to maintain the spacer disc locations. The support rods traverse the length of the DSC cavity through the nine spacer discs, and are structurally welded to the spacer discs. The guide sleeves are attached only to the bottom support disc.

The DSC spacer discs, which are spaced so as to coincide with the fuel assembly's spacer grid plates, serve to provide rigid supports to the fuel assembly. When the DSC is in the horizontal position, the fuel assembly load is transferred through the spacer grid plates to the spacer discs. If the grid plates and the spacer discs are not properly aligned, then the grid plate that is offset from its respective spacer disc transfers the fuel load to the guide sleeve along its span between spacer discs. The guide sleeve, which is made of relatively thin stainless steel plate, will be subjected to the fuel assembly weight and horizontal drop loads. This leads to the concerns that the guide sleeve could get badly deformed or tear. In such an instance, the fuel rods would have a long improperly supported span and could get damaged. Also, the deformation of guide sleeve could hinder the fuel assembly retrievability.

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**ISFSI DSC Grid Misalignment**

Fuel assembly structural integrity evaluation was performed in Reference 5 with a conservative assumption, and is the subject of a separate safety evaluation. The horizontal drop evaluation was performed assuming that the guide sleeves were rigid. This is a conservative assumption when evaluating the spacer grids, which rest directly upon the guide sleeves, and other components of the fuel assembly. Any deformation of the guide sleeve due to grid misalignment will tend to soften the impact of the drop on the fuel assembly components. Therefore, the evaluation of structural integrity of the fuel assembly itself [Ref. 5] is not adversely impacted by the misalignment of spacer grids and spacer discs.

### New Analysis

A new analysis (Section 4.7 of Reference 3) was performed to determine the impacts of misalignment of spacer discs with the spacer grid plates of the as-built fuel assemblies. The analysis focused on the guide sleeves, which are the vulnerable components, and the horizontal drop scenario, which would be the accident scenario with the most impact on the misaligned grids.

The guide sleeves are constructed of stainless metal plates bent into a sleeve with a square cross-section, and stitch-welded along one edge. The welds are 2 inches long at 6 inches center-to-center distance. The worst scenario was modeled in the analysis, which consisted of applying load to the non-welded span of the sleeve. The geometry analyzed covers the offsets at the LEF or the eighth zircalloy grid. The analysis was performed for the acceleration loads of 1g, 31g, and 75g.

It was concluded that the maximum deflection in the guide sleeve would be 0.271 inch, and the stresses generated in the sleeve would be larger, but still bounded by the stresses from the vertical drop scenario. The stresses would not be enough to cause any tearing of the sleeve material. Since the sleeve would not tear, fuel assemblies would remain retrievable.

The impact of the deformed sleeve would be on the inconel retention grid, inconel perimeter skirt/spacer grid, or the inconel perimeter skirt, depending upon the amount of offset in the alignment, but not on the fuel rods [Ref. 4]. Therefore, the fuel rods would not be damaged by the guide sleeve.

### **Reason for Activity:**

This activity is being carried out in part to resolve Issue Reports IR3-007-609 and IR3-007-611 [Refs. 6 and 7]. The Issue Reports were written to address the misalignment of spacer discs and fuel assembly spacer grids. Spacer grid locations in fuel assemblies from batches 1/2D, 1/2E, 1/2F, 1/2G, 1/2H, 1J, 2A, 2B, and 2C were found not to coincide with the corresponding DSC spacer disc locations. The worst case misalignments consisted of the following:

- the mid-plane of the LEF flow plate (load bearing surface) being 0.9742 inch lower than the bottom surface of the bottom spacer disc, and
- the bottom of eighth zircalloy grid being 1.1017 inches lower than the DSC eighth spacer disc.

The design of the DSC is intended to ensure that the worst case postulated cask drop accident will not result in deformation of the DSC Internal Basket Assembly to such a degree that post-accident retrieval of intact fuel assemblies is not assured or that fuel rod integrity is compromised.

Technical Specification section 2.3, "Transfer Cask", states that the transfer cask lifting height with a non-single-failure-proof lifting device shall not exceed 80 inches. The technical specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected. Therefore, retrievability of fuel from the DSC needs to be assured.

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**ISFSI DSC Grid Misalignment**

### **Function(s) of affected SSC:**

The affected systems, structures and components (SSCs) are DSCs and spent fuel assemblies. The DSCs consist of the outer canister and the internal basket assembly, which are classified as important-to-safety per 10 CFR 72. The subcomponents of the internal basket assemblies include the Spacer Discs, Support Rods, Guide Sleeves, and clip attachments. The spacer discs are spaced so as to coincide with the fuel assembly spacer grids.

The DSC provides containment, shielding, criticality control, configuration control related to fuel retrievability, structural support, and thermal safety functions during loading operations, transfer operations, and storage. It is designed to remain intact under all accident conditions identified in the ISFSI USAR with no loss of function. Specific design functions of the DSC include the following:

1. **Confinement** - The DSC design provides mechanical confinement of the stored fuel assemblies to prevent the dispersion of particulate or gaseous radionuclides from the fuel, and to maintain a barrier of helium around the fuel. The primary function of the DSC is to provide confinement of the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further assure containment integrity. The DCS confinement boundary also is designed to retain helium cover gas inside the DSC in order to prevent corrosion of the fuel cladding and formation of expansive oxides in the fuel itself during storage. The confinement function is achieved by the outer canister portion of the DSC only, and hence is not affected by grid misalignment.
2. **Criticality Control** - The DSC design provides for sub-criticality during the wet loading, DSC drying, and interim storage operations. This is accomplished by a combination of mechanical separation of the fuel assemblies by the internal basket assembly and neutron absorption in the steel guide sleeve material.
3. **Fuel Support and Configuration Control** - The DSC internal basket assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accidents, including a cask drop, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that retrieval of intact fuel assemblies is not assured. The structural characteristics of the Transfer Cask (TC) and the DSC limit the deceleration loads on the fuel assemblies so that their integrity is assured in the worst-case drop accident.
4. **Shielding** - The DSC materials provide gamma radiation shielding. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC loading into the Horizontal Storage Module (HSM) and at the HSM door during storage. The shielding function is achieved by the outer canister portion of the DSC only, and hence is not affected by grid misalignment.
5. **Thermal** - Decay heat is removed by thermal radiation and conduction from the DSC to the TC, and by thermal radiation and conduction and convection from the DSC to the HSM. The DSC maintains the helium cover gas, which is required for corrosion control. This cover gas improves the thermal performance of the DSC. The decay heat removal function is achieved by the outer canister portion of the DSC only, and hence is not affected by grid misalignment.



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### ISFSI DSC Grid Misalignment

Internal Basket Assembly - The functions of the internal basket assembly structures, systems and components are as follows:

1. Guide Sleeves – The guide sleeves establish storage compartments for 24 spent fuel assemblies within the DSC. The tops of the guide sleeves are flared to assist fuel handling operators in guiding the spent fuel assemblies into the sleeves. The guide sleeves are suspended approximately 1/2 inch by the clip attachments. This allows for DSC blowdown and drying via the DSC siphon port.
2. Spacer Discs – The spacer discs work together with the guide sleeves to maintain geometric separation of the fuel assemblies. The spacer discs support the weight of the guide sleeves, support rods and the spent nuclear fuel when the DSC is in a horizontal orientation. Because the spacer disc locations coincide with the fuel assembly spacer grids, for the most part, the guide sleeve by itself does not support the fuel assembly load.
3. Clip Attachments (Angles / Tabs) - The DSC internal basket assembly includes metal clip angle attachments or tab style clips, which are welded to the guide sleeves and the bottom spacer disc. The clips are designed as a fabrication convenience to restrain the guide sleeves during unloaded DSC transport, and during loading and unloading operations (fuel assembly insertion / extraction). The clip attachments also counteract withdrawal forces in the event of a stuck fuel assembly.
4. Support Rods – The support rods maintain the spacer disk location along the length of the DSC. They carry the weight of the guide sleeves, the clip angle attachments, and the spacer discs when the DSC is in a vertical orientation.
5. Fuel Assembly - The fuel assembly consists of 176 fuel and poison rods, 5 guide tubes, 5 guide tube sleeves, 8 fuel rod spacer grids, upper and lower end fittings, lower retention grid, and a hold-down device. The guide tubes, spacer grids, and end fittings form the structural frame of the assembly. The fuel rod spacer grids maintain the fuel rod pitch over the length of the assembly. The grid provides positive side restraint to the fuel rod but only frictional restraint axially. The spacer grids are the widest part on a fuel assembly. The four outer guide tubes are mechanically attached to the end fittings and the spacer grids are welded to all five guide tubes. The upper end fitting attaches to the guide tubes to serve as an aligning and lifting device for each fuel assembly. The spacer grids are the widest parts of the fuel assembly, and as such they come in contact with and transfer fuel assembly load to the guide sleeve.

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ISFSI DSC Grid Misalignment

**SAR Revision No.: 8**

## **SAR Sections Reviewed:**

The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed are listed as follows:

1.3.1.1	Dry Shielded Canister Design
3.2.5.2	Dry Shielded Canister (Combined Load Criteria)
3.3.4.1	Control Methods for Prevention of Criticality
4.2.1.2	Dry Shielded Canister (Structural Specifications)
4.2.3.2	Dry Shielded Canister Description
5.1.1.9	Removal of Fuel from the Dry Shielded Canister
8.1.1.2	Dry Shielded Canister Analysis
8.1.1.3	Dry Shielded Canister Internal Basket Analysis
8.2.3.2	Accident Analysis
8.2.5	Cask Drop
8.2.12	Load Combinations
Table 3.6-3	Summary of Design Criteria for Accident Conditions
Table 8.1-3	Maximum Dry Shielded Canister Stresses for Normal Loads
Table 8.1-4	Maximum Dry Shielded Canister Stresses for Off-Normal Loads
Table 8.2-1	NUHOMS-24P Accident Loading Identification
Table 8.2-6	Maximum Dry Shielded Canister Stresses for Drop Accident Loads
Table 8.2-8	Dry Shielded Canister Enveloping Load Combination Results for Normal and Off-Normal Loads
Table 8.2-9	Dry Shielded Canister Enveloping Load Combination Results for Accident Loads, ASME Service Level C
Table 8.2-10	Dry Shielded Canister Enveloping Load Combination Results for Accident Loads, ASME Service Level D
Appendix A	Q:3.0-2, Load Combination and Design Criteria
Appendix A	Q:BGE001.0203 and Computer Run BPLRWZ, Spacer Disk Analysis

## **Tech Spec Bases Amendment/Rev No.: 2**

Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License No. SNM-2505, Amendment 2, June 30, 2000

## **Tech Spec Bases Reviewed:**

- 2.3 Transfer Cask (TC)
- 3/4.1 Fuel to be Stored at ISFSI
- 5.0 Design Features

## SAFETY EVALUATION FORM

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## ISFSI DSC Grid Misalignment

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ Yes ☒ No May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The proposed activity consists of evaluating misalignment of fuel assembly grids and DSC spacer discs. Spacer grid locations in fuel assemblies from batches 1/2D, 1/2E, 1/2F, 1/2G, 1/2H, 1J, 2A, 2B, and 2C were found not to coincide with the corresponding DSC spacer disc locations. The worst case misalignments consisted of the following:

- the mid-plane of the LEF flow plate (load bearing surface) being 0.9742 inch lower than the bottom surface of the bottom spacer disc, and
- the bottom of eighth zircalloy grid being 1.1017 inches lower than the DSC eighth spacer disc.

The SSCs affected by this activity consist of DSCs and spent fuel assemblies. In the DSCs, the affected subcomponents consist of the guide sleeves. Due to the misalignment, the fuel assembly load increases stresses on the guide sleeves. No other SSCs are affected.

During the normal handling and storage of DSCs, the forces exerted are equivalent to the accelerations of 1g to 2g. Section 4.7 of Reference 3 evaluated the misalignment issue for a cask drop scenario, with accelerations up to 75g. Results of the evaluation are discussed below under the Consequences of Accident. Based on the results it can be safely concluded that, for a loading of 1g to 2g, the probability of malfunction of the guide sleeves will not be increased, and therefore, the DSC and Internal Basket Assembly will be able to perform their functions.

☐ Yes ☒ No May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The proposed activity will lead to a deformation of guide sleeves. However, as discussed above, the sleeve deformation is not large enough to prevent retrievability of fuel assemblies. Further, the sleeve deformation will not cause any damage to the fuel rods.

The proposed activity will not lead to breaching of the DSC barrier, or the loss of shielding, so that consequences of malfunction of equipment important to safety, namely the radiation dose to operators or radiation releases from ISFSI will not increase.

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## ISFSI DSC Grid Misalignment

☐ Yes ☒ No

May the probability of occurrence of an accident previously evaluated in the SAR be increased?

## Probability of Accident:

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. They consist of loss of shielding, external missiles, earthquake, flood, cask drop, lightning, blockage of air inlets and outlets, DSC leakage, DSC overpressurization, and forest fire. Of these accidents, the cask drop accident and the earthquake incident are impacted by this activity, related to the misalignment of fuel assembly spacer grids and DSC spacer discs. The earthquake scenario is bounded by the cask drop accident, as the acceleration postulated in a design basis earthquake is 1.5g, which is much smaller than the acceleration in the drop accident of 75g. However, the probability of occurrence of cask drop, or any other accident is not increased by this activity.

This activity has no impact on the frequency, or on the probability of occurrence of design basis external natural events such as tornado, earthquake, or flood. Also, the proposed changes have no impact on the frequency, or on the probability of occurrence of design basis external man-induced events that could affect the ISFSI such as fires, or a Liquid Natural Gas (LNG) plant or pipeline spill or explosion.

Similarly, the misalignment of fuel assembly spacer grids and DSC spacer discs will have no impact on causes or initiating events for other accidents, such as blockage of air inlets and outlets, DSC leakage, or DSC overpressurization.

☐ Yes ☒ No

May the consequences of an accident previously evaluated in the SAR be increased?

## Consequences of Accident:

The proposed activity, namely validation of as-built misalignment of fuel assembly spacer grids and DSC spacer discs, will impact the cask drop accident and earthquake incident, as stated above.

The consequences of the cask drop accident with the misaligned grids were evaluated in Section 4.7 of Reference 3. The worst drop scenario was determined to be the horizontal drop. Deceleration rates of 31g and 75g were analyzed. The most vulnerable DSC component was the guide sleeve, which experiences higher stresses because of misalignment. The evaluation concluded that stresses generated in the sleeve would be larger, but still bounded by the stresses from the vertical drop scenario. The stresses would not be enough to cause any tearing of the sleeve material. The horizontal drop would cause a maximum deflection in the guide sleeve of 0.271 inch.

The impact on critical safety functions is discussed below. The critical functions affected will be configuration and criticality controls, and confinement. Other critical functions such as shielding and thermal safety are not affected by the misalignment of grids.

Criticality Control: The structural integrity of the fuel assembly was evaluated in Reference 5. The horizontal drop evaluation was performed assuming that the guide sleeves are perfectly rigid, which is conservative for determining the impact on the structural integrity of the fuel assembly itself. Therefore, the fuel evaluation is not affected by the misalignment of spacer grids and spacer discs, and hence, the criticality control function is not impacted by the misalignment of grids.



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**ISFSI DSC Grid Misalignment**

**Configuration Control:** Configuration of fuel assemblies within the DSC needs to be maintained such that the assemblies remain retrievable. Since it was determined that the guide sleeve would not tear, fuel assemblies would remain retrievable.

**Confinement:** The worst case misalignment would cause a maximum deflection in the guide sleeve of 0.271 inch. The impact of the deformed sleeve would be on the inconel retention grid, inconel perimeter skirt/spacer grid, or the inconel perimeter skirt, depending upon the amount of offset in the alignment, but not on the fuel rods [Ref. 4]. Therefore, the fuel rods would not be damaged by the guide sleeve, and the radioactive fission products would remain confined.

**Shielding:** The DSC Internal Basket Assembly is not credited with augmenting the radiation shielding properties of the DSC, and there is no direct interface between the Internal Basket Assembly Components, and the DSC shielding materials. Therefore, there is no impact on the DSC shielding due to this activity.

**Thermal Control:** The parameters affecting the thermal analysis, such as heat generation or transfer capabilities are not impacted by the proposed activity. Therefore, there is no impact on the DSC thermal control due to this activity.

2. **The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.**

☐

Yes

☒

No

**May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?**

**Possibility of New Malfunction:**

The proposed activity validates the misalignment between fuel assembly spacer grids and DSC spacer discs. The most impacted component is the guide sleeve. The evaluation showed that the sleeve would experience higher stresses, but within the allowable values [Ref. 3]. Therefore, possibility of a malfunction of a different type is not created.

The other impacted SSCs, namely the spacer discs and support rods continue to function as per their design. They continue to provide the structural support to maintain the fuel assembly configuration within the DSC, and keep the fuel assemblies retrievable. The possibility of a malfunction of a different type than any previously evaluated is not created.

☐

Yes

☒

No

**May the possibility of an accident of a different type than any previously evaluated in the SAR be created?**

**Possibility of New Accident:**

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the USAR, and have been discussed previously. Reanalysis with the misaligned grids showed an increase in the stress level in the guide sleeve during a top drop accident [Ref. 3]. However, since there is no change to the design or operation of the NUHOMS system caused by this activity, the possibility of an accident of a different type than any previously evaluated in the SAR will not be created.

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## ISFSI DSC Grid Misalignment

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐

Yes

☒

No

Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Tech Spec Bases 2.3

**Discussion of why the margin of safety is not reduced:**

Technical Specification Section 2.3, "Transfer Cask", states that the transfer cask lifting height with a non-single-failure-proof lifting device shall not exceed 80 inches, since analyses performed for the DSC and transfer cask confirm that drops of 80 inches could be sustained without unacceptable damage or without decreasing margins of safety. In addition, the technical specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected. Therefore, retrievability of fuel from the DSC needs to be demonstrated.

Analysis demonstrated that the misalignment of grids would cause the DSC guide sleeve to deform during a horizontal drop accident, reducing the gap between the guide sleeve and the fuel assembly. However, the amount of deflection would be less than the gap, therefore, the fuel assembly would not be pinched. This deformation will not affect fuel assembly retrievability. Also, the fuel rods would not be damaged from the guide sleeve deformation.

Another scenario that could affect fuel assembly retrievability would be piercing of the guide sleeve at the lower end fitting. The analysis showed, however, that the guide sleeves would not be pierced.

The margin of safety is the difference between the allowable stress value based on ASME B&PV Code, Section III, and the material equivalent failure stress. Reference 3 concluded that the computed stress levels are below the allowable stresses. The analysis demonstrated that there would be no unacceptable damage to the DSC.

Therefore, since the fuel assembly can still be retrieved after a horizontal drop accident, computed stresses remain below the allowables, and there is no impact to the integrity of the fuel rods, the margin of safety is not reduced.

**Complete for 72.48:**

☐

Yes

☒

No

Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

The design and operation of the NUHOMS-24P dry cask storage system is not changed by this activity. This activity does not reduce the integrity of the confinement boundary, and the radioactive shielding elements are not affected. Retrievability of fuel following a design basis cask drop accident is not impacted by this activity. The fuel rods are not damaged. Because none of these attributes are changed, the occupational doses summarized in USAR Table 7.4-1 are not affected by this activity. Therefore, no occupational doses are increased.

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## ISFSI DSC Grid Misalignment

☐ Yes ☒ No Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

The NUHOMS-24P dry cask storage system confinement and radiological shielding functions are not reduced by this activity. The DSCs with misaligned fuel assembly spacer grids and DSC spacer discs, have been evaluated [Ref. 3] to ensure stresses will remain within allowable limits under the most severe postulated drop accident conditions.

This activity does not affect any area of the plant site previously undisturbed for the ISFSI, and does not cause any reason for revision to the ISFSI Updated Environmental Report. This activity does not affect the environmental conditions associated with the ISFSI. Therefore, this activity does not involve an unreviewed environmental impact.

**References:**

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 8
2. UFSAR/USAR/TSB Change Request, UCR No. 98-020, for ESP ES199800466-000
3. BGE Calculation CA04132, Rev. 0002
4. Hopper and Associates Letter HABGE-04/99-0778, from Kenneth L. Saunders to James E. Remeniuk, 4/14/99
5. BGE Calculation CA04680, Rev. 0000, C-E 14X14 Fuel Grid Horizontal Drop Evaluation
6. BGE Issue Report IR3-007-609, 03/24/1997
7. BGE Issue Report IR3-007-611, 03/24/1997
8. Technical Specifications for Calvert Cliffs ISFSI, Amendment 2
9. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1
10. 10CFR72.48 Safety Evaluation No. SE00133, ISFSI – Analysis of DSC Under Postulated Cask Drop Accident

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## ISFSI DSC Grid Misalignment

**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** The proposed activity consists of making changes to the ISFSI USAR, in order to account for the misalignment of some of the fuel assembly spacer grids in relation to the spacer discs provided within the Dry Shielded Canister (DSC). The USAR Section 1.3.1.1 states that the DSC spacer disks are "at intervals corresponding to the fuel assembly spacer grids". This was found not to be the case for a few of the spacer grids of fuel assemblies from batches 1/2 D/E/F/G/H, 1J, 2A, 2B and 2C. Misalignment was found in fuel assembly lower end fittings (LEFs) and the DSC bottom spacer discs; and in fuel assembly eighth zircalloy grids and the DSC eighth spacer discs.

The changes being made to the ISFSI UFSAR consist of revisions to Sections 1.3.1.1 and 8.2.5.2 to add statements regarding the misalignment of grids of fuel assemblies and DSCs, and its analysis. Stress values reported in Tables 8.2-6 and 8.2-10 envelope the stresses from misalignment configuration, therefore no changes are necessary.

**Reason for Activity:** This activity is being carried out in part to address the misalignment of spacer discs and fuel assembly spacer grids, as described above.

The design of the DSC is intended to ensure that the worst case postulated cask drop accident will not result in deformation of the DSC Internal Basket Assembly to such a degree that post-accident retrieval of intact fuel assemblies is not assured or that fuel rod integrity is compromised.

Technical Specification Section 2.3, "Transfer Cask", states that the transfer cask lifting height with a non-single-failure-proof lifting device shall not exceed 80 inches. The technical specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected. Therefore, retrievability of fuel from the DSC needs to be assured.

**Activity Summary:** A new analysis was performed to determine the impacts of misalignment of spacer discs with the spacer grid plates of the as-built fuel assemblies. The analysis focussed on the guide sleeves, which are the vulnerable components, and the horizontal drop scenario, which would be most impact by the misaligned grids.

The guide sleeves are constructed of stainless metal plates bent into a sleeve with a square cross-section, and stitch-welded along one edge. The welds are 2 inches long at 6 inches center-to-center distance. The worst scenario was modeled in the analysis, which consisted of applying load to the non-welded span of the sleeve. The geometry analyzed covers the offsets at the LEF or the eighth zircalloy grid. The analysis was performed for the acceleration loads of 1g, 31g, and 75g.

It was concluded that the stresses generated in the guide sleeve would be larger, but still bounded by the stresses from the vertical drop scenario. The stresses would not be enough to cause any tearing of the sleeve material. Since the sleeve would not tear, fuel assemblies would remain retrievable.

The analysis determined that a small deflection in the guide sleeve would occur. The deformed sleeve would have an impact on the inconel retention grid, inconel perimeter skirt/spacer grid, or the inconel perimeter skirt, depending upon the amount of offset in the alignment, but not on the fuel rods. Therefore, the fuel rods would not be damaged by the guide sleeve.

**USQ Determination:** This activity was evaluated against the criteria of 10CFR72.48(a)(2), such as the probability of occurrence or the consequences of an accident or the malfunction of equipment important to safety, and it was concluded that it does not involve an unreviewed safety question (USQ).



## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES199801283-001 Rev 0 50.59 Log No.: N/A 72.48 Log No.: SE00150

Based on the attached discussion, does this activity:

## Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

## Applicable to 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: Carl Faller *CFaller* Department: CEU Date: 10/14/99

PRINTED NAME AND SIGNATURE

J.E. REMENIK *JER* 10.14.99

☐ YES ☒ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp Ind.: *D.M. DEAN*

PRINTED NAME

SIGNATURE

Resp Ind.: *B.M. STARK*

PRINTED NAME

SIGNATURE

Resp Ind.: *N/A*

PRINTED NAME

SIGNATURE

Work Group: *SSCOR-17*Work Group: *EEU*Work Group: *N/A*Date: *10/25/99*Date: *10/25/99*Date: *N/A*Approved ☒ Disapproved ☐Approved ☒ Disapproved ☐Signature *G.V. PATEL*

INDEPENDENT REVIEWER

Signature *Pravin Patel*

GS-DES, GS-TES, or PE-PDSU

Date *10-15-1999*Date *10-25-1999*

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: *992 ODS* Date: *11-1-99*Recommend Approval ☒Recommend Disapproval ☐Signature *J.H. Tuck* Date *11-1-99*

POSRC CHAIRMAN

Approved ☒Disapproved ☐Signature *P.K. J.* Date *11/1/99*

PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES ☒ NOSignature: *Carl Faller*

OSSRC SES Chairman

Date: *1/20/00*

If yes, OSSRC Meeting No.

## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES199801283-001 Rev 0	50.59 Log No.: N/A	72.48 Log No.: SE00150
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**Proposed Activity:**

- 1) Installation of a permanent personnel gate (locked) in the west side of the nuisance perimeter fence (the outer fence) surrounding the Independent Spent Fuel Storage Installation (ISFSI)
- 2) Installation of a temporary security fence (with a locked vehicle gate), temporary nuisance barrier, and temporary remote sensing system (infrared). These will be oriented in the east / west direction located approximately 27 ft, 47ft, and 37 ft respectively south of existing Horizontal Storage Modules (HSM) 2A and 2B.

The above activities deviate from ISFSI USAR Figure 1.2-1 and 4.1-2 and therefore require a safety evaluation. Concurrent with the physical fence changes, the following administrative changes will be made as well:

- 1) Correction of HSM number scheme on ISFSI USAR Figure 2.4-1 to reflect "As Built"
- 2) Correction of vehicle gate location on ISFSI USAR Figures 1.2-1 and 4.1-2 to more accurately reflect the "As Built" location.
- 3) Changes to reflect the addition of HSM 3A and 3B to the ISFSI, as authorized and screened under engineering package ES199801283-000.

**Reason for Activity:**

HSM 3A and 3B are being added to the ISFSI. Construction of 3A and 3B will require the daily admittance of construction personnel inside the fenced ISFSI protected area. Doing so allows such individuals access to installed and fuel loaded HSM1A, 1B, 2A, and 2B which in turn requires increased security personnel to manage these individual's activities.

By installing a temporary fence, nuisance barrier, and remote security detection system south of the existing HSM 2A and 2B, the current ISFSI protected area boundary can be collapsed to an area more immediately surrounding HSM 1A, 1B, 2A, and 2B. This will ease the number of security personnel required to monitor construction personnel activities and will allow more freedom of movement for the construction personnel themselves.

The permanent personnel gate in the west side of the nuisance perimeter fence surrounding the ISFSI is being added at Nuclear Security's request in order to allow them access flexibility. Currently access to the area between the perimeter nuisance fence (the outer fence) and the security fence (the inner fence) where the remote sensing devices are located is through one location only; the vehicle-sized gate located on the east side. Access to the overall ISFSI protected area will still be via one location only, the existing east side vehicle size access gate.

**Function(s) of affected SSC:**

The primary function of the double perimeter fence arrangement (with remote sensing devices) that surrounds the ISFSI is for security purposes; to restrict unauthorized personnel immediate and easy access to the HSMs. The fence system components function as follows:

- a) The function of the outer 8-foot high chainlink fence is to keep people and animals (e.g. deer) that near the ISFSI from inadvertently triggering the remote sensing devices. This fence is commonly referred to as the "Nuisance Fence"
- b) The function of the inner 12-foot high chainlink fence is to keep unauthorized people from accessing the HSMs. This fence is the main security fence.
- c) The function of the remote sensing devices located between the security and nuisance fences is to alert security when unauthorized personnel breach the nuisance fence and approach the inner security fence.

A secondary function of the fence system is to reduce the potential for blockage of HSM air inlets and outlets from debris thrown about by environmental events such as tornadoes. The fence was not designed to withstand any particular size or amount of debris traveling at any particular speed but credit is taken for its presence and ability in reduce the potential that debris outside the fence may get inside the ISFSI fenced area and reach HSM inlet and outlet air vents.

## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES199801283-001 Rev 0 50.59 Log No.: N/A 72.48 Log No.: SE00150

SAR Revision No.: ISFSI USAR Rev 8.

## SAR Sections Reviewed:

ISFSI Sections2.1.2 "Site Description"Chapter 3 "Principal Design Criteria"3.3.5 "Radiological Protection"8.2.7 "Blockage of Air Inlets and Outlets"

Tech Spec Bases Rev. No:

ISFSI Tech Spec Rev 0 Amendment 1

Tech Spec Bases Reviewed:

2.0 to 2.4

and

3 / 4.1 to 3 / 4.5

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

## Probability of Malfunction:

The accidents discussed in the ISFSI USAR Chapter 8 are:

Loss of Air Outlet Shielding, Tornado Winds / Missiles, Earthquake, Flood, Cask Drop, Lightning, Blockage of Air Inlets and Outlets, Dry Shielded Canister Leakage, Accidental Pressurization of Dry Shielded Canister, Forest Fire, Liquefied Natural Gas Plant or Pipeline Spill or Explosion, Load Combinations, Other Event Considerations (Storage of Flammable Liquid Fuel)

The fence perimeter system is a passive system that restricts personnel access to the HSMs. It is not a major contributor to prevent or mitigate any of the above accidents. It is discussed in section 8.2.7.1 of the USAR and is mentioned as a contributor in reducing the potential of tornado debris from blocking the HSM air inlet and outlets.

The permanent personnel gate will still provide the above functions. The main perimeter fence is not being removed with the installation of the temporary fence so it is also available to provide these functions. Additionally, the temporary fence functions to reduce the potential that construction debris inside the ISFSI and south of the temporary fence will enter into the existing HSM area.

The changes in HSM numbering and reflection of actual location of the east vehicle size security gate are administrative in nature.

The proposed changes to the ISFSI USAR do not constitute an increase in probability of a malfunction.

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

## Consequences of Malfunction:

The fence perimeter system does not significantly mitigate any accidents discussed in the ISFSI USAR Chapter 8 therefore changes to the fence system do not increase any malfunction consequences. Failure of the permanent or temporary fence during a tornado introduces the same and equivalent circumstances as the original fence system.

## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES199801283-001 Rev 0

50.59 Log No.: N/A

72.48 Log No.: SE00150

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

The fence is a passive system and does not actively interact with the HSMs. Because there is no interaction, permanent and temporary changes to the fence do not alter any ISFSI USAR Chapter 8 accident frequencies or increase the probability of any accidents.

The changes do not alter the fence's function to reduce potential tornado affects discussed in "Blockage of Air Inlets and Outlets" because the changes do not make the probability of a tornado occurrence higher.

The changes in HSM numbering and reflection of actual location of the east vehicle size security gate are administrative in nature.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The proposed fence changes do not change, degrade or prevent actions described in or assumed in the ISFSI USAR Chapter 8 accidents.

The ability of the fence to reduce potential tornado affects (i.e. debris blocking HSM air inlets and outlets) remains intact after the changes are made. The original perimeter fence will remain in place and the permanent personnel gate being installed serves to block tornado debris in an equivalent method to that of the main fence.

The changes to the fence do not alter any assumptions previously made in evaluation of radiological consequences of Chapter 8 accidents because the changes do not alter the location of the ISFSI with relation to BGE controlled area boundaries. Therefore off site doses from accidents are not affected.

The fence is passive and does not play a direct role in mitigating radiological consequences of Chapter 8 accidents.

The fence alterations do not affect any fission product barriers.

The changes in HSM numbering and reflection of actual location of the east vehicle size security gate are administrative in nature.



## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES199801283-001 Rev 0 50.59 Log No.: N/A

72.48 Log No.: SE00150

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

**Possibility of New Malfunction:**

The changes to the fence do not pose the possibility of a new malfunction because it is a passive component of the ISFSI and does not physically interact with the HSMs. The fence does not have any active attributes that could prevent an ISFSI system from mitigating the consequences of a Chapter 8 accident nor are there any indirect means the fence could create a new malfunction.

The changes in HSM numbering and reflection of actual location of the east vehicle size security gate are administrative in nature.

☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

**Possibility of New Accident:**

The changes to the perimeter fence do not create any new credible accidents not already discussed in the ISFSI USAR Chapter 8. The main reason there is no impact is because the fence is a passive ISFSI component and does not interact directly with the HSMs. The fence changes cannot contribute to changes in fuel storage temperatures, changes to the cooling means of the stored canisters, increase the affects of natural events, impact the movement of canisters, affect the sealing methods of the storage canisters, affect off sight doses, etc. .

The changes in HSM numbering and reflection of actual location of the east vehicle size security gate are administrative in nature.

**Complete for 50.59 and 72.48:**

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO Will the margin of safety as defined in the basis for any Technical Specification be reduced?

**Bases**

2.1 to 2.4

"Functional and Operating Limits"

3 / 4.1 to 3 / 4.5

"LCO /SRs"

**Discussion of why the margin of safety is not reduced**

None of the temperature limits, irradiation limits, or radiation limits. discussed in the bases depend directly or indirectly on the location or function of the perimeter fence or administrative changes being made to the ISFSI figures

## ATTACHMENT 3, SAFETY EVALUATION FORM

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<b>ACTIVITY:</b> ES199801283-001 Rev 0	<b>50.59 Log No.:</b> N/A	<b>72.48 Log No.:</b> SE00150
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**Complete for 72.48:**

☐ YES ☒ NO Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

None of the "operation" activities listed in the ISFSI USAR Table 7.4-1 "Estimated Occupational Exposure for One Horizontal Storage Module Load" are impacted by the installation of the permanent gate or the temporary fence.

The permanent west gate is a personal access gate and does not interact with cask loading evolutions because it only permits access to the area between the nuisance fence (the outer fence) and the security fence (the inner fence). The dose estimates for Table 7.4-1 activities are therefore not affected by this change.

The temporary fence will be located 27 feet south of HSM 2A and 2B which does not leave enough room to install casks on the south side as long as the temporary fence is in that particular location. If a future decision is made to shift the fence more southerly to accommodate loading the south side 2A and 2B HSMs while the temporary fence is installed, the Table 7.4-1 activities will still not be significantly affected. The "operation" activities described in this Table 7.4-1 all take place in close proximity to the cask and the HSM itself. The fence will not slow these "operation" to any degree that an increase in dose to personnel will result.

The changes in HSM numbering and reflection of actual location of the west security gate are administrative in nature.

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

The fence changes do not alter any plant area footprints already dedicated for ISFSI installation or support.

A revision to the ISFSI Environmental Impact Statement is not required by these activities.

**Summary: (For NRC Report, provide a brief overview)**

This Safety Screen evaluates the following changes to the USAR of the Independent Spent Fuel Storage Installation (ISFSI) located at Calvert Cliffs Nuclear Power Plant:

- 1) The acceptability to install a new permanent personnel gate (locked) in the west side of the nuisance perimeter fence (the outer fence) surrounding the ISFSI.
- 2) The acceptability to install a temporary security fence (with a locked vehicle gate), nuisance barrier, and remote infrared security system. This temporary fence system will be oriented in the east / west direction located approximately 27 ft, 47ft, and 37 ft respectively south of existing Horizontal Storage Module (HSM) 2A and 2B.
- 3) Correction to the number scheme of the HSMs (administrative in nature)
- 4) Correction to the physical location of the existing vehicle gate in the east side of the perimeter fence (administrative in nature)

## ATTACHMENT 3, SAFETY EVALUATION FORM

Page 7 of 7

ACTIVITY: ES199801283-001 Rev 0

50.59 Log No.: N/A

72.48 Log No.: SE00150

## Reason:

Calvert Cliffs is adding HSMs 3A and 3B to the ISFSI (Reference Engineering Package ES199801283-000). Construction of 3A and 3B will require the daily admittance of construction personnel inside the fenced ISFSI protected area. Doing so allows such individuals access to existing and fuel loaded HSM 1A, 1B, 2A, and 2B which in turn requires increased security personnel to manage these individuals' activities. To manage this situation, a temporary fence, nuisance barrier, and remote sensing system will be installed just south of HSM 2A and 2B so the ISFSI protected area boundary can routinely be collapsed during construction to an area more immediately surrounding HSM 1A, 1B, 2A, and 2B. This will ease the number of security personnel required to monitor construction personnel activities and will allow more freedom of movement for the construction personnel themselves. The permanent personnel gate in the west side of the nuisance perimeter fence surrounding the ISFSI is being added at Nuclear Security's request in order to allow them access flexibility. Currently access to the area between the perimeter nuisance fence (the outer fence) and the security fence (the inner fence) where the remote sensing devices are located is through one location only; the vehicle-sized gate located on the east side. Access to the overall ISFSI protected area will still be via one location only, the existing east side vehicle size access gate.

The above activities deviate from information currently reflected in the ISFSI USAR Figures 1.2-1, 4.1-2, and 2.4-1 and therefore require a Safety Evaluation.

These changes do not represent an Unreviewed Safety Question (USQ), a Significant Increase in Occupational Dose, or an Unreviewed Environmental Impact.

The perimeter fencing system is a passive system surrounding the HSMs whose main function is security (i.e. to prevent unauthorized personnel from accessing the HSMs). Except for "Blockage of Air Inlets and Outlets" the fence is not credited in any ISFSI USAR Chapter 8 accident analysis, prevention assumptions, or mitigations. In the case of "Blockage of Air Inlets and Outlets" the perimeter fence along with the HSM air inlet and outlet physical separation as credited as a contributor to "reducing the potential" that the vents will become blocked by any debris stirred up by a tornado. No calculations, assumptions, or credit was taken for the fence stopping any particular size or amount of debris traveling at any particular speed. It is just referenced as being present.

## No USQ results from:

- Installation of the permanent personnel gate because it will be constructed of equivalent material, size, and location as the existing fence.
- The temporary fence system because the original perimeter fence will remain in place to reduce the potential of debris from entering the ISFSI. Any debris bounded inside the ISFSI but south of the temporary fence (i.e. the construction area of HSM 3A and 3B) will be reduced from reaching the existing HSMs by the equivalent temporary fence.
- Changes to the HSM number system or figure change to shown the actual location of the existing security gate (east side) as these are administrative in nature and do not cause any major deviations from the ISFSI USAR.

A Significant Increase in Occupational Dose to ISFSI USAR Table 7.4-1 does not occur because the fence changes do not affect the activities listed in Table 7.4-1

A Significant Unreviewed Environmental Impact does not result from these changes because the footprint to the ISFSI is not being altered and the Environmental Impact Statement requires no changes.

## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 1 of 4)

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ACTIVITY: Organization Change50.59 Log No.: SE0040972.48 Log No.: SE 00151

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: Michael A. Cox *Michael A. Cox* Department: 47 Date: 12/1/99  
 PRINTED NAME AND SIGNATURE

- ☐ YES ☒ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.:

PRINTED NAME

SIGNATURE

Work

Group: \_\_\_\_\_

Date: \_\_\_\_\_

Resp. Ind.:

PRINTED NAME

SIGNATURE

Work

Group: \_\_\_\_\_

Date: \_\_\_\_\_

Resp. Ind.:

PRINTED NAME

SIGNATURE

Work

Group: \_\_\_\_\_

Date: \_\_\_\_\_

Approved ☒Disapproved ☐

Signature

INDEPENDENT REVIEWER

Date

12/15/99Approved ☒Disapproved ☐

Signature

GS-BES, GS-TSES, or PE-PDSU

Date

12/15/99

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.:

99-101

Date:

12-22-99

Recommend

☒

Recommend

☐

Signature

Approval

Disapproval

POSRC CHAIRMAN

Date 12-22-99Approved ☒☐

Disapproved

☐

Signature

PLANT GENERAL MANAGER

Date 12/22/99

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required?

☐

YES

☒

NO

Signature:

W. Russell

OSSRC SES Chairman

Date:

5/18/00

If yes, OSSRC Meeting No. \_\_\_\_\_



**ATTACHMENT 3, SAFETY EVALUATION FORM (Page 2 of 4)**

<b>Page 2 of 4</b>	
<b>ACTIVITY:</b>	<b>Organization Change</b>
<b>50.59 Log No.:</b>	<b>SE00409</b>
<b>72.48 Log No.:</b>	<b>SE00151</b>
<b>Proposed Activity:</b>	The proposed activity is an organization change that establishes the Integrated Work Management Section. The new Master Section reports to the Plant General Manager. The following three sections will report to the Integrated Work Management Master Section: 1) Integrated Planning/Risk Management Section, 2) Outage Management Section, and 3) Scheduling/Work Coordination Section. This <del>or</del> change will require a revision to Chapter 12 in the UFSAR.
<b>Reason for Activity:</b>	To support the establishment of an Integrated Work Management Program
<b>Function(s) of affected SSC:</b>	none
<b>SAR Revision No.:</b>	26
<b>Tech Spec Bases Amendment/Rev No.:</b>	N/A
<b>SAR Sections Reviewed:</b>	Chapter 12
<b>Tech Spec Bases Reviewed:</b>	N/A
<b><u>Complete for 50.59 and 72.48:</u></b>	
1.	<p>The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.</p> <p><input type="checkbox"/> Yes    <input checked="" type="checkbox"/> No    May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?</p> <p style="padding-left: 40px;">Probability of Malfunction: The probability of a malfunction of equipment will not be increased. The new organization will work with line organizations to use disciplined methodologies to manage the risk associated with work activities.</p> <p><input type="checkbox"/> Yes    <input checked="" type="checkbox"/> No    May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?</p> <p style="padding-left: 40px;">Consequences of Malfunction: The consequences of a malfunction will not be increased. Since the new organization is aimed at properly managing risk associated with work activities, work activities will be planned to avoid or mitigate the risks associated with performing work on equipment. These actions will NOT increase consequences of malfunctions.</p> <p><input type="checkbox"/> Yes    <input checked="" type="checkbox"/> No    May the probability of occurrence of an accident previously evaluated in the SAR be increased?</p> <p style="padding-left: 40px;">Probability of Accident: The proposed organizational change helps improve Calvert Cliffs ability to manage the risk associated with work activities. As a result of improved risk management, the probability of an accident will NOT increase.</p> <p><input type="checkbox"/> Yes    <input checked="" type="checkbox"/> No    May the consequences of an accident previously evaluated in the SAR be increased?</p> <p style="padding-left: 40px;">Consequences of Accident: Since the new organization is aimed at properly managing risk associated with work activities, work activities will be planned to avoid or mitigate the risks associated with performing work on equipment. Improved risk management is independent of Consequences of a Chap 14 accident.</p>

# ATTACHMENT 3, SAFETY EVALUATION FORM (Page 3 of 4)

Page 3 of 4

ACTIVITY      Organization Change      50.59 Log No.:      SE00409      72.48 Log No.:      SE00151

2.      The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ Yes      ☒ No      May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: By assessing risk and improving the way we manage that risk, we will only have a decrease in the possibility of any malfunctions.

☐ Yes      ☒ No      May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: Improved risk management and integrated work management is aimed at reducing risk associated with work activities. This includes nuclear safety risk which is a significant contributor to the possibility of an accident. Since nuclear safety risk management will NOT decrease, the possibility of an accident will NOT increase.

Complete for 50.59 and 72.48:

3.      The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ Yes      ☒ No      Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Bases

Discussion of why the margin of safety is not reduced

The proposed organization change has no direct impact on the margin of safety as defined in any Tech Specs.

# ATTACHMENT 3, SAFETY EVALUATION FORM (Page 4 of 4)

Page 4 of 4

ACTIVITY: Organization Change 50.59 Log No.: SE00409 72.48 Log No.: SE00151

## Complete for 72.48:

☐ Yes ☒ No Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose: Integrated work management and improved risk management will help to avoid or minimize occupational exposure associated with ISFSI or other work activities which have radiation exposure risk.

☐ Yes ☒ No Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: The new organization's improved risk management procedures recognize environmental risk and seeks to mitigate that risk so that no Unreviewed Environmental Questions are introduced.

## Summary: (For NRC Report, provide a brief overview)

The proposed activity establishes an Integrated Work Management organization under the Plant General Manager. The new organization will improve risk management activities by institutionalizing the way we assess and manage risk in the following areas: 1) Nuclear Safety 2) Industrial Safety 3) Radiation Safety 4) Environmental Safety and 5) Corporate Risk.

# ATTACHMENT 3, SAFETY EVALUATION FORM (Page 1 of 8)

ACTIVITY: ES199701539-002

50.59 Log No.:

72.48 Log No.: SE00152

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: IM Sommerville *IM Sommerville* Department: Nuclear Date:  
 PRINTED NAME AND SIGNATURE

☒ YES ☐ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: R.H. Beall PRINTED NAME	Resp. Ind.: J.E. Remeniuk PRINTED NAME	Resp. Ind.: PRINTED NAME
<i>R.H. Beall</i> SIGNATURE	<i>J.E. Remeniuk</i> SIGNATURE	 SIGNATURE
Work Group: NFM	Work Group: CEU	Work Group:
Date: 4/6/00	Date: 4-27-00	Date:

Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/>	Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/>
Signature <i>Mark Finley</i> INDEPENDENT REVIEWER	Signature <i>[Signature]</i> GS-DES, GS-TSES, or PE-PDSU
Date 5/4/2000	Date 5/15/00

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 00-047 Date: 5/15/00

Recommend Approval <input checked="" type="checkbox"/> Recommend Disapproval <input type="checkbox"/>	Signature <i>[Signature]</i> POSRC CHAIRMAN	Date 5/15/00
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/>	Signature <i>[Signature]</i> PLANT GENERAL MANAGER	Date 5/16/00

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES ☒ NO

Signature: *W. Thunell* Date: 7/14/2000  
 OSSRC SES Chairman

If yes, OSSRC Meeting No. \_\_\_\_\_



# ATTACHMENT 3, SAFETY EVALUATION FORM (Page 2 of 8)

ACTIVITY: ES199701539-002

50.59 Log No.:

72.48 Log No.: SE00152

Proposed Activity: See Attached Sheets	
Reason for Activity: See Attached Sheets	
Function(s) of affected SSC: See Attached Sheets	
SAR Revision No.: 8	Tech Spec Bases Amendment/Rev No.: 1
SAR Sections Reviewed: 3.2, 8.2	Tech Spec Bases Reviewed: B2.1
<b>Complete for 50.59 and 72.48:</b>	
<p>1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?</p> <p>Probability of Malfunction: See Attached Sheets</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?</p> <p>Consequences of Malfunction: See Attached Sheets</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No May the probability of occurrence of an accident previously evaluated in the SAR be increased?</p> <p>Probability of Accident: See Attached Sheets</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No May the consequences of an accident previously evaluated in the SAR be increased?</p> <p>Consequences of Accident: See Attached Sheets</p>	
<p>2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?</p> <p>Possibility of New Malfunction: See Attached Sheets</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No May the possibility of an accident of a different type than any previously evaluated in the SAR be created?</p> <p>Possibility of New Accident: See Attached Sheets</p>	

# ATTACHMENT 3, SAFETY EVALUATION FORM (Page 3 of 8)

ACTIVITY: ES199701539-002

50.59 Log No.:

72.48 Log No.: SE00152

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐

Yes

☒

No

Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Bases

Discussion of why the margin of safety is not reduced

See Attached Sheets

Complete for 72.48:

☐

Yes

☒

No

Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

☐

Yes

☒

No

Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

Summary: (For NRC Report, provide a brief overview)

See Attached Sheets

**72.48 - SAFETY EVALUATION**  
**ISFSI - FOREST FIRE RE-ANALYSIS**

**PROPOSED ACTIVITY**

Change the ISFSI SAR, Section 8.2.10.2, to reflect the modified analysis of the Forest Fire Accident.

**Reason for Activity**

During review of the Forest Fire accident analysis, an error was discovered. This error had an effect on the temperatures experienced by the concrete of the Horizontal Storage Module (HSM) during the fire. An Issue Report, IR1-043-510, was written to track resolution and the Forest Fire analysis was revised, CA03945, Rev 1. This 72.48 discusses the results of the analysis.

**Function of the Affected SSC**

The Dry Shielded Canister (DSC) has containment, shielding, criticality control, and thermal safety functions. The primary function of the DSC is to provide containment for the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are redundant outer cover plates (top and bottom) to assure containment integrity. The DSC provides gamma shielding at its ends by the use of thick steel end plugs. These provide ALARA dose rates at the top of the canister (for DSC drying and sealing operations) and at the bottom (for minimizing dose rates at the HSM doorway). Shielding in the radial direction is not a safety function of the DSC, although it does provide a small amount due to the shell thickness.

