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10 CFR 72.56

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Calvert Cliffs Nuclear Power Plant
Independent Spent Fuel Storage Installation, License No. SNM-2505
NRC Docket No. 72-8

Subject: Response to Second Request for Additional Information Part 1

References:
1. Letter from G. H. Gellrich (Exelon) to Document Control Desk (NRC), dated March 26, 2013, License Amendment Request: High Burnup NUHOMS®-32PHB Dry Shielded Canister and Horizontal Storage Modules
2. Email from J. Goshen (NRC) to P. S. Furio (Exelon), dated May 23, 2015, Request for Additional Information

Reference 1 submitted a license amendment request for the Calvert Cliffs Nuclear Power Plant site-specific independent spent fuel storage installation. The amendment, if approved, would authorize the storage of Westinghouse and AREVA Combustion Engineering 14x14 fuel in the NUHOMS-32PHB Dry Shielded Canister system. As part of their review, the NRC staff has requested additional information (Reference 2). Responses to the requested additional information are provided in Attachment (1).

The additional information provided does not change the environmental assessment provided in Reference 1 and the categorical exclusion set forth in 10 CFR 51,22(c)(11) is still valid. There are no regulatory commitments contained in this correspondence.

Should you have questions regarding this matter, please contact Mr. Larry D. Smith at (410) 495-5219.

NMSS26

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 29, 2015.

Respectfully,

Mark D. Flaherty
Plant Manager

MDF/PSF/bjm

Attachments (1) Second Request for Additional Information Part 1

Enclosures:
1. Drawings NUH32PHB-30-3, -30-4, -30-5
2. Calculation NUH32PHB-0201
3. Drawing NUH32PHB-30-10
4. Marked up Technical Specification
5. Marked up USAR Section

cc: NRC Project Manager, Calvert Cliffs
NRC Regional Administrator, Region I
NRC Resident Inspector, Calvert Cliffs
S. Gray, MD-DNR

ATTACHMENT (1)

SECOND REQUEST FOR ADDITIONAL INFORMATION PART 1

Calvert Cliffs Nuclear Power Plant
June 29, 2015

By letter dated March 26, 2014, Exelon Generation Company, LLC (Exelon Generation), submitted license amendment request (LAR) No. 1 to the Nuclear Regulatory Commission (NRC) for Renewed Materials License No. SNM-2505 for the Calvert Cliffs independent spent fuel storage installation (ISFSI). The NRC staff has requested additional information regarding the amendment request.

Chapter 5 Structural and Materials Evaluation

RAI 5-1:

Provide all applicable drawings associated with the NUHOMS® 32PHB Dry Shielded Canister (DSC) system.

The staff received drawings in response to a previous request (RSI 5-7 of Request for Supplemental Information), but is unsure if we possess all of them in a readable form. For example, vendor DWG Nos. NUH32PHB-03-3 sheet 2 of 2 and NUH32PHB-30-4 sheet 2 of 2 are presented as DWG No. 84239SH0002. The staff does not possess sheet 1 of 2 for either of these vendor drawings. DWG No. NUH32PHB-30-4 sheet 2 of 2 contains details and sections, but without sheet 1 of 2, the staff is unaware of the component from which the details and sections are taken. Ensure DWG No. NUH32PHB-30-5 is among the included drawings. Additionally, calculation No. NUH32PHB-0201, NUHOMS®32PHB, "Weight Calculation of DSC/TC System," contains sketches in the appendix that appear to be excerpts from drawings. One of these sketches is a list of American Society of Mechanical Engineers (ASME) code exceptions for the DSC and the basket, but additional notes and the title block with the drawing number are cut off. These code exceptions do not appear anywhere in the proposed revision to the final safety analysis report (FSAR). Although Regulatory Guide 3.62 states that drawings on 8½ x 11 inches are preferred, the staff prefers the drawings be submitted on 11 x 17 inches so that the details are legible.

This information is needed to demonstrate compliance with 10 CFR 72.24.