Criticality control is provided by the DSC's internal basket assembly. A series of spacer disks and axial support rods maintain the fuel assemblies in known positions under all normal and accident conditions. The thickness and location of the spacer disks plus the relative locations of the fuel assemblies achieve the criticality control function. The DSC maintains the helium cover gas which is required for heat rejection and corrosion control. Heat is transferred via thermal radiation and conduction from the fuel through the guide sleeves, spacer disks, and cover gas to the DSC shell, where it is convectively cooled during HSM storage. The fuel rod cladding serves as a primary confinement boundary for the fuel pellet and fission products. The preservation of the fuel cladding integrity is intended to prevent oxidation of the Uranium fuel material.

During storage, the horizontal storage module supports the DSC, provides it with protection from weather and external missiles, permits heat rejection in order to maintain concrete temperatures and fuel cladding temperatures to within design

allowables, and protects the public and operating personnel from radiation which emanates from the DSC. During fuel loading, the horizontal storage module additionally provides a stable surface for docking the transfer cask or a compatible shipping cask and performing DSC transfers. The HSM is designed to withstand DSC handling loads (normal and off-normal), environmental extremes (heat, rain, snow, wind), earthquakes, lightning, external missiles (tornado, man-made), floods, fires, and explosions.

#### Revised Forest Fire Analysis

The accident analysis for the Forest Fire has been modified with BGE calculation CA03945, Rev 0001. This analysis revision corrects errors in the original analysis associated with radiation heat transfer view factors and initial HSM wall temperatures. The resulting analysis indicates that the temperatures expected are higher than those previously calculated. The calculation revision establishes criteria for evaluation of the results and evaluates the results against these criterion to confirm adequacy of the resulting fire effects on the HSM and DSC.

Criteria specified includes: allowable concrete temperature, fuel cladding temperature, HSM structural analysis, DSC internal pressure and post fire radiological conditions in the vicinity of the HSM. These results indicate that the elevated temperature at the surface of the HSM walls may cause cracking or spalling of the walls but that the associated damage will not penetrate the concrete wall to an extent that impacts the ability to meet the established criterion. Although cracking and spalling occur; due to the relatively low thermal conductivity of the concrete and thus the slow movement of the high temperature region through the concrete, it is not felt to progress quickly such that the evaluations regarding depth of spalling are invalidated.

The evaluation of the resulting conditions indicate that:

- concrete temperatures will peak at approximately 1475°F on the surface
- the concrete will exceed ACI 349 limits (350°F) to a depth of only 4.5" into the concrete wall and exceed 1200°F only to a depth of approximately 1" (concrete will maintain 25% to 75% of its compressive strength to a temperature of 1200°F).
- the HSM will be able to function after the fire incident and be in a condition which facilitates HSM repair
- fuel cladding temperatures will be maintained within the fuel cladding short term temperature limit (SAR Table 8.1-13)



- the effect on concrete structural load capacity is minimal since the impact on the concrete is limited to a reduction of load capacity in only 4.5" of the 36" concrete wall thickness
- DSC internal pressure accident limits (50 psig) are maintained
- radiological doses are not significantly increased due to the potential concrete spalling which may occur to a depth of 1".

These above points are based on the evaluations provided in Section 4.2 & 4.3 of calculation CA03945, (Transnuclear West Calculation BGE-01-410). Also, in the event of cracking and spalling to a depth of as much as 4.5", the reduction in shielding would result in an increase in dose rate on the order of a factor of 3. This increase is applied to a dose rate of 7 mrem/hr for the HSM wall surface (SAR Figure 7.4-3. This is not considered a "significant increase in occupational dose" as it involves an increase of no more than a factor of 3 and a total task estimate of dose to repair of less than 100 man-mrem. In addition to the short duration of repair actions, dose rates to the public, on or beyond the nearest boundary due to the fire accident, would be negligible, and would not result in an increase beyond the limits of 10CFR72.106 (5 Rem). A revision to SAR section 8.2.10 is required for this analysis revision and a markup is attached.

USAR Revision No:	-	8
USAR Sections Reviewed	-	3.2, 8.2
Tech Spec Bases Amendment/Rev No:	-	1
Tech Spec Bases Reviewed:	-	B 2.1

Section 3.2 describes the Structural and mechanical Design Criteria

1. **The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.**

#### **Probability of Malfunction**

The analysis revision does not alter the DSC or the interior of the HSM configuration and will therefore not alter the probability of a malfunction of the system or its components. The only component affected is passive and continues to perform its function after the forest fire. The change does not affect the structural integrity of the HSM. The change does not impact system loading and unloading operations

### **Consequences of Malfunction**

The analysis revision does not alter the DSC in a manner that will alter the consequences of a malfunction. The HSM interior and DSC temperatures are affected minimally and dose rates to the public are unaffected. Only the surface dose is increased to a maximum of 21 mrem/hr from 7 mrem/hr which only affects occupational doses. The revised analysis is not associated with system malfunctions or the evaluations of the consequences of system malfunctions. The change does not impact system loading and unloading operations.

### **Probability of Accident**

The analysis revision does not alter the DSC or HSM configuration or their interaction with the environment in any way that could impact the probability of occurrence of an accident.

### **Consequences of an Accident**

The increased HSM temperature due to the revision of the forest fire accident analysis does not result in an increase in the consequences of this accident; there are no consequences. The HSM interior and DSC temperatures are affected minimally and dose rates to the public are unaffected. Only the surface dose is increased to a maximum of 21 mrem/hr from 7 mrem/hr which only affects occupational doses.

- 2 **The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created**

### **Possibility of New Malfunction**

The possibility of a new or different malfunction is not created since the forest fire scenario is already addressed in the SAR. The discussion above documents the acceptability of these accident results on the integrity of the DSC/HSM design requirements.

### **Possibility of New Accident**

The possibility of a new or different accident is not created since the forest fire scenario is already addressed in the SAR. The discussion above documents the acceptability of these accident results on the integrity of the DSC/HSM design requirements.

**3. The margin of safety as defined in the basis for any Technical Specification is not reduced**

The margin of safety as defined in the basis for the BGE ISFSI Technical Specification 2.4 is not reduced since the analysis revision documents that the stress and dose allowables specified in the SAR and SER are still maintained (see above for detailed discussion). T/S 2.4 requirements for HSM dose rates are associated with initially loaded HSMs. The actions associated with post fire repair are considered to be within the Action required by the T/S

Thus, there is no Unreviewed Safety Question

**Occupational Dose**

There is not a significant increase in the occupational dose as discussed above. The normal maximum dose rate is 7 mrem/hr and is applicable to initially loaded HSMs. The forest fire is estimated to result in a maximum increase by a factor of 3. This is not considered a significant increase in occupational dose especially considering the short duration of repair actions

**Environmental Impact**

There is no environmental impact due to the effect of the forest fire on the HSM

**Summary: (For NRC Annual Report, provide a brief overview)**

This activity involves a change in the ISFSI SAR in order to consider a revision of the Forest Fire Accident analysis which resulted in an increased HSM concrete temperature. The temperature exceeds the ACI 349 limits of 350F to a depth of 4.5" although 25% to 75% of its strength is retained up to 1200F which occurs to a depth of 1". Some spalling and cracking may result but the structural integrity is not impaired and DSC temperatures are only minimally affected. Also, dose rate at the surface is increased but there is not a significant increase in the occupational dose and the dose to the public is not affected.

# ATTACHMENT 3, SAFETY EVALUATION FORM

Page 1 of 878

ACTIVITY: UCR 00104

50.59 Log No.:

72.48 Log No.: SE00153

## Removal of Q&A from Appendix A of the ISFSI USAR

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ X NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ X NO Involve a change in the Technical Specifications/License Conditions?  
☒ X YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ X NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ X NO Involve a Significant Unreviewed Environmental Impact?

Prepared by: Todd Baumbach J.E. RENNICK Department: Sargent & Lundy Date: 8/8/00  
Todd Baumbach  
 PRINTED NAME AND SIGNATURE

☒ X YES ☐ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: Bob Beall  
 PRINTED NAME  
Bob Beall  
 SIGNATURE

Work Group: NFM

Date: 10/13/00

Resp. Ind.: Chris Dobry  
 PRINTED NAME  
Chris Dobry  
 SIGNATURE

Work Group: PES

Date: 10/19/00

Resp. Ind.: Getachew Tesfaye  
 PRINTED NAME  
Getachew Tesfaye  
 SIGNATURE

Work Group: NRM

Date: 10/18/00

Approved ☒ Disapproved ☐  
 Signature Vic Suchodolski  
 INDEPENDENT REVIEWER  
 Date 1/8/2000

Approved ☒ Disapproved ☐  
 Signature W.E. Kemper  
 GS-DES, GS-TSES, or PE-PDSU  
 Date 10.20.00

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 00-092 Date: 10/25/00

Recommend ☒ Recommend ☐ Signature J.H. Cea Date 10/26/00  
 Approval Disapproval  
 POSRC CHAIRMAN

Approved ☒ Disapproved ☐ Signature W.E. Kemper Date 10/26/00  
 PLANT GENERAL MANAGER

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES ☒ NO  
 Signature: W.D. Russell Date: 3/7/01  
 OSSRC SES Chairman

If yes, OSSRC Meeting No. \_\_\_\_\_



ACTIVITY: UCR 00104

50.59 Log No.:

72.48 Log No.:

SE00153

**Proposed Activity:**

This activity (UCR 00104) involves the removal of questions/responses from Appendix A of the Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR). The questions being deleted, and the basis for deletion, are shown on Attachment 1 of this evaluation. The questions/responses contained in the ISFSI USAR, Appendix A are the formal NRC questions and the BGE responses that were generated during the initial licensing of the ISFSI. The majority of the responses have been incorporated into the USAR text. However, many of the questions/responses (see Attachment 1) go beyond the level of detail required in the USAR and will be deleted.

NUREG-1536, Final Report, published January 1997, "Standard Review Plan for Dry Cask Storage Systems" was reviewed and verified that no USAR information deleted was described in the NUREG-1536.

This activity is supported by NEI 98-03, Revision 1 "Guidelines for Updating Final Safety Analysis Reports", which has received NRC endorsement per Regulatory Guide 1.181. Specifically, Appendix A, Page 4 of NEI 98-03, Revision 1 states:

*"The following types of excessively detailed textural information may be removed from UFSARs, except as indicated by applicable regulatory guidance or NRC Safety Evaluation Reports:*

*Criterion 1 – Descriptive information that is not important to providing an understanding of the plant's design and operation from either a general or system functional perspective, e.g., component model numbers*

*Criterion 2 – Design information that is not important to the description of the facility or presentation of its safety analysis and design basis, e.g., component details such as specific motor horsepower ratings for MOVs*

*Criterion 3 – Design information that, if changed during the life of the plant, would have no impact on the ability of plant systems, structures, and components described in the UFSAR to perform their design basis function(s), e.g., specific HVAC equipment capacity and flow rate information for structures that do not contain equipment that performs design basis functions*

*Criterion 4 – Analytical information, e.g., detailed calculations, that is not important to providing an understanding of the safety analysis methodology, input assumptions and results, and/or compliance with relevant regulatory and industry standards."*

NOTE: The last column on Attachment 1 identifies which of the above criteria is used as a basis for deleting the associated question/response from Appendix A of the ISFSI USAR.

An NEI document titled, "NEI 98-03, Revision 1, Guidelines for Updated FSARs", signed by Anthony R. Pietrangelo, NEI Licensing Director, dated June 30, 1999 was distributed to utilities. This document consists of a series of Utility questions and NEI answers relating to specific implementation of NEI 98-03. Specific to removal / maintenance of question / response issues, Question 11 from "NEI 98-03, Revision 1, Guidelines for Updated FSARs" inquired about the status of formal NRC questions and responses with respect to inclusion in the UFSAR. The NEI response states as follows:

*"The Q & A that were submitted to the NRC during review of the initial license application remain in the docket file. Per the Questions and Responses (Q & R) Concerning the Updated Rule provided in GL 80-110 and GL 81-06, the responses should have been appropriately incorporated in the "body" of the updated FSAR. It would be expected that the level of detail used when including the responses in the FSAR would not exceed the level of detail for information that was typically included in the FSAR at that time. Some responses may not warrant incorporation in the FSAR at all, e.g., where a response provided additional information to justify the adequacy of the FSAR as written. While licensing practices may vary with respect to consideration of the Q & R as part of 10 CFR 50.59 evaluations, the Q & R are not considered part of the UFSAR and are therefore not within the scope of 10 CFR 50.59. To the extent responses are incorporated in the body of the UFSAR or as a separate volume, the information is subject to 10 CFR 50.59.*

<b>ACTIVITY:</b>	<b>UCR 00104</b>	<b>50.59 Log No.:</b>	<b>72.48 Log No.:</b>	<b>SE00153</b>
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*Commitments made in the responses, regardless of whether they were incorporated in the FSAR, remain commitments in the docket file unless the licensee has taken appropriate actions to revise or remove them.*

*Because the Q&R are not considered part of the UFSAR, they are not "historical information" as that term is used in NEI 98-03. Q&R information incorporated into the body of the FSAR would be historical only if it meets guidelines for historical information provided in NEI-98-03."*

The inclusion of the NRC questions and BGE responses into the USAR was done as a matter of convenience by BGE, and was not required by the NRC.

Relevant historical examples of applications for Appendix A in the ISFSI USAR include:

- The BGE response on USAR, Page A.3-7. The response stated, "Since the governing load combinations are not affected by this change, the SAR need not be revised." It is indicative from this response that the NRC did not consider the BGE responses part of the SAR text.
- In other instances, BGE stated that the SAR would be revised based on the NRC questions. For example, the response to question DSC-2 (USAR, Page A.C-1) states that SAR Tables 8.2-9 and 8.2-10 would be revised.

#### **Reason for Activity:**

Many of the questions/responses contained in Appendix A of the USAR contain excessive detail that goes beyond that typically required in the USAR. Additionally, engineers reviewing the USAR for 72.48 safety evaluations must look in more than one location (the text and Appendix A) to verify that the activity does not result in a change to the USAR. Incorporating the responses into the text and eliminating the ones whose detail exceeds that required of the USAR will make the task of reviewing the USAR easier.

#### **Function(s) of affected SSCs:**

NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. There are three major components of the NUHOMS-24P system. Those three components are: 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); and 3) Horizontal Storage Module (HSM).

NUHOMS-24P – the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules are being built incrementally, as needed, to match BGE's requirements for additional storage. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for storage.

Dry Shielded Canister (DSC) – the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. The DSC is designed to fit securely in the TC and to slide into the HSM from the TC. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Task Cask (TC) – the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for down ending / up righting and lifting of the cask in the Auxiliary Building. The two lower trunnions service as the axis of rotation during down ending / up righting operations and as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Horizontal Storage Module (HSM) – each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure that consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are

<b>ACTIVITY:</b>	<b>UCR 00104</b>	<b>50.59 Log No.:</b>	<b>72.48 Log No.:</b>	<b>SE00153</b>
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two-foot thick interior walls that separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide temporary storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

**Criticality Control** – The DSC design provides for sub-criticality during the wet loading, DSC drying, and interim storage operations. This is accomplished by a combination of mechanical separation of the fuel assemblies by the internal basket assembly and neutron absorption in the steel guide sleeve material.

**Fuel Support and Configuration Control** – The DSC internal basket assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accidents, including a cask drop, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that retrieval of intact fuel assemblies is not assured. The structural characteristics of the Transfer Cask (TC) and the DSC limit the deceleration loads on the fuel assemblies so that their integrity is assured in the worst-case drop accident.

**Shielding** – The DSC materials provide gamma radiation shielding. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC loading into the Horizontal Storage Module (HSM) and at the HSM door during storage. The shielding function is achieved by the outer canister portion of the DSC.

**Thermal** – Decay heat is removed by thermal radiation and conduction from the DSC to the TC, and the thermal radiation and conduction and convection from the DSC and the HSM. The DSC maintains the helium cover gas, which is required for corrosion control. This cover gas improves the thermal performance of the DSC. The decay heat removal function is achieved by the outer canister portion of the DSC.

SAR Revision No.: 9

SAR Sections Reviewed: All, including Appendix A

Tech Spec Bases Amendment/Rev No.: 2

Tech Spec Bases Reviewed: 2 and 3/4

**Complete for 50.59 and 72.48:**

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ Yes    ☒ No    May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:** The activity involves the deletion of several questions/responses (See Attachment 1) from Appendix A of the ISFSI USAR. The drawings and calculations referred to in the questions/responses are controlled under a BGE engineering document control procedures. Changes to these documents are subject to independent verification and supervisory approval. Information important to safety is not deleted. As shown in Attachment 1, each of the deletion meets one of the criteria of NEI 98-03 for the acceptable deletion of information from the USAR. The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased due to this administrative activity. No physical modification to the facility is being made due to this activity. This activity does not degrade the reliability of components required to support the plant safety functions since the design of the facility is unchanged.

ACTIVITY:	UCR 00104	50.59 Log No.:	72.48 Log No.:	SE00153
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- ☐ Yes    X    No    May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction: The BGE responses that are being deleted made changes to the SAR text and other assorted documents (drawings, calculations, etc.) when required to satisfy NRC requirements/requests. In many instances, the BGE response simply justified the existing design. The activity is administrative in nature and does not result in a physical change to the ISFSI facility or the manner in which it is operated or maintained. Therefore, the consequences of a malfunction of equipment important to safety previously evaluated in the SAR are not increased by this activity.

- ☐ Yes    X    No    May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident: Credible accidents analyzed for the ISFSI facility are described in Section 8.2 of the USAR. Any changes to the controlled documents associated with the questions/responses being deleted are subject to independent review and are controlled under BGE engineering document control procedures. Information important to safety is not deleted in this activity. As shown in Attachment 1, each of the deletion meets one of the criteria of NEI 98-03 for the acceptable deletion of information from the USAR. Therefore, the probability of an accident previously evaluated in the SAR will not be increased.

- ☐ Yes    X    No    May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident: Because this activity is administrative in nature and does not result in a physical change or modification to the ISFSI facility, the consequences of an accident, including radiological dose consequences, previously evaluated in the SAR will not be increased.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

- ☐ Yes    X    No    May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: No new equipment, procedures, or tests are being added to the ISFSI facility as a result of this activity. No physical changes are being made to existing ISFSI equipment. Information important to safety is not deleted. As shown in Attachment 1, each of the deletion meets one of the criteria of NEI 98-03 for the acceptable deletion of information from the USAR. Therefore, the possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created.

- ☐ Yes    X    No    May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: This activity is administrative in nature and does not result in any physical changes to the ISFSI facility. No new equipment, procedures, or tests will result from this change. Therefore, the possibility of an accident of a different type than any previously evaluated in the SAR will not be created.



ACTIVITY: UCR 00104

50.59 Log No.:

72.48 Log No.:

SE00153

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐

Yes

X

No

Will the margin of safety as defined in the basis for any Technical Specification be reduced?

BasesDiscussion of why the margin of safety is not reduced

2.3

The deletion of questions / responses pertaining to the transfer cask drop analysis (Bases 2.3) will not result in a reduction in the safety margin of the Technical Specifications. No physical change to the facility is being made due to this activity. The changes are administrative in nature. Any changes to the calculations associated with these questions / responses are controlled under BGE engineering document control procedures and processes that require independent verification and supervisor approval for revision.

2.4

The deletion of questions / responses pertaining to the horizontal storage module dose rates (bases 2.4) will not result in a reduction in the safety margin of the Technical Specifications. No physical change to the facility is being made due to this activity. The changes are administrative in nature. Any changes to the calculations associated with these questions / responses are controlled under BGE engineering document control procedures and processes that require independent verification and supervisor approval for revision.

3 / 4.5

The deletion of questions / responses pertaining to the forest fire analysis (Bases 3 / 4.5) will not result in a reduction in the safety margin of the Technical Specifications. No physical change to the facility is being made due to this activity. The changes are administrative in nature. Any changes to the calculations associated with these questions / responses are controlled under BGE engineering document control procedures and processes that require independent verification and supervisor approval for revision.

Complete for 72.48:☐

Yes

X

No

Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose: The changes associated with this activity are administrative in nature and will result in no physical changes to the ISFSI facility. No new tests, experiments, or procedures are generated as a result of this activity. Therefore, the proposed activity will not result in an increase in occupational dose.

☐

Yes

X

No

Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: No physical changes are made to the ISFSI facility. No changes are being made to the manner in which the ISFSI facility is being operated or maintained. Therefore, this administrative activity will not result in an unreviewed environmental impact.

<b>ACTIVITY:</b>	<b>UCR 00104</b>	<b>50.59 Log No.:</b>	<b>72.48 Log No.:</b>	<b>SE00153</b>
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**Summary: (For NRC Report, provide a brief overview)**

This activity deletes questions / responses from Appendix A of the ISFSI USAR. No physical changes to the ISFSI facility are being made by this proposed activity. No new tests, experiments, or procedures result from this activity. The information being deleted by this activity is not required per the guidance of NUREG-1536 (SRP for Dry Cask Storage Systems). It constitutes excessive detail as defined in NEI 98-03, revision 1, "Guidelines for Updating Final Safety Analysis Reports".

**USQ Determination:** This activity was evaluated against the criteria of 10CFR72.48(a)(2), such as the probability of occurrence or the consequences of an accident or the malfunction of equipment important to safety, and it was concluded that it does not involve an unreviewed safety question (USQ).

ACTIVITY: UCR 00104

50.59 Log No.:

72.48 Log No.:

SE00153

## Attachment 1

Page	Question	Basis for Deletion	Criterion
A.3-1 through A.3-7	N/A	The question/response pertains to stress analysis calculations that are beyond the level of detail required in the SAR. The BGE Response simply justified previously submitted information.	4
A.7-1	7.0-1	The question was simply asking the current status of BGE administrative processes with respect to the ISFSI. The Performance Improvement Plan no longer exists.	3
A.8-1 through A.8-4	8.0-9 (Additional Information) SAR Table 8.2-8	The questions/responses are centered on the forest fire analysis (calculation), or the specific details of how spacer disc stresses were calculated (BGE calculation 001.020), that go beyond the level of detail required in the SAR. The forest fire calculation was revised in 1998 and the USAR will be revised via approved 10CFR72.48 safety evaluation SE000152.	4
A.A-1 through A.A-6	Drawing-2, -3, -5 through -8, -10 through -13, 085-1, 087-1	The BGE response referred to revised drawings. No changes were required.	1
A.C-1 through A.C-3	DSC-1, -2, -4, -6 through -8	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. Changes to conform to NRC request/requirements were made, where required.	4
A.D-1	DSC-SUPT-1	The BGE response simply provided a revised calculation.	1
A.D-1	DSC-SUPT-3	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. No changes to the calculation were required.	4
A.D-1	DSC-SUPT-4	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. The BGE response simply justified the existing design.	1
A.D-2 through A.D-4	DSC-SUPT-5	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. The BGE response simply justified the existing design. No changes to the calculation were required.	1
A.F-1	HSM-1	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. The BGE response simply justified the existing design. No changes to the calculation were required.	4
A.F-2 through A.F-9	HSM-4	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. SAR changes to conform to NRC requests/requirements were made, where required.	4
A.F-10	HSM-5	This is an editorial comment, as noted in the NRC question.	1
A.G-1	TC-4	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. The BGE response simply justified the existing design. No changes to the calculation were required.	4
A.H-1 through A.H-3	YOKE-1	The question/response is associated with a calculation that goes beyond the level of detail required in the SAR. Changes to conform to NRC requests/requirements were made, where required.	4

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PROPOSED ACTIVITY NO: ES19980041050.59 Log No.: N/A72.48 Log No.: SE00154

Based on this 10 CFR 50.59/10 CFR 72.48 evaluation, does the Proposed Activity:

☒ YES ☐ NO

Require a License Amendment for a change to the Technical Specifications/License Conditions?

☒ YES ☐ NO

Require a License Amendment because it meets one (or more) of the eight (8) criteria of 10 CFR 50.59( c)(2)/10 CFR 72.48( c)(2)?

Prepared by: B. H. Scott/ M. KaiseruddinDepartment: MEU/Sargent & LundyDate: 7/9/01

PRINTED NAME AND SIGNATURE

☒ YES ☐ NO

Are cross-disciplinary concurrence reviews needed?

If 'YES', document completion of these reviews below:

Responsible Individual

Responsible Individual

Responsible Individual

G. Tesfaye

J. E. Remeniuk

R. H. Beall

PRINT NAME

PRINT NAME

PRINT NAME

Licensing

Project Management

NFM

PRINT ORGANIZATION

PRINT ORGANIZATION

PRINT ORGANIZATION

SIGNATURE

DATE

SIGNATURE

DATE

SIGNATURE

DATE

Print/Signature:

J. R. Sponsel

Print/Signature:

ESLUDLOW

INDEPENDENT REVIEWER

GS-DES, GS-TSES, or PE-PDSU

Date:

7/12/01

Date:

7/12/01

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 01-055Date: 7/18/01Recommend  
Approval☒Recommend  
Disapproval☐

POSRC CHAIRMAN

Date 7/18/01

Approved

☒

Disapproved

☐

PLANT GENERAL MANAGER

Date 7/18/01

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES☐ NO N/A

Print/Signature:

W T RussellDate: 9/11/01

OSSRC SES Chairman

If "YES", OSSRC Meeting No. \_\_\_\_\_

LAR reviewed and approved  
at OSSRC MTG 01-04  
on July 26, 2001.



## ATTACHMENT 3, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM (Page 2 of 13)

PROPOSED ACTIVITY NO: ES19980041050.59 Log No.: N/A72.48 Log No.: SE00154Proposed  
Activity  
(Description):

The proposed activity consists of making changes to the Independent Spent Fuel Storage Installation (ISFSI) USAR [Refs. 1 and 2]. The changes are based upon six new analyses performed to document the fuel assembly structural integrity under Transfer Cask drop scenarios. The analyses are documented in Constellation Nuclear / Calvert Cliffs Nuclear Power Plant (CCNPP) calculations CA04678, CA04679, CA04680, CA05673, CA05797 and CA05760 [Refs. 3 through 5, 14, 18, and 19].

The proposed activity addresses the fuel assemblies utilized in Units 1 and 2, batches A through J. The above mentioned calculations are based on a fuel assembly mass of 1450 lbs., which is conservative compared to the Tech Spec limit of 1300 lbs. In compliance with the Tech Sec limit, only those fuel assemblies with masses less than 1300 lbs. will be loaded into the ISFSI.

The changes to the USAR consist of the following:

1. Section 3.3.4.1, second paragraph, is being revised to replace the phrase "the DSC basket is designed to maintain the fuel configuration after a drop accident", with the phrase "the DSC basket is designed to keep the fuel assemblies separated from each other even after a drop accident".
2. Section 4.2.3.2, fifth paragraph, is being revised to delete the following sentences, "Additionally, the structural characteristics of the cask and DSC limit the deceleration loads on the fuel assemblies so that their integrity is assured in the worst case drop accident (Reference 4.4). Thus, retrievability of fuel from the ISFSI and from the DSC is assured, even following the maximum credible accident".
3. Section 5.1.1.9 is being revised to state that the DSC, transfer cask, and fuel shall be examined following any accidental drop.
4. Section 8.2.5.2 is being revised to replace the last sentence about fuel integrity with several paragraphs, which discuss the integrity of each of the components of the fuel assembly based on the new analyses.
5. Section 8.4 is being revised to add new references 8.33 through 8.39.

A review of the Technical Specifications has revealed that the following changes need to be made in them, based on the proposed activity.

1. Section 2.3: The ACTION statement will be revised to delete the phrase "from a height greater than 15 inches, (0.38 m)".

In addition, the basis for the above Technical Specification Section will be revised to delete the last sentence, which is related to the 15" drop height.

Background

The Independent Spent Fuel Storage Installation (ISFSI) at the Calvert Cliffs Nuclear Power Plant (CCNPP) stores spent fuel assemblies within Dry Shielded Canisters (DSCs). Twenty-four spent fuel assemblies are loaded into each DSC. Each DSC contains an outer leak-tight shell and an internal basket assembly. The outer shell provides the structural strength, shielding, and a leak-tight chamber for containing helium. The internal basket assembly includes twenty-four stainless steel guide sleeves (one for each spent fuel assembly), nine perforated carbon or stainless steel spacer discs,

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and four carbon or stainless steel support rods. The nine spacer discs are spaced out along the length of the DSC at locations that approximately coincide with the spent fuel assembly's eight spacer grids and the single lower retention grid. The spacer discs are not structurally attached to the DSC shell walls or inner cover plates. The guide sleeves traverse the length of the DSC cavity through openings in the nine spacer discs. Four support rods are used to maintain the spacer disc locations. The support rods traverse the length of the DSC cavity through the spacer discs, and are structurally welded to the spacer discs. The DSC is loaded into a Transfer Cask (TC) for transporting it to the storage facility, where it is placed in a Horizontal Storage Module (HSM) for a long-term on-site storage.

While an accidental drop of the TC is not considered credible, it is still postulated to occur, and its impact on the integrity of the DSC and TC is analyzed in detail and documented in the USAR. The impact of the drop on the integrity of the fuel assemblies was not analyzed, but was inferred from a Lawrence Livermore National Laboratory Report [Ref. 7].

As part of the 1998 Calvert Cliffs Nuclear Power plant "Independent Spent Fuel Storage Installation (ISFSI) Loading Restart Recovery Project," CCNPP performed an extensive evaluation of the documentation available for the Dry Shielded Canister (DSC) and its internals, to ensure that all its licensing requirements are satisfied. During the evaluation, CCNPP discovered that the spent fuel assembly safety, during a TC/DSC accident drop scenario, was not adequately demonstrated in Ref. 7, which was widely used by industry as it was distributed by the NRC. A review, by CCNPP, of the Lawrence Livermore report revealed that only the cladding was evaluated for structural adequacy. Other components of the CCNPP spent fuel assembly were not evaluated in the Lawrence Livermore report. The failure of these components could compromise the integrity of the fuel rod cladding, affect the center-to-center distance between fuel rods which could impact the criticality and thermal evaluations, and could hinder the retrievability of the spent fuel assembly from the DSC. Further, the latest NRC guidance [Ref. 8] has raised questions about the method and assumptions used in the analysis of the fuel rods. New analyses were prepared to address these issues.

The Westinghouse/CE 14X14 fuel assemblies, utilized by CCNPP, are approximately 157 inches in length and approximately eight by eight inches square in cross section. Each fuel assembly contains one hundred and seventy-six, 0.44 inch diameter fuel rods, which are closely bundled together. The fuel rods are held in place by an assembly of eight spacer grids, one retention grid, five guide tubes, an upper end fitting, and a lower end fitting. Each fuel rod contains spent nuclear fuel pellets, encased in a Zircalloy cladding. The cladding performs the safety function of preventing the release of fission product. Twenty-four spent fuel assemblies are loaded into a DSC. Within the DSC, the fuel assemblies are loosely held in place by guide sleeves belonging to the internal basket assembly.

**New Analyses**

New analyses were prepared to determine the response of fuel assembly components to a postulated TC/DSC drop. Reference 3 was prepared first to evaluate the response of all of the fuel assembly components. Subsequently, References 4 and 5 were prepared to

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perform more detailed evaluations of the spacer grid and the upper end fitting (UEF), and therefore, supersede specific portions of Reference 3 associated with these components. Reference 3 documents the responses of fuel rods, guide tubes, lower end fitting (LEF) and the retention grid. In these analyses, the DSC was not credited with providing any reduction in the deceleration of fuel assemblies during the drop.

The mass of the fuel assembly used in these analyses was such that it enveloped different types of fuel. Reference 6 provides the variations in fuel assembly masses. The maximum mass is seen from the Reference as 1360 lbs., to which 80 lbs. should be added to address the possibility of having control components included in an assembly. Therefore, the maximum fuel assembly mass was conservatively taken as 1450 lbs. It is noted, however, that CCNPP is currently limited by its Tech Specs to load into the ISFSI only those fuel assemblies whose masses are less than 1300 lbs. each.

The temperatures at which the ASME code allowables were determined in all of the analyses envelop the maximum cladding temperature of 635 °F, per Technical Specification 3.4.1.

The objectives of Reference 3 were to evaluate the fuel assembly retrievability and criticality following a drop. Fuel assemblies from Units 1 and 2 batches A-J were included in the evaluation. Axial drops, both right side up and upside down, and lateral drop were analyzed for the licensing basis deceleration of 75g. The oblique drop was not analyzed, however, the design basis deceleration for the oblique drop is bounded by the design basis decelerations of axial and lateral drops. The axial drop analysis was based on the results of a similar analysis reported in the Electric Power Research Institute (EPRI) report, EPRI NP-7419 [Ref. 9]. The lateral drop analysis was performed using finite element methodology, through which Von Mises stress intensities were calculated and compared against the allowables. Selected results of Reference 3 were updated by Reference 20 for a minor change in one of the parameters.

The calculated stress intensities and the allowables, in units of ksi, are tabulated below.

	<u>Lateral</u>	<u>Axial (Right Side Up)</u>	<u>Axial (Upside Down)</u>	<u>Allowable</u>
Fuel Rods	46.84*	30.3 (for a weaker 17X17 fuel at 88g)	<30.3	58.95
Guide Tubes	51.43*	44.59	44.59	57.96*
LEF & Reten- tion Grid	4.075	36.45	Insignificant	57.15

\*Taken from Reference [20].

It is seen that the calculated stresses are less than the allowables, therefore, no failures would occur.

Reference 4 analyzed the response of UEF flow plate, based on the consideration of the elastic-plastic material behavior. The analysis considered a top-end vertical drop scenario, which is the most limiting scenario for the UEF. The acceptance criterion used was the lack of failure, rather than meeting the code minimum stress and strain values. It was determined that after a 75g drop the UEF ligaments would not fail, and that at

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least a factor of 2 margin would be available against ductile tearing.

Reference 5 analyzed the structural integrity of spacer grids, in order to demonstrate fuel retrievability and cladding integrity. The guide sleeve, in which the assembly resides, was assumed to be perfectly rigid for conservatism. An equivalent static impact force of 75g was used in the analysis to represent the worst case loading experienced by the spacer grids during a DSC accidental horizontal drop. The Zircaloy-4 spacer grid, as a part of a spent fuel assembly is expected to be irradiated and thus exhibit brittle behavior. Nonetheless, both brittle and ductile (un-irradiated) cases were considered in the calculation.

Based on the results of this evaluation, it was determined that major structural damage of the spacer grid would occur from a 75g accident drop scenario for both ductile and brittle material behavior assumptions. The evaluation also showed that some damage would occur to the spacer grids even for drop heights of less than 15 inches, for both ductile and brittle material behavior assumptions. Therefore, ISFSI Technical Specification 2.3 criterion of a drop height of 15 inches or more for the fuel assemblies to be inspected for damage is incorrect. Also, the ISFSI USAR assertion, of a reasonable assurance that no damage would occur for drop heights of less than 15 inches, is incorrect. In addition, the perimeter strip would likely fail at the lower levels of the spacer grid and thus allow fuel rods to be relocated from their original grid locations, and create the possibility of one of them getting wedged against the guide sleeve. It was further determined that, with this possibility, an additional pull force of about 220 lbs. would be required for retrieving the fuel assembly from the DSC. This additional required pull force is less than the pull force required in case of clip angle failure scenario [Ref. 12], for which the fuel assembly retrievability was previously determined to be feasible. Therefore, retrievability of the fuel assembly from the DSC would not be compromised.

The effect of impact of a broken spacer grid fragment, during a horizontal drop, on the fuel rod cladding was investigated [Ref. 18]. Various cladding vs. fragment orientations and edge conditions were considered. The maximum cladding wall stress was found to be less than the allowable stress of 80.5 ksi.

The failure of spacer grids was determined also to cause a change in the fuel rod pitch from 0.58 inch to 0.465 inch. The impact of this pitch reduction was evaluated in Reference 14. The cases evaluated were: an optimum density helium moderated and 0, 25, 75 and 100% collapsed localized assembly, an unborated fully moderated 0, 25, 75 and 100% collapsed localized assembly, and an unborated fully moderated 0, 25, 75 and 100% collapsed DSC system. In all of the above cases the  $k_{eff}$  was calculated to be below the regulatory limit of 0.95.

Reference 19 evaluated the cladding temperature for the reduced rod pitch, and determined that it would be lower than that for the normal rod pitch because of better conductivity of the new arrangement.

## References:

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 9
2. CCNPP ISFSI USAR Change Request, UCR-00180



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	<ol style="list-style-type: none"> <li>3. CCNPP Calculation CA04678, Rev. 0000, BGE (Calvert Cliffs Units 1 &amp; 2) ISFSI Dry Storage Cask Drop Analysis</li> <li>4. CCNPP Calculation CA04679, Rev. 0000, ISFSI Fuel Assembly Upper End Fitting Structural Integrity</li> <li>5. CCNPP Calculation CA04680, Rev. 0000, ISFSI CE 14X14 Fuel Grid Horizontal Drop Evaluation</li> <li>6. BGE Memorandum NEU 99-164, from T. A. Schearer to G. V. Patel, et al., 7/7/1999</li> <li>7. Lawrence Livermore National Laboratory Report, UCID-21246, Dynamic Impact Effects on Spent Fuel Assemblies, 10/20/1987</li> <li>8. NRC Interim Staff Guidance ISG-12, Rev. 1, Buckling of Irradiated Fuel Under Drop Conditions</li> <li>9. Electric Power Research Institute Report, EPRI NP-7419, Fuel-Assembly Behavior Under Dynamic Impact Loads Due to Dry-Storage Cask Mishandling, July 1991</li> <li>10. CCNPP Issue Report IR3-007-608, 03/04/1998</li> <li>11. Technical Specifications for Calvert Cliffs ISFSI, Amendment 3</li> <li>12. CCNPP Calculation CA04132, Rev. 0003, Nutech Horizontal Module System (NUHOMS) 24P ISFSI Dry Shielded Canister Structural Analysis for DSC Numbers R001-R024</li> <li>13. CCNPP Calculation CA04141, Rev. 0002, ISFSI Transfer Cask Structural Analysis</li> <li>14. CCNPP Calculation CA05673, Rev. 0000, Criticality Analysis for Dropped Fuel Storage Cask</li> <li>15. NEI 96-07, Rev. 1, Guidelines for 10 CFR 50.59 Safety Evaluations, 11/00</li> <li>16. NRC Interim Staff Guidance ISG-3, Rev. 0, Post Accident Recovery</li> <li>17. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1</li> <li>18. CCNPP Calculation CA05797, Rev. 0000, DSC Horizontal Drop – Fuel Rod Cladding Integrity during Impact with a Broken Spacer Grid Fragment</li> <li>19. CCNPP Calculation CA05760, Rev. 0000, Effective Conductivity of the Reconfigured Fuel Assembly</li> <li>20. Hopper and Associates Letter HABGE-02/01-0952, ITR Issue Resolution – Fuel Rods and Guide Tubes, 02/13/01</li> </ol>
Reason for Activity:	<p>This activity is being carried out in part to resolve Issue Report IR3-007-608 [Ref. 10]. The report was written to identify the issue related to the fuel assembly integrity. The ISFSI USAR claimed, based on the Lawrence Livermore Report [Ref. 7], that the fuel assembly integrity was maintained during and following a cask drop. A review of the report showed that it evaluated only the cladding, but not any of the other fuel assembly components.</p> <p>The design objectives of the dry storage system include ensuring that the retrieval of fuel assemblies is still assured and that the fuel rod integrity is not compromised, following the worst case postulated cask drop accident,</p> <p>ISFSI Technical Specifications Section 2.3, "Transfer Cask", states that the transfer cask lifting height with a non-single-failure-proof lifting device shall not exceed 80 inches. The Technical Specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected. Therefore, retrievability of</p>

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	<b>72.48 Log No.:</b> <u>SE00154</u>

	<p>fuel from the DSC is demonstrated through analyses. The stipulation of 15 inches drop height needs to be deleted, so that the inspection of the DSC will be required after a drop from any height.</p> <p>ISFSI Technical Specifications Section 3.4.1 limits the maximum air temperature rise within the Horizontal Storage Module. This is based on limiting the temperature of the hottest rod in the DSC to below 635°F. The potential impact of a reduction in rod pitch on cladding temperature is addressed in this safety evaluation.</p>
Function(s) of affected SSC:	<p>The affected SSCs are the spent fuel assemblies from Units 1 and 2, batches A through J. CCNPP utilizes Westinghouse/CE 14X14 design fuel assemblies. Each fuel assembly contains one hundred and seventy-six fuel rods, which are 0.44-inch diameter each. The fuel rods are held in place by a set of eight spacer grids, one retention grid, five guide tubes, an upper end fitting, and a lower end fitting. Each fuel rod contains spent nuclear fuel pellets, encased in a Zircalloy cladding. The cladding performs the safety function of containing the fission products and preventing their release. The guide tubes, spacer grids, and end fittings form the structural frame of the assembly. The fuel assembly structural components are also effective in limiting bending stresses in fuel rod cladding, and in improving fuel rod stability under axial loads. The spacer grids maintain the fuel rod pitch over the length of the assembly. The grids provide positive side restraint to the fuel rods, but only a frictional restraint axially. The spacer grids are the widest part on a fuel assembly and are welded to all five guide tubes. The four outer guide tubes are mechanically attached to the end fittings. The upper end fitting attaches to the guide tubes to serve as an aligning and lifting device.</p> <p>The fuel rods are held together in the assembly at a pitch of 0.58 inch, which helps to control reactivity. The rods consist of enriched uranium fuel pellets stacked within a Zircalloy cladding tube. The cladding is the first barrier that prevents the fission products from escaping to the outside.</p>
UFSAR Sections reviewed where relevant information was found:	Tech Spec Sections reviewed where relevant information was found:
<p>ISFSI USAR Revision No.: 9</p> <p>ISFSI USAR Sections Reviewed:</p> <p>The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key Sections reviewed are listed as follows:</p> <ul style="list-style-type: none"> <li>1.2.1 General Description</li> <li>3.1.1 Materials to Be Stored</li> <li>3.3.4.1 Control Methods for Prevention of Criticality</li> <li>4.2.1.2 Dry Shielded Canister (Structural Specifications)</li> <li>4.2.3.2 Dry Shielded Canister Description</li> </ul>	<p>Tech Spec Bases Amendment/Rev No.: 3</p> <p>Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License No. SNM-2505, Amendment 3, April 17<sup>th</sup>, 2001</p> <p>ISFSI Tech Spec Reviewed:</p> <ul style="list-style-type: none"> <li>2.3 Transfer Cask (TC)</li> <li>3/4.1 Fuel to be Stored at ISFSI</li> <li>3/4.3.1 Ambient Temperature</li> <li>3/4.4.1 Maximum Air Temperature Rise</li> <li>5.0 Design Features</li> </ul>

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4.7.3 Individual Unit Description  
 5.1.1.2 Fuel Loading  
 5.1.1.9 Removal of Fuel from the Dry Shielded Canister  
 8.1.1.2 Dry Shielded Canister Analysis  
 8.1.1.3 Dry Shielded Canister Internal Basket Analysis  
 8.2.3.2 Earthquake - Accident Analysis  
 8.2.5 Cask Drop

Table 1.2-1 Design Parameters for the Calvert Cliffs ISFSI  
 Table 3.1-1 Principal Design Parameters for Fuel to Be Stored  
 Table 3.3-3 CE 14X14 Fuel Parameters  
 Table 3.3-5 Design Parameters for Criticality Analysis of the DSC  
 Table 3.6-3 Summary of Design Criteria for Accident Conditions  
 Table 8.1-1 Estimated Component Weights  
 Table 8.1-3 Maximum Dry Shielded Canister Stresses for Normal Loads  
 Table 8.1-4 Maximum Dry Shielded Canister Stresses for Off-Normal Loads  
 Table 8.2-1 NUHOMS-24P Accident Loading Identification

Does the proposed activity:

1. ☐ YES ☒ NO

Result in more than a minimal increase in frequency of occurrence of an accident previously evaluated in the UFSAR?

**Justification:**

Frequency of an Accident:

Accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the USAR. The major accidents consist of loss of shielding, external missiles, earthquake, flood, cask drop, lightning, blockage of air inlets and outlets, DSC leakage, DSC overpressurization, and forest fire. Of these accidents, only the cask drop accident and earthquake incident are impacted by this activity. The earthquake scenario is bounded by the cask drop accident, as the acceleration postulated in a design basis earthquake is 1.5g, which is much smaller than the acceleration in the drop accident of 75g. However, the frequency of occurrence of cask drop,

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or any other accident, is not increased by the new analysis of the fuel assembly integrity.

There is no change to the design or operation of the NUHOMS system caused by this activity. This activity does not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected. Therefore, the frequency of occurrence of an accident involving loss of HSM air outlet shielding, or blockage of HSM air inlets and outlets will not increase.

Pressurization of the DSC due to fuel cladding failure is an accident scenario identified in USAR Section 8.2.9. The limiting DSC pressurization accident event is a rupture of fuel cladding together with blockage of the HSM vents. As stated above, the impact of the cask drop on the cladding was evaluated. It was determined that the fuel cladding would not rupture, and fuel rod integrity would be maintained.

DSC leakage is an accident scenario described in USAR Section 8.2.8. The USAR indicates that there are no credible events that would initiate this type of accident. As stated in the preceding paragraphs, the frequency of an accident that would lead to cladding failure is not increased by this activity. This activity does not affect the design of the DSC pressure boundary and therefore does not increase the probability of DSC leakage.

2. ☐ YES ☒ NO

Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the UFSAR?

**Justification:****Likelihood of Malfunction:**

The proposed activity consists of evaluating the spent fuel assemblies contained in a DSC, following a postulated drop, and incorporating the results into the USAR. The analyses were based conservatively on a fuel assembly mass of 1450 lbs., which is higher than the value of 1300 lbs. stated in the USAR and Tech Spec 3.1.1. The analyses showed that the fuel rods, guide tubes, and upper and lower end fittings would maintain their integrity, but the spacer grids would be damaged. A detailed analysis of the damage showed that it would cause the fuel rods to be displaced from their grid location, and potentially get wedged between the assembly and the DSC guide sleeve. However, the analysis also showed that as a result of the wedging the additional force required to retrieve the fuel assembly was estimated to be about 220 lbs. This is less than the pull force required in the previously evaluated scenario of clip angle failure [Ref. 12], for which the fuel assembly retrievability was determined to be feasible. In addition, the fuel rod pitch would reduce from 0.58 inch to 0.465 inch, due to the spacer grid failure. References 14 and 19 established that the decrease in fuel rod pitch would not adversely impact on the criticality control or the cladding temperature.

Therefore, the likelihood of occurrence of a malfunction of equipment important to safety, namely the fuel assemblies, will not be increased.

3. ☐ YES ☒ NO

Result in more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR?

**Justification:****Consequences of Accident:**



**ATTACHMENT 3, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM (Page 10 of 13)****PROPOSED ACTIVITY NO:** ES199800410**50.59 Log No.:** N/A**72.48 Log No.:** SE00154

The proposed activity, namely analysis of fuel assembly integrity, is related to the cask drop accident and earthquake incident, as stated above.

The consequences of the cask drop accident on the fuel assemblies were evaluated in References 3 through 5, 14, 18, and 19. The impact on critical safety functions is discussed below. The critical functions affected will be the configuration and criticality controls, and confinement. Other critical functions, such as the shielding, are not affected by the fuel assemblies.

**Criticality Control:** In the fuel assembly evaluation, the deceleration value of 75g was used for a drop, which ignored any reduction in deceleration provided by the DSC. Reference 5 determined that, following a drop, spacer grids would be damaged, resulting in the reduction of fuel rod pitch to 0.465 inch. Reference 14 evaluated the criticality with reduced rod pitch, and determined that the  $k_{eff}$  would still be less than 0.95. Hence, the criticality control is maintained.

**Configuration Control:** Configuration of fuel assemblies within the DSC needs to be maintained such that the assemblies remain retrievable. During a drop, the spacer grids would be damaged. This could result in a fuel rod being removed from the grid and getting wedged between the fuel assembly and the guide sleeve. It would cause an increase in the extraction force needed to retrieve the fuel assembly. However, the analysis showed that the wedging of the fuel rods would require an additional pull force of only 220 lbs. for fuel assembly removal, which was previously determined to be within the capacity of the spent fuel handling machine. Hence the fuel assembly retrievability is not jeopardized.

**Confinement:** The drop would not rupture or damage the cladding. Therefore, the radioactive fission products would remain confined within the fuel rods.

**Shielding:** The fuel assembly, during a drop, would not impact the radiation shielding properties of the DSC, and the DSC shielding materials. Therefore, there is no increase in the probability of a malfunction of the DSC shielding due to this activity.

**Thermal Control:** The cask drop would result in a reduction of rod pitch. The local cladding temperature was analyzed and determined to be lower than that for the normal rod pitch because of better conductivity of the new arrangement. Therefore, there is no increase in the probability of a malfunction of the DSC thermal control due to this activity.

4. ☐ YES ☒ NO

Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the UFSAR?

**Justification:****Consequences of Malfunction:**

The proposed activity determined that the drop accident would not lead to breaching of the cladding, so that consequences of malfunction of equipment important to safety, namely the radiation dose to operators or radiation releases from ISFSI would not increase.

USAR Section 3.3.4.1 states that criticality control is assured by the physical properties and history of the fuel, mechanical control of the assemblies' locations in the DSC basket, neutron absorption by the materials of the basket, Calvert Cliffs administrative controls over fuel identification and handling, and the presence of soluble boron in the fuel pool for wet operations. None of these parameters would change, however, the rod pitch could decrease from 0.58 inch to 0.465 inch. The impact of this reduction of rod pitch on the criticality was evaluated, and found to be insignificant. Therefore, criticality control would be maintained, and there

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would be no increase in the radioactivity content of the fuel assemblies.

5. ☐ YES ☒ NO

Create a possibility for an accident of a different type than any previously evaluated in the UFSAR?

**Justification:****Possibility of New Accident:**

Accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the USAR, and have been discussed previously. Evaluation of the fuel assembly integrity following a drop accident showed that the fuel assembly would maintain its safety functions. The impacts of the drop accident on other components, such as the DSC, and TC were evaluated previously. The results showed that none of the components would fail to perform their safety functions. Since there is no change to the design or operation of the NUHOMS system caused by this activity, the possibility of an accident of a different type than any previously evaluated in the SAR will not be created.

6. ☒ YES ☐ NO

Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the UFSAR?

**Justification:****Possibility of New Malfunction:**

The proposed activity examines the response of a fuel assembly to a cask drop accident. The evaluation showed that the fuel assemblies would get damaged to certain extent. The components that would get damaged are the spacer grids. Previously, it was inferred from Reference 7 that the fuel assembly would not be damaged. Therefore, the likely failure of fuel assemblies is a malfunction of a different type than any that was previously evaluated in the USAR.

As discussed above, despite the damage the critical functions of the fuel assemblies would remain intact. The cladding would not be breached or ruptured, so that the fission product barrier would be maintained. The criticality would not be a concern, and the thermal response would be within limits. Therefore, the new failure of the fuel assemblies would not cause an adverse impact on safety.

7. ☐ YES ☒ NO

Result in a design basis limit for a fission product barrier as described in the UFSAR being exceeded or altered?

**Justification:**

Analyses demonstrated that one component of the fuel assemblies would get damaged following a drop accident, but the fuel assemblies would continue to be able to perform their safety functions of confinement, criticality control, retrievability, and maintaining the temperature limits. The cladding would not be ruptured, thus would be able to maintain the confinement. Fuel rod geometry would be altered, however, analysis showed that it would not compromise the criticality control. Further, analysis showed that the geometry alteration would impact retrievability, but that the assemblies would still be retrievable with an additional pull force of acceptable magnitude. This maintains the original CCNPP commitment regarding retrievability, although the latest NRC guidance [Ref. 16] states, "Recovery methods or the need for Over-Packs or Dry

**ATTACHMENT 3, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM (Page 12 of 13)****PROPOSED ACTIVITY NO:** ES199800410**50.59 Log No.:** N/A**72.48 Log No.:** SE00154

Transfer Systems to maintain safe storage conditions would then not be considered and evaluated as part of the licensing process." Since the fuel assembly can still be retrieved after a drop accident, and there is no impact to the integrity of the fuel rods and criticality control, the design basis limit for a fission product barrier is not exceeded or altered.

8. ☐ YES ☒ NO

Result in a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses?

**Justification:**

The impact of an accidental drop of the TC on the integrity of the fuel assemblies was not analyzed previously, but was inferred from a Lawrence Livermore National Laboratory Report [Ref. 7]. Subsequently, CCNPP discovered that the spent fuel assembly safety, during a TC/DSC accident drop scenario, was not adequately demonstrated in Ref. 7. A review, by CCNPP, of the Lawrence Livermore report revealed that only the cladding was evaluated for structural adequacy. Other components of the CCNPP spent fuel assembly were not evaluated in the report. The current activity includes an analysis of the components of the fuel assembly, which were not previously analyzed. The evaluation methods used are the ones that have been used before by CCNPP and the industry. Therefore this activity does not involve a departure from a method of evaluation described in the ISFSI-USAR.

**Summary:** (For NRC Report, provide a brief overview)

Proposed Activity: The proposed activity consists of making changes to the ISFSI USAR, which are based on the new analyses performed to document the fuel assembly integrity under Transfer Cask drop scenarios.

The changes being made to the ISFSI USAR consist of providing a summary of fuel assembly integrity evaluation and results.

It has been determined that the proposed activity will require the following Technical Specifications changes.

Section 2.3: The ACTION statement needs to be revised to delete the phrase "from a height greater than 15 inches, (0.38 m)"

Reason for Activity: This activity is being carried out to resolve an issue related to the fuel assembly integrity. The USAR claimed that the fuel assembly integrity was maintained during a cask drop based on the Lawrence Livermore Report UCID-21246. A review of the report showed that it evaluated only the cladding, but not any of the other components of the fuel assembly.

The design objectives of the dry storage system are to ensure that the retrieval of fuel assemblies is assured and that fuel rod integrity is not compromised, following the worst case postulated cask drop accident.

Activity Summary: The integrity of fuel assemblies contained within a DSC, following a postulated 75g drop, was analyzed. The drops considered were a horizontal drop, a right-side-up vertical drop, and an upside-down vertical drop. The oblique drop deceleration is bounded by the decelerations of axial and lateral drops. The analyses consisted of an evaluation of the impact of the drop on all of the fuel assembly components, namely the fuel rods, guide tubes, spacer grids, retention grid, and upper and lower end fittings. The objectives of this evaluation were to determine the impact on safety issues, such as confinement, criticality, cladding temperature, and retrievability.

Stress intensities were calculated for the fuel rods, guide tubes, lower end fitting, and retention grid. The calculated values were below the ASME code allowables for their respective materials. Therefore, none of these components would fail following a drop.

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The UEF was analyzed for its limiting scenario of an upside-down vertical drop. The analysis was based on the consideration of elastic-plastic material behavior. It was determined that the UEF ligaments would not fail, and that at least a factor of 2 margin would be available against ductile tearing.

The spacer grids were analyzed for their structural integrity. Both brittle (irradiated) and ductile (un-irradiated) cases were considered in the calculation. It was determined that a major structural damage of the spacer grid would occur for both ductile and brittle material behavior assumptions. The grid failures could allow fuel rods to be relocated from their original grid locations, and create the possibility of one of them getting wedged against the guide sleeve. It was further determined that, with this possibility, an estimated additional pull force of about 220 lbs. would be required for retrieving the fuel assembly from the DSC. The additional force required is within the capacity of the fuel handling machine. Therefore, retrievability of the fuel assembly from the DSC would not be compromised.

The effect of impact of a broken spacer grid fragment, during a horizontal drop, on the fuel rod cladding was investigated. Various cladding vs. fragment orientations and edge conditions were considered. The maximum cladding wall stress was found to be less than the allowable stress.

The failure of spacer grids was determined also to cause a reduction in the fuel rod pitch. The impacts of this change on the criticality and cladding temperature were analyzed. The criticality calculation determined that the effective multiplication factor ( $k_{eff}$ ) would still be less than 0.95. The cladding temperature evaluation determined that the temperature for the reduced rod pitch would be lower than that for the normal rod pitch because of better conductivity of the new arrangement.

License Amendment Determination: This activity was evaluated against the criteria of 10CFR72.48(a)(2), such as the frequency of occurrence or the consequences of an accident or the malfunction of equipment important to safety. It was concluded that the activity does require a License Amendment for a change to the Technical Specifications, and because it creates the possibility of a malfunction of an SSC important to safety with a different result than that previously evaluated in the ISFSI-USAR.



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ACTIVITY: <u>ES200000755</u>		50.59 Log No.: _____	72.48 Log No.: <u>SE00155</u>
Based on the attached discussion, does this activity: <u>Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations</u> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve an unreviewed safety question (USQ)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve a change in the Technical Specifications/License Conditions? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases? <u>Applicable to 10 CFR 72.48 Safety Evaluations</u> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve a Significant Increase in Occupational Dose? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve a Significant Unreviewed Environmental Impact?			
Prepared by: <u>Mahmoud Massoud</u> <i>M. Massoud</i>		Department: <u>NED</u>	Date: <u>9/6/00</u>
PRINTED NAME AND SIGNATURE			
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Is a special review required by groups other than the group to which the Preparer belongs?			
Resp. Ind.: <u>R. H. Beall</u> PRINTED NAME <i>R. H. Beall</i> SIGNATURE Work Group: <u>NFM</u> Date: <u>9/6/00</u>	Resp. Ind.: _____ PRINTED NAME _____ SIGNATURE Work Group: _____ Date: _____	Resp. Ind.: _____ PRINTED NAME _____ SIGNATURE Work Group: _____ Date: _____	
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <u>I M Sommerville</u> <i>I M Sommerville</i> INDEPENDENT REVIEWER Date <u>9-6-00</u>	Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <i>[Signature]</i> GS-DES, GS-TSES, or PE-PDSU Date <u>9/11/00</u>		
The POSRC has reviewed this evaluation according to NS-2-101. POSRC Meeting No.: <u>00-077</u> Date: <u>9/11/00</u>			
Recommend <input checked="" type="checkbox"/> Disapproval <input type="checkbox"/> Approval <input type="checkbox"/> Signature <i>[Signature]</i> Date <u>9/11/00</u> POSRC CHAIRMAN			
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <i>[Signature]</i> Date <u>9/11/00</u> PLANT GENERAL MANAGER			
The OSSRC has reviewed this evaluation according to NS-2-100. Full OSSRC Committee review required? <input type="checkbox"/> YES <input type="checkbox"/> NO Signature: <u>W. Thunell</u> <i>W. Thunell</i> Date: <u>11/9/00</u> OSSRC SES Chairman If yes, OSSRC Meeting No. _____			

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<b>ACTIVITY:</b>	ES200000755	<b>50.59 Log No.:</b>	72.48 Log No.:	SE00155
Proposed Activity:	As explained in the attached sheets			
Reason for Activity:	As explained in the attached sheets			
Function(s) of affected SSC:	As explained in the attached sheets			
SAR Revision No.:	8	Tech Spec Bases Amendment/Rev No.:		
SAR Sections Reviewed:	8.2	Tech Spec Bases Reviewed:		
<b><u>Complete for 50.59 and 72.48:</u></b>				
1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?
Probability of Malfunction: As explained in the attached sheets				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?
Consequences of Malfunction: As explained in the attached sheets				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the probability of occurrence of an accident previously evaluated in the SAR be increased?
Probability of Accident: As explained in the attached sheets				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the consequences of an accident previously evaluated in the SAR be increased?
Consequences of Accident: As explained in the attached sheets				

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<b>ACTIVITY</b>	ES200000755	<b>50.59 Log No.:</b>	<b>72.48 Log No.:</b>	<b>SE00155</b>
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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ Yes     ☒ No     May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: As explained in the attached sheets

☐ Yes     ☒ No     May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: As explained in the attached sheets

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ Yes     ☒ No     Will the margin of safety as defined in the basis for any Technical Specification be reduced?

<u>Bases</u> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<u>Discussion of why the margin of safety is not reduced</u> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
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ACTIVITY: ES200000755 50.59 Log No.: 72.48 Log No.: SE00155

Complete for 72.48:

☐ Yes ☒ No Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose:

As Explained in the attached sheets.

☐ Yes ☒ No Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact:

As Explained in the attached sheets.

Summary: (For NRC Report, provide a brief overview)

As explained in the attached sheets



72.48 – SAFETY EVALUATION  
ISFSI – SAFETY ANALYSIS UPDATE

**PROPOSED ACTIVITY**

This safety evaluation is prepared to update Section 8.2.9.2 of SAR of the ISFSI to reflect the modified analysis of the DSC internal pressure during accident condition.

**Reason for Activity**

Nuclear Engineering Unit procedures require an owner acceptance review of vendor calculations. During such review of TRANSNUCLEAR WEST (TNW) calculation BGE001.0401, "DSC Internal Pressure, Rev. 1" (NEU calculation CA03947) two discrepancies were detected. The first error, dealt with non-conservative pressure, temperature, and volume used to calculate the helium mass for fuel rods. Correct values of 465 psia, 68 F, and 1.99 in<sup>3</sup> now replace the earlier values of 435 psia, 630 F, and 1.23 in<sup>3</sup>, respectively. Issue report IR1-043-511 was created to trace the resolution of this change. The second discrepancy deals with the helium temperature used in the backfill process of the Dry Shielded Canister (DSC). The correct temperature of 290 F calculated by NEU through a transient analysis replaces 362 F used in the earlier analysis. The latest revision of the TNW calculation now uses the updated values and calculates a higher helium mass available for DSC pressurization in a design base accident. This results in a higher peak pressure of 64.55 psia, which is still less than the pressure limit of 64.7 psia.

**Function of the Affected SSC**

The affected SSC is the DSC. The safety functions of DSC are containment, shielding, criticality control, and heat transfer. The primary function of the DSC is to provide containment for the spent nuclear fuel. Hence, the DSC consists of a stainless steel shell, which is hermetically sealed by welding to the two inner top and bottom cover plates. There are also two outer cover plates welded to the shell to ensure containment integrity. The gamma ray shielding at both ends of the DSC is provided by the use of thick lead plugs. This is to minimize exposure from the top during the DSC drying and sealing process. This is also to minimize exposure from the bottom of the DSC while placed in the horizontal storage module (HSM). The shell thickness provides some radial shielding even though shielding in the radial direction is not a safety function of the DSC.

The internal basket assembly of the DSC provides criticality control. The fuel assemblies are maintained in the desired position by a series of guide sleeves and axial support rods during normal and accident conditions. The location and the thickness of the guide sleeves in addition to the distance between the fuel assemblies provide the criticality control. Heat is transferred from the fuel rods to the DSC shell and the cover plates by a combination of thermal radiation, thermal conduction, and internal natural circulation

mechanisms. The conduction heat transfer takes place through guide-sleeves, spacer grids, as well as the helium cover gas. The internal circulation takes place by the helium gas between the heat source (fuel rods), and the heat sink (DSC shell and cover plates). The DSC shell in turn is air cooled by natural convection provided by ventilation in the horizontal storage module (HSM). Cooling of the fuel rods is essential in maintaining the integrity of the cladding, which serves as the primary containment barrier of the fission gases and prevents oxidation of uranium. Finally, the DSC integrity must be maintained as it acts as the final barrier for the release of fission gases in to the environment. The design pressure limit of the DSC under accident conditions is 64.7 psig. An accident condition is defined as an event leading to the blockage of all HSM vent paths when ambient temperature is 103 F and 30% of fuel rod gases are released in to the DSC.

### **Revised Analysis**

The DSC internal pressure is a factor of the gas mass in the DSC. The contribution to the gas mass in the DSC consists of three components as follows. First, the backfill helium injected into the DSC subsequent to the fuel assembly loading. Second, the fill helium of fuel rods assumed to enter DSC in a hypothetical failure of all rods. Third, the fuel rod fission gases of which 30% is assumed to enter DSC in a hypothetical failure of all rods. Calculation of the mass of each gas requires three parameters namely, pressure, temperature, and volume as detailed below.

Mass of backfill helium. The ISFSI technical specification 2.2.2 for helium backfill specifies a pressure up to 2.5 psig  $\pm$  2.5 psi. A conservative pressure of 5 psig is used in the analysis. As part of this activity the administrative procedure ISFSI-01, "Independent Spent Fuel Storage Installation Procedure" that fills the DSC with helium will be changed to restrict the maximum fill pressure to 2.5 psig. This is to account for 2.5 psi instrument uncertainty. The DSC helium backfill mass is calculated using a DSC volume of 235 ft<sup>3</sup> and a conservatively low temperature of 290 F. The fill temperature is obtained from a transient analysis to ensure the maximum partial pressure is reached due to the injected helium. This results in an additional helium mass of about 9% than originally calculated.

Mass of fuel rod helium. The rod fill helium mass is calculated using revised values for pressure, temperature, and fuel rod gap volume. These are 465 psia for pin pressure, 68 F for gas temperature, and a conservative gap volume of 1.99 in<sup>3</sup> per rod. These changes resulted in a helium mass, which is larger by a factor of about 3.6 compared to the originally calculated helium mass.

Mass of fuel rod fission gases. No discrepancy was found in the calculation of the fission gases. Hence, no change is made and the total moles of the fission gases remain as 194. Using the above mentioned mass of gases, the partial pressure due to the DSC helium backfill is 26.49 psia and the partial pressure due to the fuel rod helium and fission gases is 38.06 psia. Using the design basis accident condition (ambient temperature of 103 F), total DSC pressure reaches 64.55 psia, being below the DSC design pressure of 64.7 psia.

Since the peak pressure in the most conservative circumstance, used in the analysis, is still below the design limit, it can then be concluded that the additional mass of the helium gas does not adversely affect any of the DSC safety functions.

<b>ISFSI USAR Revision No.:</b> .....	8
<b>ISFSI USAR Section Reviewed:</b> .....	8.2.7. and 8.2.9
<b>ISFS Tech Spec. Bases Amendment/Rev. No.:</b>	1
<b>ISFSI Tech Specification Bases Reviewed:</b>	2.2.2 and 2.4

**1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR in not increased**

**Probability of Malfunction**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. This activity involves making changes to fuel parameters assumed in an ISFSI accident analysis for the fuel, to be stored in the BGE Calvert Cliffs ISFSI facility. Critical functions that must be maintained are containment, shielding, criticality control, and thermal safety functions. The probability of a malfunction is only increased if the performance of any equipment or components required to perform the above functions is degraded. In this case, none of these functions are degraded.

The source strength of the gamma and neutron radiation remain within the original design limits and shielding properties are unchanged, thus shielding functions are not impacted by the changes outlined above. The requirements for heat transfer for the DSC to maintain temperatures below normal operating limits are not affected by these changes. The increase in initial temperature of the helium fill gas does not challenge the DSC's containment function since calculated pressures remain below design limits. The DSC and fuel assembly functions to prevent criticality are not impacted by the changes in fuel parameters since the changes in initial uranium mass and fuel pellet diameter are still bounded by the existing criticality analysis. Thus the probability of any malfunctions is not increased.

**Consequence of Malfunction**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. Critical functions that must be maintained are containment, shielding, criticality control, and thermal safety. The probability of a malfunction is increased if the performance of any equipment or components required to perform these functions is degraded. As discussed earlier, none of these functions are degraded. Gamma and neutron source strengths remain within the original design limits and shielding

properties are unchanged, thus shielding functions are not impacted by this change to the fuel parameters. Heat transfer functional requirements for the DSC to maintain temperatures below normal operating limits are not affected by these changes. The increase in initial pressure of helium fill gas does not challenge the DSC's containment function since calculated pressures remain below design limits. The DSC and fuel assembly functions to prevent criticality are not impacted by the changes in fuel gap volume. Therefore, there is no increase in the consequences of malfunction of equipment important to safety. There is no release of gases. Hence there is no consequences.

### **Probability of Accident**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. Accidents affected by this change in fuel parameters include the drop accident, the accidental pressurization, and the blockage of air inlets and outlets. The changes in fuel parameters do not lead to an increased likelihood of any of these accidents. Assembly weights remain unchanged and within acceptable limits, thus the drop accident probability is not increased. The increased moles of the helium fill gas and the fuel rod gap volume does not increase the probability of accidental pressurization of the DSC. This is because, the calculated peak pressure using conservative inputs and assumptions remains below the design limit. There is no change to the operation of the ISFSI system caused by this activity, therefore there is no change to the probability of any analyzed accident.

### **Consequences of an Accident**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. Accidents affected by this change in fuel parameters include the drop accident, the accidental pressurization, and the blockage of air inlets and outlets.

Increases in consequences only occur when doses to the public are increased beyond what were previously calculated. Gamma and neutron source strengths remain within the original design limits and shielding properties are unchanged, thus shielding functions are not impacted by this change to the fuel parameters. The increase in initial temperature of the helium fill gas does not challenge the DSC's containment since the calculated peak pressure remains below the design limit. The DSC and fuel assembly functions to prevent criticality are not impacted by the changes in fuel parameters since the change in the fuel rod gap volume has no effect on the criticality analysis. Additionally there are no changes to



the operations of the ISFSI created by this activity. Therefore, there is no increase in the consequences of accidents evaluated in the SAR. There is no release of radioactive materials to the environment. Hence, there are no consequences.

**2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created**

The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

**Possibility of New Malfunction**

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. This activity involves a revised analysis of the mass of helium in the DSC, to be stored in the CEG Calvert Cliffs ISFSI facility. Critical functions that must be maintained are containment, shielding, criticality control, and thermal safety functions. All fuel parameters remain within acceptable limits, thus no new malfunctions exist. Since the operation of the ISFSI system is not changed by these changes in fuel parameters, no new malfunctions of equipment or materials are involved.

**Possibility of New Accident**

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. The operation of the ISFSI system is not changed by the revised analysis discussed above. Criticality is not affected and all other parameters remain within acceptable limits, thus the possibility of a new accident does not exist.

**3. The margin to safety as defined in the basis for any Technical Specification is not reduced**

The margin of safety as defined in the basis for the BGE ISFSI Technical Specification 2.4 is not reduced since the analysis documents that the stress and dose allowables specified in the FSAR and SER are still maintained. Technical Specification 2.4 requirements for HSM dose rates are associated with initially loaded HSMs. Technical specification 2.2.2 is respected in the analysis. Thus there is no Unreviewed Safety Question.

**Occupational Dose**

An increase in occupational dose will not occur as a result of this activity. The operation of the ISFSI system is not changed by the changes determined in the revised analysis. Gamma and neutron source strengths remain within the original design limits and shielding properties are unchanged, thus occupational doses are not affected.

**Environmental Impact**

An environmental impact will not occur as the result of this activity. Integrity of the DSC or transfer cask is not affected by this activity. Shielding functions of the DSC and the transfer cask are not affected by this activity. This activity does not affect any area of the plant site previously undisturbed for the ISFSI, and does not cause any reason for revision to the ISFSI Updated Environmental Report. The proposed activity does not affect the environmental conditions associated with the ISFSI.

**Summary: (For NRC Annual Report, provide a brief overview)**

This activity involves a change in the ISFSI UFSAR to reflect the revised peak pressure calculated for the DSC. This revised peak pressure is larger than before but still below the design limit. No other parameter is affected. The reason for calculating a new peak pressure for the DSC is the fact that the DSC helium mass is increased due to two factors. First, a more conservative temperature is used for helium during the backfill process to maximize the DSC pressure in the most limiting accident scenario. The second factor is the use of a larger fuel rod gap volume, which increases helium mass stored in each fuel rod.

Gamma and neutron source strengths remain within the original design limits and shielding properties are unchanged, thus shielding functions are not impacted by the change in the fuel gap volume. Heat transfer functional requirements for the DSC to maintain temperatures below normal operating limits are not affected by these changes. The increase in initial temperature of the helium fill gas does not challenge the DSC's containment function since calculated pressures remain below design limits. The DSC and fuel assembly functions to prevent criticality are not impacted by the change in fuel gap volume. Assembly weight and overall DSC weights remain within acceptable limits. Thus the changes do not involve a Unreviewed Safety Question.

NUHOMS-24P design, this accident assumes that the fuel rods and the DSC pressure boundary are ruptured due to an event of unspecified origin.

#### 8.2.8.2 Accident Analysis

There are no structural or thermal consequences resulting from the DSC leakage accident described above. The radiological consequences of this accident are presented in Section 8.2.8.3.

#### 8.2.8.3 Accident Dose Consequences

Whole body and maximum organ doses are calculated for a hypothetical individual assumed to be present at the nearest controlled area boundary location (with respect to the ISFSI, approximately 3900') for the duration of the event. A meteorological dispersion parameter ( $X/Q$ ) of  $3.0 \times 10^{-4} \text{ sec/m}^3$  was used in calculating the maximum potential doses at the 3900' controlled area boundary. The resulting calculated doses are 0.1 mrem and 17.8 mrem for the maximum off-site total body and skin doses, respectively. These accident doses are well within the 10 CFR 72.106 limit of 5000 mrem.

### **8.2.9 ACCIDENTAL PRESSURIZATION OF DRY SHIELDED CANISTER**

For more information see Reference 8.16.

This accident addresses the consequences of accidental pressurization of the DSC.

#### 8.2.9.1 Cause of Accident

Internal pressurization of the DSC could result from fuel cladding failure that would release fuel rod fill gas and free fission gas.

#### 8.2.9.2 Accident Analysis

The maximum DSC accident pressurization was calculated assuming that the fuel rod fission gas release fraction is 30%, and that the fuel rod fill gas pressure is 435 psia. The resulting internal DSC pressure was calculated at the Calvert Cliffs maximum ambient temperature of 103°F. The limiting accident for DSC pressurization is the HSM blocked vent case discussed in Section 8.2.7. Under these conditions, the gas temperatures in the DSC will rise to 548°F producing a DSC internal pressure of 30.9 psig. The maximum DSC shell local primary membrane stress intensity due to accident pressurization was calculated using 50 psig, the design basis accident pressure discussed in Reference 8.1, and was determined to be 5.1 ksi.

#### 8.2.9.3 Accident Dose Calculations

Since the maximum DSC accident pressure is within the design basis limits, there are no dose consequences.

### **8.2.10 FOREST FIRE**

For more information see Reference 8.18.

## ATTACHMENT 3, SAFETY EVALUATION FORM (Page 1 of 4)

Page 1 of 10

ACTIVITY: <u>ES200000755</u>			50.59 Log No.: _____			72.48 Log No.: <u>SE00156</u>		
Based on the attached discussion, does this activity: Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve an unreviewed safety question (USQ)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve a change in the Technical Specifications/License Conditions? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases? Applicable to 10 CFR 72.48 Safety Evaluations <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve a Significant Increase in Occupational Dose? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Involve a Significant Unreviewed Environmental Impact?								
Prepared by: <u>Mahmoud Massoud</u> <i>M. Massoud</i>			Department: <u>NED</u>			Date: <u>9/13/00</u>		
PRINTED NAME AND SIGNATURE								
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			Is a special review required by groups other than the group to which the Preparer belongs?					
Resp. Ind.: <u>R. H. Beall</u> PRINTED NAME <i>R. H. Beall</i> SIGNATURE			Resp. Ind.: _____ PRINTED NAME _____ SIGNATURE			Resp. Ind.: _____ PRINTED NAME _____ SIGNATURE		
Work Group: <u>NFM</u> Date: <u>9/11/00</u>			Work Group: _____ Date: _____			Work Group: _____ Date: _____		
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <i>[Signature]</i> INDEPENDENT REVIEWER Date <u>9/11/2000</u>			Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <i>[Signature]</i> GS-DES, GS-TSES, or PE-PDSU Date <u>9/14/00</u>					
The POSRC has reviewed this evaluation according to NS-2-101. POSRC Meeting No.: <u>00-078</u> Date: <u>9/13/00</u>								
Recommend <input checked="" type="checkbox"/> Disapproval <input type="checkbox"/> Signature <i>[Signature]</i> POSRC CHAIRMAN Date <u>9/13/00</u>								
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature <i>[Signature]</i> PLANT GENERAL MANAGER Date <u>9/20/00</u>								
The OSSRC has reviewed this evaluation according to NS-2-100. Full OSSRC Committee review required? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Signature: <i>[Signature]</i> Date: <u>11/9/00</u> OSSRC SES Chairman If yes, OSSRC Meeting No. _____								



**ATTACHMENT 3, SAFETY EVALUATION FORM (Page 2 of 4)**

**Page 2 of 10**

<b>ACTIVITY:</b>	ES200000755	<b>50.59 Log No.:</b>	72.48 Log No.:	<b>SE00156</b>
Proposed Activity:	As explained in the attached sheets			
Reason for Activity:	As explained in the attached sheets			
Function(s) of affected SSC:	As explained in the attached sheets			
SAR Revision No.:	8	Tech Spec Bases Amendment/Rev No.:		
SAR Sections Reviewed:	8.2	Tech Spec Bases Reviewed:		
<b><u>Complete for 50.59 and 72.48:</u></b>				
1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?
Probability of Malfunction: As explained in the attached sheets				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?
Consequences of Malfunction: As explained in the attached sheets				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the probability of occurrence of an accident previously evaluated in the SAR be increased?
Probability of Accident: As explained in the attached sheets				
<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No	May the consequences of an accident previously evaluated in the SAR be increased?
Consequences of Accident: As explained in the attached sheets				

# ATTACHMENT 3, SAFETY EVALUATION FORM (Page 3 of 4)

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<b>ACTIVITY</b>	ES200000755	<b>50.59 Log No.:</b>	<b>72.48 Log No.:</b>	<b>SE00156</b>
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2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ Yes    ☒ No    May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: As explained in the attached sheets

☐ Yes    ☒ No    May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: As explained in the attached sheets

Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ Yes    ☒ No    Will the margin of safety as defined in the basis for any Technical Specification be reduced?

<u>Bases</u> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<u>Discussion of why the margin of safety is not reduced</u> <u>As explained in the attached sheets</u> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
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# ATTACHMENT 3, SAFETY EVALUATION FORM (Page 4 of 4)

Page 4 of 10

ACTIVITY: ES200000755 50.59 Log No.: 72.48 Log No.: SE00156

Complete for 72.48:

☐ Yes ☒ No Will the proposed activity involve a significant increase in occupational dose?

A significant increase in occupational dose: As explained in the attached sheets

☐ Yes ☒ No Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: As explained in the attached sheets

Summary: (For NRC Report, provide a brief overview)

As explained in the attached sheets

72.48 – SAFETY EVALUATION  
ISFSI – FUEL PARAMETER UPDATE

**PROPOSED ACTIVITY**

This safety evaluation is prepared to update ISFSI SAR to reflect changes in Tables 1.2-1, 3.3-3, and 3.3-5.

**Reason for Activity**

This activity is a result of the resolution of IR3-007-603. This issue report documents that Batches A, B, and C used in Units 1 and 2 had different uranium mass, pellet diameter, and clad thickness than specified in various tables of the ISFSI SAR. In response to this issue report, the design basis analysis for ISFSI has been verified as bounding for parameters of Units 1 and 2 fuel Batches A, B, and C. This activity will incorporate the fuel batch A, B, and C parameters into the ISFSI SAR as necessary.

Regarding the uranium mass issue, the IR notes that fuel assemblies contain as much as 399 kg of uranium while only 386 kg of uranium is specified in Table 1.2-1 of the ISFSI SAR. The change to Table 1.2-1 includes replacement of “nominal” to “minimum” for initial uranium content. Regarding the pellet diameter, the IR notes that the actual fuel assembly characteristics for Batches A, B, and C (pellet diameter of 0.3805 inches) are different than that specified in SAR Table 3.3-3 (pellet diameter of 0.3765 inches). Regarding clad thickness, Batches A, B, and C have clad thickness of 0.026 inches. The change to Tables 3.3-3 and 3.3-5 includes a footnote describing that the slight deviation of pellet diameter and clad thickness do not affect the results of design basis analysis.

**Function of the Affected SSC**

The affected SSC is the DSC. The DSC has containment, shielding, criticality control, and thermal safety functions. The primary function of the DSC is to provide containment for the spent nuclear fuel. Hence, the DSC consists of a stainless steel shell, which is hermetically sealed by welding to the two inner top and bottom cover plates. There are also two outer cover plates welded to the shell to ensure containment integrity. The gamma ray shielding at both ends of the DSC is provided by the use of thick lead plugs. This is to minimize exposure from the top during the DSC drying and sealing process. This is also to minimize exposure from the bottom of the DSC while placed in the horizontal storage module (HSM). The shell thickness provides some radial shielding even though shielding in the radial direction is not a safety function of the DSC.

The internal basket assembly of the DSC provides criticality control. The fuel assemblies are maintained in the desired position by a series of guide sleeves and axial support rods during normal and accident conditions. The location and the thickness of the guide sleeves in addition to the distance between the fuel assemblies provide the criticality control. Heat



is transferred from the fuel rods to the DSC shell and the cover plates by a combination of thermal radiation, thermal conduction, and internal natural circulation mechanisms. The conduction heat transfer takes place through guide-sleeves, spacer grids, as well as the helium cover gas. The internal circulation takes place by the helium gas between the heat source (fuel rods), and the heat sink (DSC shell and cover plates). The DSC shell in turn is air cooled by natural convection provided by ventilation in the horizontal housing module (HSM). Cooling of the fuel rods is essential in maintaining the integrity of the cladding, which serves as the primary containment of the fission gases and prevents oxidation of uranium. Finally, the DSC integrity must be maintained as it acts as the final barrier for the release of fission gases in to the environment.

### **Revised Analysis**

Mass of uranium and pellet diameter. As part of the resolution of IR3-007-603, it was noted that different calculations use different values for uranium mass. This is justified, as the goal in all such calculations is to use conservative inputs and assumptions. In a calculation where the goal is to determine the amount of negative reactivity, the use of a low value for uranium mass is justified and conservative. On the other hand, a high value for uranium mass is conservative when the goal was to determine the sources of positive reactivity. In conclusion, the current criticality analysis is bounding for Batches A, B, and C parameters.

Fuel Pellet Diameter. Issue report IR3-007-603 denotes that several fuel assemblies listed in the ISFSI SAR are different from actual fuel assembly characteristics for Batches A, B, and C. Table 3.3-3 and 3.3-5 of ISFSI SAR specifies pellet diameter of 0.3765. The pellet diameter of Batches A, B, and C is 0.3805 inches. Resolution of this issue is based on the fact that, criticality is a function of uranium mass and density. The uranium mass and density in calculation CA03971 (Vectra calculation 113-113.0600) bounds all applicable fuel batches, i.e., for Batches A – G for Units 1 and 2.

Clad thickness. Similar to fuel pellet diameter, there are discrepancies between fuel clad thickness specified in the ISFSI SAR Tables 3.3.-3 and 3.3-5 and clad thickness of fuel Batches A, B, and C. Resolution of this issue is based on the fact that there is no concern regarding reactivity. Clad thickness affects fuel rod gap volume that is considered in SE00155. Clad thickness also affects the allowable pressure stress for a given clad temperature. To ensure that the maximum stress remains below the allowable, and no fuel would fail within the specified ISFSI lifetime and specified fuel burnup, calculation CA03949 (TNW BGE-01.0403, Rev. 1) performs a conservative analysis and establishes a clad temperature limit. The results of new cases analyzed for the thinner cladding associated with Batches A, B and C indicate that the clad temperature limit remains conservative for these batches as well.

ISFSI USAR Revision No.:.....	8
ISFSI USAR Section Reviewed:.....	Tables 1.2-1, 3.3-3, and 3.3-5
ISFS Tech Spec. Bases Amendment/Rev. No.:	1
ISFSI Tech Specification Bases Reviewed:	-

- 1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR in not increased**

#### **Probability of Malfunction**

The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. This activity involves uranium mass, pellet diameter, and clad thickness. None of these changes would have any affect on the DSC function. Critical functions that must be maintained are containment, shielding, criticality control, and thermal safety functions. The probability of a malfunction is only increased if the performance of any equipment or components required to perform the above functions is degraded. In this case, none of these functions are degraded.

The source strength of the gamma and neutron radiation remain within the original design limits and shielding properties are unchanged, thus shielding functions are not impacted by the changes outlined above. The requirements for heat transfer for the DSC to maintain temperatures below normal operating limits are not affected by these changes. The DSC and fuel assembly functions to prevent criticality are not impacted by the changes in fuel parameters since the changes in initial uranium mass, fuel pellet diameter, and clad thickness are still bounded by the existing criticality analysis. The cladding temperature limit is also not affected. Thus the probability of any malfunctions is not increased.

#### **Consequence of Malfunction**

The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. Critical functions that must be maintained are containment, shielding, criticality control, and thermal safety. The probability of a malfunction is increased if the performance of any equipment or components required to perform these functions is degraded. As discussed earlier, none of these functions are degraded. Gamma and neutron source strengths remain within the original design limits and shielding properties are unchanged, thus shielding functions are not impacted by this change to the fuel parameters. Heat transfer functional requirements for the DSC to maintain temperatures below normal operating limits are not affected by these changes. The DSC and fuel assembly functions to prevent criticality are not impacted by the changes in fuel parameters since the changes in initial uranium mass, fuel pellet diameter, and clad thickness are still bounded by the existing criticality analysis. The cladding temperature limit is also not affected. Therefore,

there is no increase in the consequences of malfunction of equipment important to safety. There is no release of gases. Hence there are no consequences.

### **Probability of Accident**

The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this activity. Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. Accidents affected by this change in fuel parameters include the drop accident, the accidental pressurization, and the blockage of air inlets and outlets. The changes in fuel parameters do not lead to an increased likelihood of any of these accidents. Assembly weights remain unchanged and within acceptable limits, thus the drop accident probability is not increased. The DSC and fuel assembly functions to prevent criticality are not impacted by the changes in fuel parameters since the changes in initial uranium mass, fuel pellet diameter, and clad thickness are still bounded by the existing criticality analysis. The cladding temperature limit is also not affected. There is no change to the operation of the ISFSI system caused by this activity, therefore there is no change to the probability of any analyzed accident.

### **Consequences of an Accident**

The consequences of an accident previously evaluated in the SAR will not be increased as a result of this activity. Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. Accidents affected by this change in fuel parameters include the drop accident, the accidental pressurization, and the blockage of air inlets and outlets.

Increases in consequences occur only when doses to the public are increased beyond what were previously calculated. Gamma and neutron source strengths remain within the original design limits and shielding properties are unchanged, thus shielding functions are not impacted by this change to the fuel parameters. The DSC and fuel assembly functions to prevent criticality are not impacted by the changes in fuel parameters since the changes in initial uranium mass, fuel pellet diameter, and clad thickness are still bounded by the existing criticality analysis. There are no changes to the operations of the ISFSI created by this activity. Therefore, there is no increase in the consequences of accidents evaluated in the SAR. The cladding temperature limit is also not affected. There is no release of radioactive materials to the environment. Hence, there are no consequences.

**2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created**

The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

**Possibility of New Malfunction**

The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this activity. Critical functions that must be maintained are containment, shielding, criticality control, and thermal safety functions. All fuel parameters remain within acceptable limits, thus no new malfunctions exist. Since the operation of the ISFSI system is not changed by these changes in fuel parameters, no new malfunctions of equipment or materials are involved.

**Possibility of New Accident**

The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this activity. Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. The operation of the ISFSI system is not changed by the revised analysis discussed above. Criticality is not affected and all other parameters remain within acceptable limits, thus the possibility of a new accident does not exist.

**3. The margin to safety as defined in the basis for any Technical Specification is not reduced**

The margin of safety as defined in the basis for the BGE ISFSI Technical Specification 2.4 is not reduced since the analysis documents that the stress and dose allowable specified in the FSAR and SER are still maintained. Thus there is no Unreviewed Safety Question. Regarding the mass of uranium, pellet diameter, and clad thickness, the margin to safety is not reduced. This is true because the analyses of record remain bounding.

**Occupational Dose**

An increase in occupational dose will not occur as a result of this activity. The operation of the ISFSI system is not changed by the changes determined in the revised analysis. Gamma and neutron source strengths remain within the original design limits and shielding properties are unchanged, thus occupational doses are not affected.



**Environmental Impact**

An environmental impact will not occur as the result of this activity. Integrity of the DSC or transfer cask is not affected by this activity. Shielding functions of the DSC and the transfer cask are not affected by this activity. This activity does not affect any area of the plant site previously undisturbed for the ISFSI, and does not cause any reason for revision to the ISFSI Updated Environmental Report. The proposed activity does not affect the environmental conditions associated with the ISFSI.

**Summary: (For NRC Annual Report, provide a brief overview)**

This activity is a result of the resolution of IR3-007-603. This issue report documents that batches A, B, and C used in units 1 and 2 had different uranium mass, pellet diameter, and clad thickness than specified in various tables of the ISFSI SAR. In response to this issue report, the design basis analysis for ISFSI have been verified as bounding for parameters of units 1 and 2 fuel batches A, B, and C. This activity will incorporate the fuel batch A, B, and C parameters into the ISFSI SAR as necessary.

Regarding the uranium mass issue, the IR notes that fuel assemblies contain as much as 399 kg of uranium while only 386 kg of uranium is specified in Table 1.2-1 of the ISFSI SAR. The change to Table 1.2-1 includes replacement of “nominal” to “minimum” for initial uranium content. Regarding the pellet diameter, the IR notes that the actual fuel assembly characteristics for Batches A, B, and C (pellet diameter of 0.3805 inches) are different than that specified in SAR Table 3.3-3 (pellet diameter of 0.3765 inches). The change to Tables 3.3-3 and 3.3-5 includes a footnote describing that the slight deviation of pellet diameter and clad thickness do not affect the results of design basis analysis.

Gamma and neutron source strengths remain within the original design limits and shielding properties are unchanged, thus shielding functions are not impacted by the change in the fuel parameters. Heat transfer functional requirements for the DSC to maintain temperatures below normal operating limits are not affected by these changes. The DSC and fuel assembly functions to prevent criticality are not impacted by the changed fuel parameters. The cladding temperature limit is also not affected. Assembly weight and overall DSC weights remain within acceptable limits. Thus the changes do not involve a Unreviewed Safety Question.

**TABLE 1.2-1**  
**DESIGN PARAMETERS FOR THE CALVERT CLIFFS ISFSI**

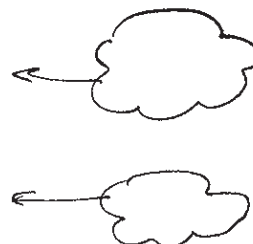
**GENERAL DESIGN REQUIREMENTS**

Capacity (Fuel Assemblies/Canister)	24 Pressurized Water Reactor Assemblies
Reference Fuel Assembly Parameters:	
Burnup: Max. Assembly Average	47,000 MWD/MTU
Initial Enrichment (Maximum)	4.5 w/o U <sup>235</sup>
Initial Uranium Content (Nominal)	386 kg/Assembly
Decay Heat Power (Maximum)	0.66 kW/Assembly
Cooling Time	As Required for Decay Heat Limit
Fuel Rod Array	Combustion Engineering 14x14
Assembly Weight (Maximum)	1,300 lbs
Maximum Assembly Envelope	8.25 in <sup>2</sup>
Effective Multiplication Factor:	
Normal	K <sub>eff</sub> < 0.95
Off-Normal	K <sub>eff</sub> < 0.98
Internal DSC Atmosphere	Helium
Ambient Temperature Range	-3°F to 103°F
Solar Heat Load:      Maximum	127 Btu/hr-ft <sup>2</sup>
Average	82 Btu/hr-ft <sup>2</sup>
Nominal Dose at HSM Surface During Storage (Away from Openings)	20 mrem/hr
Maximum Dose at HSM Door and Penetrations	100 mrem/hr
Peak Long-Term Clad Temperature (70°F Ambient)	612°F
Credit for Burnup Criticality Analysis	Based on 1.8% equivalent initial enrichment
Maximum Assembly Length (Includes Radiation Growth)	less than 158.0"
Active Fuel Length	136.7"

Minimum

**TABLE 3.3-5**  
**DESIGN PARAMETERS FOR CRITICALITY ANALYSIS OF THE DSC**



<u>PARAMETERS</u>	<u>DESIGN VALUE</u>
<b>FUEL ASSEMBLIES</b>	
Number/Type	24/CE design 14x14
Rod Array	14x14
Number of Fuel Rods	176
Number of Control Rod Guide Tubes	5
Number of Instrument Tubes	1 (1 of the 5 Guide Tubes)
Rod Pitch (inches)	0.580
Burnup Credit	0 - 45 GWD/MTU
<b>FISSILE CONTENT (% initial U equivalent)</b> $U^{235}$	1.8 - 4.5
<b>FUEL PELLETS</b>	
Density	95% Theoretical
Diameter (inches)	0.3765 *
<b>FUEL ROD CLADDING</b>	
Material	Zircaloy - 4
Thickness (inches)	0.028 *
Outside Diameter (inches)	0.440
<b>CONTROL ROD GUIDE TUBES</b>	
Material	Zircaloy - 4
Thickness (inches)	0.040
Outside Diameter (inches)	1.115
<b>INSTRUMENT TUBE</b>	
Material	Zircaloy - 4
Thickness (inches)	0.040
Outside Diameter (inches)	1.115
<b>DSC GUIDE SLEEVES</b>	
Material	Stainless Steel
Thickness (inches)	0.1050
<b>DSC FILL MATERIAL</b>	
Material	Pure Water
Density (g/cm <sup>3</sup> )	0.0 - 1.0
<b>DSC SHELL</b>	
Material	Stainless Steel
Thickness (inches)	0.625
Outside Diameter (inches)	67.25
<b>CASK</b>	
Material	Stainless Steel/Lead
Thickness (inches)	6.25 <sup>a</sup>
Outside Diameter (inches)	80.5 <sup>a</sup>



For more information see Reference 3.14.

<sup>a</sup> Exclusive of the Cask Neutron Shield

TABLE 3.3-3  
CE 14x14 FUEL PARAMETERS

<u>FUEL ASSEMBLY PARAMETER</u>	<u>INCHES</u>	
Fuel Clad OD	0.44	
Fuel Pellet OD	0.3765 *	
Clad Thickness	0.028 *	
Fuel Rod Pitch	0.58	
Guide Tube OD	1.115	
Guide Tube Thickness	0.04	
Active Fuel Height	136.7	
Fuel Rods/Assembly	176	
No. of Guide Tubes	5	

Reference: J. W. Roddy, "Physical and Decay Characteristics of Commercial LWR Spent Fuel," ORNL/TM-9591/V1&R1, January 1988.

For more information see Reference 3.14.

\* The fuel pellet OD and clad thickness varied slightly for fuel batches A, B, and C in Units 1 and 2. These variances do not affect the results of design basis analysis.



## SAFETY EVALUATION FORM

Page 1 of 11

ACTIVITY: ES200000900

50.59 Log No.: N/A

72.48 Log No.: SE00157

## ISFSI - Evaluation of Transfer Cask Integrity

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

Applicable to 10 CFR 72.48 Safety Evaluations

- ☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by:

  
 Mohammed Kaiseruddin

Department: Sargent &amp; Lundy

Date:

10/18/00

PRINTED NAME AND SIGNATURE

- ☒ YES ☐ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye

PRINTED NAME

  
 SIGNATURE

Work Group: Licensing

Date: 10/18/00

Resp. Ind.: C. J. Dobry

PRINTED NAME

  
 SIGNATURE

Work Group: PES

Date: 10/19/00

Resp. Ind.: R. H. Beall

PRINTED NAME

  
 SIGNATURE

Work Group: NFM

Date: 10/18/00

Approved ☒Disapproved ☐

Signature

  
 INDEPENDENT REVIEWER

Date: 10.19.00

Approved ☒Disapproved ☐

Signature

  
 W.E. KEMPERS - DES, GS-TSES, or PE-PDSU

Date: 10.20.00

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 00-092

Date: 10/25/00

Recommend ☒Recommend ☐

Signature

  
 POSRC CHAIRMAN

Date: 10/27/00

Approval

Disapproval

Approved ☒Disapproved ☐

Signature

  
 PLANT GENERAL MANAGER

Date: 10/26/00

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES☒ NO

Signature:

  
 OSSRC SES Chairman

Date: 01/12/01

If yes, OSSRC Meeting No. \_\_\_\_\_

## SAFETY EVALUATION FORM

Page 2 of 11

ACTIVITY: ES200000900

50.59 Log No.: N/A

72.48 Log No.: SE00157

## ISFSI – Evaluation of Transfer Cask Integrity

**Proposed Activity:**

The proposed activity consists of making changes to the ISFSI USAR [Refs. 1 and 2]. The changes are based upon the re-evaluation of Transfer Cask (TC) structural integrity, which was undertaken because of some concerns in the existing analysis that were identified during an internal review. The new analysis is documented in Baltimore Gas and Electric (BGE) calculation CA04141 [Ref. 7].

The changes to the USAR consist of the following:

1. Section 8.1.1.9 (C) is being replaced by the following text; " Transfer Cask thermal loads are calculated using an axisymmetric cask model. A fuel assembly decay heat power of 15.8 kW was applied as a uniform heat flux to the transfer cask inner surfaces. Convection coefficients, applied as surface loads to the cask outer surfaces, are based on simplified equations for heat loss from various surfaces to air. They are: 0.0066 BTU/hr-in<sup>2</sup>-°F, for the cylindrical shell, and 0.0051 BTU/hr-in<sup>2</sup>-°F through the cask and plates. Two bounding ambient temperature cases are considered, consisting of -3 °F and 103 °F, representing the site-specific historical extremes. A bounding solar heat flux of 62 BTU/hr-ft<sup>2</sup> is also applied for the hot ambient case."
2. Section 8.2.5.2 is being revised to provide a better description of transfer cask drop analysis as, " using the ANSYS 3-D transfer cask one-half model. For the vertical, horizontal, and corner drop orientations, the contacting surface was assumed to be rigid. A static equivalent load of 75g was applied. The internal loading of the DSC was represented as pressure loadings applied to the transfer cask inner surfaces."
3. Table 3.6-1 is being revised to provide site-specific design loads for the TC upper trunnion.
4. Table 8.1-1 is being revised.
5. Tables 8.2-14 through 8.2-16 are being updated with the new calculated stress values and the allowables.
6. Section 8.4 is being revised to add Reference 8.33.