CCNPP RESPONSE RAI 5-1:

The requested drawings (NUH32PHB-30-3, 30-4 and 30-5) are enclosed (Enclosure 1). All sheets of the drawings are included. Calculation NUH32PHB-0201 is also enclosed (Enclosure 2). All drawings, including those in the calculation are 11 x 17 inches.

RAI 5-2:

Provided justification why the new canister lead gamma shielding is now a Category C material not in accordance with NUREG/CR-6407 guidance.

Drawing parts list provided as part of response to additional information states the new canister's lead gamma shielding is a category C material.

This information is needed to demonstrate compliance with 10 CFR 72.24 and 10 CFR 72.56.

CCNPP RESPONSE RAI 5-2:

The new canister lead gamma shielding is classified as Category "B "material in accordance with NUREG/CR-6407 guidance. Both items 3 and 56 (lead shielding) of drawing NUH32PHB-30-10 (Enclosure 3), shows that they are "B" Quality Category. This is also documented in "Q" classifications. Thus, the drawing-bill of material correctly identifies lead gamma shielding material category along with the quality classification document.

Chapter 6 Thermal Evaluation

RAI 6-1:

Provide additional information and justification that forced cooling (FC) will be maintained during transport and is reliable for recovery action.

The staff reviewed the response to RAI 6-2b and concluded that it lacks sufficient detail to verify that FC is always operable during transport or FC would be quickly recoverable in the event of failure. The staff performed an independent analysis of the transfer operation and determined that the peak cladding temperature limit of 752°F would be exceeded in the event that FC fails and is not quickly recoverable. Technical Specification (TS) 3.3.2.1 does not currently consider this scenario. Therefore, the staff needs additional information to assure FC will be operable during transport or justify why FC could be quickly recoverable in the event of a failure, or the staff requests that TS 3.3.2.1 be modified to incorporate appropriate actions to be taken in the event that FC cannot be maintained.

This information is required by the staff to determine compliance with 10 CFR 72.128(a)(4).

CCNPP RESPONSE RAI 6-1:

To provide additional assurance that the FC system is maintained during transfer operations and is reliable, this response is broken into three sections.

1. Description of the FC system

This section includes a description of the FC system and describes the redundancies and the testing requirements prior to loading operations. It also compares this FC system to other NUHOMS systems that are currently licensed by the NRC to provide an overview of the heat loads considered for the DSCs that utilize the FC system.

The FC system proposed for the Calvert Cliffs Transfer Cask (TC) will be used if the transfer operation cannot be completed within the time limits noted in TS 3.3.2.1 during the transfer of a 32PHB DSC with heat loads greater than 21.12 kW. The FC system provides forced-air flow of ambient air around a loaded 32PHB DSC, which is contained within the TC, during movement from the fuel building to the onsite ISFSI. The FC system consists of:

a. Two blowers (Each blower is independently coupled to each respective motor)
b. Two diesel generators
c. Two flexible power cords to connect the blowers to the diesel generators
d. A ducting system consisting of flexible ducting, diffuser assembly, wye fitting, and coupling to connect the outlet of the blowers to the opening at the transfer cask ram access cover plate.

During required operation, one diesel generator will be started to supply 240 VAC power to one blower. The operation of one blower is sufficient to provide the required airflow. However, since the system is equipped with two independent sets of equipment as noted above, the second generator and blower can be used to provide the required airflow if necessary. This redundant setup of the FC system ensures that the forced-air flow will be readily available if necessary. In addition to the redundant diesel generators, the blowers can also be operated using the facility power by connecting them to a 240 VAC power receptacle. This provides an additional power supply option for operating the blowers.

The entire FC system is subjected to periodic maintenance as recommended by the respective manufacturers of the individual components. Further, if the heat load of a 32PHB DSC is greater than 21.12 kW, the FC system is installed on the transfer skid and verified operable prior to commencing the transfer operations. This requirement is added to TS 3.3.2.1 as noted in Item 2 of this response.