**Background**

The Independent Spent Fuel Storage Installation (ISFSI) at the Calvert Cliffs Nuclear Power Plant (CCNPP) stores spent fuel assemblies within Dry Storage Canisters (DSCs). Twenty-four spent fuel assemblies are loaded into each DSC. Each DSC contains an outer leak-tight shell and an internal basket assembly. The outer shell provides the structural strength, shielding, and a leak-tight chamber for containing helium. The internal basket assembly includes twenty-four stainless steel guide sleeves (one for each spent fuel assembly), nine perforated carbon or stainless steel spacer discs, and four stainless steel support rods. The nine spacer discs are spaced out along the length of the DSC at locations that approximately coincide with the spent fuel assembly's eight spacer grids and the single lower retention grid. The spacer discs are not structurally attached to the DSC shell walls or inner cover plates. The guide sleeves traverse the length of the DSC cavity through openings in the spacer discs. The support rods are used to maintain the spacer disc locations. The support rods traverse the length of the DSC cavity through the spacer discs, and are structurally welded to the spacer discs. The DSC is loaded into a Transfer Cask (TC) for transporting it to the storage facility.

CCNPP utilizes the Combustion Engineering 14X14 fuel assemblies. Each of the fuel assemblies is approximately 157 inches in length and approximately 8X8 inches square in cross section.

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50.59 Log No.: N/A

72.48 Log No.: SE00157

**ISFSI – Evaluation of Transfer Cask Integrity****New Analysis**

A new analysis was prepared to re-evaluate the TC structural integrity.

Reference 11 provides the maximum dry weights of the regular and with the value-added pellets (VAP) spent fuel assemblies. CCNPP will be using the VAP fuel assemblies in the future. The new fuel assemblies are approximately 30 lbs. heavier than the old ones. Reference 11 lists the maximum mass of a spent fuel assembly as 1360 lbs., and the weight of a control element assembly (CEA) as 80 lbs. Since the fuel assemblies can be moved and stored with the CEAs inserted in them, the maximum fuel assembly weight used in the analysis was 1450 lbs., which allows for some margin for uncertainties. It is noted that CCNPP is not permitted by its Tech Specs to load into ISFSI any fuel assemblies that are heavier than 1300 lbs. The use of the higher mass in the analysis at this time is conservative, and will be applicable later when CCNPP seeks permission to load the higher mass fuel assemblies into the ISFSI. Using the nominal dimensions of the Dry Shielded Canister (DSC) and Transfer Cask (TC) components, and standard material densities, the final weights of the components were calculated and documented in References 6 and 16. The weight of a DSC sealed and fully loaded with the VAP fuel assemblies was calculated to be 69,400 lbs., which is more than the nominal value used earlier of about 65,000 lbs., but less than the enveloping value used of 80,000 lbs.

The TC integrity analysis is documented in References 7 and 16. The analysis utilized the ANSYS 3-D transfer cask one-half model. For the on-site transfer in normal operating conditions, the design parameters considered for the upper trunnion analysis were +/- 1g vertically, +/- 1g axially, +/- 1g laterally, and (+/- 1/2g vertically +/- 1/2g axially +/- 1/2g laterally). For the vertical, horizontal, and corner drop orientations, the contacting surface was assumed to be rigid. A static equivalent load of 75g was applied. The internal loading of the DSC was represented as pressure loadings applied to the Transfer Cask inner surfaces. Results of the calculations showed that, in all cases, the calculated stresses for the various parts of the TC remained below the code allowables. It is noted here that in Tables 8.2-14 through 8.2-16, the allowable stress values for some of the sub-components are being reduced. This represents only a correction. The values provided earlier were good for the carbon steel. The new values are good for the stainless steel, of which the subject sub-components are made.

**Reason for Activity:**

This activity incorporates into the USAR the resolution to Issue Reports IR3-005-169 and IR3-005-172 [Refs. 3 and 4]. These issue reports identified inconsistencies in the structural analysis of the TC. A new analysis was prepared [Ref. 7] to replace the one with inconsistencies.

The design objectives of the dry storage system are to ensure that in normal operating conditions the spent fuel can be stored safely without adverse consequences to the operators, public, and the environment. The design objectives in abnormal and accident conditions, such as following the worst case postulated cask drop accident, are that the fuel rod integrity is not compromised and that the retrieval of fuel is still assured.

Technical Specifications Section 2.3, "Transfer Cask", states that the transfer cask lifting height with a non-single-failure-proof lifting device shall not exceed 80 inches. The Technical Specification also states that for drops greater than 15 inches the DSC will be returned to the spent fuel pool and be visually inspected. Therefore, retrievability of fuel from the DSC is demonstrated following a TC drop accident.

**Function(s) of affected SSCs:**

The affected SSCs are the fuel assemblies, DSCs, and TCs.

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**ISFSI – Evaluation of Transfer Cask Integrity**Fuel Assembly

The fuel assembly consists of 176 fuel and poison rods, 5 guide tubes, 5 guide tube sleeves, 8 fuel rod spacer grids, upper and lower end fittings, lower retention grid, and a hold-down device. The guide tubes, spacer grids, and end fittings form the structural frame of the assembly. The fuel rod spacer grids maintain the fuel rod pitch over the length of the assembly. The grid provides positive side restraint to the fuel rod but only frictional restraint axially. The spacer grids are the widest part on a fuel assembly. The four outer guide tubes are mechanically attached to the end fittings and the spacer grids are welded to all five guide tubes. The upper end fitting attaches to the guide tubes to serve as an aligning and lifting device for each fuel assembly. The fuel rods are held together in the assembly at a pitch of 0.58 inch, which helps to control the criticality. The rods consist of enriched uranium fuel pellets stacked within a Zircalloy cladding tube. The cladding is the first barrier that prevents the fission products from escaping to the outside.

Dry Storage Canister

The DSC is classified as important-to-safety per 10 CFR 72. It consists of the outer canister and the internal basket assembly. The sub-components of the internal basket assembly include the Spacer Discs, Support Rods, and Guide Sleeves. The internal basket assembly components are not attached structurally to the outer canister.

The DSC provides containment, shielding, criticality control, configuration control related to fuel retrievability, structural support, and thermal safety functions during loading operations, transfer operations, and storage. It is designed to remain intact under all accident conditions identified in the ISFSI USAR with no loss of function. Specific design functions of the DSC include the following:

1. **Confinement** - The DSC design provides mechanical confinement of the stored fuel assemblies to prevent the dispersion of particulate or gaseous radionuclides from the fuel. The primary function of the DSC is to provide confinement of the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further assure containment integrity. The DSC confinement boundary is designed also to retain helium cover gas around the fuel in order to prevent corrosion of the fuel cladding and formation of expansive oxides in the fuel during storage.
2. **Criticality Control** - The DSC design provides for sub-criticality during the wet loading, DSC drying, and interim storage operations. This is accomplished by a combination of mechanical separation of the fuel assemblies by the internal basket assembly and neutron absorption in the stainless steel guide sleeve.
3. **Fuel Support and Configuration Control** - The DSC internal basket assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accidents, including a cask drop, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that retrieval of fuel is not assured.
4. **Shielding** - The DSC materials provide gamma radiation shielding. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC loading into the Horizontal Storage Module (HSM) and at the HSM door during storage.
5. **Thermal** - Decay heat is removed by thermal radiation and conduction from the DSC to the TC, and by thermal radiation and conduction and convection from the DSC to the HSM. The DSC maintains



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**ISFSI – Evaluation of Transfer Cask Integrity**

the helium cover gas, which is required for corrosion control. This cover gas improves the thermal performance of the DSC.

The functions of the internal basket assembly components are as follows:

6. Guide Sleeves – The guide sleeves establish storage compartments for 24 spent fuel assemblies within the DSC. The tops of the guide sleeves are flared to assist fuel-handling operators in guiding the spent fuel assemblies into the sleeves.
7. Spacer Discs – The spacer discs work together with the guide sleeves to maintain geometric separation of the fuel assemblies. The spacer discs support the weight of the guide sleeves, support rods and the spent nuclear fuel when the DSC is in a horizontal orientation.
8. Support Rods – The support rods maintain the spacer disk locations along the length of the DSC. They carry the weight of the guide sleeves, and the spacer discs when the DSC is in a vertical orientation.

Transfer Cask

The TC is important to safety because it protects the DSC during handling. The TC is also considered safety-related since dropping a loaded TC, which weighs about 100 tons, has the potential for creating unanalyzed accident situations in the power plant. The TC is a cylindrical vessel with a bottom end closure assembly and a bolted top cover plate. Its cylindrical walls are formed from three concentric steel shells, the middle of which is the structural shell. Lead is poured between the inner and the middle shells to provide gamma shielding, and a solid neutron shielding material is poured between the middle and the outer shells. Two upper trunnions are located near the top of the cask, and are used for lifting. Two lower trunnions serve as the axis of rotation of the TC, and provide support.

The solid neutron shielding material used in the cask outer annulus, and top and bottom covers produces water vapor and a small quantity of non-condensable gases when heated to above 212 °F. The off gassing produces an internal pressure, which increases with temperature.

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## ISFSI – Evaluation of Transfer Cask Integrity

ISFSI USAR Revision No.: 9

### ISFSI USAR Sections Reviewed:

The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key Sections reviewed are listed as follows:

1.2.1	General Description
4.2.1	Structural Specifications
8.1.1	Normal Operations Structural Analysis
8.2	Accidents
8.2.5	Cask Drop
8.4	References
Table 1.2-1	Design Parameters for the Calvert Cliffs ISFSI
Table 3.1-1	Principal Design Parameters for Fuel to Be Stored
Table 3.3-3	CE 14X14 Fuel Parameters
Table 3.6-1	Summary of Design Criteria for Normal Operating Conditions
Table 3.6-3	Summary of Design Criteria for Accident Conditions
Table 8.1-1	Estimated Component Weights
Table 8.2-1	NUHOMS-24P Accident Loading Identification
Table 8.2-14	NUHOMS-24P Transfer Cask Enveloping Load Combination Results for Normal and Off-Normal Loads (ASME Service Levels A and B)
Table 8.2-15	NUHOMS-24P Transfer Cask Enveloping Load Combination Results for Accident Loads (ASME Service Level C)
Table 8.2-16	NUHOMS-24P Transfer Cask Enveloping Load Combination Results for Accident Loads (ASME Service Level D)

### Tech Spec Bases Amendment/Rev No.: 2

Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License No. SNM-2505, Amendment 2, June 30, 2000

### Tech Spec Bases Reviewed:

2.3	Transfer Cask (TC)
3/4.1	Fuel to be Stored at ISFSI
5.0	Design Features

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ISFSI – Evaluation of Transfer Cask Integrity

Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The proposed activity consists of re-evaluating the structural integrity of TC, and incorporating the results into the USAR. The TC is important to safety because it protects the DSC during handling. The TC is also considered safety-related since dropping a loaded TC, which weighs about 100 tons, has the potential for creating unanalyzed accident situations in the power plant. TC is also designed to provide gamma and neutron shielding in order to keep personnel doses as low as reasonably achievable (ALARA) during the DSC transfer to Horizontal Storage Module (HSM).

The ISFSI equipment, whose functions may be impacted by the lack of structural integrity of the TC, are the fuel assemblies, DSC and TC. The fuel assemblies and DSCs are designed to withstand the accident and abnormal loads, which are much larger than the normal dead weight and handling loads.

The probability of malfunction of equipment important to safety is not impacted by the re-analysis of TC structural integrity.

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The malfunctions to be considered are of the ISFSI important-to-safety components listed above.

The consequences of failure of the fuel assemblies, DSC and TC are all related to the release of radioactivity into the atmosphere or the dose to operators or the public. The fuel characteristics, such as the decay heat level and radiation dose criteria applicable to ISFSI components, are not impacted by the re-analysis of TC structural integrity.

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. They consist of loss of shielding, external missiles, earthquake, flood, cask drop, lightning, blockage of air inlets and outlets, DSC leakage, DSC overpressurization, and forest fire. Of these accidents, only the cask drop accident and earthquake incident are impacted by this activity. The earthquake scenario is bounded by the cask drop accident, as the acceleration postulated in a design basis earthquake are 0.25g horizontally and 0.17 vertically, which are much smaller than the acceleration in the drop accident of 75g. However, the probability of occurrence of cask drop, or any other accident, is not impacted by the TC integrity analysis.

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**ISFSI – Evaluation of Transfer Cask Integrity**

There is no change to the design or operation of the NUHOMS system caused by this activity. This activity does not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected. Therefore, the probability of occurrence of an accident involving loss of HSM air outlet shielding, or blockage of HSM air inlets and outlets will not increase.

Pressurization of the DSC due to fuel cladding failure is an accident scenario identified in USAR Section 8.2.9. The limiting DSC pressurization accident event is a rupture of fuel cladding together with blockage of the HSM vents. The impact of the cask drop on the cladding was evaluated previously, and it was determined that the fuel cladding would not rupture and fuel rod integrity would be maintained.

DSC leakage is an accident scenario described in USAR Section 8.2.8. The USAR indicates that there are no credible events that would initiate this type of accident. As stated in the preceding paragraphs, the probability of an accident that would lead to cladding failure is not increased by this activity. This activity does not affect the design of the DSC pressure boundary and therefore does not increase the probability of DSC leakage.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The proposed activity, namely the evaluation of TC integrity, is related to the cask drop accident and earthquake incident, as stated above.

The ISFSI important-to-safety components that could be impacted by the TC integrity are the fuel assemblies, DSC, and TC. The evaluation of the fuel assembly integrity is not included in the scope of this change; a separate safety evaluation for it is being prepared [Ref. 8]. The evaluation of DSC structural integrity was addressed separately in earlier safety evaluations [Refs. 9 and 10]. The TC was evaluated for a design basis vertical and horizontal drops of 75g. The calculated stresses in TC sub-components were all found to be below the code allowables. Therefore, the TC would not fail, would continue to perform its design functions, and the consequences of the accident would not be increased.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

**Possibility of New Malfunction:**

The proposed activity evaluates the structural integrity of TC. It does not impact any of the thermal or environmental parameters that would affect other equipment important-to-safety. Therefore, there is no possibility created of a new malfunction in any of the important-to-safety ISFSI components.

☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?



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ACTIVITY: ES200000900

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72.48 Log No.: SE00157

**ISFSI – Evaluation of Transfer Cask Integrity****Possibility of New Accident:**

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the USAR, and have been discussed previously. Evaluation of the structural integrity of the TC showed that the important-to-safety components of ISFSI would maintain their safety functions. The impacts of the drop accident on components, such as the fuel assemblies, and DSC were evaluated previously. The results showed that none of the components would fail to perform their safety functions. The impacts on the TC were evaluated with similar results. Since there is no change to the design or operation of the NUHOMS system caused by this activity, the possibility of an accident of a different type than any previously evaluated in the SAR would not be created.

**Complete for 50.59 and 72.48:**

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO

Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Tech Spec Bases: 2.3

**Discussion of why the margin of safety is not reduced:**

The margin of safety is defined as range of values between the acceptance limit reviewed and approved by the NRC as part of the licensing basis and the failure point [Ref. 14]. USAR Section 3.2.5 defines the acceptance criteria for ISFSI components, none of which would be exceeded. It is noted here that in Tables 8.2-14 through 8.2-16, the allowable stress values for some of the sub-components are being reduced. This represents only a correction. The values provided earlier were good for the carbon steel. The new values are good for the stainless steel, of which the subject sub-components are made.

Therefore, the margin of safety would not be reduced.

**Complete for 72.48:**

☐ YES ☒ NO

Will the proposed activity involve a significant increase in occupational dose?

**A significant increase in occupational dose:**

The radiation protection design and operation of the NUHOMS-24P dry cask storage system would not be changed by this proposed activity. The analysis of the TC under the design basis accidental drop conditions showed that it would not impact the radioactivity confinement boundary or the criticality control. Retrieval of fuel following a drop would still be assured. Occupational dose associated with post DSC accident recovery is not addressed in the Calvert Cliffs ISFSI USAR, however, the occupational dose for fuel retrieval, following the unlikely cask drop accident, is expected to be minimized through the use of special procedures and precautions. Because none of these attributes would be changed, the occupational doses summarized in USAR Table 7.4-1 would not be affected by this activity.

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ACTIVITY: ES200000900

50.59 Log No.: N/A

72.48 Log No.: SE00157

## ISFSI – Evaluation of Transfer Cask Integrity

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

**A significant unreviewed environmental impact:**

The NUHOMS-24P dry cask storage system confinement and radiological shielding functions would not be reduced by this activity. The fuel assemblies, DSC and TC were determined to maintain their safety functions under the most severe postulated drop accident conditions.

This activity would not affect any area of the plant site previously undisturbed for the ISFSI, and would not cause any reason for revision to the ISFSI Updated Environmental Report. This activity would not affect the environmental conditions associated with the ISFSI. Therefore, this activity would not involve an unreviewed environmental impact.

**References:**

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 9
2. CCNPP ISFSI USAR Change Request, UCR00193
3. BGE Issue Report IR3-005-169, 02/10/1998
4. BGE Issue Report IR3-005-172, 05/11/1998
5. BGE Calculation 8067-16-10-6, Rev. 1, Fuel Assembly Weight
6. BGE Calculation CA03988, Rev. 0001, Final Weight Calculation of NUHOMS-24P DSC / TC System
7. BGE Calculation CA04141, Rev. 0001, ISFSI Transfer Cask Structural Evaluation
8. BGE 10CFR72.48 Safety Evaluation, SE00154 (Under Preparation)
9. BGE 10CFR72.48 Safety Evaluation, SE00148
10. BGE 10CFR72.48 Safety Evaluation, SE00146
11. BGE Memorandum NEU 99-164, from T. A. Schearer to G. V. Patel, et al., 7/7/1999
12. Technical Specifications for Calvert Cliffs ISFSI, Amendment 2
13. Calvert Cliffs Updated Final Safety Analysis Report (UFSAR), Rev. 26
14. NEI 96-07, Rev. 0, Guidelines for 10 CFR 50.59 Safety Evaluations, 09/97
15. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1
16. Hopper & Associates Letter HABGE-09/00-0893, Fuel Assembly Weight Issue, 9/25/00

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ACTIVITY: ES200000900

50.59 Log No.: N/A

72.48 Log No.: SE00157

## ISFSI – Evaluation of Transfer Cask Integrity

**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:** The proposed activity consists of making changes to the ISFSI USAR. The changes are based upon the re-evaluation of Transfer Cask (TC) structural integrity, which was undertaken because of some concerns in the existing analysis that were identified during an internal review. The new analysis is documented in Baltimore Gas and Electric (BGE) calculation CA04141.

The USAR is being revised to describe the TC re-analysis methodology and modeling, and update the calculated results presented in Chapter 8 Tables.

**Reason for Activity:** Inconsistencies were identified in the structural analysis of the TC during an internal review. A new analysis was prepared to resolve the inconsistencies and replace the old analysis.

The design objectives of the dry storage system are to ensure that in normal operating conditions the spent fuel can be stored safely without adverse consequences to the operators, public, and the environment. The design objectives in abnormal and accident conditions, such as following the worst case postulated cask drop accident, are that the fuel rod integrity is not compromised and that the retrieval of fuel is still assured.

**Activity Summary:** New analysis was prepared to re-evaluate the structural integrity of the TC.

Using a conservative fuel assembly mass of 1450 lbs., the nominal dimensions of the Dry Shielded Canister (DSC) and Transfer Cask (TC) components, and standard material densities, the final weights of the components were calculated. The weight of a DSC sealed and fully loaded with fuel assemblies was determined to be less than the enveloping value used earlier of 80,000 lbs.

The ISFSI important-to-safety components that could be impacted by the TC integrity are the fuel assemblies, DSC, and TC. The evaluation of the fuel assembly integrity is the subject of a separate safety evaluation. The evaluation of DSC structural integrity was addressed separately in earlier safety evaluations. The TC was evaluated for a design basis vertical and horizontal drops of 75g. The calculated stresses in TC sub-components were all found to be below the code allowables.

**USQ Determination:** This activity was evaluated against the criteria of 10CFR72.48(a)(2), such as the probability of occurrence or the consequences of an accident or the malfunction of equipment important to safety, and it was concluded that it does not involve an unreviewed safety question (USQ).

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ACTIVITY: ES199800312

50.59 Log No.: N/A

72.48 Log No.: SE00158

## ISFSI - Disposition of ITR Issues and Other USAR Changes

Based on the attached discussion, does this activity:

Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve an unreviewed safety question (USQ)?  
☐ YES ☒ NO Involve a change in the Technical Specifications/License Conditions?  
☒ YES ☐ NO Require a change or addition to the UFSAR/USAR/Technical Specification Bases?

Applicable to 10 CFR 72.48 Safety Evaluations

☐ YES ☒ NO Involve a Significant Increase in Occupational Dose?  
☐ YES ☒ NO Involve a Significant Unreviewed Environmental Impact?

Prepared by:

Mohammed Kaiseruddin

Department: Sargent &amp; Lundy

Date:

01/02/01

PRINTED NAME AND SIGNATURE

☒ YES ☐ NO Is a special review required by groups other than the group to which the Preparer belongs?

Resp. Ind.: G. Tesfaye

PRINTED NAME

  
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Work Group: Licensing

Date:

1/8/01

Resp. Ind.: C. J. Dobry

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Work Group: PES

Date:

1/19/01

Resp. Ind.: R. H. Beall

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Work Group: NFM

Date:

1/18/01

Approved ☒ Disapproved ☐

Signature

  
 INDEPENDENT REVIEWER

Date

1.12.01

Approved ☒ Disapproved ☐

Signature

  
 GS-DES, GS-TSES, or PE-PDSU

Date

1/23/01

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 01-006

Date: 01/29/01

Recommend Approval

☒

Recommend Disapproval

☐

Signature

  
 POSRC CHAIRMAN

Date: 1/29/01

Approved

☒

Disapproved

☐

Signature

  
 PLANT GENERAL MANAGER

Date: 1/29/01

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES☒ NO

Signature:



OSSRC SES Chairman

Date: 7/12/01

If yes, OSSRC Meeting No.



## SAFETY EVALUATION FORM

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ACTIVITY: ES199800312

50.59 Log No.: N/A

72.48 Log No.: SE00158

## ISFSI – Disposition of ITR Issues and Other USAR Changes

**Proposed Activity:**

The proposed activity consists of making changes to the ISFSI USAR [Refs. 1 and 2]. The changes are being made to:

1. resolve discrepancies in the USAR identified during an Independent Technical Review (ITR) [Ref. 3],
2. correct the DSC design temperature value to 460 °F, and
3. delete the specific calculated values of individual component weights, stresses and temperatures.

The proposed activity does not involve any hardware changes.

For the ease of discussion and evaluation, the proposed changes to the USAR can be categorized into six categories, as described in the table below.

Change Category	Subject	Description	Supporting Analyses
1	Load Combinations	Load combinations used in the structural analyses of ISFSI components have been re-defined using site specific information.	Refs. 4 and 5
2	Transfer Cask (TC) Structural Analysis	The transfer cask structural integrity was re-analyzed. This re-analysis was evaluated for safety previously as 72.48 safety evaluation number SE00157. Some of the related USAR changes are incorporated through the current safety evaluation.	Refs. 7 and 10
3	Thermal/ Pressure Parameters	Discrepancies identified in the thermal/ pressure parameters, through the independent technical review (ITR), are resolved.	Refs. 4 and 5
4	Dry Shielded Canister (DSC) Structural Analysis	The DSC structural integrity was re-analyzed. This re-analysis was evaluated for safety previously as 72.48 safety evaluation numbers SE00133, SE00146, and SE00148. Some of the related USAR changes are incorporated through the current safety evaluation.	Refs. 6, 8, and 9
5	Deletion of Calculated Stress Values	Specific calculated stress values for ISFSI components and sub-components are deleted from the USAR as unnecessary details. The allowable stress values and the statement that the calculated stresses are within the allowables are left in.	None
6	New Design Temperature Value	A new higher design temperature value of 460 °F is used to be consistent with the SER and USAR. The affected structural analyses are revised.	Ref. 6

Specific changes to the USAR are being made in Chapters 3, 4 and 8. A log of the changes being made, along with category to which each change belongs, is shown in Attachment 1. Where applicable, the ITR discrepancy number is also listed against the change.

## SAFETY EVALUATION FORM

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ACTIVITY: ES199800312

50.59 Log No.: N/A

72.48 Log No.: SE00158

### ISFSI – Disposition of ITR Issues and Other USAR Changes

#### Background

The Independent Spent Fuel Storage Installation (ISFSI) at the Calvert Cliffs Nuclear Power Plant (CCNPP) utilizes the Nutech Horizontal Modular Storage (NUHOMS)-24P dry storage system. The system consists of concrete horizontal storage modules (HSMs), which provide passive storage for spent fuel assemblies that are placed within Dry Storage Canisters (DSCs). Twenty-four spent fuel assemblies are loaded into each DSC. Each DSC contains an outer leak-tight shell and an internal basket assembly. The outer shell provides the structural strength, shielding, and a leak-tight chamber for containing helium. The helium provides an inert atmosphere within the DSC. The internal basket assembly includes twenty-four stainless steel guide sleeves (one for each spent fuel assembly), nine perforated carbon or stainless steel spacer discs, and four stainless steel support rods. The nine spacer discs are spaced out along the length of the DSC at locations that approximately coincide with the spent fuel assembly's eight spacer grids and the single lower retention grid. The spacer discs are not structurally attached to the DSC shell walls or inner cover plates. The guide sleeves traverse the length of the DSC cavity through openings in the spacer discs. The support rods are used to maintain the spacer disc locations. The support rods traverse the length of the DSC cavity through the spacer discs, and are structurally welded to the spacer discs.

The fuel assemblies are loaded into the DSC, which is placed inside a Transfer Cask (TC), within the fuel handling building. The TC is then transported to the storage facility.

CCNPP utilizes the Combustion Engineering 14X14 fuel assemblies. Each of the fuel assemblies is approximately 157 inches in length and approximately eight by eight inches square in cross section.

#### Analyses / Justifications

As stated in the Proposed Activity above, the changes being made accomplish three objectives. The analyses and justification for the respective changes are as follows.

##### 1. Resolution of ITR Discrepancies

Baltimore Gas & Electric (BG&E) identified potential discrepancies related to ISFSI during efforts associated with NRC's Confirmatory Action Letter (CAL), dated July 7, 1995, on Docket No. 72-1004. The discrepancies were related to pressure testing, design input values, and other code commitments. In order to establish the scope and safety significance of these discrepancies, BG&E contracted Transnuclear West (TN-W) to conduct an Independent Technical Review (ITR) [Ref. 3]. The scope of the ITR was to compile all safety significant licensing commitments and then verify that those commitments have been satisfied in the areas of design, fabrication, testing, surveillance, installation, and operations. The scope also included identifying discrepancies or failures to comply with the commitments, and defining actions to resolve the discrepancies such that, after completion of the actions, license compliance will be achieved with all safety significant commitments.

The ITR by Transnuclear West identified 43 discrepancies, and recommended actions to resolve them. These are duplicated in Attachment 2. Thirty-three of the discrepancies, which are marked with an asterisk in Attachment 2, are included in the scope of this safety evaluation.

BG&E contracted Hopper & Associates to evaluate the actions recommended by TN-W, and assist in closing them. The evaluation of the discrepancies and recommendations by Hopper & Associates are documented in References 4 and 5. Hopper & Associates also prepared documents that were necessary to resolve the discrepancies. These documents consisted of two calculations [Refs. 6 and 7], and changes to the USAR, which are included in Ref. 2.

Reference 6 is a re-analysis of the structural integrity of the Dry Shielded Canister (DSC). It resolves the discrepancies that were identified based on the previous design basis calculation. A complete discussion

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of how each discrepancy was resolved is included in References 4 and 5. Results of this calculation were incorporated into the USAR, and evaluated for safety, in accordance with 10CFR72.48, in References 8 and 9.

Similarly, Reference 7 is a re-analysis of the structural integrity of the Transfer Cask (TC). It resolves the discrepancies that were identified based on the previous design basis calculation. A complete discussion of how each discrepancy was resolved is included in References 4 and 5. Results of this calculation were incorporated into the USAR, and evaluated for safety, in accordance with 10CFR72.48, in Reference 10.

Another major change to the USAR is the addition of load combination Tables. Load combinations are currently cited in the USAR through references to the Topical Report [Ref. 12]. The new Tables being added now are based on the TR Tables, but are modified to incorporate site-specific parameters. For example, the load combinations for the flooding scenarios are being deleted, because the Calvert Cliffs ISFSI site is not susceptible to flooding.

**2. DSC Design Temperature**

The DSC design temperature used in the earlier analyses was 400 °F, instead of the correct value of 460 °F, as listed in USAR Table 3.6-3. The design temperature affects the stress allowables, and the pressures that would be developed within the DSC in the abnormal scenarios. Reference 6 documents the DSC analysis based on the correct design temperature. The new stress allowables were determined to be higher than the calculated stresses, and the pressures developed were also determined to be acceptable for the stresses that they would induce and were lower than the relief valve settings. Therefore, the DSC design is safe even with the new higher design temperature.

**3. Deletion of Specific Calculation Results**

The actual calculated results of DSC and TC sub-component stresses, temperatures and pressures were reported in the USAR Tables and text, and in some cases the calculational models were depicted in Figures. Such level of detail is not required in the USAR, and is being deleted. The information left in the USAR consists of the allowable parameters, and assessments that the calculated parameters are below the allowables.

NUREG-1567, Standard Review Plan for Spent Fuel Dry Storage Facilities, [Ref. 11] was consulted to determine if the information being deleted is expected to be provided in the USAR. The accident analysis section of the SRP expects an "evaluation of calculated stress intensity level against the allowable stress intensity level..." Therefore, it is acceptable to include an assessment of calculated stresses and other parameters against the allowables, and delete the actual calculated parameters.

The deletion of these details is also supported by NEI 98-03, Revision 1 "Guidelines for Updating Final Safety Analysis Reports", which received NRC endorsement through Regulatory Guide 1.181. Specifically, Appendix A, Page 4 of the NEI document states:

*"The following types of excessively detailed textural information may be removed from UFSARs, except as indicated by applicable regulatory guidance or NRC Safety Evaluation Reports:*

*Criterion 4 – Analytical information, e.g., detailed calculations, that are not important to providing an understanding of the safety analysis methodology, input assumptions and results, and/or compliance with relevant regulatory and industry standards."*

The multitudes of changes being made to the USAR are listed in Attachment 1, and are categorized into six categories as listed above in the Proposed Activity. Analyses that support the changes are also referenced in the same place.

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#### Reason for Activity:

This activity incorporates into the USAR the resolution of ITR discrepancies. In addition, it incorporates the results of DSC structural analysis at the correct higher design temperature, and deletes unnecessary details from the USAR. The ITR was performed in connection with the CAL issued by the NRC. The resolution of the ITR discrepancies provides assurance that the licensing commitments made in connection with the ISFSI would be met.

The incorporation of DSC analysis results, performed at the correct design temperature, is necessary to correct the earlier use of a lower design temperature.

The deletion of unnecessary information from the USAR is important, because otherwise any minor changes to dimensions or parameters, which may provide inconsequential changes in calculated results, would require revisions to the USAR.

#### Function(s) of affected SSCs:

The affected SSCs are the fuel assemblies, DSCs, TCs, and HSMs.

##### Fuel Assembly

The fuel assembly consists of 176 fuel and poison rods, 5 guide tubes, 5 guide tube sleeves, 8 fuel rod spacer grids, upper and lower end fittings, lower retention grid, and a hold-down device. The guide tubes, spacer grids, and end fittings form the structural frame of the assembly. The fuel rod spacer grids maintain the fuel rod pitch over the length of the assembly. The grid provides positive side restraint to the fuel rod but only frictional restraint axially. The spacer grids are the widest part on a fuel assembly. The four outer guide tubes are mechanically attached to the end fittings and the spacer grids are welded to all five guide tubes. The upper end fitting attaches to the guide tubes to serve as an aligning and lifting device for each fuel assembly. The fuel rods are held together in the assembly at a pitch of 0.58 inch, which helps to control the criticality. The rods consist of enriched uranium fuel pellets stacked within a Zircalloy cladding tube. The cladding is the first barrier that prevents the fission products from escaping to the outside.

##### Dry Storage Canister

The DSC is classified as important-to-safety per 10 CFR 72. It consists of the outer canister and the internal basket assembly. The sub-components of the internal basket assembly include the Spacer Discs, Support Rods, and Guide Sleeves. The internal basket assembly components are not attached structurally to the outer canister.

The DSC provides containment, shielding, criticality control, configuration control related to fuel retrievability, structural support, and thermal safety functions during loading operations, transfer operations, and storage. It is designed to remain intact under all accident conditions identified in the ISFSI USAR with no loss of function. Specific design functions of the DSC include the following:

1. **Confinement** - The DSC design provides mechanical confinement of the stored fuel assemblies to prevent the dispersion of particulate or gaseous radionuclides from the fuel. The primary function of the DSC is to provide confinement of the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further assure containment integrity. The DSC confinement boundary is designed also to retain helium cover gas around the fuel in order to prevent corrosion of the fuel cladding and formation of expansive oxides in the fuel during storage.
2. **Criticality Control** - The DSC design provides for sub-criticality during the wet loading, DSC drying, and interim storage operations. This is accomplished by a combination of mechanical separation of



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the fuel assemblies by the internal basket assembly and neutron absorption in the steel guide sleeve material.

3. Fuel Support and Configuration Control - The DSC internal basket assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accidents, including a cask drop, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that retrieval of intact fuel assemblies is not assured.
4. Shielding - The DSC materials provide gamma radiation shielding. The DSC provides gamma shielding at its ends by the use of lead shield plugs. These provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC loading into the Horizontal Storage Module (HSM) and at the HSM door during storage.
5. Thermal - Decay heat is removed by thermal radiation and conduction from the DSC to the TC, and by thermal radiation and conduction and convection from the DSC to the HSM. The DSC maintains the helium cover gas, which is required for corrosion control. This cover gas improves the thermal performance of the DSC.

The functions of the internal basket assembly components are as follows:

6. Guide Sleeves – The guide sleeves establish storage compartments for 24 spent fuel assemblies within the DSC. The tops of the guide sleeves are flared to assist fuel-handling operators in guiding the spent fuel assemblies into the sleeves.
7. Spacer Discs – The spacer discs work together with the guide sleeves to maintain geometric separation of the fuel assemblies. The spacer discs support the weight of the guide sleeves, support rods and the spent nuclear fuel when the DSC is in a horizontal orientation.
8. Support Rods – The support rods maintain the spacer disk locations along the length of the DSC. They carry the weight of the guide sleeves and the spacer discs when the DSC is in a vertical orientation.

#### Transfer Cask

The TC is important to safety because it protects the spent fuel container during handling. The TC is also considered safety-related since dropping a loaded TC, which weighs about 95 tons, has the potential for creating unanalyzed accident situations in the power plant. The TC is a cylindrical vessel with a bottom end closure assembly and a bolted top cover plate. Its cylindrical walls are formed from three concentric steel shells, the middle of which is the structural shell. Lead is poured between the inner and the middle shells to provide gamma shielding, and a solid neutron shielding material is poured between the middle and the outer shells. Two upper trunnions are located near the top of the cask, and are used for lifting. Two lower trunnions serve as the axis of rotation of the TC, and provide support.

The solid neutron shielding material used in the cask outer annulus, and top and bottom covers produces water vapor and a small quantity of non-condensable gases when heated to above 212 °F. The off gassing produces an internal pressure, which increases with temperature.

#### Horizontal Storage Module

The HSM is considered important to safety because it protects the DSC during storage. It consists of a concrete structure that provides shielding and support for the DSCs.

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**ISFSI USAR Revision No.:** 9

**ISFSI USAR Sections Reviewed:**

Because of the large scope of changes being made to the USAR, almost the entire USAR was reviewed, except the site-related Sections. In particular, the main chapters reviewed in their entirety were 1, 3, 4, 5, 7, and 8.

**Tech Spec Bases Amendment/Rev No.:** 2

Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License No. SNM-2505, Amendment 2, June 30, 2000

**Tech Spec Bases Reviewed:**

- 2.1 Fuel to be Stored at ISFSI
- 2.2 Dry Shielded Canister (DSC)
- 2.3 Transfer Cask (TC)
- 2.4 Horizontal Storage Module (HSM)
- 3/4.1 Fuel to be Stored at ISFSI
- 5.0 Design Features

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Complete for 50.59 and 72.48:

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Probability of Malfunction:**

The proposed activity consists of making changes to the ISFSI USAR. The changes are being made to resolve discrepancies in the USAR identified during the ITR, correct the DSC design temperature value to 460 °F, and delete the specific calculated values of individual component weights, stresses and temperatures. The proposed activity does not involve any hardware changes. Analyses that form the bases of the USAR changes have shown that none of the components of ISFSI are adversely impacted. The calculated stresses are below the allowables. The information being deleted from the USAR does not establish the safety of the related components.

Therefore, the probability of malfunction of equipment important to safety will not be increased because of the proposed changes.

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

**Consequences of Malfunction:**

The malfunctions to be considered are of the ISFSI important-to-safety components listed above.

The consequences of failure of the fuel assemblies, DSC, TC, and the HSM are all related to the release of radioactivity into the atmosphere or the dose to operators or the public. The fuel characteristics, such as the decay heat level and radiation dose criteria applicable to ISFSI components, are not altered. Also, the shielding and containment properties of the DSC and TC are not compromised. Therefore, the consequences of failure of any of the above equipment will not be impacted by this activity.

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

**Probability of Accident:**

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the SAR. They consist of loss of shielding, external missiles, earthquake, flood, cask drop, lightning, blockage of air inlets and outlets, DSC leakage, DSC overpressurization, and forest fire. However, the probability of occurrence of cask drop, or any other accident, is not increased by the changes being made to the USAR.

There is no change to the design or operation of the NUHOMS system caused by this activity. This activity does not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected. Therefore, the probability of occurrence of an accident involving loss of HSM air outlet shielding, or blockage of HSM air inlets and outlets will not increase.

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Pressurization of the DSC due to fuel cladding failure is an accident scenario identified in USAR Section 8.2.9. The limiting DSC pressurization accident event is a rupture of fuel cladding together with blockage of the HSM vents. This activity does not compromise the fuel cladding, or the fuel rod integrity.

DSC leakage is an accident scenario described in USAR Section 8.2.8. The USAR indicates that there are no credible events that would initiate this type of accident. As stated in the preceding paragraphs, the probability of an accident that would lead to cladding failure is not increased by this activity. This activity does not affect the design of the DSC pressure boundary and therefore does not increase the probability of DSC leakage.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

**Consequences of Accident:**

The proposed activity, namely the USAR changes related to the resolution of ITR discrepancies and other items, is related to several accidents, particularly the cask drop accident, as stated above.

The consequences of the cask drop accident on the TC and DSC were evaluated in References 6 through 10. The impact on critical safety functions was evaluated in the same references. The fuel assembly evaluation is the subject of another safety evaluation (SE00154), which is under preparation.

Other changes being made to the USAR consist of revision to the load combination tables, incorporation of DSC analysis results that was performed with the correct design temperature, and the deletion of specific calculated sub-component stresses and temperatures. None of these activities affects the fuel cladding or the fuel rod integrity. Information important to safety is not being deleted. The information being deleted meets the NEI 98-03 criteria for deletion.

Therefore, consequences of an accident previously evaluated in the SAR will not be increased.

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created.

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

**Possibility of New Malfunction:**

The proposed activity makes changes to the USAR to incorporate the resolution of ITR discrepancies and other items. None of the changes impact the environment, functioning, or the procedures related to the equipment important to safety. The information being deleted from the USAR is not important to safety. Therefore, there is no possibility created of a new malfunction in any of the important-to-safety ISFSI components.

☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?



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## Possibility of New Accident:

Credible accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the USAR, and have been discussed previously. Evaluation of the proposed changes to the USAR showed that the important-to-safety components of ISFSI would maintain their safety functions. Since there is no change to the design or operation of the NUHOMS system caused by this activity, the possibility of an accident of a different type than any previously evaluated in the SAR would not be created.

## Complete for 50.59 and 72.48:

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO

Will the margin of safety as defined in the basis for any Technical Specification be reduced?

Tech Spec Bases: 2.3

## Discussion of why the margin of safety is not reduced:

The margin of safety is defined as the range of values between the acceptance limit reviewed and approved by the NRC as part of the licensing basis and the failure point [Ref. 14]. USAR Section 3.2.5 defines the acceptance criteria for ISFSI components, none of which would be exceeded. The use of the correct design temperature for DSC does reduce the allowable stresses, but the new values are still below the code allowables and hence do not represent a change in the licensing basis. The allowable stresses are not being deleted from the USAR. Therefore, the margin of safety would not be reduced.

## Complete for 72.48:

☐ YES ☒ NO

Will the proposed activity involve a significant increase in occupational dose?

## A significant increase in occupational dose:

The radiation protection design and operation of the NUHOMS-24P dry cask storage system would not be changed by this proposed activity. The supporting analyses showed that the ISFSI equipment would maintain the radioactivity confinement boundary, and maintain the criticality control. Retrieval of fuel following a drop would still be assured. Occupational dose associated with post DSC accident recovery is not addressed in the Calvert Cliffs ISFSI USAR, however, the occupational dose for fuel retrieval, following the unlikely cask drop accident, is expected to be minimized through the use of special procedures and precautions. Because none of these attributes would be changed, the occupational doses summarized in USAR Table 7.4-1 would not be affected by this activity.

☐ YES ☒ NO

Will the proposed activity involve a significant unreviewed environmental impact?

## A significant unreviewed environmental impact:

The NUHOMS-24P dry cask storage system confinement and radiological shielding functions would not be reduced by this activity.

This activity would not affect any area of the plant site previously undisturbed for the ISFSI, and would not cause any reason for revision to the ISFSI Updated Environmental Report. This activity would not

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affect the environmental conditions associated with the ISFSI. Therefore, this activity would not involve an unreviewed environmental impact.

**References:**

1. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Rev. 9
2. CCNPP ISFSI USAR Change Request, UCR-00194
3. Transnuclear West Report No. 0113-92003-R-001, Independent Technical Review of Baltimore Gas & Electric Calvert Cliffs NUHOMS Project, Rev. 1, 9/1/98
4. Hopper and Associates Letter No. HABGE-06/99-0789 with Attachment, Resolution of Transnuclear West Independent Technical Review Comments for the BGE Calvert Cliffs NUHOMS Project, 6/2/99
5. Hopper and Associates Letter No. HABGE-10/00-0908, ITR Issues Disposition Response, 10/17/2000
6. BGE Calculation CA04132, Rev. 0002, Nutech Horizontal Module System (NUHOMS) 24P ISFSI Dry Shielded Canister Structural Analysis for DSC Assemblies R001-R024
7. BGE Calculation CA04141, Rev. 0002, ISFSI Transfer Cask Structural Evaluation
8. BGE 10CFR72.48 Safety Evaluation, SE00146
9. BGE 10CFR72.48 Safety Evaluation, SE00148
10. BGE 10CFR72.48 Safety Evaluation, SE00157
11. NUREG-1567, Standard Review Plan for Spent Fuel Dry Storage Facilities (Final Report), March, 2000
12. Topical Report for the NUTECH Horizontal Modular Storage (NUHOMS) System for Irradiated Nuclear Fuel, NUH-002, Rev. 2
13. Calvert Cliffs Updated Final Safety Analysis Report (UFSAR), Rev. 26
14. NEI 96-07, Rev. 0, Guidelines for 10 CFR 50.59 Safety Evaluations, 09/97
15. Calvert Cliffs ISFSI Updated Environmental Report, Rev. 1
16. Technical Specifications for Calvert Cliffs ISFSI, Amendment 2

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**Summary:** (For NRC Report, provide a brief overview)

**Proposed Activity:**

The proposed activity consists of making changes to the ISFSI USAR. The changes are being made to (1) resolve discrepancies in the USAR identified during an Independent Technical Review (ITR), (2) correct the DSC design temperature value to 460 °F, and (3) delete the specific calculated values of individual component weights, stresses and temperatures. The proposed activity does not involve any hardware changes.

**Reason for Activity:**

This activity incorporates into the USAR the resolution of ITR discrepancies. In addition, it incorporates the results of DSC structural analysis at the correct higher design temperature, and deletes unnecessary details from the USAR. The ITR was performed in connection with the CAL issued by the NRC. The resolution of the ITR discrepancies provides assurance that the licensing commitments made in connection with the ISFSI would be met.

The deletion of unnecessary information from the USAR is important, because otherwise any minor changes to dimensions or parameters, which may provide inconsequential changes in calculated results, would require revisions to the USAR.

**Activity Summary:**

Several changes to the USAR are being made in chapters 3, 4, and 8. The changes are categorized as follows:

- Load combinations used in the structural analyses of ISFSI components have been re-defined using site specific information.
- The transfer cask structural integrity was re-analyzed.
- Discrepancies identified in the thermal/ pressure parameters are resolved.
- The DSC structural integrity was re-analyzed.
- Specific calculated stress values for ISFSI components and sub-components are deleted from the USAR as unnecessary details. The allowable stress values, and the statement that the calculated stresses are within the allowables, are left in. The deletion was justified, as such information was not listed as required in NUREG-1567, Standard Review Plan for Spent Fuel Dry Storage Facilities.
- A new higher design temperature value of 460 °F is used to be consistent with the SER and USAR. The affected structural analyses are revised.

**USQ Determination:** This activity was evaluated against the criteria of 10CFR72.48(a)(2), such as the probability of occurrence or the consequences of an accident or the malfunction of equipment important to safety, and it was concluded that it does not involve an unreviewed safety question (USQ).

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Attachment 1

## USAR Change Log

Change No.	USAR Section	USAR Page	Description	Change Category	ITR Discrepancy No.
1	3.2.5	3.2-3	Add text references to new tables of site-specific load combinations.	1	D102, D310
2	T3.2-2	New	Copy HSM load combinations table from the Topical Report (TR).	1	D102
3	T3.2-3	New	Copy TR Table 3.2-5a, and modify it to make it site-specific.	1	D102
4	T3.2-4	New	Copy TR Table 3.2-5b, and modify it to make it site-specific.	1	D102
5	T3.6-1	3.6-4	Re-define design loads for transfer cask upper trunnions.	2	D301
6	T3.6-3	3.6-8	Revise DSC internal pressure design parameter to 50 psig	3	D602
7	4.7	4.7-2	Revise the bottom neutron shield relief valve setting to 40 psig.	3	D306
8	8.1.1.1. A	8.1-1	Text is revised to delete specific calculated component weights.	5	-
9	8.1.1.2	8.1-2	Text is revised in accordance with the new analysis, and to delete stress calculation model figures and result tables.	4, 5	-
10	8.1.1.3	8.1-3	Text is revised to delete stress calculation model figures and result tables.	5	-
11	8.1.1.4	8.1-4	Text is revised to delete stress calculation result tables.	5	-
12	8.1.1.5	8.1-4, -5	Text is revised to delete stress calculation result tables.	5	-
13	8.1.1.9	8.1-6	Text is revised in accordance with the new analysis, and to delete stress calculation model figures and result tables.	2, 5	-
14	8.1.2.1. C	8.1-7	Text is revised to delete stress calculation result tables.	5	-
15	8.1.2.2	8.1-8	Text is revised to delete stress calculation result tables.	5	-
16	8.1.3.1	8.1-11	Text is revised to delete temperature calculation model figures and result tables.	5	-
17	8.1.3.2	8.1-11, -12	Text is revised to delete temperature calculation model figures and result tables.	5	-
18	8.1.3.3	8.1-12	Text is revised to delete temperature calculation result table.	5	-
19	T8.1-1	8.1-14	Delete table of calculated weights.	5	-
20	T8.1-2	8.1-15	Delete table of calculated stresses.	5	-
21	T8.1-3	8.1-16	Delete table of calculated stresses.	5	-



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Attachment 1

Change No.	USAR Section	USAR Page	Description	Change Category	ITR Discrepancy No.
22	T8.1-4	8.1-17	Delete table of calculated stresses.	5	-
23	T8.1-5	8.1-18	Delete table of calculated stresses.	5	-
24	T8.1-6	8.1-19	Delete table of calculated stresses.	5	-
25	T8.1-7	8.1-20	Delete table of calculated deflections	5	-
26	T8.1-8	8.1-21	Delete calculated stress values.	5	-
27	T8.1-9	8.1-22, -23	Delete table of calculated temperatures.	5	-
28	T8.1-10	8.1-24	Delete table of calculated stresses.	5	-
29	T8.1-11	8.1-25	Delete table of calculated temperatures.	5	-
30	T8.1-12	8.1-26	Delete table of calculated temperatures.	5	-
31	T8.1-13	8.1-27	Delete table of calculated temperatures.	5	-
32	T8.1-14	8.1-28	Delete table of calculated temperatures.	5	-
33	F8.1-1	?	Delete calculation model.	5	-
34	F8.1-2	?	Delete calculation model.	5	-
35	F8.1-3	?	Delete calculation model.	5	-
36	F8.1-4	?	Delete calculation results.	5	-
37	F8.1-5	?	Delete calculation model.	5	-
38	F8.1-6	?	Delete calculation model.	5	-
39	F8.1-7	?	Delete calculation model.	5	-
40	F8.1-8	?	Delete calculation model.	5	-
41	N/A	N/A	Not used.	N/A	N/A
42	F8.1-10	?	Delete calculation results.	5	-
43	F8.1-11	?	Delete calculation results.	5	-
44	F8.1-12	?	Delete calculation model.	5	-
45	F8.1-13	?	Delete calculation results.	5	-
46	F8.1-14	?	Delete calculation results.	5	-
47	F8.1-15	?	Delete calculation results.	5	-
48	F8.1-16	?	Delete calculation results.	5	-
49	8.2.2.2. A	8.2-2	Revise text to delete reference to results tables that are being deleted.	5	-
50	8.2.2.2. B	8.2-2	Revise text to reflect the revised analysis.	2	D302
51	8.2.2.2. C	8.2-3	Revise text to delete reference to results tables that are being deleted.	5	-
52	8.2.2.2. D	8.2-3, thru -5	Revise text to reflect the revised analysis.	2	D302
53	8.2.3.2	8.2-6, -7	Revise text to delete reference to results tables that are being deleted.	5	-
54	8.2.5.2	8.2-9, -10	Revise text to reflect new analyses, and references to the deleted result tables.	2, 4, 5	D309, D314
55	8.2.7.2	8.2-12	Revise text to delete reference to results tables that are being deleted.	3	-
56	8.2.9.2	8.2-19	Revise the DSC internal pressure value.	3	-

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ACTIVITY: ES199800312

50.59 Log No.: N/A

72.48 Log No.: SE00158

ISFSI – Disposition of ITR Issues and Other USAR Changes

Attachment 1

Change No.	USAR Section	USAR Page	Description	Change Category	ITR Discrepancy No.
57	8.2.12	8.2-22	Revise text to delete references to deleted results tables.	5	-
58	T8.2-2	8.2-25	Delete calculation results table.	5	-
59	T8.2-3	8.2-26	Delete calculation results table.	5	-
60	T8.2-4	8.2-27	Delete calculation results table.	5	-
61	T8.2-5	8.2-28	Delete calculation results table.	5	-
62	T8.2-6	8.2-29	Delete calculation results table.	5	-
63	T8.2-7	8.2-30	Delete calculation results table.	5	-
64	T8.2-8	8.2-31	Delete calculation results from the table.	5	-
65	T8.2-9	8.2-32	Delete calculation results from the table.	5, 6	-
66	T8.2-10	8.2-33	Delete calculation results from the table.	5, 6	-
67	T8.2-11	8.2-34	Delete calculation results table.	5	-
68	T8.2-12	8.2-35	Delete calculation results from the table.	5	-
69	T8.2-13	8.2-36	Delete calculation results table.	5	-
70	T8.2-14	8.2-37	Delete calculation results from the table.	5	D305
71	T8.2-15	8.2-38	Delete calculation results from the table.	5	D305
72	8.2-16	8.2-39	Delete calculation results from the table.	5	D305

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50.59 Log No.: N/A

72.48 Log No.: SE00158

ISFSI - Disposition of ITR Issues and Other USAR Changes

Attachment 2

## ATTACHMENT H

## BGE ITR Discrepancy Resolution

Discrep. No.	Description	Recommended Action	Action to be Completed by
D101	Design specification references incorrect fuel burnup values	Revise design specification	BGE 2F199800014 MS 001 GAYCZKOWSKI
D102 ★	Clarify structural analysis loading conditions evaluated	Revise SAR to reconcile differences between Topical Report (referenced by SAR) and Design Specification/Calculations	BGE 2F199800014 MS 002 REHENIUK
D301 ★	Discrepancy between SAR and calculation loads for the cask upper trunnion	Revise SAR	BGE 2F199800014 MS 003 REHENIUK
D302 ★	Tornado analysis results for wind stability provided in SAR but not included in design calculations	Add analysis to design calculations and revise SAR if necessary	BGE 2F199800014 MS 004 REHENIUK
D303 ★	Stress intensities not calculated in accordance with ASME Code	Add reference to this discrepancy and to the confirmatory analysis in the cask structural calculation	BGE 2F199800014 MS 005 REHENIUK
D304	Design analysis could not provide a detailed dose profile at the location of the docking ring.	Unresolved item. Review available dose data and document adequacy of local dose with respect to SAR limit.	BGE 2F199800014 MS 006 BEALL
D305 ★	Incorrect allowable stress intensities reported in SAR.	Revise SAR.	BGE 2F199800014 MS 007 REHENIUK
D306 ★	Test pressure for bottom shield cavity was 45 psig, SAR specifies 50 psig.	Revise SAR and/or revise relief valve setpoint.	BGE 2F199800014 MS 008 REHENIUK
D307 ★	Incorrect reference to computer run providing the basis for thermal stress intensity calculation for the neutron shield jacket support rings.	Reference this discrepancy and the confirmatory analysis in the calculation.	BGE 2F199800014 MS 009 REHENIUK
D308 ★	Elastic thermal stress analysis indicates stresses above 3Sm, therefore an elasto-plastic analysis is required.	After further review this concern was found to be related to a local discontinuity which does not require analysis per code requirements.	No action 2F199800014 MS 010 REHENIUK
D309 ★	Error in data used to represent crush reaction for the side drop analysis.	Reference this discrepancy and the confirmatory analysis in the cask structural analysis.	BGE 2F199800014 MS 011 REHENIUK
D310 ★	Load cases specified in SAR are inconsistent with Topical Report.	Revise SAR.	BGE 2F199800014 MS 012 REHENIUK

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ISFSI - Disposition of ITR Issues and Other USAR Changes

Attachment 2

Discrep. No.	Description	Recommended Action	Action to be Completed by
D311 ★	Tornado missile analysis does not consider a downward impact load on the top of the cask.	Document in design calcs that this load condition is not governing.	BGE 2F199800014 H5 013 REHENIUK
D312 ★	Cask bottom plate stresses were calculated at the center of the plate only. Higher stresses at the fixed boundary were not evaluated.	Update analysis and SAR. Impact evaluated and found to be acceptable.	BGE 2F199800014 H5 014 REHENIUK
D313	Technical specification 10.3.2.6 requires surface swipes on inside <i>but not exterior of cask</i> . Swipes of external surface are not taken. This is not consistent with 49CFR173.443(d).	Revise SAR to clarify that CFR requirement is not appropriate due to ALARA concerns and is not necessary based on cask handling procedures.	BGE 2F199800014 H5 015 BEALL
D314 ★	Cask corner drop stress summary reports equivalent stresses not stress intensities.	Update cask calc. Impact evaluated and found to be acceptable.	BGE 2F199800014 H5 016 REHENIUK
D401 ★	ANSI N14.6 stress analysis requirements not rigorously followed.	Review indicates acceptability of design. Incorporate into cask structural analysis.	BGE 2F199800014 H5 017 REHENIUK
D501 ★	Assumptions used in missile load on analysis of HSMs appears to be inconsistent with respect to target ductility assumptions versus the effect of design methods on material ductility.	Incorporate a discussion of this issue into the HSM calculations to substantiate the assumptions used.	BGE 2F199800014 H5 018 REHENIUK
D502 ★	Inconsistency in dimensions between drawings and specifications.	Review and resolve the inconsistency by revising the appropriate documents.	BGE 2F199800014 H5 019 REHENIUK
D503	Documentation of the acceptability of DSC support steel lubricant with respect to environmental qualification (temperature and dose) was not included in design basis analyses.	Incorporate a discussion of the vendor qualification of the lubricant for the environmental conditions in analyses or specifications.	BGE 2F199800014 H5 020 BEALL
D504 ★	The method used for summation of load cases for the HSM SAR analysis was not appropriate.	Revise SAR to reflect the appropriate method of load combination. No impact on acceptability of results.	BGE 2F199800014 H5 021 REHENIUK
D601 ★	The SAR/SER maximum operating temperatures reported for determination of stress allowables is not consistent with the design analyses.	Revise the SAR to reflect the appropriate temperatures and allowables. No impact on acceptability of results.	BGE 2F199800014 H5 022 REHENIUK
D602	DSC internal pressure for accident	The design conditions used	BGE

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Attachment 2

Discrep. No.	Description	Recommended Action	Action to be Completed by
D602 ★	conditions reported in the SAR is not consistent with the analysis.	envelope the analysis value. Revise the SAR to reflect the correct values.	2F199800014 NS 023 RENNIUK
D603 ★	Summation of stresses for the various load cases may not be conservative.	Revise design analyses to document the basis for acceptability of the method used. See confirmatory analysis for review and acceptance of the approach used.	BGE 2F199800014 NS 024 RENNIUK
D604 ★	DSC calculations used ASME section NB criteria where NG criteria may have been more appropriate.	Revise analysis to document the basis and acceptability of the method used.	BGE 2F199800014 NS 025 RENNIUK
D605 ★	Stresses above 3Sm were determined without application of plastic analysis acceptance criteria.	Confirmatory analysis determined that stresses are within allowables. Revise SAR to reflect the results of the confirmatory analysis.	BGE 2F199800014 NS 026 RENNIUK
D606	DSC thermal analysis model used for heat transfer in HSM may not be accurate.	Considered to be an insignificant impact. Incorporate basis for acceptability of the thermal model into thermal analysis.	No action required 2F199800014 NS 027 MASSOUD
D607 ★	Finite element model used for spacer disc may not provide accurate results.	Confirmatory analysis indicates that results are acceptable. Incorporate a discussion of the confirmatory analysis in the design calculation.	BGE 2F199800014 NS 028 RENNIUK
D608 ★	Thermal modeling of DSC in transfer cask may not be appropriate.	After further review it was determined that the model used was sufficiently accurate. Incorporate a discussion of the acceptability of the model into the design calculation.	No action required 2F199800014 NS 029 RENNIUK
D609 ★	ANSYS nodal temperature input was incorrect.	Confirmatory analysis indicates that the analysis results are acceptable when the error is corrected. Revise design calculation to reference confirmatory analysis or incorporate a discussion of the impact of the error.	BGE 2F199800014 NS 030 RENNIUK
D610	Thermal analysis incorrectly references 8 year old fuel as basis for evaluation. The correct heat load associated with 10 year old	Revise analysis to correct the erroneous statement.	BGE 2F199800014 NS 031 BEALL

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Discrep. No.	Description	Recommended Action	Action to be Completed by
	fuel is used in the analysis.		
D611 ★	Structural analysis of spacer disc in basket does not model interaction between spacer discs and the potential impact on out-of-plane bending.	Confirmatory analysis indicates that code allowables are met when a more appropriate model is used. Revise design analysis to reference confirmatory analysis.	BGE 2F199800014 NS 032 REHENIUK
D612 ★	Plastic analysis modulus of elasticity for plastic region not consistent with ANSYS/Code recommendations.	Confirmatory analysis performed confirming adequacy with respect to the appropriate code allowables. Revise design analysis to reference/incorporate the confirmatory analysis.	BGE 2F199800014 NS 023 REHENIUK
D613 ★	DSC shell local bending circumferential stress does not use the bounding DSC weight of 80,000 lbs. The associated stress is calculated as a stress intensity without justification.	The resulting stresses are not controlling and therefore the error does not impact the bounding analyses. Revise the design analysis to justify the approach used or to revise to incorporate the bounding weight.	BGE 2F199800014 NS 034 REHENIUK
D614 ★	Modeling of support ring welds is not accurate.	A confirmatory analysis using more a more appropriate model supports the calculation results. Incorporate a discussion of the confirmatory analysis, or reference to it, in the design calculation.	BGE 2F199800014 NS 035 REHENIUK
D615 ★	Modeling of DSC shell/lead shield plug interface is not substantiated.	Further review indicates that the model used was appropriate.	No action required 2F199800014 NS 036 REHENIUK
D616 ★	Basis for analysis of support rod/discs with respect to NG2330 not found.	Subsequent review has found the appropriate basis/analysis.	No action required 2F199800014 NS 037 REHENIUK
D617 ★	Fabrication specification, NUH-03-107 does not require proof pressure testing.	Addressed in response to confirmatory action letter. Results of this review have been incorporated in Revision 6 of NUH-03-107 and associated issued ECNs 95-0021, 95-0037 and 96-0067.	No action required 2F199800014 NS 038 REHENIUK
D618 ★	Inconsistent reference to applicable ASME code section for the DSC basket (NG vs. NB).	Review and update SAR as necessary to make it consistent with SER. No impact on analysis.	BGE 2F199800014 NS 039 REHENIUK
D619	ORIGEN code calculations of source term used incorrect input data.	The erroneous input data was not used in the analysis. Revise the calculation to reference the correct data.	No action required 2F199800014 NS 040 GAYCEKOWSKI

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ACTIVITY: ES199800312	50.59 Log No.: N/A	72.48 Log No.: SE00158
ISFSI – Disposition of ITR Issues and Other USAR Changes		Attachment 2





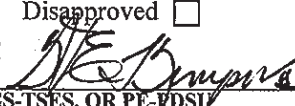
Discrep. No.	Description	Recommended Action	Action to be Completed by
D620	Secondary gamma sources were not appropriately modeled in dose analysis model.	A review of the actual data used and its generic basis which envelopes BGE Calvert Cliffs fuel indicate that the existing analysis is adequate.	No action required 2F19980001A NS041 GRV02K0W5K1
D621	Neutron and gamma dose rates were benchmarked against a fuel different than the design basis fuel.	Further review indicates that the benchmarks were bounding for the design basis fuel.	No action required 2F19980001A NS042 GRV...SK1
D622	DSC bottom end closure welds were tested using a soap bubble test instead of a helium leak test.	A CAR has been issued to review and address this issue. Further testing may be required to document license compliance. Testing of unloaded DSCs indicates that the fabricated components meet the helium leak test criteria.	BGE to evaluate TNW basis for acceptability provided for this discrepancy. BGE to assess need for further testing. 2F19980001A NS043 BENLL

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## ATTACHMENT 3, SAFETY EVALUATION FORM

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<b>ACTIVITY: ES200001036-000</b>		<b>50.59 LOG NO.:</b>	<b>72.48 LOG NO.: SE00159</b>
Based on the attached discussion, does this activity:			
Applicable to 10 CFR 50.59 and 10 CFR 72.48 Safety Evaluations			
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	Involve an unreviewed safety questions (USQ)?	
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	Involve a change in the Technical Specifications/License Conditions?	
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	Require a change or addition to the UFSAR/USAR/Technical Specification Bases?	
Applicable to 10 CFR 72.48 Safety Evaluations			
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	Involve a Significant Increase in Occupational Dose?	
<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	Involve a Significant Unreviewed Environmental Impact?	
Prepared by: <u>B. H. Scott</u>  Department: <u>42-01-03</u> Date: <u>11/3/00</u> <small>PRINTED NAME AND SIGNATURE</small>			
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO    Is a special review required by groups other than the group to which the Preparer belongs?			
Resp Ind.: <u>R. H. Beall</u> <small>PRINTED NAME</small>  <small>SIGNATURE</small>		Resp. Ind.: <u>R. O. Hardies</u> <small>PRINTED NAME</small>  <small>SIGNATURE</small>	
Work Group: <u>NFM</u>		Work Group: <u>MEIU</u>	
Date: <u>11/6/00</u>		Date: <u>11/6/00</u>	
Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature: <u>M. A. BLACKWELL</u>  <small>INDEPENDENT REVIEWER</small>		Approved <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/> Signature: <u>W.E. KEMPER</u>  <small>GS-DES, GS-TSES, OR PE-TDSU</small>	
Date: <u>11/6/00</u>		Date: <u>11-6-00</u>	
The POSRC has reviewed this evaluation according to NS-2-101.			
POSRC Meeting No.: <u>00-095</u>		Date: <u>11/6/00</u>	
Recommend Approval <input checked="" type="checkbox"/> Disapproval <input type="checkbox"/>	Signature: <u>J. T. Call</u> <small>POSRC CHAIRMAN</small>	Date: <u>11/6/00</u>	
Approval <input checked="" type="checkbox"/> Disapproved <input type="checkbox"/>	Signature: <u>P. Katz</u> <small>PLANT GENERAL MANAGER</small>	Date: <u>11/6/00</u>	
The OSSRC has reviewed this evaluation according to NS-2-100.			
Full OSSRC Committee review required? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
Signature: <u>W. Russell</u> <small>OSSRC SES Chairman</small>		Date: <u>01/12/01</u>	
If yes, OSSRC Meeting No. _____			



## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES200001036-000

50.59 LOG NO.:

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**Proposed Activity:** Allow use of Dry Shielded Canister (DSC) BGE-24P-W042 without the four stainless steel plugs installed in the top spacer disc of the basket assembly.

**Reason for Activity:** The ISFSI USAR states that all DSC structural components are fabricated from type 304 stainless steel, except the spacer disks and support rods may be fabricated from aluminum coated carbon steel. BGE requested an alternative material for the spacer disks and support rods to reduce fabrication costs. The top spacer disc of DSC BGE-24P-W042 is made of carbon steel and coated with a flame spray aluminum to provide the necessary corrosion resistance. There are four threaded holes in the top spacer disk used during fabrication of the canister. These four holes are not sprayed with the aluminum coating. To protect the carbon steel surfaces in these holes, stainless steel plugs are inserted prior to shipping the DSC. The stainless steel plugs for DSC BGE-24P-W042 were mistakenly removed at CCNPP during preparations for loading the DSC. The DSC has been filled and the top shield plug assembly and top cover plate have been welded in place.

**Function(s) of affected SSC.** NUHOMS-24P (Nutech Horizontal Modular System) is a dry storage system that provides safe, interim storage for irradiated fuel assemblies. The system was designed by Pacific Nuclear Fuel Services (formerly Nutech Engineers, Inc.), which has since become Vectra Technologies, Inc. There are three major components of the NUHOMS-24P system that are addressed in this safety evaluation. Those three components are 1) Dry Shielded Canister (DSC); 2) Transfer Cask (TC); and 3) Horizontal Storage Module (HSM). A detailed description of each of these components is contained in the USAR and the NUHOMS-24P Topical Report. What follows is a brief description of the NUHOMS-24P system and those three components.

NUHOMS-24P - the Calvert Cliffs license allows construction and operation of a total of 120 HSM's, which can house 2880 fuel assemblies. These modules can be built incrementally, as needed, to match BGE's requirements for additional storage. There are currently 48 HSM's constructed, which will allow for the continued generation and storage of spent fuel until approximately 2002. Each HSM contains one DSC, and each DSC contains 24 fuel assemblies. The fuel assemblies are transferred from the spent fuel pool via the DSC and the TC via the heavy haul road to the ISFSI site, where the DSC is then inserted into the HSM for interim storage.

Dry Shielded Canister (DSC) - the DSC is a Type 304 stainless steel cylinder with an internal stainless steel or aluminum coated carbon steel basket assembly that houses 24 fuel assemblies. (DSC BGE-24P-W042 is aluminum coated carbon steel.) The DSC is designed to fit securely in the TC and to slide into the HSM from the TC without undue galling. The function of the DSC is to provide physical and radiological protection, and structural support of the spent fuel during loading operations and storage in the HSM. The DSC has been designed for the worst-case postulated accidents, so that retrievability of the fuel from the DSC is assured even following a maximum credible accident.

Transfer Cask (TC) - the TC is a stainless steel cylinder with a bottom end closure assembly and a bolted top cover plate. There are two upper lifting trunnions near the top of the cask for downending / uprighting and lifting of the cask in the Auxiliary Building. The two lower trunnions serve as the axis of rotation during downending / uprighting operations and act as supports during transport. The function of the TC is to provide radiological shielding during DSC closure operations and during transfer of the DSC to and from the ISFSI site. The TC is important to safety since it provides shielding and protection of the DSC from impact loads.

Horizontal Storage Module (HSM) - each HSM is a reinforced, concrete structure constructed in place at the ISFSI site. Calvert Cliffs employs a 2 x 6 array, a massive concrete structure which consists of twelve HSM's in two rows of six. The side walls and roof are three feet thick, whereas the front walls are three and one half feet thick. There are two foot thick interior walls which separate each HSM and provide neutron and gamma shielding and prevent scatter in adjacent modules during DSC loading. The function of the HSM is to safely provide interim storage of the DSC's. The HSM provides the necessary radiological protection to the public at all times. Each HSM has been designed for worst case postulated and hypothetical accidents, including scenarios such as design basis tornadoes and tornado missiles.

SAR Revision No.: 9

SAR Sections Reviewed: The main chapters reviewed were 1, 3, 4, 5, 7, and 8. The key sections reviewed were 1.3, 3.4, 3.6, 4.2, 5.1, 7.4, 8.1, and 8.2.

Tech Spec Bases Rev. No. Amendment 2

Tech Spec Bases Reviewed: All

Complete for 50.59 and 72.48

## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES200001036-000

50.59 LOG NO.:

72.48 LOG NO.: SE00159

1. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR is not increased.

☐ YES ☒ NO May the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Probability of Malfunction: The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as the result of this proposed activity. The NUHOMS-24P system is a totally passive installation that is designed to provide shielding and safe confinement of irradiated fuel. The passive nature in itself provides a minimal probability for any malfunction to occur. There are no possible malfunctions of the DSC which are described or evaluated in the USAR as a result of the USAR allowing the DSC spacer disks and support rods to be fabricated from type 304 stainless steel or aluminum coated carbon steel. The use of aluminum coated carbon steel was evaluated by Pacific Nuclear Fuel Services in 1991 via vendor calculation no. BGE001.0216 (Carbon Steel DSC Basket Assembly). The calculation evaluated the DSC for allowable stresses, ductility, and corrosion resistance.

Once the DSC has been loaded, the canister is evacuated and backfilled with helium. The EPRI NMAC "Boric Acid Corrosion Guidebook" states that the corrosion rate of carbon steel in the presence of dry boric acid crystals is essentially zero. Similarly, in deaerated solutions, the corrosion rate is less than 0.001" per year. Since the canister is initially evacuated, any contained water will be evaporated and removed. The helium backfill provides an inert long term environment. Therefore, a corrosion rate of <0.001" per year is appropriate. This will represent a corrosion depth of 0.050" over the 50 year design life of the canister, limited to the vicinity of the threaded holes. The plate was exposed to borated water in the spent fuel pool for approximately forty four hours during fuel loading. The EPRI Guidebook estimates a corrosion rate of <0.008" per year, i.e., <0.00005" corrosion for a 48 hour period, for boric acid concentrations and temperatures typical of the spent fuel pool. Therefore, corrosion of the exposed surface during this immersion period was negligible and limited to the surfaces in the threaded holes. The minimal corrosion that may be experienced during canister loading and over the 50 year design life will not adversely impact the structural integrity of the basket assembly under any of the design loading conditions. The original evaluation of the carbon steel plates concluded that there is sufficient margin in the calculated stresses to ensure that the corrosion resulting from a lengthy exposure of unprotected carbon steel to the pool environment would not jeopardize the safe operation of the DSC for any of its design basis functions. The strength of carbon steel for structural support of the stored spent fuel exceeds that of the stainless steel.

☐ YES ☒ NO May the consequences of a malfunction of equipment important to safety previously evaluated in the SAR be increased?

Consequences of Malfunction: The consequences of a malfunction of equipment important to safety previously evaluated in the SAR will not be increased as a result of this proposed activity. As stated above, there are no possible malfunctions of the DSC which are described or evaluated in the USAR as a result of the USAR allowing the DSC spacer disks and support rods to be fabricated from type 304 stainless steel or aluminum coated carbon steel. Likewise there are no malfunctions of the DSC described or evaluated in the USAR which are affected by the minimal corrosion potentially resulting from the omission of the four plugs in the upper spacer disc. As such, there are no consequences to consider.

☐ YES ☒ NO May the probability of occurrence of an accident previously evaluated in the SAR be increased?

Probability of Accident: The probability of occurrence of an accident previously evaluated in the SAR will not be increased as the result of this proposed activity. One accident scenario described in the ISFSI USAR addresses the structural integrity of the transfer cask, the DSC, and its internals under a postulated transfer cask accident condition. The accident analysis included the use of either type 304 stainless steel or aluminum coated carbon steel spacer disks and support rods. The minimal corrosion expected in the vicinity of the four missing plugs will not negatively impact the results of the structural analysis.

☐ YES ☒ NO May the consequences of an accident previously evaluated in the SAR be increased?

Consequences of Accident: The consequences of an accident previously evaluated in the SAR will not be increased as a result of this proposed activity. The cask drop analysis concluded that the transfer cask, the DSC, and its internal basket assembly and contained fuel will maintain its structural integrity through a cask drop. Since the use of either material was considered in the analysis, and since any potential corrosion resulting from the omission of the four plugs in the top spacer disc will not adversely impact the structural integrity of the assembly, there will be no increase in the accident dose consequences already described in the USAR.

## ATTACHMENT 3, SAFETY EVALUATION FORM

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ACTIVITY: ES200001036-000 | 50.59 LOG NO.: 72.48 LOG NO.: SE00159

2. The possibility for an accident or malfunction of a different type than any evaluated previously in the SAR is not created

☐ YES ☒ NO May the possibility of a malfunction of a different type than any previously evaluated in the SAR be created?

Possibility of New Malfunction: The possibility of a malfunction of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity. One possible malfunction of the DSC which is not described or evaluated in the USAR is the corrosion of the DSC carbon steel spacer disks and support rods due to exposure to spent fuel pool environment of borated water. The material corrosion properties are only relevant during transfer of fuel to the DSC in the spent fuel pool since the storage atmosphere is made inert with Helium and there is no oxygen present to support corrosion of the carbon steel spacer disks and support rods. As discussed previously, the corrosion rates predicted for carbon steel in the spent fuel pool environment during DSC fuel loading will result in minimal corrosion during the 48 hours the spacer plate was exposed to pool water.

☐ YES ☒ NO May the possibility of an accident of a different type than any previously evaluated in the SAR be created?

Possibility of New Accident: The possibility of an accident of a different type than any previously evaluated in the SAR will not be created as a result of this proposed activity.

Complete for 50.59 and 72.48

3. The margin of safety as defined in the basis for any Technical Specification is not reduced.

☐ YES ☒ NO Will the margin of safety as defined in the basis for any Technical Specifications be reduced?

Bases

Discussion of why the margin of safety is not reduced

None of the Technical Specifications nor the Bases are affected by this activity.

Complete for 72.48

☐ YES ☒ NO Will the proposed activity involve a significant increase in occupation dose?

A significant increase in occupational dose: A significant increase in occupational dose will not occur as a result of this proposed activity. This activity will allow the use of DSC BGE-24P-W042 without the four plugs installed in the top spacer disc. The exposure of portions of the carbon steel spacer plate to borated pool water during fuel loading will result in negligible corrosion and will not adversely affect the operation or the associated occupational exposures as described in ISFSI USAR Table 7.4-1.

☐ YES ☒ NO Will the proposed activity involve a significant unreviewed environmental impact?

A significant unreviewed environmental impact: A significant unreviewed environmental impact will not occur as the result of this proposed activity. The proposed activity does not affect the environmental conditions of the ISFSI.

Summary: (For NRC Report, provide a brief overview)

The proposed activity is to allow use of Dry Shielded Canister (DSC) BGE-24P-W042 without the four stainless steel plugs installed in the top spacer disc of the basket assembly. The ISFSI USAR states that all DSC structural components are fabricated from type 304 stainless steel, except the spacer disks and support rods may be fabricated from aluminum coated carbon steel. BGE requested an alternative material for the spacer disks and support rods to reduce fabrication costs. The top spacer disc of DSC BGE-24P-W042 is made of carbon steel and coated with a flame spray aluminum to provide the necessary corrosion resistance. There are four threaded holes in the top spacer disc used during fabrication of the canister. These four holes are not sprayed with the aluminum coating. To protect the carbon steel surfaces in these holes, stainless steel plugs are inserted prior to shipping the DSC. The stainless steel plugs for DSC BGE-24P-W042 were mistakenly removed at CCNPP during preparations for loading the DSC. The DSC has been filled and the top seal plug assembly and top cover plate have been welded in place.

Minimal corrosion expected during the short period of immersion in the spent fuel pool. After the DSC is loaded, it is evacuated and backfilled with helium. This creates an inert environment inside the DSC which will minimize any

**ATTACHMENT 3, SAFETY EVALUATION FORM**

Page 5 of 5

**ACTIVITY: ES200001036-000 | 50.59 LOG NO.:**

**72.48 LOG NO.: SE00159**

corrosion of the exposed area of the spacer disc. The corrosion predicted over the 50 year design life of the DSC will not adversely impact the structural integrity of the canister. After a thorough review, it has been concluded that the proposed activity:

- Does not constitute an Unreviewed Safety Question (USQ)
- Does not reduce the margin of safety as defined in the basis for any ISFSI Technical Specification
- Does not result in a significant increase in occupational dose
- Does not constitute an Unreviewed Environmental Impact (UEI)



## ATTACHMENT 3, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM (Page 1 of 7)

Proposed Activity NO: ES200101042	50.59 Log No.:	
	72.48 Log No.:	SE00160

Does the *Proposed Activity*:☐ YES ☒ NO

Require a License Amendment for a change to the Technical Specifications/License Conditions?

Based on this 10 CFR 50.59/10 CFR 72.48 evaluation, does the *Proposed Activity*:☐ YES ☒ NO

Require a License Amendment because it meets one (or more) of the eight (8) criteria of 10 CFR 50.59(c)(2)/10 CFR 72.48(c)(2)?

Prepared by: Kim I.R. Knippel/ Kim I.R. Knippel Department: 4A-30-06 Date: 9/23/02  
 PRINTED NAME AND SIGNATURE

☒ YES ☐ NO

Are cross-disciplinary concurrence reviews needed?

If 'YES', document completion of these reviews below:

Responsible Individual	Responsible Individual	Responsible Individual
<u>Robert H. Brall</u>	<u>Getachew Tesfaye</u>	
PRINT NAME	PRINT NAME	PRINT NAME
<u>NEM/4A-30-03</u>	<u>NRIM (4A-01)</u>	
PRINT ORGANIZATION	PRINT ORGANIZATION	PRINT ORGANIZATION
<u>MAH/Dei</u> <u>9/24/02</u>	<u>Getachew Tesfaye</u> <u>09/24/02</u>	
SIGNATURE DATE	SIGNATURE DATE	SIGNATURE DATE
Print/Signature: <u>Gemma E. Gwyndol</u>	Print/Signature: <u>[Signature]</u>	
INDEPENDENT REVIEWER	GS-DES, GS-TSES, or PE-PDSU	
Date: <u>9/23/02</u>	Date: <u>9/25/02</u>	

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 02-070

Recommend ☒ Recommend ☐  
 Approval Disapproval

Date: 9/25/02

POSRC CHAIRMAN

Approved ☒ Disapproved ☐

PLANT GENERAL MANAGER

Date: 9/27/02

The OSSRC has reviewed this evaluation according to NS-2-100.

Full OSSRC Committee review required? ☐ YES☒ NO

Print/Signature: ANIL JULKA / Anil Julka  
 OSSRC SES Chairman

Date: 3-4-04

If 'YES', OSSRC Meeting No. \_\_\_\_\_

**ATTACHMENT 3, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM (Page 2 of 7)**

<b>Proposed Activity NO: ES200101042</b>	<b>50.59 Log No.:</b>	
	<b>72.48 Log No.:</b>	<b>SE00160</b>

**Proposed Activity (Description):** 72.48 EVALUATION FOR THE ISFSI 24P TRANSFER CASK AND HSM DOSE RATE CALCULATIONS WITH MCNP

The Nuclear Engineering Unit has performed an Owner Acceptance Review (OAR) of the new source term, shielding and dose rate calculations that support the CCNPP ISFSI. These new calculations were required to correct all of the errors identified in several IR's (e.g., IR1-001-560, IR1-001-562, and IR1-001-563) and are documented in CA05923, CA05924, CA05925, and CA05926 which are contained in ES200101042. These CCNPP calculations document OAR of Duke Engineering & Services (DES) calculations CCNPP-DES-001/002/003/004 that will provide the new design basis calculations and models for the ISFSI 24P Dry Shielded Canister (DSC), Transfer Cask (TC), and Horizontal Storage Module (HSM). One additional in-house calculation has been performed (CA06058) to recalculate the ISFSI 24P 5 Phase Site Dose Rates. These new calculations require ISFSI SAR changes (UCR00317 & UCR00358), utilize new and improved methodology and have been performed with the Los Alamos National Laboratory Monte Carlo N-Particle Transport Code System MCNP4C. Prior to implementation of the new ISFSI design basis calculations and the ISFSI SAR changes (UCR00317 & UCR00358) a 72.48 evaluation will be required. These new calculations will supersede the existing calculations of record (that contain many errors and utilize less accurate deterministic methods) when the 72.48 Evaluation is completed, POSRC approved and documented in ES200101042. These new calculations result in < 10% decrease in the margin to all applicable dose and dose rate limits. Thus, replacing the existing calculations with these new ones will not require prior NRC approval. Utilization of MCNP itself as a new method/code in and of itself will not require prior NRC approval due to it's prior NRC SER acceptance for several Utilities and Private Companies that have used MCNP for criticality and shielding licensing analysis (Attachment 1). This conclusion is formally documented in ES200101042 and SE00160. ES200101042 also contains UCR00358. UCR00358 is an update to the ISFSI SAR chapters 1, 3, 7, and 8 to incorporate the new design bases dose rates obtained from ES200101042. UCR00358 also contains a new ISFSI SAR Figure 7.2-1 (Attachment 2 - "24P Design Basis Radiological Limit Curve") and some consolidation and elimination of redundant information in chapters 1, 3, 7 and 8. Adherence to both the heat generation rate and radiological source term limits will be procedurally controlled via FH350 and CA05803.

**Reason for Activity:** IR200100638 Resolution and to enable the new Design Basis ISFSI shielding calculations with MCNP (contained in ES200101042) to supercede the original calculations.

**ATTACHMENT 3, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM (Page 3 of 7)**

<b>Proposed Activity NO: ES200101042</b>	<b>50.59 Log No.:</b>	
	<b>72.48 Log No.:</b>	<b>SE00160</b>

**Affected SSC Design Functions:**

The Dry Shielded Canister (DSC), Transfer Cask (TC), and Horizontal Storage Modules (HSM's) as shielding and storage devices for the spent fuel have not been affected by the new design basis calculations. However, the procedure for loading the spent fuel (FH-350) and the ISFSI SAR will be updated to reflect the new design basis dose rates obtained with the code MCNP4C (with the correction of deficiencies detailed in the Proposed Activity above). No physical changes to the DSC, TC or HSM are needed as a result of the new calculations. MCNP4C is simply an improved methodology that yields more accurate results (compared to the existing methodology of record). The radiological source term is the same as the original design basis and is calculated from ORIGEN2 for a CCNPP Westinghouse/Combustion Engineering 14X14 PWR fuel assembly with 3.40 w% U-235 enrichment and a burnup of 42 GWD/MTU at a decay time of eight (8) years. Industry standard and separate gamma and neutron axial flux shaping factors were utilized to develop the source term input for both the Cask and HSM models. Both Cask and HSM model dose rate results have been demonstrated conservative via benchmarks with actual CCNPP Cask and HSM loadings.

<b>UFSAR/USAR Sections reviewed where relevant information was found:</b>	<b>Tech Spec Sections reviewed where relevant information was found:</b>
1, 3, 5, 7, 8, and 9	2 and 3/4

Proposed Activity NO: ES200101042	50.59 Log No.:	
	72.48 Log No.:	SE00160

Does the *proposed activity*:

1. ☐ YES ☒ NO

Result in more than a minimal increase in frequency of occurrence of an accident previously evaluated in the UFSAR/USAR?

Justification: This activity calculates the dose rates (and doses) associated with the CCNPP ISFSI Cask Loading and HSM facility by utilizing new calculational methodology and does not affect the frequency of occurrence of any accident.

2. ☐ YES ☒ NO

Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the UFSAR/USAR?

Justification: This activity calculates the dose rates (and doses) associated with the CCNPP ISFSI Cask Loading and HSM facility yielded by utilizing new calculational methodology and does not affect the likelihood of occurrence of a malfunction of any SSC

3. ☐ YES ☒ NO

Result in more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR/USAR?

Justification: There are only three accidents that have dose consequences. One is the Cask Drop Accident, the second is the Blockage of Air Inlets and Outlets and the third is the Dry Shielded Canister Leakage. The Cask Drop Accident has had its contact (1" from the side) dose rate increase from the currently documented value of 977 mrem/hr to 1126 mrem/hr. The total dose accumulated from a worker at 15' for 8 hours actually decreases to 776 mrem from 1310 mrem. The contact dose rate is less than a 10% increase in the margin to the regulatory limit of 5 rem. The 15' dose has decreased due to the conservative omega ( $\Omega$ ) scaling that was applied to the original calculation's contact dose rate. The original methodology utilized an infinite ( $\infty$ ) source geometry multiplied by a function of the ratio of the square of the distance from the source. The Blockage of HSM Air Inlets and Outlets has had its dose consequence increase from a value of 400 mrem to 584 mrem. This is less than a 10% increase in the margin to the 5 rem limit. There have been no changes to the Dry Shielded Canister Leakage Analysis.

4. ☐ YES ☒ NO

Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the UFSAR/USAR?

Justification: CCNPP ISFSI Cask Loading and HSM operations have no non-accident analysis of malfunctions of SSCs important to safety (with dose consequences) evaluated in the USAR.

5. ☐ YES ☒ NO

Create a possibility for an accident of a different type than any previously evaluated in the UFSAR/USAR?

Justification: This activity only calculates the dose rates (and doses) associated with the CCNPP ISFSI Cask Loading and HSM facility yielded by utilizing new calculational methodology and does not create a possibility for an accident of a different type than any previously evaluated in the USAR.



**ATTACHMENT 3, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM (Page 5 of 7)**

<b>Proposed Activity NO: ES200101042</b>	<b>50.59 Log No.:</b>	
	<b>72.48 Log No.:</b>	<b>SE00160</b>

6. ☐ YES ☒ NO

Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the UFSAR/USAR?

Justification: This activity only calculates the dose rates (and doses) associated with the CCNPP ISFSI Cask Loading and HSM facility yielded by utilizing new calculational methodology and does not create the possibility for a malfunction of any SSC.

7. ☐ YES ☒ NO

Result in a design basis limit for a fission product barrier as described in the UFSAR/USAR being exceeded or altered?

Justification: This activity only calculates the dose rates (and doses) associated with the CCNPP ISFSI Cask Loading and HSM facility yielded by utilizing new calculational methodology and does not calculate or affect any design basis limit for a fission product barrier.

8. ☐ YES ☒ NO

Result in a departure from a method of evaluation described in the UFSAR/USAR used in establishing the design bases or in the safety analyses?

Justification: This product is a calculation of the dose rate (and doses) associated with the CCNPP ISFSI Cask Loading and HSM operations that utilize a new NRC-approved methodology (MCNP) that provides more precise results (See attached writeup) and hence is not considered a departure from a method of evaluation described in the USAR. Several NRC SER's have been issued for both shielding and criticality licensing analysis that utilize MCNP. One of these is USNRC, "Safety Evaluation Report Concerning the Private Fuel Storage Facility," Docket 72-22, 9/29/2000. Utilizing this NRC approved methodology (MCNP) provides more precise results and its use (alone) does not necessitate prior approval. A list of other MCNP SER's is included as Attachment 1.

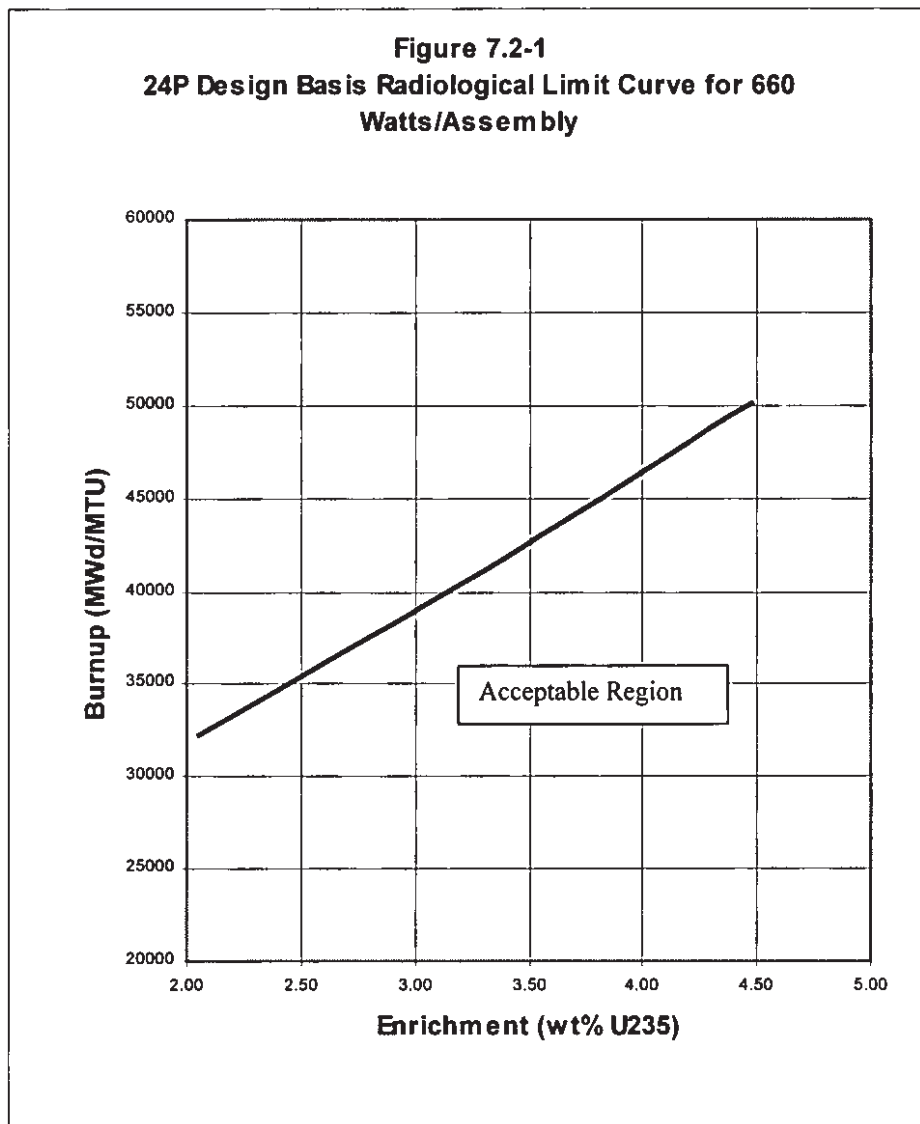
**Summary:** (For NRC Report, provide a brief overview) CCNPP has performed new calculations that will supersede the original design basis dose calculations and models for the Independent Spent Fuel Storage Installation (ISFSI) 24P Dry Shielded Canister (DSC), Transfer Cask (TC) and Horizontal Storage Module (HSM). These calculations use improved methodology (3D vs 1D etc.) and have been performed with the Los Alamos National Laboratory Monte Carlo N-Particle Transport Code System MCNP4C. Several NRC SER's have been issued for both shielding and criticality licensing analysis that utilize MCNP. The calculations include measured benchmarks, are conservative, and did not 'Result in more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR'.

**Attachment 1**

**List of MCNP SER's**

- 1) Safety Evaluation By The Office Of Nuclear Reactor Regulation Related To Amendment No. 182 To Facility Operating License No. Dpr-28, Vermont Yankee Nuclear Power Corporation, Vermont Yankee Nuclear Power Station, Docket No. 50.271.
- 2) Transnuclear West Standardized Advanced Nuhoms ® System Horizontal Modular Storage System For Irradiated Nuclear Fuel Docket No. 72-1029 Model Nos. Standardized Advanced Nuhoms ® -24P Transnuclear West, Inc. Certificate Of Compliance No. 1029
- 3) Safety Evaluation Report For Disposal Criticality Analysis Methodology Topical Report, Revision 0 June 2000 U.S. Nuclear Regulatory Commission Office Of Nuclear Material Safety And Safeguards Washington, DC 20555-0001.
- 4) Safety Evaluation Report Docket No. 72-1026 Fuelsolutions Storage System Certificate Of Compliance No. 1026
- 5) Safety Evaluation By The Office Of Nuclear Reactor Regulation GE Nuclear Energy Topical Report NEDC-32983P "General Electric Methodology For Reactor Pressure Vessel Fast Neutron Flux Evaluations" Project No. 710
- 6) Holtec International Hi-Storm 100 Cask System Safety Evaluation Report
- 7) Safety Evaluation Report Docket No. 71-9302 Model No. Nuhoms ® -MP197 Transportation Package Certificate Of Compliance No. 9302 Revision No. 0

ISFSI SAR Figure 7.2-1



- \* This curve is valid for all assemblies that have cooled at least 9 years.
- \*\* All assemblies loaded into DSC must meet the source spectra requirements of Technical Specification 2.1
- \*\*\* This bounding radiological limit curve may be superseded with bundle specific source spectra calculations based on actual cooling times.

**ATTACHMENT 4, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM**

Proposed Activity No: ES200100208-000		50.59 Log No.:	
		72.48 Log No.: SE00162	
Does the Proposed Activity:			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Require a License Amendment for a change to the Technical Specifications/License Conditions?	
Based on this 10 CFR 50.59/10 CFR 72.48 evaluation, does the Proposed Activity:			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Require a License Amendment because it meets one (or more) of the eight (8) criteria of 10 CFR 50.59( c)(2)/10 CFR 72.48( c)(2)?	
Prepared by: Shane R. Gardner		Department: TK-30-01	Date: 9/2/09
Printed Name and Signature			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Are cross-disciplinary concurrence reviews needed?	
If "YES", document completion of these reviews below:			
Responsible Individual		Responsible Individual	
Responsible Individual		Responsible Individual	
Print Name		Print Name	
Print Name		Print Name	
Print Organization		Print Organization	
Print Organization		Print Organization	
Signature		Signature	
Date		Date	
Signature		Signature	
Date		Date	
INDEPENDENT REVIEWER: John R. Massari		9/2/09	
Print/Signature		Date	
APPROVED: Phil I. Wengloski		9/2/09	
Print/Signature		Date	
Manager - Engineering Services or Director - Nuclear Fuels Services			



## ATTACHMENT 4, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM

### Proposed Activity (Description):

The proposed activity is to authorize loading of undamaged, non-VAP fuel with stainless steel pins and/or vacancies into the 32P DSCs. The proposed activity includes adding administrative restrictions in the fuel selection procedure. The design change technical evaluation demonstrates the DSC will continue to meet its design requirements. Additional controls are introduced to limit the exposure and cooling time of the stainless steel pins such that the design basis shielding evaluation described in the USAR is unaffected. Also, controls are introduced that limit the configuration of vacancies such that the structural adequacy of the fuel assembly will be maintained during design basis accidents.

### Reason for Activity:

As eligible fuel in the spent fuel pool is depleted there is a need to load reconfigured fuel assemblies. In the 2009 loading campaign Guardian fuel will be loaded (ECP-09-000054) and about one DSC worth of fuel containing inert stainless steel pins or vacancies. These assemblies are structurally intact and undamaged so they can logically be loaded into the ISFSI provided they meet all the design and licensing requirements. Other generically licensed NUHOMS systems allow storage of these kinds of assemblies, although fuel with vacancies is often stored as damaged fuel.

### Affected UFSAR/USAR/ISFSI-USAR Described Design Functions:

- **Confinement** - The DSC design provides mechanical confinement of the stored fuel assemblies to prevent the dispersion of particulate or gaseous radionuclides from the fuel, and to maintain a barrier of helium around the fuel. The primary function of the DSC is to provide confinement of the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further support the confinement integrity. The DSC confinement boundary is also designed to retain helium cover gas inside the DSC in order to prevent corrosion of the fuel cladding and formation of expansive oxides in the fuel itself during storage.
- **Shielding** - The DSC materials provide radiation shielding. The DSC provides shielding at its ends by the use of lead shield plugs. These plugs provide "As Low As Reasonably Achievable" (ALARA) dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC loading into the horizontal storage module (HSM) and at the HSM door during storage. The NUHOMS®-32P DSC has full-length egg crate plates and full-length steel rails with aluminum inserts. When compared to the NUHOMS®-24P DSC, the full-length egg crate plates provide additional shielding between the assemblies, and the rails provide additional shielding between the assemblies and the transfer cask. This additional shielding partly compensates for the additional spent fuel assemblies, so the dose rates outside the transfer cask are only slightly higher for the NUHOMS®-32P DSC than for the NUHOMS®-24P DSC. The dose rates outside the HSMs are lower for storage of a NUHOMS®-32P DSC than a NUHOMS®-24P DSC.
- **Criticality Control** - The DSC design provides for sub-criticality during the wet loading, DSC drying, and interim storage operations. This is accomplished by a combination of the physical properties of the fuel; fixed neutron absorbers in the NUHOMS®-32P DSC basket; 2,450 ppm soluble boron in the spent fuel pool water; and CCNPP administrative controls for fuel identification, verification, and handling. Optimum moderation was utilized for both internal and external moderation. The internal moderator was modeled with a soluble boron concentration of 2,450 ppm while the external moderator was modeled with pure water. The internal moderator is defined as that part of the moderator that is contained within the basket, while the external moderator is defined as that part of the moderator that is contained outside of the basket (between the basket to canister gap, between the canister to transfer cask gap, and the neutron shield).
- **Fuel Support and Configuration Control (Fuel Retrievability)** - The DSC internal basket assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accidents, including a cask drop, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that retrieval of intact fuel assemblies is not assured. The structural characteristics of the transfer cask (TC) and the DSC limit the deceleration loads on the fuel assemblies so that their integrity is assured in the worst-case drop accident. The guide sleeves establish storage compartments for 32 spent fuel assemblies within the DSC. The borated egg crate plates work together with boron dissolved in the fuel pool water (2,450 ppm) to maintain sub-criticality. The egg crate plates work together with the guide sleeves and rails to maintain the fuel assembly geometry. The egg crates and rails support the weight of the fuel assemblies when the DSC is in a horizontal position.

### Effects on Design Functions

In order to determine the effects on the design functions of the proposed activity two new calculation were performed:

**ATTACHMENT 4, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM**

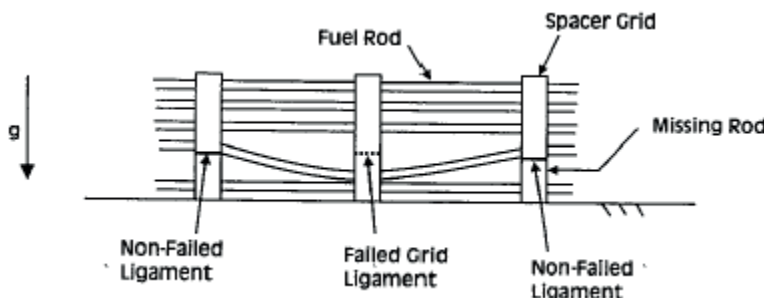
CA06534, "Accidental Drop Loading Evaluation of 14x14 Fuel Assembly with Missing Fuel Rods" (Hopper Elmore and Associates)

CA06367, "Comparison of the Radiological, Thermal, and Reactivity Characteristics of Assemblies with Missing or Inert Fuel Rods with the 32P ISFSI DSC Design Bases"

ES2001000208-000 and the associated 72.48 screen determined that none of the affected design functions were adversely affected. The following description summarizes the results of that evaluation and screen.

Calculation CA06534 analyzes the affect on cladding integrity for a fuel assembly containing missing fuel rods vacancies. The analysis is performed for the limiting design basis horizontal cask drop accident. The loads on the fuel assembly correspond to the design requirement of 75g. The analysis was performed similar to a previous calculation, for the 24P, CA05797, "DSC Horizontal Drop – Fuel Rod Cladding Integrity During Impact with a Broken Spacer Grid Fragment." Essentially CA06534 is an extension of CA05797 to address vacancies.

Calculation CA06534 determined that the stress in horizontal spacer grid ligaments is excessive when vacancies are present and ligaments would fail. This is in addition to the failure of the vertical spacer grid ligaments previously determined in CA05797. The analysis determined that the likely scenario would result in failure of all horizontal spacer grid ligaments and the fuel rod would fall through the vacancy and strike the next fuel rod. However, to bound the horizontal spacer grid ligament failure CA06354 conservatively assumes that only one ligament fails resulting in the fuel rod being pinned by adjacent grid spacers and the rod deflecting until it strikes the fuel rod below. This scenario is depicted by the following figure extracted from CA06534:



The analysis determined that the maximum cladding stress excessive if more than two vacancies were present in any one column. The limiting configuration was determined to be up to two vacancies in one column and the maximum cladding stress was 68.5 ksi, which is less 77.5 ksi determined for the vertical ligament failure/grid collapse scenario in CA05797 and also less than the 0.9 x 80.5 ksi (USAR 8.2.5.2) stress allowable for irradiated zircaloy. As a result, the proposed activity, with the limitation of up to 2 vacancies in any on column, is bounded by the existing cladding stress analyses as described in USAR 8.2.5.2. It is noted that the analyses described in USAR 8.2.5.2 relate to the 24P and not the 32P.

Calculation CA06367 reanalyzes the criticality, shielding and decay heat effects of the proposed change. With respect to criticality, the analyses are performed using the bounding case from calculation CA06227, "Criticality Analysis of the NUHOMS 32P for Calvert Cliffs ISFSI", which is the analysis of record. The computer model, code, and code revision are the same. The input to the computer model is modified to introduce inert stainless steel rods and vacancies. The material specification for stainless steel is based on the material reference in CA06227. The criticality analysis considers a number of variation in the configuration of the inert stainless steel rods and vacancies to identify the most reactive geometry. The calculated k-effective values are added to two KENO standard deviations resulting in the maximum k-effective with 95% probability and 95% confidence (95/95). The 95/95 k-effective values calculated all remain less than the previously determined bounding value of 0.9412. Because the replacement of fuel rods reduces the available

**ATTACHMENT 4, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM**

fissionable material the k-effective would be expected to decrease with the number inert stainless steel rods and vacancies. This was confirmed by calculation CA06367. The calculation also evaluates a case where stainless steel rods are concentrated on the periphery of the basket to maximize reflect and therefore reduce system leakage. Calculation CA06367 further evaluates the impact on the off-normal criticality calculation models in CA05896, "Criticality Analysis for Fuel Misloads and Accidents" and confirm the bounding k-effective of 0.9413 is not exceeded.

The effects on the shielding analysis due to the introduction of activated stainless steel rods were evaluated in CA06367 by performing a comparative analysis of the gamma source terms. The analysis is performed by using the design basis ORIGEN2 models from CA05803, "ISFSI 24P Assembly Insertion Requirements." The computer model, code and code revision are the same. The input to the computer model is modified to introduce stainless steel rods. The material specification for stainless steel is based on the material reference in CA05803. Calculation CA06367 determines an energy dependent dose rate response function using the MCNP models from CA06292, "NUHOMS 32P Radiation Dose Rates for Loading and Transfer." The response function provides a means to compare source terms on a dose rate basis. The response function allows consideration of the energy dependency of the source and the effects of shielding. The calculation analyzed several cases that varied the number of activated steel rods, exposure and cooling time, both for the steel rods and the host assembly, such that the resultant dose rates are bounded by the dose rate from the design basis assembly source. The results summary from CA06367 are presented below:

SS Pin Exposure MWd/MTU	# SS Pins Allowed by Years after 660W			
	0 years	1 year	2 year	3 year
20000	0	12	21	30
30000	0	7	13	18
40000	0	5	9	13

As the results indicate the configurations analyzed do not exceed the dose rate due to the design basis assembly source of 35.9 mrem/hr. Therefore the design basis gamma source in USAR 12.7.2.1 is bounding and hence the radiation shielding analyses in USAR 12.7.6 and 12.8.2.5.3 are unaffected by the proposed change.

From the ORIGEN2 calculations performed to analyze the gamma source terms, the decay heat due to the activated steel rods was also evaluated in CA06367. The decay heat produced by irradiated stainless steel is typically far less than the actinides and fission products present in spent fuel. This was confirmed by CA06367. The results show that decay heat produced by an activated steel rod quickly falls below the design basis heat of 660 watts/176 after about 4 years. The analysis of CA06367 also confirms that the thermal source of an activated stainless steel rod decays faster than a spent fuel rod, thus ensuring that the decay heat of the spent fuel rod will always be bounding.

As a result of the evaluations performed in CA06354 and CA06367 it is concluded that there are no adverse affects on the design functions of the 32P DSC. However, these conclusions are predicated on criteria restricting the configuration of the inert stainless steel rods and vacancies. To implement these criteria new procedures are required for fuel assembly qualification and these procedures are described in the USAR and constitute an adverse affect on a method of controlling design basis functions, thus requiring evaluation under 10 CFR 72.48.

**ATTACHMENT 4, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM**

UFSAR/USAR/ISFSI-USAR Sections reviewed where relevant information was found:	Tech Spec Sections reviewed where relevant information was found:
3.1.1, 3.1.1.3, Table 3.1-3, 3.3.1, Table 3.3-1, Table 3.3-3, 7.2.1, 8.2.1, 8.2.5.2, 9.4.1, 9.4.1.1, Table 9.4-1, 12.3.3.4.3, 12.3.3.4.4, 12.3.3.4.5, 12.3.6, Table 12.3-2, Table 12.3-3, 12.7.2.1, 12.7.6, 12.8.2.5, 12.8.2.5.3, 12.8.2.8	2.1, 2.4, 3.11
<p>Does the proposed activity:</p> <p>1. <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> N/A      Result in more than a minimal increase in frequency of occurrence of an accident previously evaluated in the UFSAR/USAR/ISFSI-USAR?</p> <p>Justification:</p> <p>The 32P DSC and the fuel assemblies to be stored are passive structures. The proposed activity has been evaluated to show that the fuel assembly can withstand the limiting and bounding cask drop accident. The 32P DSC and fuel assembly have no ability to initiate an accident or off-normal event. Therefore, the presence of inert stainless steel rods and/or vacancies cannot directly influence the expected frequency of an accident or off-normal event as defined in the USAR.</p> <p>2. <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> N/A      Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the UFSAR/USAR/ISFSI-USAR?</p> <p>Justification:</p> <p>The proposed activity has been evaluated to show the cladding can withstand the limiting and bounding cask drop accident. A malfunction of the cladding is defined by a loss of the structural integrity of the zircaloy due to excessive stress.</p> <p>The maximum cladding wall stress calculated in CA06354 is 68.5 ksi for the limiting condition of 2 vacancies in any one column of the fuel array. That value is bounded by the previously determined value of 77.5 ksi in CA05797 due to a collapsed grid. Since the probability of cladding failure is proportional to the maximum cladding wall stress it is evident that the proposed activity does not result in an increase in the likelihood of occurrence of a malfunction of an SSC important to safety.</p> <p>The proposed activity does not influence any other SSC malfunctions beyond cladding failure.</p>	



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Does the proposed activity:

3. ☐ YES ☒ NO ☐ N/A      Result in more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR/USAR/ISFSI-USAR?

Justification:

As described above the proposed activity was evaluated against all the design requirements and safety analyses, including dose consequences associated with the cask drop and DSC leakage events. The analysis in CA06354 showed that cladding integrity is unaffected during a cask drop as long as no more than 2 vacancies are allowed in any one column of fuel rods. Also, CA06367 determined that the activation of stainless steel rods does not generate any radioactive gases, and actually reduces the activity available for release inside the DSC. Therefore, based on these evaluations it is concluded that there can be no increase in the dose consequences in the DSC leakage accident.

Calculation CA06367 also analyzed the impact of introducing activated stainless steel rods on the fixed radiation source term. The activated stainless steel rods will reduce the neutron source by replacing actinides and fission products in the spent fuel rods with the activated light elements which don't produce neutrons. Thus, the neutron dose consequences due to the proposed activity will decrease. The calculation in CA06367 also analyzed the gamma source of the activated stainless steel through consideration of the effect on dose rates on the transfer cask. The analysis determined the limiting number of activated stainless steel pins, exposure and cooling time, such that the dose consequences associated with the transfer cask will not exceed the current design and licensing bases. Therefore, by design there can be no increase in the dose consequences in the DSC cask drop accident.

In general, because of the evaluations described above the design of the proposed activity will prevent an adverse effect on all the dose consequences for the 32P system. The limitations necessary to maintain the design bases will be implemented during the selection and qualification of fuel assemblies containing stainless steel rods and/or vacancies.

4. ☐ YES ☒ NO ☐ N/A      Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the UFSAR/USAR/ISFSI-USAR?

Justification:

As described above the proposed activity will not increase the source terms and by design will ensure the dose consequences are bounded or less than the current design bases. As a result, there is no increase in any dose consequences for the 32P system.

5. ☐ YES ☒ NO ☐ N/A      Create a possibility for an accident of a different type than any previously evaluated in the UFSAR/USAR/ISFSI-USAR?

Justification:

Since the proposed activity involves a fuel assembly with inert stainless steel rods and/or vacancies and which is a passive structure that is compliant with the structural design criteria specified in the USAR, there is no possibility for the inert stainless steel rods and/or vacancies to initiate an accident. The fuel assembly must, by Technical Specification, be intact and undamaged. The proposed activity has been evaluated on this basis and has shown the fuel assembly and 32P DSC will continue to meet the design requirements. Because the fuel assembly is intact and undamaged the loading and unloading operations are unaltered. The proposed activity does not create a possibility of an accident of a different type than previously evaluated in the USAR.

**ATTACHMENT 4, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM**

6. ☐ YES ☒ NO ☐ N/A Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the UFSAR/USAR/ISFSI-USAR?

Justification:

The proposed activity could lead to a malfunction of the cladding due to a different kind of failure mode. This occurs during the limiting design basis cask drop event where calculation CA06354 has shown that vertical grid spacer ligaments could fail due to excessive stress. This new mode is not a malfunction with a different result because the result or effect is the same as and bounded by that previously described in the USAR. That is, the result is the same, provided the configuration of vacancies is limited to no more than two in any one column, to previous evaluations that have shown there will be no cladding failure. Also, the result remains bounded by the confinement evaluation described in USAR 12.8.2.8, which conservatively assumes 100% cladding failure. Thus any hypothetical failure, although shown to not occur, would be bounded by confinement evaluation previously described in the USAR.

7. ☐ YES ☒ NO ☐ N/A Result in a design basis limit for a fission product barrier as described in the UFSAR/USAR/ISFSI-USAR being exceeded or altered?

Justification:

The proposed activity relates to three design basis limits for fission product barrier as described in the USAR:  $k$ -effective  $< 0.95$ , cladding stress  $< 80.5$  ksi and fuel assembly decay heat  $< 660$  watts. In calculation CA06367 criticality control was reanalyzed to show that the resultant  $k$ -effective due to any reconfiguration of fuel assemblies with inert stainless steel rods and/or vacancies will always be less than current safety analyses as described in the USAR. To address the structural integrity of the fuel assembly calculation CA06354 determined the maximum cladding stress due to failure of a horizontal grid spacer ligament due to the limiting design basis cask drop accident. The calculated maximum cladding stress was determined to be bounded by existing analyses described in the USAR for the 24P for the collapsed grid. Thus, with respect to criticality control and fuel assembly structural integrity the proposed change does not exceed or alter the design basis limit for fission product barrier as described in the USAR.

The radiation source term evaluation for the proposed activity indicates that additional cooling time is required for fuel assemblies with irradiated stainless steel rods, which indirectly requires the assembly heat load to be less than 660 watts. The assembly heat load will also be reduced as the thermal source from the irradiated stainless steel rod will be less than the spent fuel rod it replaced. The reduction in the heat load limit is necessary not to protect the cladding fission product barrier as the design basis limit for a fission product barrier is intended (i.e. to maintain the peak cladding temperature limits), but rather to ensure the design basis gamma source is not exceeded. Therefore, the change in the assembly heat load does not result in a design basis limit for a fission product barrier being exceeded or altered.

8. ☐ YES ☐ NO ☒ N/A Result in a departure from a method of evaluation described in the UFSAR/USAR/ISFSI-USAR used in establishing the design bases or in the safety analyses?

Justification: See 10CFR72.48 screening form attached to ES200100208-000. The methods used to evaluate the proposed change are fully compliant with the methods of evaluation as described in the USAR sections 3.1.1.3, 7.2.1, 12.3.3.4.3, 12.3.3.4.4 and 12.3.3.4.5.

Summary: (For NRC Report, provide a brief overview)

The purpose of this activity is modifying the design of the NUHOMS-32P system to allow storage of irradiated and unirradiated inert stainless steel rods and/or missing fuel rods. To allow storage of such assemblies new design analyses have been performed to evaluate the effects on the design basis functions.

The presence of vacancies was analyzed to ensure the structural integrity of the fuel assembly and

#### **ATTACHMENT 4, 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM**

cladding will be maintained during the limiting design basis horizontal cask drop accident. The evaluation performed determined the vacancy will lead to failure of the horizontal spacer grid ligaments, however the resultant cladding stress was determined to be bounded by the previous analyses and will remain within the stress allowable when no more than two vacancies are allowed in any one column of the fuel assembly. This limitation on vacancies will be controlled by modification of the fuel qualification and selection procedure. This configuration and result ensures the cladding fission product barrier is not challenged, is bounded by previous design analyses and therefore does not result in any undue risk to the health and safety of the public.

To verify the affect on criticality control, the design basis criticality analysis normal and off-normal models were reanalyzed by introducing inert stainless steel rods and vacancies. The new criticality model results demonstrated a decreasing trend in k-effective with the number of inert stainless steel rods and vacancies and all resulting k-effective values were found to be bounded by the existing safety analysis results. The criticality analyses considered the limitation of no more than two vacancies allowed in any one column and determined no further configuration limitations. Therefore, the proposed activity will have no adverse affect on the criticality control design function of the NUHOMS-32P system.

The proposed activity will introduce storage of activated stainless steel pins. The radiological source term of an assembly with activated stainless steel pins was compared to the design basis gamma assembly source term to ensure the dose rates for the NUHOMS-32P system will not be exceeded. The evaluation determined certain configuration requirements to meet this objective. The results of the evaluation show the dose rates will be maintained provided the number of activated stainless steel pins, their exposure and cooling time and additional host assembly cooling time is specified. These limitations on storage of assemblies with irradiated stainless steel pins will be controlled by modification of the fuel qualification and selection procedure. Also, thermal source of the activated stainless steel pin was analyzed and compared to the existing design basis thermal source. The results show the thermal source of an activated stainless steel pin is much less than the design basis spent fuel rod and will always be bounded by the design basis spent fuel rod for cooling times beyond four years.

In conclusion the proposed activity to store assemblies containing inert stainless steel rods and/or vacancies in the NUHOMS-32P system has been evaluated against all affected design requirements and functions. The evaluations have shown there are no adverse affects on the design bases and the existing design analyses will continue to bound the proposed activity. In support of this conclusion, several new limitations on the configuration of assemblies containing inert stainless steel rods and/or vacancies have been identified and will be incorporated into the procedures for the qualification and selection of fuel assemblies.

# 10 CFR 50.59/10 CFR 72.48 EVALUATION FORM

(Page 1 of 3)

PROPOSED ACTIVITY NO: ES200100653  
Supplement 000, Revision 0001

50.59 Log No.: N/A

72.48 Log No.: SE00163 Rev. 0001

## USE OF NUHOMS-32P DRY SHIELDED CANISTER

Does the Proposed Activity:

☒ YES ☐ NO

Require a License Amendment for a change to the Technical Specifications/License Conditions?

Based on this 10 CFR 50.59/10 CFR 72.48 evaluation, does the Proposed Activity:

☒ YES ☐ NO

Require a License Amendment because it meets one (or more) of the eight (8) criteria of 10 CFR 50.59(c)(2)/10 CFR 72.48(c)(2)?

Prepared by: L. O. Wenger *L.O. Wenger* Department: 4A-11-07 Date: 10/25/05  
PRINTED NAME AND SIGNATURE

☒ YES ☐ NO

Are cross-disciplinary concurrence reviews needed?

If 'YES', document completion of these reviews below:

<b>Responsible Individual</b>	<b>Responsible Individual</b>	<b>Responsible Individual</b>
J. Kilpatrick	R. Beall	G. Gryczkowski
PRINT NAME	PRINT NAME	PRINT NAME
<i>J.G. KILPATRICK</i>	<i>NFM</i>	<i>FOSU</i>
PRINT ORGANIZATION	PRINT ORGANIZATION	PRINT ORGANIZATION *
<i>JCF</i> <i>10/27/05</i>	<i>W.H. Beall</i> <i>10/27/05</i>	<i>John M. S.</i> <i>10/28/05</i>
SIGNATURE DATE	SIGNATURE DATE	SIGNATURE DATE
<b>Responsible Individual</b>	<b>Responsible Individual</b>	<b>Responsible Individual</b>
M. Massoud	J. Massari	G. Tesfaye
PRINT NAME	PRINT NAME	PRINT NAME
<i>FOSU</i>	<i>FOSU</i>	<i>LICENSING</i>
PRINT ORGANIZATION	PRINT ORGANIZATION	PRINT ORGANIZATION
<i>Mohamed Massoud</i> <i>10/28/05</i>	<i>John M. S.</i> <i>10/28/05</i>	<i>John M. S.</i> <i>10/28/05</i>
SIGNATURE DATE	SIGNATURE DATE	SIGNATURE DATE
INDEPENDENT REVIEW: Print/Signature: <u>H. D. Enoch / <i>H. D. Enoch</i></u> <i>10/28/2005</i>		
INDEPENDENT REVIEWER Date		

APPROVED: Print/Signature: J. J. McHale *J. J. McHale* *10/28/05*  
Manager, COMPP Engineering Services or  
Director, Nuclear Fuels Services Date

The POSRC has reviewed this evaluation according to NS-2-101.

POSRC Meeting No.: 05-032

Date: 10/28/05

Recommend ☒ Approval

Recommend ☐ Disapproval

*John M. S.*  
POSRC CHAIRMAN

Date

Approved ☒

Disapproved ☐

*John E. Bellah*  
PLANT GENERAL MANAGER

Date *10/28/05*

\* J. Massari verified that comments provided by G. Gryczkowski via e-mail on 10/3/05 were incorporated.



**PLANT GENERAL MANAGER**

The NSRB Engineering Sub-Committee has reviewed this evaluation according to NS-2-100.

Full NSRB review required?

☐ YES

☒ NO

Print/Signature: \_\_\_\_\_

*W. J. Jones*

NSRB Engineering Sub-Committee

Date: \_\_\_\_\_

*4/16/08*

If 'YES', NSRB Meeting No. \_\_\_\_\_

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**PROPOSED ACTIVITY NO:** ES200100653,  
Supplement 000, Revision 0001

**50.59 Log No.:** N/A

**72.48 Log No.:** SE00163 Rev. 0001

**USE OF NUHOMS-32P DRY SHIELDED CANISTER**

**Proposed Activity (Description):** See Attachment 1

**Reason for Activity:** See Attachment 2

**Affected UFSAR/USAR Described  
Design Functions:**

See Attachment 3

**UFSAR/USAR Sections reviewed where relevant  
information was found:**

(See Attachment 4)

**Tech Spec Sections reviewed where relevant information  
was found:**

All Sections of the Tech. Spec. were reviewed.  
Specifically: 2.1, 2.4, 3.1.1, 3.2.1.1, 3.3.1.1, 3.4.1.1,  
4.2.1.1, 4.2.1.2, and 4.4.1.2.

*Does the proposed activity:*

1. ☐ YES ☒ NO ☐ N/A

Result in more than a minimal increase in frequency of occurrence of an accident  
previously evaluated in the UFSAR/USAR?

Justification: See Attachment 5

2. ☐ YES ☒ NO ☐ N/A

Result in more than a minimal increase in the likelihood of occurrence of a  
malfunction of a structure, system or component (SSC) important to safety  
previously evaluated in the UFSAR/USAR?

Justification: See Attachment 6

**10 CFR 50.59/10 CFR 72.48 EVALUATION FORM**  
(Page 3 of 3)

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**PROPOSED ACTIVITY NO:** ES200100653,  
Supplement 000, Revision 0001

**50.59 Log No.:** N/A

**72.48 Log No.:** SE00163 Rev. 0001

**USE OF NUHOMS-32P DRY SHIELDED CANISTER**

Does the *proposed activity*:

3. ☐ YES ☒ NO ☐ N/A

Result in more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR/USAR?

Justification: See Attachment 7

4. ☐ YES ☒ NO ☐ N/A

Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the UFSAR/USAR?

Justification: See Attachment 8

5. ☐ YES ☒ NO ☐ N/A

Create a possibility for an accident of a different type than any previously evaluated in the UFSAR/USAR?

Justification: See Attachment 9

6. ☐ YES ☒ NO ☐ N/A

Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the UFSAR/USAR?

Justification: See Attachment 10

7. ☒ YES ☐ NO ☐ N/A

Result in a design basis limit for a fission product barrier as described in the UFSAR/USAR being exceeded or altered?

Justification: See Attachment 11

8. ☒ YES ☐ NO ☐ N/A

Result in a departure from a method of evaluation described in the UFSAR/USAR used in establishing the design bases or in the safety analyses?

Justification: See Attachment 12

Summary: (For NRC Report, provide a brief overview) See Attachment 14

## **PROPOSED ACTIVITY DESCRIPTION**

### **Activity:**

The proposed activity is the use of a new design of Dry Shielded Canister (DSC), NUHOMS-32P, for storing spent fuel at the Calvert Cliffs Nuclear Power Plant's (CCNPP's) Independent Spent Fuel Storage Installation (ISFSI). The use of NUHOMS-32P DSCs will be made in addition to NUHOMS-24P DSCs. These two types of DSCs have the same external dimensions; however, the internal basket of the NUHOMS-32P DSC is designed to store 32 fuel assemblies. NUHOMS-32P Basket design is based on Transnuclear TN-68 design, which is approved by the NRC.

There are no physical changes being made to the Transfer Cask (TC) or the Horizontal Storage Modules (HSMs). (Note: The DSC Upender L-Bracket has been redesigned to support the additional weight of the NUHOMS 32P DSC. This activity will be issued under ES200100653-001-0000.) All the major steps for loading a DSC (vacuum drying, welding, etc.) are the same for the two DSC systems.

The activity also consists of the following additional fuel assembly changes, which have been included in the design analysis of NUHOMS-32P DSC.

- Increase of fuel assembly weight from 1,300 lbs. to 1,450 lbs. This accounts for the weight increase during irradiation and the possible storage of control components with the assembly.
- A limiting fuel assembly mass of 0.400 MTU, compared to the previously used nominal value of 0.386 MTU. This bounds all standard CE 14x14 fuel assemblies used at CCNPP.
- Increase in fuel assembly neutron source design basis in calculating the radiation dose, in order to account for higher burnups in lower enriched assemblies.

The changes being made to the ISFSI USAR consist of revising each existing section to add information about the NUHOMS-32P DSC where possible, and adding a new chapter, Chapter 12, which contains new information that is specific to the NUHOMS-32P DSC. The format of the new Chapter 12 follows the format of the CCNPP ISFSI USAR. It presents analyses to show that the NUHOMS-32P system meets all the requirements of 10 CFR 72.

### **Background:**

The CCNPP ISFSI stores spent fuel assemblies inside a Dry Shielded Canister in a concrete reinforced horizontal storage module.. The spent fuel assemblies are first discharged into the spent fuel pool, where they are allowed to decay and cool. The assemblies are then transferred to and stored within the DSC which is loaded inside the Transfer Cask. The interior of the DSC is then vacuum dried, filled with the inert gas medium, helium, and sealed by welding. The DSC and Transfer Cask are then transported to the HSM.

The DSC is aligned with the storage location in a HSM and pushed in by a ram mechanism. The spent fuel decay heat is removed from the HSM by natural air circulation. The storage of the fuel assemblies is a completely passive system.

### **NUHOMS-32P DSC Design:**

NUHOMS-32P DSC is designed to store 32 spent fuel assemblies, which is eight more assemblies than NUHOMS-24P DSC. The external and internal dimensions of the DSC shell are the same in both the designs. The NUHOMS-32P storage capacity is increased by reducing the size of and the space between the storage locations. Since the external dimensions of the DSCs

are the same, the TC and HSM designs are not altered, however, their capability to accommodate the NUHOMS-32P is established through analyses.

Major components of the NUHOMS-32P DSC consist of guide sleeves, egg-crate plates (borated and un-borated), peripheral steel rails with aluminum inserts, end shield plugs, DSC shell, and end cover plate (see figures 1 and 2). Location of the vent and siphon ports have been moved from the DSC shell wall (in NUHOMS-24P DSC) to the DSC shield plug (in NUHOMS-32P DSC). This change is made to improve the welding operation of the shield plug to the DSC shell. Similar to the NUHOMS-24P DSC, the NUHOMS-32P DSC serves to provide confinement, shielding, criticality control, and structural integrity of the fuel during transit and storage of the spent fuel assemblies.

The NUHOMS-32P DSC's basket consists of 32 stainless steel guide sleeves (one for each spent fuel assembly) and uses stainless steel and aluminum (borated and unborated) plates, which are designed similar to an egg-crate, to support the guide sleeves. Both the guide sleeves and the egg-crate components run the full length of the DSC cavity. This allows the guide sleeves to be in contact with the egg-crate components over the entire length of the DSC cavity. There are peripheral steel rails around the egg-crate components. These steel rails maintain the position of the egg-crate components and the stainless steel guide sleeves within the DSC shell. As with the NUHOMS-24P DSC design, the basket assembly is not attached to the DSC shell walls or cover plates. Figures 1 and 2 illustrate the NUHOMS-32P DSC geometry and design.

#### **Differences In Design:**

The main difference between the NUHOMS-32P and NUHOMS-24P DSCs is the spent fuel storage capacity, namely the NUHOMS-32P can store 32 fuel assemblies compared to NUHOMS-24P that can store 24 fuel assemblies. The NUHOMS-32P DSC is designed to accommodate the extra weight and thermal loads imposed by the larger number of fuel assemblies.

1. The NUHOMS-32P basket assembly is a different design than the NUHOMS-24P design. Specifically, the NUHOMS-32P DSC basket assembly design, differs from the NUHOMS-24P design as follows:

It has narrower guide sleeves,

- Center-to-center distance between guide sleeves is smaller,
  - Neutron absorber material is provided between the guide sleeves to maintain the fuel configuration sub-critical,
  - Additional radiation shielding is offered by the new basket assembly design, and
  - The basket thermal resistance is lower and hence provides more efficient heat transfer.
2. The DSC shell for NUHOMS-32P has the same internal and external dimensions as the shell for NUHOMS-24P, but is slightly re-designed to support a future transportation license.
  3. The DSC shell design accident pressure is increased to 100 psig.
  4. The TC design remains the same as before, and has been analyzed for its ability to handle the NUHOMS-32P DSC.
  5. The transfer vehicle (trailer, skid positioning system, and cask support skid) design remains the same as before, and has been analyzed for its ability to handle the NUHOMS-32P DSC.
  6. The ram mechanism design remains the same as before, and has been analyzed to cope with the situation of a jammed NUHOMS-32P DSC.



7. The HSM design remains the same as before, and has been analyzed for its ability to handle the NUHOMS-32P DSC.
8. Increase of fuel assembly weight from 1,300 lbs. to 1,450 lbs (Note: the higher weight of 1450 lbs was incorporated by Technical Specification amendment for the 24P.) This accounts for the weight increase during irradiation and the possible storage of control components with the assembly. The larger weight of the fuel assembly has been used in the analyses.
9. A limiting assembly mass of 0.400 MTU, compared to the previously used nominal value of 0.386 MTU. This bounds all standard CE 14x14 fuel assemblies used at CCNPP. The larger mass has been used in the analyses.
10. A higher assembly neutron source has been used in calculating the radiation dose, in order to account for higher burnups in lower enriched assemblies.
11. The blocked vent accident response time at the HSM has been reduced from 24 hours to 12 hours. This reduced time is considered sufficient to unblock the vents.
12. The heavy haul road remains the same as before, and has been analyzed to handle the NUHOMS-32P DSC.
13. The support equipment for cask closing operation (vacuum drying, welding, etc.), remains the same as before, and has been analyzed to support closing the NUHOMS-32P DSC.

Numerical Values of the differences are tabulated in Table 1.

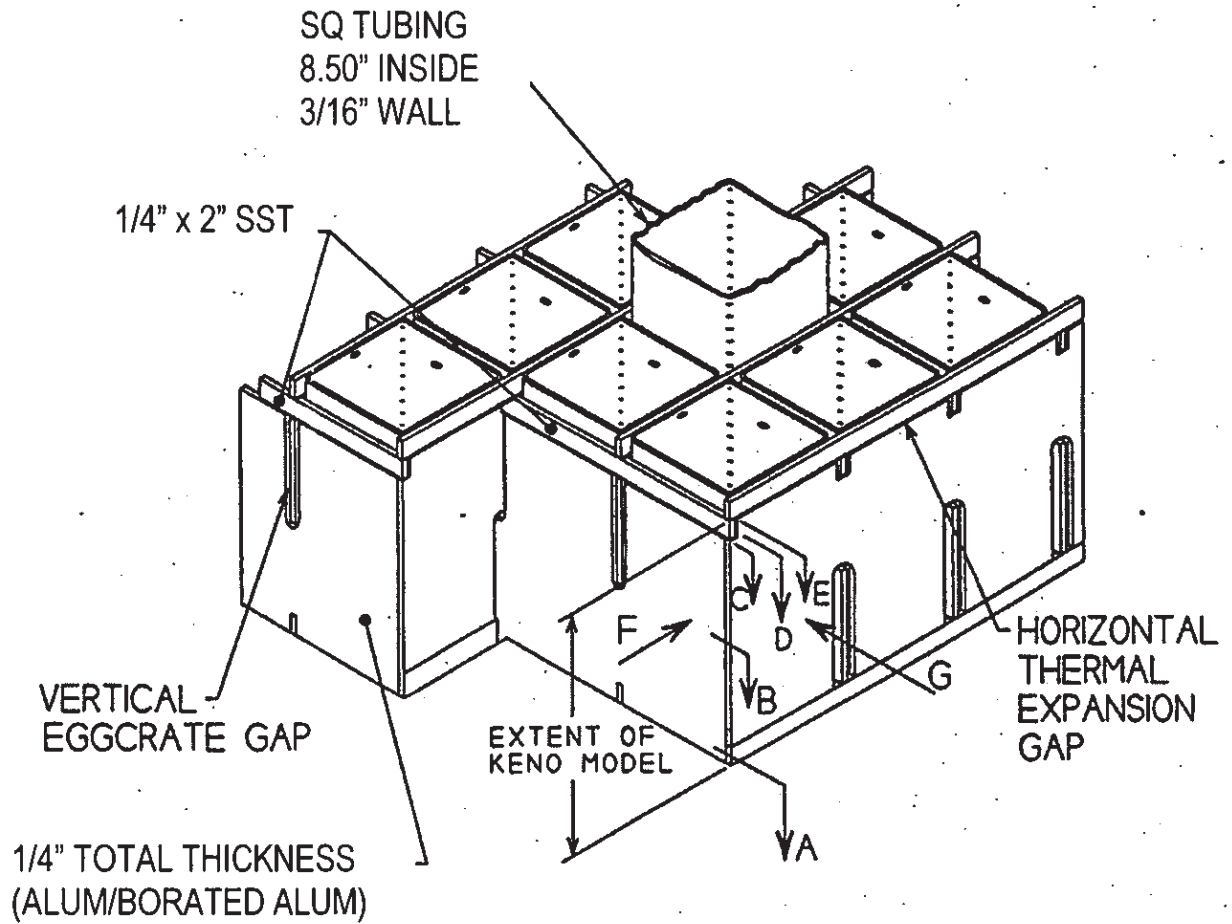


**Table 1**  
**Differences Between the Existing and New Designs**

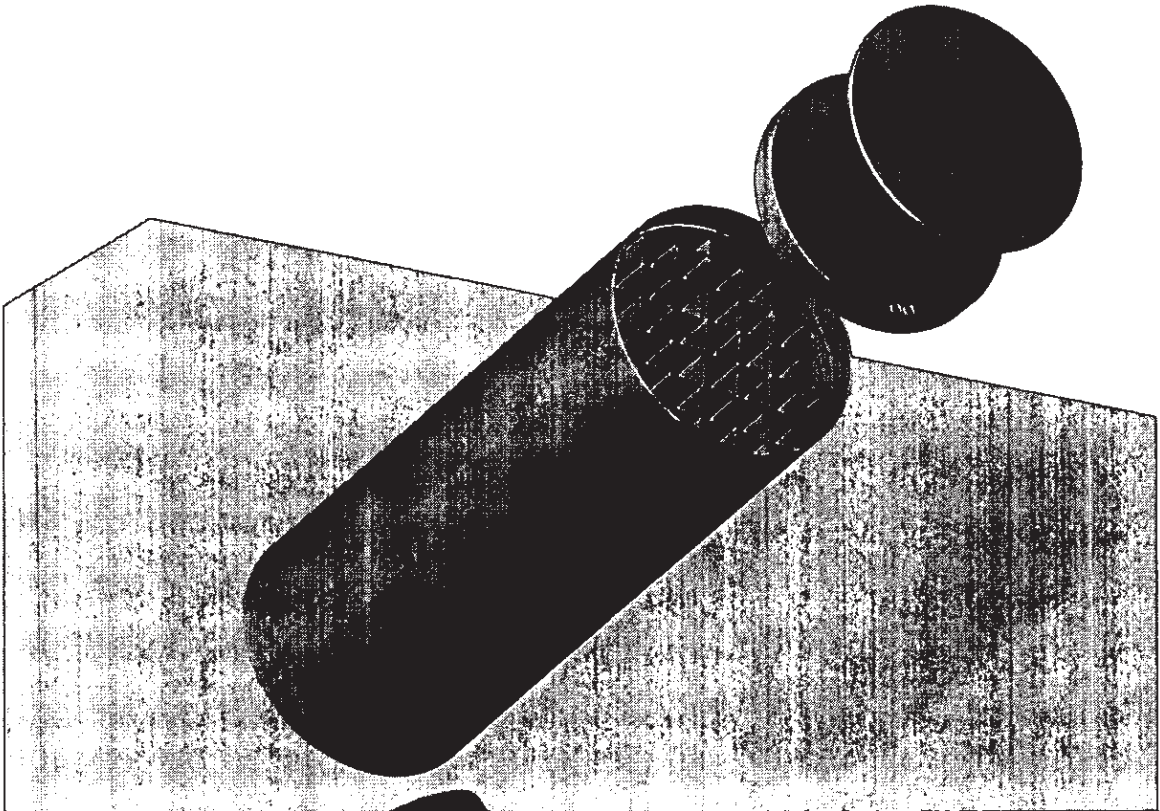
Parameter	NUHOMS-24P DSC	NUHOMS-32P DSC
No. of Fuel Assemblies	24	32
Guide Sleeve Dimension	8.7"x 8.7"	8.5"x 8.5"
Guide Sleeve Spacing	10.36"	9.125"
Lead Shielding Thickness - Top Shield Plug	4.375"	4.00"
Top Shield Plug Top Casing Plate	0.375"	0.75"
Spent Fuel Pool Min. Boron 10 Concentration	1800 ppm	2450 ppm
Borated Aluminum Plates – Boron Content	None	0.01 g/cm <sup>2</sup>
Fuel Assembly Mass	0.386 MTU (Nominal)	0.400 MTU (Maximum)
Neutron Source	2.23E+08 n/s/assy	3.3E+08 n/s/assy
Fuel Assembly Weight	1300 lbs <sup>(1)</sup>	1450 lbs
Loaded Dry DSC Weight	65.0 kips	91.0 kips
Total Heat Source (0.66 kW/assy)	15.84 kW	21.12 kW
DSC Shell Design Pressure (Accident Condition)	50 psig	100 psig
Blocked Vent Restoration Time	24 hours	12 hours
Optimum Moderation Assumption	Pure Water	Borated Water

(1) A Technical Specification Amendment was issued for 24P for a maximum weight of 1450.

Figure 1  
Basket Geometry – NUHOMS 32P DSC



**Figure 2**  
**NUHOMS 32P DSC**





**Attachment 2****72.48 Log No. SE00163 – 0001 - USE OF NUHOMS-32P DRY SHIELDED CANISTER****REASON FOR ACTIVITY**

This proposed activity will increase the dry storage capacity at the CCNPP ISFSI. A NUHOMS-32P DSC stores eight more spent fuel assemblies than a NUHOMS-24P DSC using the same external shell dimensions.

The spent fuel storage in ISFSI is temporary until the U.S. Department of Energy (DOE) begins to accept the fuel for permanent storage.

The ISFSI at the Calvert Cliffs Nuclear Power Plant (CCNPP) provides for the temporary dry storage of spent fuel assemblies within the DSCs. Each DSC is stored in one HSM. CCNPP has a license to build a total of 120 HSMs.

The NUHOMS-32P DSC design allows CCNPP to reduce the minimum number of canisters to be loaded each year from four (using the NUHOMS-24P DSC design) to three (with the NUHOMS-32P DSC design while increasing the total storage capacity of the ISFSI by 576 assemblies). This is expected to reduce the total annual radiological dose and loading costs and extend the total storage loading lifetime at the ISFSI by 6 years.

**Attachment 3****72.48 Log No. SE00163 – 0001 - USE OF NUHOMS-32P DRY SHIELDED CANISTER****AFFECTED UFSAR/USAR DESCRIBED DESIGN FUNCTIONS**

The NUHOMS-32P DSC stores eight more spent fuel assemblies than the previously analyzed NUHOMS-24P DSC. As a result, the following DSC design parameters are affected:

- ◆ Spacing between the fuel assemblies is decreased,
- ◆ Radiation sources are increased,
- ◆ Thermal sources are increased, and
- ◆ Overall weight is increased,

The effects on SSC design functions of utilizing the NUHOMS-32P DSC are summarized in Table 2. As seen in the table, the design functions of many SSCs and major components are adversely affected due to the changes identified above.

NUHOMS-32P DSC features that are designed to support its design functions are described below. A discussion of evaluation of adverse effects of changes in the above four parameters on the design functions is also presented in Table 2.



**Attachment 3**  
**72.48 Log No. SE00163 – 0001 - USE OF NUHOMS-32P DRY SHIELDED CANISTER**

**Table 2**  
**Affected USAR SSC Design Functions**

SSC and other Major Components	Design Function (USAR Table 3.3-1)	Affected By	Is the Effect Adverse?
Dry Shielded Canister (DSC) Internal Basket Assembly and Outside Shell	Criticality Control	Fuel Assembly Spacing Decrease	Yes
	Fuel Support (Structural Integrity)	Weight Increase	Yes
	Cover Gas Containment	Internal pressure affected by thermal source increase and reduction in free volume due to 8 more assemblies	Yes
	Radioactive Material Confinement	Cladding Temp. and internal pressure, affected by thermal source increase.	Yes
	Shielding (Surface Dose)	Radiation Sources Increase	Yes
Transfer Cask	On-Site Fuel Transport (Structural Integrity)	Weight Increase	Yes
	Shielding (Surface Dose)	Radiation Sources Increase	Yes
Horizontal Storage Module (HSM)	Shielding (Surface Dose)	Radiation Sources Increase	Yes
	DSC Support	Weight Increase	Yes
	DSC Tornado Missile Protection	None	No
	DSC Cooling	Thermal Source Increase	Yes
Ram Equipment	Ram force to cope with a DSC jammed in the HSM	Weight Increase	Yes
Transfer Equipment (Cask Support Skid and Positioning System Transfer Trailer Optical Alignment System Tractor)	Transfer Cask Movement, DSC Transfers	Weight Increase	Yes

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**1. DSC Design Features That Support the Design Functions**

The DSC consists of the outer canister shell and the internal basket assembly, and is classified in Section 3.2 of the CCNPP ISFSI USAR as important-to-safety per 10 CFR 72. The DSC provides containment (confinement), shielding, criticality control, configuration control related to fuel retrievability, structural support, and thermal safety functions during loading operations, transfer operations, and storage. It is designed to remain intact under all accident conditions identified in the CCNPP ISFSI USAR with no loss of function. Specific design functions of the DSC include the following:

1. **Confinement** - The DSC design provides mechanical confinement of the stored fuel assemblies to prevent the dispersion of particulate or gaseous radionuclides from the fuel, and to maintain a barrier of helium around the fuel. The primary function of the DSC is to provide confinement of the spent nuclear fuel. This is achieved by the stainless steel shell and two inner shield plugs (top and bottom ends) which are welded to the shell assembly. There are also outer cover plates (top and bottom) to further support the confinement integrity. The DSC confinement boundary also is designed to retain a helium cover gas inside the DSC in order to prevent corrosion of the fuel cladding and formation of expansive oxides in the fuel itself during storage.
2. **Shielding** - The DSC materials provide radiation shielding. The DSC provides shielding at its ends by the use of lead shield plugs. These plugs provide ALARA dose rates at the top of the canister during drying and sealing operations and at the bottom for minimizing dose rates during DSC loading into the horizontal storage module (HSM) and at the HSM door during storage.

The NUHOMS-32P DSC has full-length egg crate plates and full-length steel rails with aluminum inserts. When compared to the NUHOMS-24P DSC, the full-length egg crate plates provide additional shielding between the assemblies, and the rails provide additional shielding between the assemblies and the transfer cask. This additional shielding partly compensates for the additional spent fuel assemblies, so the dose rates outside the transfer cask are only slightly higher for the NUHOMS-32P DSC than for the NUHOMS-24P DSC. The dose rates outside the HSMs are generally lower (except on the HSM Door) for storage of a NUHOMS-32P DSC than a NUHOMS-24P DSC.

3. **Criticality Control** - The DSC design provides for sub-criticality during the wet loading, DSC drying, and interim storage operations. This is accomplished by a combination of the physical properties of the fuel; fixed neutron absorbers in the NUHOMS-32P DSC basket; 2,450 ppm soluble boron in the spent fuel pool water; and CCNPP administrative controls for fuel identification, verification, and handling.

Optimum moderation was utilized for both internal and external moderation. The internal moderator was modeled with a soluble boron concentration of 2450 ppm while the external moderator was modeled with pure water. The internal moderator is defined as that part of the moderator that is contained within the basket, while the external moderator is defined as that part of the moderator that is contained outside of the basket (between the basket to canister gap, between the canister to transfer cask gap, and the neutron shield).



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4. Fuel Support and Configuration Control (Fuel Retrievability) - The DSC internal basket assembly provides support for the spent fuel assemblies during normal operations. The DSC also provides configuration control related to post accident recovery of spent nuclear fuel. The DSC is designed so that the worst-case postulated accidents, including a cask drop, will not result in deformation of the Internal Basket Assembly or the DSC shell to such a degree that retrieval of fuel assemblies is not assured. The structural characteristics of the transfer cask (TC) and the DSC limit the deceleration loads on the fuel assemblies so that their integrity is assured in the worst-case drop accident.

The guide sleeves establish storage compartments for 32 spent fuel assemblies within the DSC. The borated egg crate plates work together with boron dissolved in the spent fuel pool water (2,450 ppm) to maintain subcriticality.

5. Heat Removal - During transfer operations, decay heat is removed by thermal radiation and gaseous conduction. During storage in the HSM heat is removed via natural circulation airflow. Decay heat is also radiated from the DSC surface to the heat shield and HSM walls where natural convection air flow and conduction through the walls removes the heat. The DSC also maintains the helium cover gas, which is required for corrosion control. This cover gas improves the thermal performance of the DSC.

## 2. Effect of Decreased Fuel Assembly Spacing - Criticality Control Within DSC

The criticality control in the NUHOMS-32P DSC, with the reduced fuel assembly spacing, is achieved by:

- Increasing the boron concentration in fuel pool water from 1,800 ppm to 2,450 ppm, and
- Providing poison plates between the fuel assembly storage locations within the DSC. The poison plates consist of borated aluminum plates with a minimum boron ( $B^{10}$ ) areal density of  $0.010 \text{ g/cm}^2$ .

### BORATED ALUMINUM INSPECTIONS

The effectiveness of borated aluminum is established through neutronic testing (Reference 14). Boron-10, which is enriched to 95 w/o, appears as discrete particles of  $AlB_2$  uniformly distributed in the aluminum matrix. Test coupons are cut from the borated sheets and tested for neutron transmission. The transmission through the coupons is compared with transmission through calibrated standards. The effective boron-10 content of each coupon must be greater than  $0.010 \text{ g/cm}^2$ ; otherwise the associated sheet is rejected.

### CRITICALITY ANALYSES

Design basis criticality analyses were performed for Combustion Engineering (CE) design 14x14 non-Value Added Pellet (VAP) fuel assemblies containing  $UO_2$  enriched up to 4.5 wt% U-235. The Upper Subcriticality Limit (USL), as defined in NUREG/CR-6361, Section 4, is calculated for the CCNPP fuel and NUHOMS-32P design through a series of calculations to be 0.9422. An effective multiplication factor ( $k_{eff}$ ) that is less than USL ensures that the  $k_{eff}$  will be lower than the regulatory limit of 0.95 even when the biases and uncertainties in design parameters are taken into account.

The criticality within the NUHOMS-32P DSC has been analyzed for the following conditions:

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- Normal operations
  - wet loading (optimum moderation)
  - dry storage (via moderator exclusion)
- Off-normal or accident conditions
  - fuel mis-load. Fuel mis-load analyses were performed for CE design 14x14 Value Added Pellet (VAP) fuel assemblies containing  $\text{UO}_2$  enriched up to 5.0 wt% U-235, to determine how many VAP assemblies can be loaded without exceeding the  $k_{\text{eff}}$  limit.
  - off-normal poison plate thickness and accidental cask drop.

The criticality analyses are documented in Reference Series 1. The fuel mis-load analysis demonstrates that up to two fresh VAP assemblies can be loaded at optimum moderation (2,450 ppm boron concentration in the DSC) without exceeding the  $k_{\text{eff}}$  limit. These analyses demonstrate that the  $k_{\text{eff}}$  in all cases is below the USL of 0.9422. The analyses confirm that the Calvert Cliffs site-specific NUHOMS-32P design satisfies the requirements of 10 CFR 72.124 for normal, off-normal, and hypothetical accident conditions.

### 3. Effect of Increased Radiation Sources

The increase in radiation sources affects the radiation dose around the DSC, TC and HSM. Radiation sources inside a fully fuel-loaded NUHOMS-32P DSC are higher than those in a fully fuel-loaded NUHOMS-24P DSC because of the larger number of fuel assemblies. The gamma source per assembly is the same as before. The neutron source has been revised to a higher value to account for higher burnups in lower enriched assemblies. The change to an egg-crate basket design has increased the shielding provided by the DSC by the following:

- Addition of full length aluminum plates (borated and non-borated) between the guide sleeves and,
- Addition of full length stainless steel rails and aluminum rail inserts between the DSC stainless steel cylindrical shell and the outside guide sleeves.

The radiation dose analyses that support the NUHOMS-32P DSC upgrade addresses normal, off-normal and hypothetical accident conditions. They are essentially the same (see Attachment 12) in form and methodology to the design basis analyses that support the NUHOMS-24P DSC. Radiation dose rate values are calculated at various locations around the DSC, around the TC and around the HSM. The calculations are documented in Reference Series 4. The calculation results are tabulated in Table 3. They show that the gamma dose rates from the NUHOMS-32P DSC are similar to those from the NUHOMS-24P DSC. The neutron dose rates are higher due to the increased neutron source term. Outside the HSM, however, the neutrons do not dominate the total dose because the concrete in the HSM is an effective neutron shield. As such, the total doses outside the HSM are comparable for the NUHOMS-32P and NUHOMS-24P DSCs.

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The total dose rate values around the HSM for NUHOMS-32P DSC are comparable to those of NUHOMS-24P DSC. Thus, the total storage time dose to the public remains unchanged. The ISFSI USAR (p. 7.4-2) also provides a calculation of the maximum dose outside the ISFSI site fence during seismic restraint installation. This dose is composed of two components: dose from all closed/loaded HSMs and dose from the HSM where the seismic restraint is being installed. CCNPP Drawing 84075 shows that the outer fence is 94 feet from the HSMs in the N/S direction, and 53 feet from the HSMs in the E/W direction. From the results of CA06327 and CA06058 the maximum doses at these locations from a site consisting of 120 loaded HSMs of 32Ps or 24Ps are 0.4 mrem/hr in the N/S direction, and 0.6 mrem/hr in the E/W direction. CA06327 indicates that the dose rate at a distance of 66.7 feet directly in front of a loaded 32P HSM with the door open 2 feet for seismic restraint installation is 17.1 mrem/hr. Note that this tally location is conservative because a person outside the fence in the N/S direction cannot get closer than 94' from the front of the HSM, and a person on the E/W side will not be in a direct line of sight of the open HSM. The ISFSI USAR indicates that seismic restraint installation requires a maximum of 5 minutes (0.08 hours) and can nominally be done in 1 minute (0.017 hours). Thus, a person just outside the fence would conservatively receive a maximum of 1.37 mrem (0.08 hr x 17.1 mrem/hr) during the seismic restraint installation process. If that person remained outside the fence for an entire hour during the seismic restraint installation, their dose would conservatively not exceed 1.97 mrem (1.37 mrem from seismic restraint installation + 0.6 mrem from the fully loaded ISFSI site). This is within the 10CFR20.105 requirement that no individual (member of the public) may receive greater than 2 mrem in any 1 hour. Therefore the dose to the public is not affected by the change to the NUHOMS-32P DSC.

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**TABLE 3**

DOSE ANALYSIS RESULTS - NOMINAL DOSE RATES (MREM/HR)

<u>LOCATION</u>	<u>NEUTRON</u>		<u>GAMMA</u> (PRI + SEC)		<u>TOTAL</u>	
	24P <sup>c</sup>	32P	24P <sup>c</sup>	32P	24P <sup>c</sup>	32P
<u>DSC in HSM<sup>d</sup></u>						
1. HSM Wall or Roof	0.5	0.6	12	9.3	12.5	9.9
2. HSM Air Outlet	1	1.2	81	54.3	82	55.5
3. Center of Door	5	5.8	5	6.3	10	12.1
4. Doorway (Max., 1 ft. into opening)	621	1075	2619	2943	3240	4018
5. Air Inlet Vent	1	1	72	67	73	68
6. 1m from HSM Door	2	3	4	4.8	6	7.8
<u>DSC in Transfer Cask</u>						
1. Centerline <sup>a</sup> DSC Shield Plug (Flooded DSC) <sup>e</sup>	4	1.5	76	90.9	80	92
2. DSC Cover Plate (Dry DSC) <sup>e</sup>						
2.1 Center	45	48	96	98	141	147
2.2A Edge <sup>b</sup> (Wet Gap)	80	98	62	61	142	159
2.2B Edge <sup>b</sup> (Dry Gap)	124	134	136	137	260	271
3. Transfer Cask <sup>f</sup>						
3.1 Side	69	98	72	48	141	146
3.2 Top	6	8.5	1.0	1.4	7	10
3.3 Bottom	56	104	63	74	119	178
TC Drop Accident (@ 15')	80.6	117.9	15.8	9.7	97	127.6

- (a) The DSC/cask annular gap is filled with water. All but the top 6 inches of the DSC inner cavity is filled with water.
- (b) Nominal at edge of cover plate. The total dose rate is approximately a factor of 3 lower at the top edge of the transfer cask, and several times higher inside the dry annulus.
- (c) NUHOMS-24P DSC dose rates are from Calculations CA05924 and CA05925 (see Reference Series 4)
- (d) NUHOMS-32P DSC in the HSM dose rates are from Calculation CA06293 (see Reference Series 4)
- (e) NUHOMS-32P DSC dose rates are from Calculation CA06327 (see Reference Series 4)
- (f) NUHOMS-32P DSC dose rates are from Calculation CA06292 (see Reference Series 4)



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**4. Effect of Increased Thermal Sources**

The increase in thermal sources affects the pressure inside the DSC, temperatures in and around the DSC, and temperatures of the HSM concrete. The heat source in the NUHOMS-32P DSC is larger than the one in NUHOMS-24P DSC because of the increased number of fuel assemblies stored. The decay heat criterion used to load a fuel assembly into the DSC remains the same as before, namely 660 watts. With eight more assemblies the NUHOMS-32P DSC will have a heat source of 21.12 kW. The following design features have been included in the NUHOMS-32P DSC to improve the heat transfer and accommodate the larger heat source.

- Addition of full length aluminum plates (borated and non-borated) between the guide sleeves,
- Addition of stainless steel rails and aluminum rail inserts between the DSC stainless steel cylindrical shell and the outside guide sleeves.

Temperature and pressure analyses for the NUHOMS-32P DSC design has been performed as follows:

- Vacuum Drying
- Operating Pressures in the DSC
- Thermal Expansion of the DSC Components
- Thermal Analysis of the DSC in the Transfer Cask
- Thermal Analysis of the DSC in the HSM
- Thermal Analysis of the HSM
- HSM Exit Air Temperature

Analyses have been performed for the normal, off-normal and accident conditions, which are as follows:

- Cask drop during transit, which leads to the cladding rupture and escape of fuel gases into the DSC
- Blocking of all air vents in HSM for a period of 36 hours. The NUHOMS-24P design assumed that the HSM vents were blocked for 48 hours. A smaller time of blocking of the vents is used for NUHOMS-32P. This is justifiable because the vents are inspected every 24 hours. In the very low probability event where all three vents are found blocked cooling can be restored within 12 hours.

Analyses have been performed to determine the temperatures of the fuel assembly cladding within the DSC and temperatures around the DSC, TC and the HSM. The analyses are documented in the Reference Series 3, 5 and 6 respectively. Results of the analyses are tabulated in Table 4. The analyses confirm that the component temperature limits for the TC, DSC, and HSM are not exceeded for normal, off-normal, and accident conditions for the NUHOMS-32P DSC design at CCNPP. In addition, the HSM vents are required to be inspected at 24 hour intervals to maintain the vents unblocked to assure that the design temperature of the HSM concrete is not exceeded (see Technical Specifications Surveillance Requirement 4.4.1.2).



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**Table 4**  
**Thermal Analysis Results<sup>(i)</sup> – NUHOMS-32P DSC**

Operating Condition	Cladding Temp (°F)	Helium Temp (°F)	DSC Pressure (psig) <sup>(i)</sup>	DSC Surface Temp (°F)	HSM Concrete Temp (°F) <sup>(c)</sup>	HSM Δ Air Temp (°F)	TC Lead Shield Temp (°F)	TC Neutron Shield Resin Temp (°F)
Vacuum Drying	750	-	3 Torr	-	-	-	-	-
Therm/Press Limit	1058	-	3 Torr	-	-	-	-	-
Transfer at 103°F	742	621	13.7 (88.5 <sup>(a)</sup> )	-	-	-	370	277 <sup>(e)</sup>
Therm/Press Limit	1058	-	100	-	-	-	620	280 <sup>(h)</sup>
Transfer at -3°F	664	<sup>(f)</sup>	-	-	-	-	265	224
Therm/Press Limit	1058	-	-	-	-	-	620	280 <sup>(h)</sup>
Storage at 70°F	597	484	10.1	292	157	60	-	-
Therm/Press Limit	635	-	15	-	200	60	-	-
Storage at 103°F	620	509	10.8	323	201	64	-	-
Therm/Press Limit	1058	-	50	-	350	60 <sup>(d)</sup>	-	-
Storage at -3°F	545	<sup>(f)</sup>	-	223	65	49	-	-
Therm/Press Limit	1058	-	-	-	350	60	-	-
Accident <sup>(b)</sup> at 103°F	<838 <sup>(e)</sup>	725	98.5	571	387	-	-	-
Therm/Press Limit	1058	-	100	-	395	-	-	-

a Transfer with accidental drop concurrent with failure of all fuel clad and release of gases.

b Assumes failure of all fuel clad and HSM vents blocked for 36 hours.

c Concrete temperatures are calculated at the roof, floor, and wall locations of the HSM. Of these the maximum value is listed for ambient temperatures of 103°F and 70°F. The maximum concrete temperature for the -3°F case is not reported as it is bound by the 103°F and normal storage cases. The minimum concrete temperature that the HSM could hypothetically experience is -3°F.

d CA06299 (Exit Air Temp. and Bulk Air Temp. w/in the HSM) provides input into CA06302 (HSM Thermal Analysis – Max. Summer Temp.). CA06302 provides input to CA06306 (DSC Thermal analysis – Off Normal Storage Condition – Max. Summer Temp.). The results of CA06306 confirm that Fuel Cladding temperature remains well below thermal limits. ISFSI TS 3.4.1.1 establishes a maximum air temperature rise limit of ≤ 60°F. The basis for this TS Limit was selected to limit the hottest rod in the DSC to below 635°F at 70°F ambient air temperature. CA06299 predicts a maximum bulk air temperature rise across the DSC of 64°F. This predicted temperature rise should not be confused with the TS limit of ≤ 60°F. CA06306 establishes that Fuel Cladding temperature remains well below thermal limits. The TS Limit of ≤ 60°F is an operator guideline that establishes

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- a TS Limiting Condition for Operation that initiates operator action to increase monitoring and/or corrective action for the on-set of an adverse condition.
- e Reference Series 6, CA06304 only evaluates the blocked vent accident at 24 and 48 hour end points. The 48 hour case is conservatively reported for maximum fuel clad temperature.
  - f The off-normal minimum winter temperature cases (transfer and storage) are bounded by the results of the off-normal summer maximum temperature cases. No values are reported for the minimum winter cases. There is no temperature limit on the DSC Helium fill gas. Helium temperature is an input to determining the maximum internal pressure of the DSC under various operating conditions.
  - g Mass averaged bulk temperature of the neutron absorbing resin.
  - h Resin thermal limit was qualified by test.
  - i. The value of 15 psig is used as a design pressure for normal conditions; 30 psig is conservatively used in the associated stress calculations for normal conditions; 50 psig is used for off-normal conditions, and 100 psig is used for the associated stress calculations under accident conditions.
  - j. A bounding analysis was performed to determine the effect of increasing the mesh density from 5x5 and 6x6 to 14x14 in the fuel region. The results of the analysis are presented in the response to Question 8. The analysis shows that by increasing the mesh density to 14x14, the fuel cladding temperature increases by 1° F for normal conditions of storage and for the blocked vent accident condition. It is expected that the fuel cladding temperature will similarly increase for the other conditions listed in Table 4. These other conditions have significant margin to the thermal limits and are not the bounding cases. The limiting condition for the DSC pressure is the blocked vent condition. The gas temperature is conservatively assumed to increase 10°F which is greater than the temperature increase for any of the basket components. At this temperature, the DSC pressure would increase to 99.4 psig, which is below the design pressure of 100 psig.

**5. Effect of Increased Weight - Structural Integrity**

The structural integrity of the DSC, Plant Structures, TC, Access Route, and HSM is impacted by the increase in weight (See Table 5) of the DSC and the increase in temperatures (See Table 4). The weights of TC, Cask Support Skid and HSM remain unchanged.

The impact of these changes is analyzed on the structural design of the following components:

- DSC Basket Assembly
- DSC Shell
- TC
- Transfer Skid
- Lifting Devices, such as Yoke and trunnions (the plant facilities' evaluation of cranes and floor slabs is evaluated under a separate 50.59 review)
- Access Road Hydraulic Ram (for DSC insertion and removal), and
- HSM

The analyses are done for normal, off-normal and accident conditions. The analyses are documented in Reference Series 2 and 7. The bounding or the controlling calculated stress values, which correspond to the applicable accident cases, are tabulated in Table 6. The stainless steel thickness in the top shield plug top casing plate welded to the DSC shell is doubled from 0.375" thick to 0.75". To compensate for the increased thickness in the stainless steel, the lead thickness was reduced from 4.375" to 4.000" to maintain the over all thickness at 6.25". The results show that the stresses imposed by the heavier and hotter NUHOMS-32P DSC on all of these components are maintained within the allowable structural limits. Other variations between the NUHOMS-32P and NUHOMS-24P DSCs (such as lifting lugs and relocation of the vent and siphon ports to improve the welding operation of the shield plug to the DSC shell) have no impact on the structural integrity of the canister.

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Hydraulic Ram System

The Hydraulic Ram System (HRS) is used to insert and extract the DSC into or from the HSM. The HRS has a maximum capacity of 80 kips.

The HRS design is not changed as a result of this proposed activity. The weight of the 32P DSC exceeds the weight of the 24P DSC.

A reduction of the ability to apply a ram force equal to the weight of the loaded 32P DSC, has the potential to adversely affect CCNPP's ability to extract a jammed DSC. However, the following features are incorporated into ISFSI procedures to minimize the potential for a jammed DSC:

- To help ease the sliding of the DSC in and out of the HSM, a dry film lubricant is applied to the support rails inside the HSM and the TC, both of which are in contact with the DSC during horizontal DSC transfer. The lubricant used is Perma-Slik RGAC, which the manufacturer certifies as providing a coefficient of friction of 0.02 to 0.04. Thus, the normal force required to insert or extract the NUHOMS-32P DSC is calculated (Reference Series 7, DSC Loading and Unloading Loads) using a nominal coefficient of friction (which credits the use of a dry film lubricant) of 0.04, to be 4.5 kips. This is well within the HRS capacity.
- The ISFSI Operating Procedure (Reference 15) limits the DSC insertion force to about 20 kips, which is approximately 25% of the NUHOMS-24P DSC weight and 21% of the 32P DSC weight. When a force larger than the setpoint is required, the DSC is considered jammed. Administrative controls are used at that point to remove, inspect and re-insert the DSC, or apply a larger force, i.e., up to 80,000 lbs. The administrative controls will ensure that the force applied for insertion will not exceed the maximum force that can be applied by the HRS to extract a jammed DSC.

It should be noted that the NRC has accepted (Reference 16) a HRS capacity of 80 kips for Generic License NUHOMS 32PT series DSCs, whose dry weights range from 88 kips to 101.2 kips. NUHOMS-32P DSC has a dry weight of 91 kips (95 kips is conservatively used in the Loading and Unloading Loads calculation). This weight is within the range of 32PT series weights previously approved by the NRC.



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**Table 5**  
**Weights and Loads – NUHOMS-24P vs. NUHOMS-32P**

	Weight/Force (kips)	
	NUHOMS-24P	NUHOMS-32P
Fuel Assembly	1.3 <sup>(a)</sup>	1.45
DSC - Empty	34.6	44.6
DSC - Loaded with Fuel <sup>(c)</sup>	65.0	91.0
Access Road <sup>(c)</sup> (Designed for 140 ton)	120.5 ton	131.3 ton

- (a) A Technical Specification Amendment was issued for 24P for a maximum weight of 1450 lbs.
- (b) The (conservative) transfer trailer load associated with moving a fuel-loaded NUHOMS-32P DSC is 132.35 ton.
- (c) The actual loaded weight of 32P is 91.0 kips, 95 kips is conservatively used for structural analysis.

**TABLE 6**  
**Maximum Calculated Stresses for 32P DSC**

DSC SHELL ASSEMBLY	TYPE OF STRESS <sup>(*)</sup>	MAXIMUM CALCULATED STRESSES FOR LEVEL D (ksi)	LEVEL D ALLOWABLE STRESS (ksi)
		32P	
Shell	$P_L + P_B$	50.2	57.3
Bottom Cover Plate	$P_L + P_B$	42.2	62.7
Lead Plug Top Casing Plate	$P_L + P_B$	49.7	58.0
Top Outer Cover Plate	$P_L + P_B$	55.4	58.0

\*  $P_L$  = Local Member Stress;  $P_B$  = Bending Stress

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Table 6 (continued)

Structural Analysis – Maximum Calculated Stresses for all other components

ISFSI Component	Stress Type	Calculated Maximum Stress, ksi	Level D Allowable Stress, ksi
<u>DSC Basket Assembly</u>			
Basket	$P_L + P_B$	38.1	57.0
Rails	$P_L + P_B$	31.7	57.1
Rail Stud	Shear	17.6	19.7
<u>Transfer Cask</u>			
Shell	$P_L + P_B$	42.0	70.0
Top Cover Plate	$P_L + P_B$	38.2	64.4
Bottom Cover Plate	$P_L + P_B$	47.8	64.4
Hydraulic Ram Load Normal – 23.7K	$P_L + P_B$	5.8	28.4 (Level A)
Hydraulic Ram Load DSC Jamming - 95 K	$P_L + P_B$	23.2	28.4 (Level B)
<u>Lifting Mechanisms</u>			
	Stress Type	Maximum Calculated Stress, ksi	Code Allowable, Stress, ksi
Upper Trunnion (ANSI N14.6 Code)	Stress Intensity	7.0	13.1
Lower Trunnion (ANSI N14.6 Code)	Stress Intensity	2.51	30.5
Lifting Yoke Assembly: (ASME Code NF)	Load	Maximum Stress, ksi	Allowable Stress, ksi
Lift Beam	Ultimate Load	111.4	116.0
	Yield Load	66.9	104.0
Pin	Ultimate Load	132.9	135.0
	Yield Load	79.8	105.0
Lifting Hook	Ultimate Load	114.4	116.0
	Yield Load	103.9	104.0
	Test Load	66.8	104.0

The access road was previously evaluated for a 140-ton load. The transfer trailer load associated with moving a fuel-loaded NUHOMS-32P DSC is 131.3 ton. The calculation is based on 132.25 ton.

**USAR Sections Reviewed:**

All chapters of the CCNPP ISFSI USAR were reviewed.

**Does the *proposed activity*:****(1.) Result in more than a minimal increase in frequency of occurrence of an accident previously evaluated in the USAR?****NO****Justification:**

Accidents analyzed for the Calvert Cliffs ISFSI, for the use of NUHOMS-24P DSCs, are discussed in Section 8.2 of the USAR. Analyses of the same accidents with the use of NUHOMS-32P DSCs are discussed in the new USAR Chapter 12 as follows:

- 12.8.4.1 Loss of Air Outlet Shielding
- 12.8.4.2 Tornado Winds/Tornado Missile
- 12.8.4.3 Earthquake
- 12.8.4.4 Flood
- 12.8.4.5 Transfer Cask Drop
- 12.8.4.6 Lightning
- 12.8.4.7 Blockage of Air Inlets and Outlets
- 12.8.4.8 Dry Shielded Canister Leakage
- 12.8.4.9 Accidental Pressurization of Dry Shielded Canister
- 12.8.4.10 Forest Fire
- 12.8.4.11 Liquefied Natural Gas Plant or Pipeline Spill or Explosion
- 12.8.4.12 Load Combinations
- 12.8.4.13 Other Event Considerations

The use of NUHOMS-32P DSC does not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected except for the increased weight of the DSC, higher radiation sources and the higher heat load in the DSC.

Of the above listed events, those potentially impacted by the use of NUHOMS-32P DSC are the transfer cask drop, DSC leakage, accidental pressurization of the DSC, and load combinations. The frequency of occurrence of the other events are dependent upon natural phenomena and are independent of the type of DSC used.

**TRANSFER CASK DROP**

The cask drop accident is postulated to occur during the DSC's transit to and from the plant and the HSM. Outside dimensions of the DSC are not being altered and aspects of the postulated event, such as the height of the drop, angle of drop, surface of drop as a result are not impacted. Therefore there are no aspects of the proposed change that could potentially impact the frequency of the drop accident. There are other aspects of the proposed change such as the increases in DSC weight, source term and surface temperature which could potentially affect the consequences of the cask drop accident. These aspects of the proposed change are discussed under Question No. 3. Therefore, it is concluded that the activity does not result in more than a minimal increase in the frequency of occurrence of the cask drop accident.



### DSC LEAKAGE

The NUHOMS-32P DSC shell and cover designs have been modified by moving the vent and siphon ports from shell wall to the shield plug to improve the welding operation of the shield plug to the DSC shell as compared to the NUHOMS -24P DSC shell and cover designs. This proposed change, however, has no impact on the frequency of occurrence of DSC leakage since the welding operation remains essentially the same and testing to verify leak-tightness is performed using similar techniques and equipment as used on the 24P DSC.

### ACCIDENTAL PRESSURIZATION OF DSC

Accidental pressurization of DSC has been analyzed for the following two scenarios:

1. DSC in storage in the HSM with ambient temperature of 103°F, the air outlet/inlet vents blocked for up to 36 hours, and fission gases leaked out of the cladding.
2. DSC in transit at an ambient temperature of 103°F, and DSC accidentally dropped causing the fission gases to be leaked out of the cladding.

The frequency of scenario 1 does not change with the 32P DSC loaded in the HSM. Although the higher heat load of the 32P DSC design results in increased shell temperatures earlier than those experienced by the 24P design, fuel clad temperature limits are not exceeded up to the 36 hour duration analyzed for this accident. Technical Specification surveillance requirements ensure that within 24 hours, that a blocked vent can be detected and actions can be taken to restore cooling.

Similarly, the frequency of scenario 2 does not change with the 32P in transit to the HSM with ambient temperature of 103°F. As discussed previously, outside dimensions of the DSC are not being altered and aspects of the transfer cask drop event, such as the height of the drop, angle of drop, surface of the drop are not impacted. As a result, there are no aspects of the proposed change that could potentially impact the frequency of the drop accident. There are other aspects of the proposed change such as the increases in DSC weight, source term and surface temperature which could affect the consequences of the cask drop accident. These aspects of the proposed change are discussed under Question No. 3. Therefore, it is concluded that the activity does not result in more than a minimal increase in the frequency of occurrence of the accidental pressurization of the DSC accident.

### LOAD COMBINATIONS

With exceptions noted under Question 7 of this evaluation, the load combinations are otherwise the same for the NUHOMS-32P and 24P DSC systems for all specified normal, off-normal, and postulated accident conditions. For all load combinations, the design acceptance criteria for the NUHOMS-32P and 24P DSC shells, transfer cask, lifting trunnions, HSM, and other miscellaneous components are the same. The NUHOMS-32P DSC internal basket assembly is designed to meet the ASME code requirements applicable for core support structures, similar to the NUHOMS-24P DSC basket assembly. The same transfer cask and equipment are used to transport the NUHOMS-32P and NUHOMS-24P DSC from the spent fuel storage pool to the ISFSI, and the cask travel path and the bounding ambient temperature range (-3°F and 103°F) are the same while transporting either fuel-loaded DSC. Load combinations structural reanalysis for the NUHOMS-32P DSC, transfer cask, and HSM which account for the effects of the additional 8 fuel assemblies, increased fuel assembly weight, and basket design, confirm that the stresses

imposed by the NUHOMS-32P DSC on all important-to-safety components are maintained within the required structural limits for the specified normal, off-normal, and postulated accident conditions (Reference Series 2, and 7). Therefore, the frequency of occurrence of an accident will not be increased by the NUHOMS-32P DSC load combinations.

### HSM EVALUATION

Structural reanalysis of the HSM concrete structure, DSC supports, and miscellaneous structural steel components of the HSM storing the NUHOMS-32P DSC confirm the structural integrity of the HSM under all normal, off-normal, and accident conditions (Reference Series 7). To assure that the HSM concrete design temperature is not exceeded, the HSM vents are required to be inspected at 24 hour intervals (see Technical Specifications Surveillance Requirement 4.4.1.2) to verify that they are open, and to have them unblocked within 12 hours after a blockage is discovered.

- It is noted here that the time allowed to unblock the vents is being decreased from 24 hours to 12 hours. This change is deemed acceptable, because the vents are inspected every 24 hours. If a vent is found blocked cooling can be restored within 12 hours.

Therefore the frequency of occurrence of an accident will not be increased by the decrease in time allowed to unblock vents in the HSM.

### Conclusion:

In conclusion, the affects of the proposed changes do not increase the frequency of any of identified accidents discussed above and previously evaluated in the USAR. In general, incorporating the use of the 32P canister (which will hold 8 additional spent fuel assemblies) will reduce the annual number of DSC loading, transport and storage evolutions, however over the life of the ISFSI the number of loading and transfer evolutions will remain the same. In effect, this will have a null impact on the frequency of occurrence of the accidents discussed above.

**Does the *proposed activity*:**

**(2.) Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the USAR?**

**NO**

**Justification:**

The structure, system or component (SSC) associated with the ISFSI comprise the DSC and its internal basket, the TC and HSM, as described in the USAR Section 3.2. These SSCs are impacted by the proposed activity because of the activity's effect on their design parameters. The use of the NUHOMS-32P DSC, which is the primary focus of the proposed activity, requires changes to the following design parameters:

1. Boron concentration in the spent fuel pool
2. Weight of the DSC
3. Heat source in the DSC
4. Radiation source in the DSC

**1. Boron Concentration**

The proposed activity requires the boron concentration in the spent fuel pool to be increased from 1,800 ppm to 2,450 ppm, to control the criticality during loading/unloading and drying operations. The DSC and its internals are exposed to the increased soluble boron concentration only during cask loading (and unloading) which is expected to take less than 24 hours. There is a substantial body of industry experience (including the use of the NUHOMS-24P DSC) with exposure of aluminum and stainless steel to borated and unborated water, which confirms that stainless steel and aluminum are suitable for these conditions. Therefore, malfunction of SSCs important to safety due to increased soluble boron is not increased.

One side effect of boron in the spent fuel pool is the generation of hydrogen. Generation of hydrogen is primarily due to corrosion chemical reactions with aluminum and galvanic corrosion in the presence of spent fuel pool water. The potential for hydrogen generation in a NUHOMS-32P DSC will be different from that in a NUHOMS-24P DSC, because of the differences in aluminum surface area and the different alloys of aluminum employed in the two designs. However, the amount of hydrogen generated is not relevant because the hydrogen concentration in the DSC is sampled before there is any welding or cutting of the top shield plug. The USAR Section 5.1.1.2 states that before welding or cutting of the top shield plug begins, a small tube is inserted into the DSC vent port. A hydrogen monitor is connected to the tube to continuously sample for hydrogen gas during the top shield plug welding/cutting process. If the hydrogen concentration reaches 60% of the lower flammability limit, welding/cutting activities are stopped. The DSC air space is then purged with filtered plant air. Thus, the potential for hydrogen explosion is eliminated.

**2. Weight of the DSC**

The weight of a fully fuel-loaded DSC is being increased from 65.0 kips to 91.0 kips due to the additional eight (8) fuel assemblies, increased fuel assembly weight, and basket design. As discussed in Attachments 1 and 5, all SSCs have been analyzed for normal, off-normal and accident conditions using the increased weight of the NUHOMS-32P DSC. The maximum

resulting stresses have been shown to be smaller than the stress allowables. Therefore, the increased weight of the DSC will not result in more than a minimal increase the likelihood of occurrence of a malfunction of the SSCs.

Structural analyses for the NUHOMS-32P DSC, transfer cask, and HSM, which account for the effects of increased DSC weight, confirm that the stresses in these components remain within the allowables.

Other major equipment affected by the weight increase is the DSC transport equipment and hydraulic ram system. The transport equipment have been analyzed and found to be adequate to handle the extra load.

The Hydraulic Ram System (HRS) capacity is 80 kips. The normal force required to insert or extract a NUHOMS-32P DSC is nominally calculated to be 4.5 kips, which is well within the HRS capacity.

However, for NUHOMS-24P DSC the HRS design basis was to have a capacity equal to the DSC weight, to cope with a jammed DSC. For NUHOMS-32P this design basis will not be met. However, the existing HRS capacity of 80 kips is considered sufficient to cope with a jammed NUHOMS-32P DSC due to the following:

- ISFSI operating procedure limits the HRS force to be applied for DSC insertion to approximately 20 kips. Administrative controls are imposed when the force required exceeds the above value. The administrative controls will ensure that the force applied for insertion will not be large enough that the force required to extract a jammed DSC will be within the HRS capacity.
- NRC has accepted a HRS capacity of 80 kips for the General License NUHOMS-32PT series DSCs, whose dry weights range from 88 kips to 101.42 kips. NUHOMS-32P DSC has a dry weight of 91 kips, which is within the range of 32PT series weights.

Absent any regulatory requirements that define a minimum static coefficient of friction, while meeting all Code requirements, the NEI Guidance is met by the proposed activity and a finding of “no more than minimal increase” is appropriate for the 32P DSC design.

### 3. Heat Source in the DSC

The proposed activity increases the heat source in the DSC from 15.84 kW to 21.12 kW (0.66 kW/Assembly). The DSC design has been modified to provide more heat transfer surfaces to compensate for the higher heat sources. Thermal analyses for the NUHOMS-32P DSC show that the increased heat source does not increase component temperatures in the HSM, DSC, or TC beyond their design limits (Reference Series 3, 5, and 6) for normal, off-normal, or accident conditions. Therefore, the proposed activity does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the USAR. Another effect of higher heat source in the DSC is a higher internal gas pressure. The DSC accident pressurization analysis for the NUHOMS-32P DSC shows that the increased number of fuel rods, higher heat source, and the decreased DSC internal volume does not increase the internal DSC pressure beyond its 100 psig design limit (Reference Series 2 and 7) for normal, off-normal, or accident conditions. Therefore,



the likelihood of occurrence of a malfunction of an SSC important to safety due to increased heat source in a NUHOMS-32P DSC is not more than minimally increased.

To assure that the HSM concrete design temperature is not exceeded, the HSM vents are required to be inspected at 24 hour intervals, and if the vents are blocked then 12 hours are allowed to restore the normal air flow. Chapter 8.2.7.3 of the NUHOMS-24P USAR discusses the blocked vent accident dose consequences and provides the only USAR reference to an assumed time for a blocked vent recovery operation. The assumed time to unblock the vents is 8 hours. Since the proposed change does not affect the physical characteristics of the HSM, nor is the frequency of the accident changed as a result of the NUHOMS-32P design, the only affect of the proposed activity is an increase in the heat-up rate of the HSM concrete due to the greater heat load of the NUHOMS-32P design. The analyses discussed in Attachment 3 demonstrate that concrete temperatures remain below allowable thermal limits for up to 36 hours following a blocked vent accident. The maximum time that a blocked vent accident could go undetected is 24 hours based on Technical Specification surveillance requirements. Accordingly, the 12 hours allowed for unblocking HSM vents where the HSM contains a NUHOMS-32P DSC is within previously assumed response times for the NUHOMS-24P DSC design described in the USAR for a blocked vent accident. Dose consequences for this accident are discussed under Question 3 of this evaluation.

Accordingly, the likelihood of occurrence of a malfunction of an SSC important to safety due to increased heat load in a NUHOMS-32P DSC is not more than minimally increased.

#### 4. Radiation Source in the DSC

The proposed activity increases the radiation (neutron and gamma) source in the DSC. The fuel assembly neutron source design basis was increased for calculating the radiation dose, in order to account for higher burnups in lower enriched assemblies. This impacts the radiation dose to the DSC components and components in the DSC vicinity. Radiation dose analyses have been performed for the DSC components. The accumulated dose is not large enough to impact any of the components. Also the confinement of a higher source of radioactive gases is not a problem, because the DSC confinement is maintained.

Shielding is provided by the DSC, transfer cask, and horizontal storage module (HSM). These SSCs have been evaluated for the NUHOMS-24P DSC in the USAR. These components are passive, and the safety requirement with regard to shielding is that they retain their integrity under the Hypothetical Accident Conditions (HAC) and normal conditions.

Shielding analyses for the NUHOMS-32P DSC, which account for the additional eight (8) fuel assemblies and basket redesign, show that the dose rates are higher on the outside of the DSC and transfer cask; but, as discussed above, the total accumulated dose values are well within the capabilities of the materials (stainless steel, aluminum, and concrete). Therefore, the likelihood of malfunction of shielding SSC important to safety due to radiation is not more than minimally increased.

The top shield plug (TSP) is redesigned in anticipation of future licensing of the NUHOMS-32P DSC for transportation in a 10 CFR 71 approved overpack. The design change involves a reduction in the lead shield thickness (decrease from 4.375 inches to 4.00 inches, minimum) and

an increase in the steel plate thickness of the top shield plug top casing plate from 0.375 inches to 0.75 inches. The effect of this change is to slightly increase dose rates near the TSP (~6% higher than if the old TSP design had been used for the 32P DSC), but the effects on dose rates outside the NUHOMS HSM are insignificant (Reference Series 4). The specific dose rates are provided in Table 3. Thus the functionality of the top shield plug is essentially unchanged by this modification. Therefore, the likelihood of occurrence of a malfunction of shielding on an SSC important to safety is not more than minimally increased due to reduced lead and increased steel thicknesses in the TSP plates.

The change involves substitution of one component for another (a NUHOMS-32P DSC for a NUHOMS-24P DSC). Both of these components (the DSCs) have the same functions and analyses have shown that the functional requirements of the DSC continue to be met.

#### HSM EVALUATION

Structural reanalysis of the HSM concrete structure, DSC supports, and miscellaneous structural steel components of the HSM storing the NUHOMS-32P DSC confirm the structural integrity of the HSM under all normal, off-normal, and accident conditions (Reference Series 7). To assure that the HSM concrete design temperature is not exceeded, the HSM vents are required to be inspected at 24 hour intervals (see Technical Specifications Surveillance Requirement 4.4.1.2) to verify that they are open, and to have them unblocked within 12 hours after a blockage is discovered.

Therefore, likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety previously evaluated in the USAR is not more than minimally increased.

Based on the above discussions, the proposed activity does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of an ITS SSC previously evaluated in the USAR.

Does the *proposed activity*:

(3.) Result in more than a minimal increase in the consequences of an accident previously evaluated in the USAR?

NO

**Justification:**

Accidents analyzed for the Calvert Cliffs ISFSI, for the use of NUHOMS-24P DSCs, are discussed in Section 8.2 of the USAR. Analyses of the same accidents with the use of NUHOMS-32P DSCs are discussed in the new USAR Chapter 12 as follows:

- 12.8.4.1 Loss of Air Outlet Shielding
- 12.8.4.2 Tornado Winds/Tornado Missile
- 12.8.4.3 Earthquake
- 12.8.4.4 Flood
- 12.8.4.5 Transfer Cask Drop
- 12.8.4.6 Lightning
- 12.8.4.7 Blockage of Air Inlets and Outlets
- 12.8.4.8 Dry Shielded Canister Leakage
- 12.8.4.9 Accidental Pressurization of Dry Shielded Canister
- 12.8.4.10 Forest Fire
- 12.8.4.11 Liquefied Natural Gas Plant or Pipeline Spill or Explosion
- 12.8.4.12 Load Combinations
- 12.8.4.13 Other Event Considerations

The use of NUHOMS-32P DSCs does not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected except for the increased weight of the DSC, higher radiation sources and the higher heat load in the DSC.

Of the above listed events, those potentially impacted by the use of NUHOMS-32P DSC are the transfer cask drop, DSC leakage, and Forest Fire. USAR Sections 8.1.2.1 and 8.1.2.2 discuss two off-normal events involving a jammed DSC and thermal loads. These events, however, do not have radiological consequences and as a result are not discussed under this evaluation.

Consequences of an accident refer to the accident radiological dose consequences. SSCs and their design functions related to radiological dose consequences of an accident are discussed below.

#### TRANSFER CASK EVALUATION

The transfer cask drop accident bounds evaluated accidents with regard to the transfer cask. Structural reanalysis of the transfer cask with a fuel-loaded NUHOMS-32P DSC confirm the structural integrity of the transfer cask under various cask drop accidents (Reference Series 7). Dose calculations for the NUHOMS-32P DSC transfer cask drop accident assume that the

neutron shielding is lost. As with the NUHOMS-24P DSC, the possibility of radiation source redistribution within the DSC during the accident is conservatively accounted for by the assumption of homogenized source within the DSC. The analyses indicate that the doses are 1518 mrem/hr at 1" from the side of the Transfer Cask, and 127.6 mrem/hr at 15 feet (Reference Series 4). The latter yields an eight-hour recovery dose of 1,021 mrem at 15 feet. Section 4.7.3.3 of the USAR indicates a contact dose rate limit of 5,000 mrem/hr for this accident, and 10 CFR 72.106 establishes an accident dose limit of 5 rem at the site boundary. Section 8.2.5.3 of the USAR indicates that the NUHOMS-24P DSC contact dose rate is 1,126 mrem/hr, and the eight-hour recovery dose to an on-site worker at 15 feet will be 776 mrem. Since total dose at 15 feet is less than 5 rem, the 10CFR 72.106 (site boundary) limit is also met. Both the dose rates, and the accident dose for the NUHOMS-32P DSC with the increased neutron source term meet the limits.

Guidance contained in NEI 96-07, Appendix B, provides that, "An increase in accident consequences from a proposed activity is defined to be no more than minimal if the increase is less than or equal to 10 percent of the difference between the current bounding calculated dose value and the regulatory limit (10 CFR 72.106, as applicable)." The difference in the 32P - 15 foot worker/site-boundary dose (i.e., 1021 mrem) and the 24P - 15 foot worker/site-boundary dose (i.e., 776 mrem) is 245 mrem. Ten percent of the difference between the regulatory limit and the current bounding calculated dose value (i.e.,  $10\% \times 5,000 - 776$ ) is 422 mrem. Since 245 mrem is less than the current bounding calculated dose value of 422 mrem the results meet the standard of NEI 96-07, Appendix B for being considered not more than a minimal increase.

The cask drop accident bounds all other scenarios with regard to creating conditions under which nuclear criticality is possible. Criticality is prevented (therefore the dose is limited) during dry conditions by excluding the possibility of introducing moderator (e.g., water) into the DSC cavity during the dry operations of transfer and storage. Therefore, the criticality control function of the DSC is to preclude the introduction of moderator, (e.g., water) into the interior of the DSC after it is removed from the spent fuel pool. Analyses have been performed which confirm that the NUHOMS-32P DSC will maintain its integrity under the same normal and accident conditions as the NUHOMS-24P DSC (Reference Series 1).

There are no design basis accidents involving a wet canister; however, the criticality analyses for the cask drop accident assume that the consequences of the drop result in the fuel pins being rearranged into the most reactive geometry for both wet and dry conditions. These analyses confirm that the reactivity remains below the upper subcritical limit (USL) for both wet and dry conditions (Reference Series 1).

Additionally, consistent with 10 CFR 72.124, "Criteria For Nuclear Criticality Safety," both the NUHOMS-32P DSC and the NUHOMS-24P DSC are designed such that at least two unlikely, independent, and concurrent or sequential changes are required to create conditions under which nuclear criticality is possible. Both designs require the malfunction of at least two items of equipment important to safety for criticality to be possible.

Based on the above discussion, the consequences of accidents previously evaluated in the USAR do not increase with respect to nuclear criticality control.

#### DSC LEAKAGE

The DSC is designed to ensure no leakage, and analyses for the NUHOMS-32P DSC confirm that the results of applicable structural analyses are unchanged for normal, off-normal and accident



conditions, so a breach of the confinement barriers is not credible (Reference Series 2). Nevertheless, to demonstrate the safety of the NUHOMS-24P DSC, a non-mechanistic leak of a single DSC is analyzed in Section 8.2.8 of the USAR. The postulated accident is the instantaneous release directly to the environment of the gap inventory of Kr-85 from all the fuel rods in all 24 assemblies. The original calculated skin and total body doses for the NUHOMS-24P DSC were 17.8 and 0.11 mrem, respectively. This calculation utilized 18-month operating cycle inputs for calculating the Kr-85 gap fraction using the ANSI/ANS 5.4 method.

The NUHOMS-32P DSC doses are evaluated using the original methodology but for a 24-month operating cycle. Calculation CA03902 (Reference Series 4) determines the skin and total body dose values of 60.1 and 0.36 mrem, respectively. These dose values remain well within the regulatory limits, as specified in 10 CFR 72.106, of 50 rem to the skin and 5 rem to the total body. The increase in dose values over those reported in the USAR for the 24P are  $60.1 - 17.8$  or 42.3 mrem to the skin and  $0.36 - 0.11$  or 0.25 mrem to the total body. Ten percent of the difference between the regulatory limit and the current bounding calculated dose values for skin dose (i.e.,  $10\% \times 50,000 - 17.8$ ) is 4,998 mrem and total body dose (i.e.,  $10\% \times 5000 - 0.11$ ) is 499.9. Since 60.1 is significantly less than 4998 mrem and 0.36 mrem is significantly less than 499.9 mrem it is concluded the current bounding calculated dose values for skin and total body exposure meet the standard of NEI 96-07, Appendix B for being considered not more than a minimal increase.

#### HSM EVALUATION

Structural reanalysis of the HSM concrete structure, DSC supports, and miscellaneous structural steel components of the HSM storing the NUHOMS-32P DSC confirm the structural integrity of the HSM under all normal, off-normal, and accident conditions (Reference Series 7). To assure that the HSM concrete design temperature is not exceeded, the HSM vents are required to be inspected at 24 hour intervals (see Technical Specifications Surveillance Requirement 4.4.1.2) to verify that they are open, and to have them unblocked within 12 hours after a blockage is discovered. Two scenarios involving the HSM that are analyzed in the USAR have potential radiological consequences; (a) blockage of the air inlets and outlets, and (b) concrete cracking and spallation due to fire.

Direct doses from the first analyzed scenario, blockage of air inlets and outlets with a NUHOMS-32P DSC in the HSM, are bounded by the doses with a NUHOMS-24P DSC installed. The dose rate at the air inlet with a NUHOMS-32P DSC is 68 mrem/hr (Table 3), which is less than the 73 mrem/hr with a NUHOMS-24P DSC installed.

For the second analyzed scenario, the spalling of concrete from the HSM in a forest fire increases from 4.5" for the 24P to 6" for the 32P (CA06629; reference series 6). CA03945 (reference series 6) indicates that a 12" reduction in concrete thickness would produce a factor of 20 increase in dose rate at the HSM surface. This translates to an increase by a factor of 3 for a 4.5" reduction in concrete thickness, and a factor of 4.5 for a 6" reduction in concrete thickness. The original design goal was that the spalling not increase dose rates to a level beyond which repair actions could be performed by conventional methods (1 rem/hr). Forest fire spalling would result in a dose rate of 45 mrem/hr at the 32P HSM surface ( $4.5 \times 9.9$  mrem/hr from Table 3) which is still significantly below the 1 rem/hr design goal for spalling repair. Thus, it can be concluded that the 32P DSC would also not adversely impact the ability to repair spalled concrete following a forest fire. In addition, the impact of forest fire induced spalling must be evaluated against the requirements of 10CFR72.106, which establishes an accident dose limit of 5 rem at the site

boundary. ISFSI USAR Section 2.1.2.2 indicates that the minimum distances from the ISFSI to the site boundary is 3900 feet. From the results of CA06293 and CA06058 the maximum dose rate at 3000 feet from an ISFSI site consisting of 120 loaded HSMs of 32Ps or 24Ps is less than  $1\text{E-}5$  mrem/hr in both the N/S and E/W directions. A conservative normal annual site boundary dose would then be 0.09 mrem ( $1\text{E-}5$  mrem/hr x 8760 hrs) for either a fully loaded 24P or 32P ISFSI site. While concrete spalling caused by a forest fire would not be allowed to persist for a year without repair, such spalling would conservatively increase the annual site boundary dose to 0.27 mrem for a full 24P ISFSI site ( $3 \times 0.09$  mrem), and 0.41 mrem for a full 32P ISFSI site ( $4.5 \times 0.09$  mrem). Thus, the change to a 32P conservatively increases the annual site boundary dose following a forest fire by 0.14 mrem ( $0.41 - 0.27$ ). Ten percent of the difference between the regulatory limit and the current bounding calculated dose value (i.e.,  $10\% \times 5,000 - 0.27$ ) is 499 mrem. Therefore, these results meet the standard of NEI 96-07, Appendix B for being considered a minimal increase.

A third accident scenario for the HSM presented in the NUHOMS Topical Report with radiological consequences, "Loss of Air Outlet Shielding," is evaluated for the CCNPP NUHOMS-24P in Section 8.2.1 of the ISFSI USAR. This accident was considered not credible for CCNPP HSM because the air outlet shielding is designed to remain in place and withstand all design events including the effects of tornado missiles. The HSM design is not being altered for use with the 32P, and therefore, this conclusion still applies.

Based on the above discussion, the proposed activity does not exceed the accident dose limits established by 10 CFR 72.106 and does not produce more than a minimal increase in the consequences of an accident previously evaluated in the ISFSI USAR

Does the *proposed activity*:

**(4.) Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the USAR?**

**NO**

**Justification:**

The structure, system or component (SSC) associated with the ISFSI comprise the DSC and its internal basket, the TC and HSM, as described in the USAR Section 3.2. Of these SSCs, only the DSC and its internal basket assembly have been changed. Structural evaluations of the DSC and its internal basket assembly confirm their structural integrity under all specified normal, off-normal, and accident conditions (Reference Series 2). Structural reevaluation of the transfer cask, the reinforced concrete HSM, and the DSC support structure for the increased weight and thermal load of the NUHOMS-32P DSC confirm the structural integrity of these components under all specified normal, off-normal, and accident conditions (Reference Series 2). No changes to the reinforced concrete HSM and its DSC support structure, and the transfer cask have been made.

**CRITICALITY CONTROL**

Consistent with 10 CFR 72.124, "Criteria For Nuclear Criticality Safety," both the NUHOMS-32P DSC and the NUHOMS-24P DSC are designed such that at least two unlikely, independent, and concurrent or sequential changes are required to create conditions under which nuclear criticality is possible. Therefore, the consequences of a malfunction of any single piece of equipment important to criticality safety are unchanged.

**DSC LEAKAGE DOSE**

The SSCs important to safety with regard to radiation safety (doses to the operators and doses to the public) consists of the DSC, transfer cask, and horizontal storage module. The DSC is designed to ensure no leakage, and the analysis for the NUHOMS-32P DSC confirm that a breach of the confinement barriers is not credible. A non-mechanistic leakage of the DSC is discussed in response to Question 3 (above) regarding the consequences of an accident.

Thus, the consequences of a malfunction of an SSC important to safety previously evaluated in the USAR remains unchanged.

**Does the *proposed activity*:**

**(5.) Create a possibility for an accident of a different type than any previously evaluated in the USAR?**

**NO**

**Justification:**

Accidents analyzed for the Calvert Cliffs ISFSI are discussed in Section 8.2 of the USAR. They consist of loss of shielding, external missiles, earthquake, flood, cask drop, lightning, blockage of air inlets and outlets, DSC leakage, DSC overpressurization, forest fire, liquefied natural gas plant or pipeline spill or explosion, load combinations, and the onsite storage of flammable liquid fuel.

There is no change to the design of the NUHOMS system caused by this activity other than the use of the NUHOMS-32P DSCs. There is, however, a change in operation in that soluble boron is credited for criticality control. This activity does not modify the external configuration of the DSC envelope. The interface between the DSC and the HSM during ISFSI operations and interim storage of the DSC remains unaffected except for the increased weight of the DSC and the additional heat load in the DSC. The HSM vents are required to be inspected at 24 hour intervals to verify that they are unblocked, and to assure the HSM concrete short term local design temperature limit of 395°F is not exceeded.

The changes that support the upgrade from the NUHOMS-24P DSC to the NUHOMS-32P DSC are:

- Redesign of the DSC basket to hold eight (8) more fuel assemblies
- Use of fixed neutron absorber plates in the DSC to control criticality
- Increased fuel pool soluble boron concentration from 1,800 ppm to 2,450 ppm
- Removing the requirement for limiting initial enrichment based on burnup
- Increased fuel assembly neutron source term
- Modified top shield plug
- Increased fuel assembly weight

The components of the NUHOMS-32P DSC and NUHOMS-24P DSC internals perform passive safety functions, which they fulfill by retaining their structural integrity and remaining in place. Calculations for the NUHOMS-32P DSC basket confirm that the results of applicable structural analyses are unchanged for Hypothetical Accident Conditions and normal operation, so the guide sleeves, basket plates, and outer rails and aluminum inserts remain in place. These analyses also confirm that the DSC shell remains intact and precludes the release of radioactive material, or the ingress of water (moderator). Therefore, there is no accident of a different type than analyzed in the USAR, that is created by the redesign of the basket to hold eight (8) more assemblies (Reference Series 2 and 7).

The fixed neutron absorbers are borated aluminum plates between two unborated aluminum plates. The effectiveness of borated aluminum plates as neutron shielding is established through testing (Reference 14). In addition, the aluminum and stainless steel plates are not adversely affected by exposure to borated and unborated water as confirmed by a substantial body of industry experience. Therefore, the possibility for an accident of a different type than any previously evaluated in the USAR involving the use of fixed neutron absorbers is not credible.

As discussed in Attachment 6, one side effect of boron in the spent fuel pool is the generation of hydrogen. Generation of hydrogen is primarily due to corrosion chemical reactions with



aluminum and galvanic corrosion in the presence of spent fuel pool water. The potential for hydrogen generation in a NUHOMS-32P DSC will be different from that in a NUHOMS-24P DSC, because of the differences in aluminum surface area and the different alloys of aluminum employed in the two designs. However, the amount of hydrogen generated is not relevant because the hydrogen concentration in the DSC is sampled before there is any welding or cutting of the top shield plug. The USAR Section 5.1.1.2 states that before welding or cutting of the top shield plug begins, a small tube is inserted into the DSC vent port. A hydrogen monitor is connected to the tube to continuously sample for hydrogen gas during the top shield plug welding/cutting process. If the hydrogen concentration reaches 60% of the lower flammability limit, welding/cutting activities is stopped. The DSC air space is then purged with filtered plant air. Thus, the potential for hydrogen explosion is eliminated.

The means for ensuring subcriticality are different for the NUHOMS-24P DSC and NUHOMS-32P DSC. The current NUHOMS-24P DSC ISFSI criticality analysis of record credits no soluble boron but does assume a fuel burnup credit, relying on a fresh fuel enrichment limit of 1.8 w/o U-235 and an equivalency calculation for higher enrichments. The presence of fixed neutron absorbers in the NUHOMS-32P DSC basket assembly along with credit for soluble boron in the moderator eliminates the need for burnup credit to meet criticality acceptance criteria.

A dilution event is considered not credible, because the spent fuel pool water is normally maintained at 2,450 or greater ppm boron concentration and because multiple alarms and operator actions exist to prevent this scenario. (An exemption request with the provisions of 10CFR50.68 was approved by the NRC to allow the use of boron credit in lieu of fuel burnup credit.) After the DSC is dried and sealed, there is no credible way for water to enter the DSC. Soluble boron is only credited in accident scenarios for the NUHOMS-24P DSC.

Increasing the neutron source term (from  $2.23\text{E}+08$  n/s/assy to  $3.3\text{E}+08$  n/s/assy) does not impact equipment important to safety. As discussed below, the increased neutron fluence remains well within the capabilities of the materials of construction, concrete, stainless steel and aluminum.

The effects of radiation on concrete from a filled DSC are determined to be negligible for the NUHOMS-24P DSC in Section 8.1.1.5 of the USAR. This is based on the evaluation performed in Section 8.1.1.5 of the NUHOMS-24P Topical Report (Reference 12). In the case of neutron irradiation, the NUHOMS 24P Topical Report determines that an estimated 50-year fluence of  $1.2\text{E}+14$  n/cm<sup>2</sup> for a source of  $3.715\text{E}+09$  n/sec-DSC ( $24 \times 1.548\text{E}+08$  n/sec-assembly) will not impact the structural integrity of the concrete. This conclusion remains valid for the CCNPP NUHOMS-24P DSC because the neutron source term is not significantly higher than that evaluated in the Topical Report ( $2.23\text{E}+08$  n/sec-assembly /  $1.548\text{E}+08$  n/sec-assembly = 1.44). In the case of the NUHOMS-32P the DSC neutron source term will be  $1.056\text{E}+10$  n/sec-DSC ( $32 \times 3.3\text{E}+08$  n/sec-assembly) which is a factor of approximately 2.8 higher than that used in the Topical Report. This yields an estimated 50-year fluence of  $3.4\text{E}+14$  n/cm<sup>2</sup> for the concrete, which is conservative because it does not account for the additional shielding present in the NUHOMS-32P DSC basket design. This value is still well below the critical value for neutron induced degradation of concrete, which is approximately  $1.0\text{E}+19$  n/cm<sup>2</sup> (Reference 11).

In the case of gamma irradiation, the NUHOMS-24P Topical Report (Reference 12) determines that a gamma source of  $3.85\text{E}+16$  MeV/sec-DSC ( $24 \times 1.6\text{E}+15$  MeV/sec-assembly) results in a gamma flux of  $6.8\text{E}+10$  MeV/cm<sup>2</sup>-sec in the HSM concrete. The temperature rise in concrete due to this flux is considered negligible per ANS/ANSI 6.4-1977. In the case of the NUHOMS-32P DSC, the gamma source is higher by a factor of 1.27 ( $32 \times 1.53\text{E}+15$  MeV/sec-assembly =

4.9E+16 MeV/sec-DSC). However, as the data in Table 3 shows, even with the increase gamma source in the NUHOMS-32P DSC, the gamma dose rates outside the DSC are comparable or lower than the NUHOMS-24P DSC due to the increased shielding present in the NUHOMS-32P DSC basket design. The lower dose rates are due to reduced gamma flux on the outer surface of the DSC, which is the flux that impacts the HSM concrete. Therefore, since the incident gamma flux will be the same or lower than the NUHOMS-24P DSC, the NUHOMS-32P DSC gamma flux will also have a negligible impact on the concrete temperatures of the HSM. Hence, the effects of radiation on the HSM concrete are determined to be negligible for a NUHOMS-32P DSC inside the HSM. △

The top shield plug (TSP) was redesigned in anticipation of future licensing of the NUHOMS-32P DSC for transportation in a 10 CFR 71 approved overpack. The design change involves a reduction in the lead shield thickness (decrease from 4.375 inches to 4.00 inches, minimum) and an increase in the steel plate thickness of the top shield plug top casing plate from 0.375 inches to 0.75 inches. The specific dose rates are provided in Table 3. The functionality of the top shield plug is essentially unchanged by this modification so it does not create the possibility of an accident of a different type than any previously evaluated in the USAR. △

Thermal analyses for the NUHOMS-32P DSC which account for the additional eight fuel assemblies show that the increased decay heat load does not increase component temperatures in the HSM, DSC, or TC beyond their design limits (Reference Series 3, 5, and 6) for normal, off-normal, or accident conditions. Therefore, this modification does not create the possibility of an accident of a different type than any previously evaluated in the USAR.

The DSC accidental pressurization analysis for the NUHOMS-32P DSC which accounts for the additional eight fuel assemblies shows that the internal DSC pressure is not increased beyond its 100 psig design limit (Reference Series 2 and 7) for normal, off-normal, or accident conditions. Therefore, this modification does not create the possibility of an accident of a different type than any previously evaluated in the USAR. △

The change involves the substitution of one component for another (a NUHOMS-32P DSC for a NUHOMS-24P DSC). Based on the discussion above, the proposed activity does not create a possibility for an accident of a different type than any previously evaluated in the USAR.

**Does the *proposed activity*:**

**(6.) Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the USAR?**

**NO**

**Justification:**

Section 3.2 "STRUCTURAL AND MECHANICAL SAFETY CRITERIA" of the USAR states that the Calvert Cliffs ISFSI components that are important to safety are the reinforced concrete HSM and its DSC support structure, the DSC and its internal basket assembly, and the transfer cask. The proposed activity directly impacts the DSC and its internal basket, which are redesigned to store 32 fuel assemblies as opposed to 24 fuel assemblies stored in NUHOMS-24P DSC. The increase weight and heat and radiation source of the new DSC then indirectly affects the loads and stresses on the TC and HSM.

Detailed evaluations of the SSCs have been performed for normal and off-normal operating conditions and accident conditions, as reported in Attachment 3. Results of the analyses have shown that the proposed activity will not result in any malfunction of the DSCs.

#### CRITICALITY CONTROL

Structural analysis of the new basket assembly has shown that the basket assembly will be able to maintain its configuration even under accident conditions. Therefore, criticality control will be maintained.

#### FUEL ASSEMBLY SPACING

The proposed activity requires the DSC guide sleeves to be reduced in size from 8.7" to 8.5" and the spacing between them to be reduced from 10.36" to 9.125". This change has the potential to impact criticality control within the DSC. The DSC design has been modified by adding borated aluminum plates between the fuel assemblies (between the guide sleeves) to compensate for the reduction in spacing. The effectiveness of borated aluminum plates as neutron shielding is established through testing (Reference 14).

Consistent with 10 CFR 72.124, "Criteria for Nuclear Criticality Safety," the continued efficacy of the neutron absorber material, borated aluminum, when exposed to borated water in the spent fuel pool is confirmed by industry and CCNPP experience. The duration of exposure to borated water is normally less than 24 hours. There is a substantial body of industry and CCNPP experience with exposure of aluminum to borated and unborated water, which confirms that stainless steel and aluminum are suitable for these conditions. Therefore, the malfunction of the borated aluminum neutron absorbers is not credible.

As discussed in Attachment 3, the NUHOMS-32P DSC configuration has been analyzed for criticality during normal, off-normal, and accident conditions, the analysis results show that criticality meets the applicable criteria, and hence does not create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the USAR.

#### SHIELDING & DOSE

The results of postulated failures to the NUHOMS-32P DSC have been evaluated for the effects of the upgrade. These analyses have confirmed that upgrading to the NUHOMS-32P DSC does

not cause materials of construction to be challenged, or design basis limits to be exceeded. Therefore there are no new failure modes or mechanisms that would change the results of postulated and hypothetical malfunctions previously evaluated in the USAR.

The change involves the substitution of one component for another (a NUHOMS-32P DSC for a NUHOMS-24P DSC). Based on the discussion above, the proposed activity will not create the possibility of a malfunction of an SSC important to safety with a different result than any previously evaluated in the USAR.



Does the *proposed activity*:

(7.) Result in a design basis limit for a fission product barrier as described in the USAR being exceeded or altered?

YES.

**Justification:**

The fission product barriers for a spent fuel storage cask system and their related parameters are tabulated below.

Barrier	Function	Design Parameter	Current Limit	Proposed Limit	Exceeded/Altered?
Fuel Cladding	Protect Against Gross Rupture	Cladding Temp	635 °F / 1058°F	635 °F/ 1058°F	No / No
		Criticality ( $K_{eff}$ )	<0.95	<0.95	No
		Decay Heat	0.66 kW/Assembly	0.66 kW/Assembly	No
Confinement Boundary (DSC Shell)	Keep Fission Products Confined	Canister Accident Design Pressure	50 psig	100 psig	Yes (Altered)
		Stress Allowable	64 ksi	57.3 ksi	Yes (Altered)
		Leak Rate (Helium)	<10 <sup>-4</sup> atm-cc/s	<10 <sup>-4</sup> atm-cc/s	No

Following are details of the above parameters.

#### CLADDING TEMPERATURE

The fuel cladding damage threshold temperature at CCNPP for normal operating conditions is 635°F (335°C) (Reference 18). For short-term off-normal, short-term accident, and fuel transfer operations (e.g. vacuum drying of the cask) the fuel cladding temperature limit is 1,058°F (570°C) per Reference 18.

The fuel cladding temperature has been evaluated for various operating conditions and ambient temperatures, and the results are tabulated in Attachment 3, Table 4. It is seen that for normal storage conditions the cladding is maintained at a temperature not exceeding 597°F (below 635°F), and during off-normal and accident conditions the cladding temperature does not exceed 838°F (below 1,058°F).

#### CRITICALITY

Design basis criticality analyses are performed for Combustion Engineering (CE) design 14x14 non-Value Added Pellet (VAP) fuel assemblies containing UO<sub>2</sub> enriched up to 4.5 wt% U-235. Loading of the fresh fuel in NUHOMS-32P was considered, same as is done for NUHOMS-24P analysis. The Upper Subcriticality Limit (USL), as defined in NUREG/CR-6361, Section 4, is calculated for the CCNPP fuel and NUHOMS-32P design through a series of calculations to be 0.9422. An effective multiplication factor ( $k_{eff}$ ) that is less than USL ensures that the  $k_{eff}$  will be lower than the regulatory limit of 0.95 even when the bias and uncertainties in design parameters are taken into account.

The criticality within the NUHOMS-32P DSC is analyzed for the following conditions:

- Normal operations
  - wet loading (optimum moderation)
  - dry storage (via moderator exclusion)
- Off-normal or accident conditions
  - fuel mis-load. Fuel mis-load analyses are performed for CE design 14x14 Value Added Pellet (VAP) fuel assemblies containing  $\text{UO}_2$  enriched up to 5.0 wt% U-235, to determine how many VAP assemblies can be loaded without exceeding the  $k_{\text{eff}}$  limit.
  - off-normal poison plate thickness and accidental cask drop.

The criticality analyses are documented in Reference Series 1. The fuel mis-load analysis demonstrates that up to two VAP assemblies can be loaded at optimum moderation without exceeding the  $k_{\text{eff}}$  limit. These analyses demonstrate that the  $k_{\text{eff}}$  in all cases is below the USL of 0.9422. The analyses confirm that the Calvert Cliffs site-specific NUHOMS-32P design satisfies the requirements of 10 CFR 72.124 for normal, off-normal, and hypothetical accident conditions.

#### CANISTER DESIGN PRESSURE

The pressure design limit for NUHOMS-32P is 100 psig, which is higher than the pressure design limit for NUHOMS-24P of 50 psig. NUHOMS-32P canister is analyzed for a pressure of 100 psig, and is found to be capable of withstanding it without exceeding any of the stress allowables. However, this requires a prior NRC approval, because the design basis limit for a fission product barrier is altered.

#### STRESS ALLOWABLE

The NUHOMS-32P DSC confinement boundary consists of the DSC shell, top shield plug top casing plate, siphon/vent block, alignment block, top shield plug lifting lug round bar, bottom cover plate, and the associated structural joint welds. The design requirements for the NUHOMS-32P and NUHOMS-24P DSC shell assembly and the associated structural welds are the same. Stress analyses of the NUHOMS-32P DSC for the effects of loads associated with dead weight, pressure, thermal, handling, seismic, and cask drop confirm that stresses in the DSC shell assembly components and the associated structural welds are within the current limits and the structural integrity of the DSC confinement boundary is maintained under all specified normal, and off-normal conditions except for the 100 psig applied to the outer pressure boundary, and the accident condition for 100 psig applied to the inner pressure boundary (reference series 2).

Confinement boundary stress allowables have been altered for one off-normal and most accident conditions as follows (reference series 2, CA06359, Rev. 5, pp34 and A7):

1. The condition of 100 psig applied to the outer pressure boundary (outer top cover plate) has been changed from an off-normal to an accident condition; correspondingly, the stress limits for this condition have been changed from ASME service level C to ASME service level D allowables.
2. For all accident conditions except 100 psig applied to the inner pressure boundary, the analysis has been changed from an elastic to an elastic/plastic analysis, with a corresponding change from ASME elastic allowables to ASME elastic/plastic allowables.

In conclusion, two of the design basis limits for a fission product barrier, namely the DSC design pressure and the confinement boundary stress allowables, are altered. Prior NRC approval is required. The change in design pressure was submitted to the NRC as part of the license amendment application, and the analysis which include the change in stress allowables were sent to the NRC with the response to RAI No. 1 for that application.



Does the *proposed activity*:

**(8.) Result in a departure from a method of evaluation described in the USAR used in establishing the design bases or in the safety analyses?**

**YES**

**Justification:**

Analyses performed for this activity consist of thermal, criticality, radiation dose and shielding and structural analyses. As demonstrated below, except in the cases of changes to methodologies used for crediting burnup to fixed and dissolved neutron absorber credit for the criticality analysis and the analysis changes from an elastic to an elastic/plastic analysis for all accident conditions except 100 psig applied to the inner pressure boundary, as discussed under previous Question No. 7, the analytical methods used are either the same, or where new methods are used they are approved by the NRC for the intended application, that is, for a NUHOMS dry storage system. Where elements of an analytical method have changed, e.g., revisions to an analytical code, they yield results that are essentially the same or are conservative. In accordance with NEI 96-07, Rev. 1, Appendix B, section B.4.3.8, such changes are not departures from a method of evaluation described in the USAR..

In particular the computer codes; ANSYS, SCALE and MCNP are verified in accordance with Transnuclear Q/A computer qualification/verification procedure. The Transnuclear Q/A Program has been accepted and audited by the NRC and CEG. The analysts that utilize the Codes are trained both by attending training classes given by the Code developers and by experienced Transnuclear Code users. This meets the NRC Generic Letter 83-11 criteria.

**THERMAL EVALUATION**

The primary portion of the thermal evaluation of the NUHOMS® 32P uses a methodology that differs from the thermal analysis methodology utilized for the NUHOMS-24P as described in the CCNPP USAR. The new methodology has been compared in detail with the methodology used for the thermal analysis of the NUHOMS® CoC 1004 amendment 5 for the 32PT.

The 32P thermal methodology has three major new features shown in the following table.

Feature	CCNPP ISFSI 24P USAR	32P
Solution method	HEATING6 finite difference	ANSYS finite element
Model geometry	2D	3D
Treatment of effective transverse thermal conductivity of fuel.	Temperature at the boundary of a fuel assembly and peak temperatures are calculated using an iterative process. These temperatures are then used with the methodology in the NUHOMS®-24P Topical Report for effective fuel conductivity values. See Section 8.1.3 of the USAR.	From detailed finite element model of fuel, according to method of the TRW Spent Nuclear Fuel Effective Conductivity Report.



Use of Approved 32PT Thermal Methodology for the 32P within Appropriate Constraints and Limits in Accordance with NEI 96-07 B4.3.8.2

The new methodology has been compared in detail with the methodology used for the thermal analysis of the NUHOMS® CoC 1004 amendment 5 for the 32PT. The use of the 32PT methodology is appropriate to the CCNPP ISFSI with the 32P canister as follows:

- a) The 32P maximum thermal load of 21 kW is below the 24 kW limit of the 32PT.
- b) The 32P and 32PT basket designs both rely on conduction and radiation from the fuel through plates adjacent to the fuel compartments to peripheral transition rails to the canister wall, rather than tube and disc designs, in which convection is also a factor.
- c) The 32PT is analyzed in the standard Model 80/102 HSM; the 32P is analyzed in the CCNPP HSM, which is similar in internal dimensions and air exit paths.
- d) The 32PT is analyzed in a transfer cask with a liquid neutron shield, while the CCNPP transfer cask has a solid neutron shield. The application of the 32PT methodology to the CCNPP transfer cask is appropriate because the treatment of conduction through the solid neutron shield is much simpler than the conduction/convection heat transfer in the liquid neutron shield.

The following Tables 1-3 break down various parts of the thermal evaluation into more detailed constituents, compares the 32P and the 32PT approved methodology, and addresses any differences. One element of the approved 32PT methodology that differs is the 32P thermal analysis, the version of the ANSYS code used, is dealt with here separately.

#### ANSYS Revision Comparison

ANSYS revision 5.6 was used for the thermal analysis of the NUHOMS® system with the 32PT canister. ANSYS revisions 5.6, 5.7, and 6.0 are used to perform the 32P thermal analyses (Reference Series 3, 5, and 6).

DCALC CA06619 benchmarks revisions of ANSYS 5.6 and 6.0 to demonstrate that the results are essentially the same. Changes introduced in ANSYS 5.7 were not used in any of the 32P thermal analysis so ANSYS 5.6 and 5.7 are identical for this purpose. ANSYS 8.1 was used to evaluate temperatures with a finer homogenized fuel mesh. DCALC CA06639 benchmarks ANSYS 5.7 and 8.1 and finds no difference for this calculation.

Therefore, changes to elements of the methodology, (i.e.,) various ANSYS revisions used subsequent to ANSYS 5.6 are not departures from a methodology described in the USAR.

Table 1: Modeling of DSC Internals

Constituent	Approved 32PT	32P	comment
Basket model	Half length, 3D	Full length, 3D	Because the location of the fuel in the canister is slightly off-center axially, a full-length model represents the basket and fuel more accurately, and is therefore appropriate.
Calculation of Effective Transverse Fuel Conductivity	Transverse effective conductivity of the homogenized fuel is calculated based on 2D ANSYS model of fuel cross section. No convection is considered in the model.	No change	
Calculation of Effective Axial Fuel Conductivity	Calculated from cross-sectional area of Zircaloy cladding only	No change	
Homogenized fuel mesh density	14x14	Non-uniform mesh, courser at center of fuel, finer at perimeter	As-discussed below a bounding thermal analysis was performed for 32P using a 14x14 mesh density with acceptable results
Heat generating conditions	Heat generating conditions applied on homogenized fuel assembly regions using peaking factors.	No change	

Table 2: Modeling of DSC in Transfer Cask

Constituent	Approved 32PT	32P	comment
Transfer cask model	2D of cask cross section	Full length 3D quarter symmetry	3D required to model neutron shielding material and gussets explicitly.  Because very little heat is rejected through the ends of the cask, the full length model will not significantly change results for maximum cladding and component temperatures.
Canister to cask radiation heat transfer	ANSYS /AUX 12	No change	
Canister centering	DSC shell is off set within the transfer cask. Air gaps at top and bottom are 0.702 inch and 0.108 inch respectively. DSC shell rests on the cask rails.	DSC is centered in the cask. No cask rails are considered in the model.	A study shows that considering a uniform gap is conservative regarding the maximum DSC shell temperature.
Heat input	Heat load is applied as uniform heat flux over the inner surface of the DSC. Insolence is applied as uniform heat flux over the top half of the cask outer surface using an absorptivity factor.	No change	
Cask to ambient convection	Free convection	Same, using revised convection coefficients	Revised coefficients are input only, not methodology.
Radiation from cask to ambient	Radiation to ambient is modeled using ANSYS /AUX12 methodology	Radiation is lumped into an effective convection coefficient to ambient.	Lumping convection and radiation together yields essentially the same results for maximum cladding and component temperatures as treating radiation explicitly.



Table 3: Modeling of DSC in HSM

Constituent	Approved 32PT	32P	comment
HSM model	2D of the HSM cross section at mid-length	No change	
Heat input	Heat load is applied as uniform heat flux over the inner surface of the DSC.	No change	
Convective heat removal from canister	Convection applied over DSC and HSM walls using various bulk temperatures.	No change	
Radiative heat removal from canister	ANSYS /AUX12 models radiation from canister to heat shields and heat shields to concrete	No change	
Accident analysis of blocked vents	Convection in closed cavity is considered for the accident analysis of the blocked vents.	No convection is considered for the blocked vent case analysis.	No convection yields more conservative results for the fuel cladding temperature.

Evaluation of Homogenized Fuel Mesh Size

The detailed breakdown and comparison of the 32P thermal analysis with the 32PT thermal analysis found only one area where there was a difference. The 32PT finite element model used a 14x14 uniform transverse mesh for each homogenized fuel assembly, while the 32P used a non-uniform mesh, coarser at the center of the fuel, but finer at the boundaries. In order to evaluate this difference the 32P thermal analysis for normal condition and for the blocked vent accident condition was re-run with a 14x14 transverse fuel mesh. The result was the following changes:

	Temperature increase (°F)	
	Normal Condition	Blocked Vent Accident
Fuel Cladding	+1	+1
Fuel Compartments	+9	+7
Aluminum Basket Plates	+10	+7
Stainless Steel Bars	+9	+8
Basket Rails	+4	+3

These changes resulted in the following increases in basket temperatures:

Component	Maximum Temperature for Normal Storage Conditions (°F)		
	Original Model	Temperature increase	Updated Temperatures
Fuel Compartments	571	+9	580
Aluminum Basket Plates	567	+10	577
Stainless Steel Bars	570	+9	579
Basket Rails	419	+4	423

These changes resulted in the following increases in the Maximum Temperature for Transfer Conditions at 103°F, ambient temperatures:

Component	Maximum Temperature for Transfer Conditions, 103°F Ambient (°F)		
	Original Model	Temperature increase	Updated Temperatures
Fuel Compartments	717	+9	726
Aluminum Basket Plates	717	+10	727
Stainless Steel Bars	717	+9	726
Basket Rails	573	+4	577

The basket temperature in the center region increases 10°F from 717°F to 727°F and in the periphery increases 4°F from 573°F to 577°F. The structural analysis uses a uniform temperature of 725°F for the entire basket. Since the maximum stress in the basket does not occur in the high temperature region, this increase does not affect the results of the structural analysis.

It is conservatively assumed that the temperature of the gas increases by the maximum increase for any component (10°F). This temperature increase results in an internal pressure increase of 0.9 psi. This increases the accident storage pressure from 98.5 to 99.4 psig, still within the 100 psig design limit.

Therefore, the difference in the meshing of the fuel does not have a significant effect on maximum fuel cladding temperature, structural analysis, or internal pressure.

#### CRITICALITY CONTROL EVALUATION

Criticality safety of the NUHOMS-32P DSC is evaluated using computer code CSAS25/KENO V.a of SCALE 4.4. This is an upgrade from the code that was used to evaluate the NUHOMS-24P DSC, namely CSAS4/KENO V.a of SCALE 3. This change will not be evaluated because the following change requires the criticality analysis to be submitted for NRC approval.

The current NUHOMS-24P DSC ISFSI criticality analysis of record credits no soluble boron but does assume a fuel burnup credit, relying on a fresh fuel enrichment limit of 1.8 w/o U-235 and an equivalency calculation for higher enrichments. The presence of fixed neutron absorbers in the NUHOMS-32P DSC basket assembly along with credit for soluble boron in the moderator eliminates the need for burnup credit to meet criticality acceptance criteria.

The ISFSI Technical Specification 3/4.2.1 (Dissolved Boron Concentration) requires 1,800 ppm of soluble boron in the spent fuel pool (SFP), which is credited by the double contingency principle for postulated accidents and abnormal conditions (e.g., optimum moderation, assembly mis-loading). The proposed NUHOMS-32P DSC ISFSI criticality analysis credits 2,450 ppm of soluble boron and no burnup credit. Soluble boron dilution is assumed not to be a credible

accident. The criticality analysis for the NUHOMS-24P DSC considered an optimum moderation with pure water. That is a conservative assumption, but is considered not credible, because the spent fuel pool water is normally maintained at 2,450 or greater ppm boron concentration. After the DSC is dried and sealed, there is no credible way for water to enter the DSC.

Therefore, the use of boron credit in lieu of fuel burnup credit is considered to constitute a new method for the criticality analysis described in the ISFSI USAR. The NUHOMS-32P DSC criticality analysis was sent to the NRC in the December 12, 2003 License Amendment Request to revise the Technical Specifications to support the ISFSI NUHOMS-32P upgrade (Reference 10).

### SHIELDING and DOSE EVALUATION

The methodology used for the 24P shielding evaluation in the CCNPP ISFSI USAR, sections 7.2 and 7.3, consists of calculation of source terms by the computer code ORIGEN2, and shielding analysis using the three-dimensional Monte Carlo Code MCNP4C. The MCNP4C methodology replaced the computer programs ANISN (one dimensional discrete ordinates), and SKYSHINE (empirical far-field reflection) used for the original 24P dose calculations. The use of MCNP4C has been previously accepted by the NRC and was previously evaluated for the 24P DSC in SE00160.

As documented in calculation CA06293, (Reference Series 4), the current dose rate calculations for the NUHOMS-32P DSC were prepared using MCNP4B2, with essentially the same modeling as used in the revised 24P calculations. The per-assembly source term was not recalculated for the 32P; the source term from the 24P was used, with the exception that the per-assembly neutron source strength (an input) was scaled up to  $3.3\text{E}8$  n/sec, as discussed in Attachment 3. RSICC Code Package CCC-700 identifies the major changes from MCNP4B to MCNP4C. These changes represent changes to inputs (e.g., ENDF/B cross-sections), features that are not used (macrobodyies), or changes to elements of the method that result in essentially the same results, since the results are well within the general accuracy of shielding calculations. In addition, comparisons between 4B and 4C performed at Calvert Cliffs (included with Reference Series 4) confirm that differences in results between the same case run in 4B and 4C are statistically insignificant (differences are within the relative error of the calculation result). Comparisons between MCNP4C and an even earlier version, MCNP4A are also documented in CA05925 Appendix E and also show statistically insignificant differences in the results produced by identical cases run on both versions. Finally, MCNP 4B has also been previously accepted by the NRC (CoC No. 9293, Rev. 1 for the TN-68 Transport Package and CoC No. 9302 for the NUHOMS®-MP197 Transport Package).

Based on NRC's review and approval of the LARs using MCNP4B, and based on a review of the differences between MCNP4C and MCNP4B, the changes to elements of the methodology are not departures from a method of evaluation described in the USAR.

In addition, the calculation performed to evaluate off-site dose for a non-mechanistic DSC leakage event (USAR Section 8.2.8.3) was performed for the 32P DSC using the same methodology as used for the 24P DSC (i.e., same dose conversion factors, ANSI/ANS 5.4 calculated gap fractions,  $\chi/Q$  value, etc.). Inputs were changed to reflect the increased number of assemblies in the 32P DSC, and account for 24-month operating cycles and the bounding 0.4



MTU assembly uranium loading. Therefore, there was no change from the method of evaluation described in the USAR.

### STRUCTURAL EVALUATION

The weight calculations for the NUHOMS-32P DSC are described in Reference Series 2. These calculations use the same methodology as the NUHOMS-24P DSC weight calculations.

The following table provides a comparison of the methods used to analyze the DSC, Transfer Cask, and HSM.

DSC Basket

	CCNPP ISFSI USAR (24P) Method	32P Method
Analytical Code	ANSYS 5.2, 5.3	ANSYS 5.6, & 6.0
Dimensions / geometry	2D, 3D	3D
Materials behavior	Elastic/Plastic	Elastic/Plastic

The methodologies for the 32P are approved by their use in the USAR, except for one element, the ANSYS revision used. The changes from ANSYS 5.2 to 5.3 include features that are not used in the DSC basket analysis (see ANSYS release notes ANSYS 5.3.000663, June 1996), so ANSYS 5.2 and 5.3 may be regarded as identical for the purpose here. DCALC No. CA06630 benchmarks revisions 5.3, 5.6, and 6.0 to demonstrate that the results are essentially the same. Therefore, the change in an element of the methodology from ANSYS 5.2 and 5.3 to ANSYS 5.6 and 6.0 is not a departure from an approved method, in accordance with NEI 96.07 B4.3.8.1.

The exclusive use of 3D modeling for the 32P basket structural analysis is dictated by the tube and transition rail construction of the 32P basket, which differs from the 24P's tube and disc design. The structural analysis of the 32P basket is virtually identical to that of the TN-68 basket, a similar basket design approved by NRC CoC 72-1027.

DSC Shell

	CCNPP ISFSI USAR (24P) Method	32P Method
Analytical Code	ANSYS 5.2	ANSYS 5.6, 6.0, & 8.1
Dimensions / geometry	2D	2D
Materials behavior	Elastic	Elastic/Plastic, Elastic

The change from elastic to elastic/plastic materials behavior is an 'element of the methodology' change. Although elastic-plastic materials behavior was used for the 24P basket analysis, its approval by the NRC for a plate structure cannot be used to infer NRC approval of elastic/plastic analysis to a shell structure. The application of plastic analysis to a shell structure for the 32P is an element of a method that results in less conservative results as compared to elastic analysis to the plate structure used for the 24P. Hence, the change results in a departure from a method of evaluation described in the USAR used in establishing the design bases or in the safety analyses. This analysis was submitted to the NRC for approval with the response to the Request for Additional Information.

### Transfer Cask

A combination of hand and finite element calculations were used for the transfer cask structural evaluation. The hand calculations are the same as the USAR methods. The finite element methods are as follows:

	CCNPP ISFSI USAR (24P) Method	32P Method
Analytical Code	ANSYS 5.2	See note
Dimensions / geometry	3D	See note
Materials behavior	Elastic	See note

Note: The geometry of the transfer cask is not changed. The only change is the increase of the DSC weight from the 24P to the 32P. The stress results of the USAR calculation are scaled up to include the effect of the increased 32P DSC weight.

### HSM

The following HSM component structural capabilities are re-evaluated for the 32P DSC:

1. DSC support and miscellaneous steel: The results of the 24P analysis are scaled for the additional 32P DSC weight.
2. Horizontal storage module transfer cask restraint evaluation: The loading and resulting stresses of the 24P restraint evaluation are scaled for the increased weight of the 32P DSC.
3. DSC Seismic restraint calculation: The same hand calculation method that is used for the 24P is used to evaluate the 32P.
4. HSM concrete design: A combination of hand and finite element calculations were used for the HSM concrete structural evaluation. Following table lists the comparison of the HSM evaluations between the 24P DSC and 32P DSC.

	CCNPP ISFSI USAR HSM Evaluation (24P DSC)	HSM Evaluation (32P DSC)
Material Properties	No changes between 24P DSC and 32P DSC	
Soil Spring Evaluation	Spring constant is adjusted slightly for the 32P increased weight	
Model Representation	No changes between 24P DSC and 32P DSC	
Dead Load	The load is adjusted to account for the 32P increased weight	
Live Load	No changes between 24P DSC and 32P DSC	
Seismic Load	The seismic forces used for 32P evaluation are adjusted to account for the increased weight	
Thermal Load	Finite element models are used for thermal loads calculations. The model geometry, node and element numbers, cross-section properties, boundary conditions and material properties are identical for 24P and 32P evaluation. The only difference is 24P uses STRUDEL and 32P uses ANSYS. Since only beam elements are used in the analyses, the theory and all other inputs are identical, therefore there is no significant change in the analyses.	

In conclusion, two cases where a methodology departs from a method of evaluation described in the USAR used in establishing the design bases or in the safety analyses have been identified. One case involves crediting fixed and dissolved neutron absorber materials in lieu of burnup for criticality calculations. The other case involves an analysis change from elastic to an elastic/plastic analysis for all accident conditions except 100 psig applied to the inner pressure boundary. Prior NRC approval is required. The change in burnup versus fixed and dissolved neutron absorber credit was submitted to the NRC as part of the license amendment application. The second change involving elastic versus elastic/plastic material properties was sent to the NRC in follow-on correspondence related to the request for additional information for the 32P application.

**References:**

1. Reference Series 1 (Criticality Analysis)

CCNPP Calculation No. CA05895, "The Criticality Benchmarks," Revision 0

CCNPP Calculation No. CA05896, "Criticality Analysis for Fuel Misloads and Accidents," Revision 0

CCNPP Calculation No. CA06227, "Criticality Analysis of the NUHOMS-32P for Calvert Cliffs ISFSI," Revision 0

CCNPP Calculation No. CA05673, "Criticality Analysis for a Dropped Fuel storage Cask, Revision 0

2. Reference Series 2 (DSC Structural Analysis)

CCNPP Calculation No. CA06319, "Weight Calculations of DSC/TC System," Revision 1

CCNPP Calculation No. CA06335, "Basket Stress Analysis Due to Accident Transfer Drop Loads," Revision 0

CCNPP Calculation No. CA06325, "NUHOMS-32P Basket Rail Buckling Analysis - Accident," Revision 0

CCNPP Calculation No. CA06326, "NUHOMS 32P Basket Stress Analysis for Storage Loads (Normal and Accident)," Revision 0

CCNPP Calculation No. CA06328, "NUHOMS-32P Dynamic Stress Strain Lead Properties at Different Temperatures," Revision 0

CCNPP Calculation No. CA06331, "NUHOMS-32P DSC Lifting Fixture Stress Analysis," Revision 0

CCNPP Calculation No. CA06332, "NUHOMS-32P DSC Bottom Stress Analysis for Lifting Loads," Revision 0

CCNPP Calculation No. CA06334, "NUHOMS-32P Basket Buckling Analysis," Revision 1

CCNPP Calculation No. CA06336, "Basket Stress Analysis (Normal) for Transfer Loads," Revision 0

CCNPP Calculation No. CA06359, "NUHOMS 32P - DSC Structural Analysis," Revision 5

CCNPP Calculation No. CA04678, "BGE (Calvert Cliffs Units 1 & 2) ISFSI Dry Storage Cask Drop Analysis"

CCNPP Calculation No. CA04680, "ISFSI CE 14x14 Fuel Grid Horizontal Drop Evaluation"

CCNPP Calculation No. CA05797, "DSC Horizontal Drop – Fuel Rod Cladding Integrity During Impact with a Broken Spacer Grid Fragment"

CCNPP Calculation No. CA06630, Sensitivity study of ANSYS versions used in 32P structural analysis

3. Reference Series 3 (DSC Thermal Analysis)

CCNPP Calculation No. CA06295, "Effective Fuel Properties," Revision 0

CCNPP Calculation No. CA06296, "Finite Element Model, Thermal Analysis," Revision 0



CCNPP Calculation No. CA06297, "Transfer Thermal Analysis, 103°F Ambient," Revision 1

CCNPP Calculation No. CA06298, "Transfer Thermal Analysis, -3°F Ambient," Revision 0

CCNPP Calculation No. CA06300, "Maximum Operating Pressure, Storage and Transfer," Revision 1

CCNPP Calculation No. CA06305, "DSC Thermal Analysis – Normal Storage Conditions," Revision 0

CCNPP Calculation No. CA06306, "DSC Thermal Analysis - Off Normal Conditions (Max. Summer Temperature)," Revision 0

CCNPP Calculation No. CA06307, "DSC Thermal Analysis - Off Normal Conditions (Min. Winter Temperature)," Revision 0

CCNPP Calculation No. CA06308, "Effective Fuel Properties for Vacuum Drying," Revision 0

CCNPP Calculation No. CA06311, "Temperature Profile of the DSC," Revision 0

CCNPP Calculation No. CA06312, "Thermal Analysis of Storage Cases Poison Plates in Basket," Revision 0

CCNPP Calculation No. CA06314, "Thermal Analysis of Vacuum Drying," Revision 0

CCNPP Calculation No. CA06340, "Thermal Expansion Calculation for Transfer and Storage Conditions," Revision 0

CCNPP Calculation No. CA05760, "Effective Conductivity of the Reconfigured Fuel Assembly"

CCNPP Calculation No. CA06619, Rev. 0, Heat Transfer Analysis Comparison between ANSYS Versions 5.6, 5.7, and 6.0.

CCNPP Calculation No. CA06637, Rev. 0, Sensitivity Analysis of Homogenized Fuel Region

CCNPP Calculation No. CA06638, Rev. 0, Sensitivity Study of Structural Analysis due to the Mesh Density Changes of the Thermal Model

CCNPP Calculation No. CA06639, Rev. 0, Benchmarking Heat Transfer Analysis for ANSYS Versions 5.7 & 8.1

4. Reference Series 4 (Radiation Dose Analysis)

CCNPP Calculation No. CA06291, "Atomic Fractions for the Shielding Analysis of the NUHOMS 32P Basket," Revision 0

CCNPP Calculation No. CA06292, "NUHOMS-32P Radiation Dose Rates Loading and Transfer," Revision 0

CCNPP Calculation No. CA06293, "NUHOMS-32P – HSM Dose Rates for Calvert Cliffs ISFSI," Revision 0

CCNPP Calculation No. CA06327, "Shielding Evaluation with the New Top Shield Plug for NUHOMS-32P," Revision 0

Engineering Evaluation ES200200585, Evaluation of the Shielding Source Terms for the ISFSI 32P Phase I Design," Revision 0

CCNPP Calculation No. CA05924, "Calvert Cliffs ISFSI/NUHOMS-24P Radiation Dose Rates for Cask Loading and Transfer," Revision 1

CCNPP Calculation No. CA05925, Calvert Cliffs ISFSI/NUHOMS-24P HSM Dose Rates," Revision 0

CCNPP Calculation No. CA03902, "Fission Gas Release Dose Rates," Revision 0

5. Reference Series 5 (TC – Thermal Analysis)

CCNPP Calculation No. CA06309, "Sensitivity of the Component Temperatures to the Position of the DSC in the Transfer Cask," Revision 0

CCNPP Calculation No. CA06310, "Sensitivity of the Transfer Cask Thermal Analysis to the Axial Gaps Between DSC and Transfer Cask," Revision 0

CCNPP Calculation No. CA06313, "Thermal Analysis of Transfer Cask with Poison Material in Basket," Revision 0

6. Reference Series 6 (HSM – Thermal Analysis)

CCNPP Calculation No. CA06299, "Exit Air Temperature and Bulk Air Temperatures Within the HSM," Revision 0

CCNPP Calculation No. CA06301, "HSM Thermal Analysis - Normal Storage Conditions," Revision 0

CCNPP Calculation No. CA06302, "HSM Thermal Analysis – Max. Summer Temperature," Revision 0

CCNPP Calculation No. CA06303, "HSM Thermal Analysis - Minimum Winter Temperature," Revision 0

CCNPP Calculation No. CA06304, "HSM Thermal Analysis - Accident Conditions (Blocked Vents)," Revision 0

CCNPP Calculation No. CA06341, "Maximum Temperature Gradient Across the Concrete Walls of the HSM," Revision 0

CCNPP Calculation No. CA03945, Rev. 1, ISFSI - Revised Forrest Fire Evaluation.

CCNPP Calculation No. CA6629, Rev. 0, "Forrest Fire Radiological Evaluation for the NUHOMS-32P HSM

CCNPP Calculation No. CA06618, "Thermal Accident Blocked Vents for the DSC End Assemblies," Revision 0

7. Reference Series 7 (Structural Analysis)

CCNPP Calculation No. CA04000, "NUHOMS 32P ISFSI Yard Paving and Approach Slab Evaluation," Revision 2

CCNPP Calculation No. CA06329, "NUHOMS-32P – Transfer Cask Structural Analysis," Revision 2

CCNPP Calculation No. CA06333, "NUHOMS-32P Lift Beam System Stress Analysis," Revision 0

CCNPP Calculation No. CA06393, "NUHOMS 32P – CCNP Fuel Pool Floor and Cask Support Platform Evaluation," Revision 1

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- CCNPP Calculation No. CA06364, "NUHOMS 32P - CCNP ISFS HSM Facility Evaluation," Revision 0
- CCNPP Calculation No. C-92-126, "ISFSI – ISFSF Access Road Pavement Design Evaluation," Revision 0
- CCNPP Calculation No. C-92-127, "ISFSI – ISFSF Access Road Utility Tunnel Evaluation," Revision 0
- CCNPP Calculation No. C-92-128, "ISFSI – ISFSF Access Road Pavement Design Evaluation," Revision 0
- CCNPP Calculation No. C-92-129, "Evaluation of Aux. Building Slab at EL. 45' for ISFSI Cask Transport Vehicle Loads. (NUHOMS 24P and 32P), Revision 1
- CCNPP Calculation No. C-92-130, "NUHOMS-32P Transfer Cask Drop on Safety Related Piping and Ductbank," Revision 1
- CCNPP Calculation No. C-92-267, "Overturning & Sliding Evaluation for NUHOMS 32P ISFSI Onsite Transfer Cask," Revision 0
- CCNPP Calculation No. C-93-151, "NUHOMS-32P Transfer Cask Curb Drop Evaluation," Revision 2
- CCNPP Calculation No. CA04679, "ISFSI Fuel Assembly Upper End Fitting Structural Integrity"
- CCNPP Calculation No. CA06499, "32P DSC Loading and Unloading Loads," Revision 2
8. Calvert Cliffs Independent Spent Fuel Storage Installation USAR, Revision 12
  9. Design Criteria for an Independent Spent Fuel Storage Installation (Dry Storage Type), American National Standard, ANSI/ANS 57.9-1984
  10. Constellation Energy Group letter to the U.S. Nuclear Regulatory Commission, "Revision to the Technical Specifications to Support the ISFSI NUHOMS-32P Upgrade," Dated December 12, 2003
  11. Ichikawa, T and Koizumi, H, "Possibility of Radiation-induced Degradation of Concrete by Alkali-Silica Reaction of Aggregates," Journal of Nuclear Science and Technology, Vol. 39, P. 880-884, August 2002
  12. "Topical Report for the NUTECH Horizontal Modular Storage System for Irradiated Nuclear Fuel NUHOMS®-24P," NUH-002, Revision 1a, July-1989
  13. NRC - Safety Evaluation Report for the Baltimore Gas and Electric Company's Safety Analysis Report for an Independent Spent Fuel Storage Installation at Calvert Cliffs, November 1992
  14. Transnuclear E-20112, "Procurement Specification for Borated Aluminum Sheets for the NUHOMS-32P Dry Shielded Canister," Revision 3
  15. Calvert Cliffs Nuclear Power Plant Technical Procedure ISFSI-02, Independent Spent Fuel Storage Installation (ISFSI) Unloading, Revision 8
  16. Nuclear Regulatory Commission Safety Evaluation Report, Docket No. 72-1004, Standardized NUHOMS Modular Storage System for Irradiated Nuclear Fuel, Certificate of Compliance No. 1004, Amendment 5

17. CCNPP Specification SP-0564C, "NUHOMS-32P Dry Shielded Canister Design Specification"
18. PNL-6189, Levy, I.S., et al., Pacific Northwest Laboratories, "Recommended Temperature Limits for Dry Storage of Spent Light-Water Zircaloy Clad Fuel Rods in Inert Gas" May 1987.
19. Safety Evaluation Supporting Issuance of License for Baltimore Gas & Electric Co. ISFSI, SNM-2505
20. CA04680, Rev. 0 (HABGE-02/98-610, R4), (24P) DSC Structural Analysis



**Summary: (For NRC Report, provide a brief overview)**

**Proposed Activity:** The proposed activity is the use of a new design of Dry Shielded Canister (DSC), NUHOMS-32P, for storing spent fuel at the Calvert Cliffs Nuclear Power Plant's (CCNPP's) Independent Spent Fuel Storage Installation (ISFSI). The use of NUHOMS-32P DSCs will be made in addition to the use of NUHOMS-24P DSCs. These two types of DSCs have the same external dimensions; however, the NUHOMS-32P DSC can store 32 fuel assemblies. NUHOMS-32P Basket design is based on Transnuclear TN-68 design, which is approved by the NRC.

There are no physical changes being made to the Transfer Cask (TC) or the Horizontal Storage Modules (HSMs). All the major steps for loading a DSC (vacuum drying, welding, etc.) are the same for the NUHOMS-24P DSC and the NUHOMS-32P DSC systems.

The activity also consists of the following additional fuel assembly changes, which are not directly associated with the new NUHOMS-32P DSC design, but have been included in the design analysis of NUHOMS-32P DSC.

- Increase of fuel assembly weight from 1,300 lbs. to 1,450 lbs. This accounts for the weight increase during irradiation and the possible storage of control components with the assembly.
- A limiting assembly mass of 0.400 MTU, compared to the previously used nominal value of 0.386 MTU. This bounds all standard CE 14x14 fuel assemblies used at CCNPP.
- Increase in fuel assembly neutron source design basis in calculating the radiation dose, in order to account for higher burnups in lower enriched assemblies.

**Reason for Activity:** This proposed activity will increase the ISFSI storage capacity. The NUHOMS-32P DSC design also allows CCNPP to reduce the minimum number of canister loadings each year from four (using the NUHOMS-24P DSC design) to three (with the NUHOMS-32P DSC design). This should reduce the total annual radiological dose associated with the canister loading.

**Activity Evaluation:** New analyses are performed to verify that confinement, shielding, criticality control, structural stresses, and passive heat removal are acceptable with the use of NUHOMS-32P DSCs at the CCNPP ISFSI.

The results of the analyses demonstrate that the new DSC and the existing TC and HSM with the use of the new DSCs meet all of the design criteria, and will provide for a safe storage of the spent fuel assemblies under normal, off-normal and postulated accident conditions.

**Conclusion:** The proposed activity has been evaluated against the eight criteria of 10CFR 72.48(c)(2). Criteria 7 and 8, which concern the design basis limits for the fission product barrier and a departure from a method of evaluation described in the USAR, are not met. It is concluded that the proposed activity will require a License Amendment prior to its implementation.