Review of Licensed NUHOMS Systems with FC

The FC system described above is identical to the FC system that is currently in use for the various NUHOMS DSCs approved under CoC 1004. The use of a similar FC system has been previously approved by the NRC as shown below:

CoC #	Amendment #	DSC Type	Maximum Heat Load (kW)
1004	8	24PTH	40.8
	10	32PTH1	40.8
	10	61BTH	31.2
	13	37PTH	30.0
	13	69BTH	35.0
1029	3	32PTH2	37.2

As seen from the above table, the use of a similar FC system has been previously approved for DSCs with much higher heat loads than the maximum heat load of 29.6 kW proposed for the 32PHB DSC.

2. Clarification to TS 3.3.2.1

This section adds TS 3.3.2.2 to require that the FC system be installed on the transfer skid and verified operable before initiating the transfer operation of a 32PHB DSC with heat loads greater than 21.12 kW.

To ensure that the FC system is installed correctly and verified operable when required, the following requirement is added as TS 3.3.2.2:

> "If the heat load of a NUHOMS 32 PHB DSC is greater than 21.12 kW, the Forced Cooling system shall be installed on the transfer skid and verified operable prior to commencing the transfer operations of a loaded NUHOMS 32 PHB DSC."

3. Clarification to TS 3.3.2.1

This section modifies TS 3.3.2.1 Action by changing the time for any recovery action to 10 hours from the 2 hours specified currently. This ensures that there is sufficient time to return the DSC to the cask handling area in the unlikely event that the FC is unavailable.

The FC system as described in Item 1 includes a complete set of redundant equipment to ensure that the forced-air flow is always available when needed. However, to provide additional assurance that the fuel cladding temperature will not exceed 752°F during normal transfer operations, TS 3.3.2.1 is modified to support an additional scenario where the FC system might not be available or is unrecoverable from failure.

To accommodate this scenario, where the FC system is unavailable and the transfer time limits are exceeded, the following changes are proposed to TS 3.3.2.1:

Reduce the transfer time limit in Technical Specification 3.3.2.1 as follows:

- 62 hours for a DSC with a total heat load > 21.12 kW and ≤ 23.04 kW
- 38 hours for a DSC with a total heat load > 23.04 kW and ≤ 25.60 kW
- 10 hours for a DSC with a total heat load > 25.60 kW and ≤ 29.60 kW

The above changes in the transfer time are a 10 hour reduction from those calculated in NUH32PHB-402, Revision 1. Therefore, the remaining 10 hours of time to complete the transfer operations are used to initiate one of the Actions listed in TS 3.3.2.1. This ensures that there is sufficient time to return the DSC to the cask handling area in the unlikely event that the FC is unavailable.

The revised TS pages are provided in Enclosure 4 and supersede TS 3.3.2.1 pages provided earlier.

Chapter 9 Confinement Evaluation

RAI 9-1:

Provide an explanation for the 10% fuel rod rupture assumption during the storage accident condition pressure calculation and confirm the structural integrity of the 32PHB DSC system under accident conditions, assuming 100% fuel rod failure.

Exelon's RSI 9-4 response assumed 10% of the fuel rods fail during the accident blocked vent storage condition. The response also quoted the NUREG-1536 guidance of assuming 100% fuel rod failure during an accident event but provided no justification for not following that guidance.

This information is needed to determine compliance with 10 CFR 72.122.

CCNPP RESPONSE RAI 9-1:

NUREG-1536, Revision 1, describes criteria of NRC acceptance for off-normal conditions up to 10% of fuel rods ruptured and 100% of the fuel rods ruptured for design-basis accident. The accident case considers both DSC storage and transfer conditions. The DSC internal pressure is determined based on 100% rod failure and is evaluated for transfer accident conditions in calculation NUH32PHB-0404. The accident transfer case is the bounding case compared to the accident storage blocked vents case due to higher fuel cladding temperature and 100% fuel rod rupture. The 100% fuel rod rupture is based on a drop event for transfer of the DSC in the transfer cask. The drop event is not a credible event for the storage accident blocked vents case.

As described in Section P.4.6.7.5 of the Updated Final Safety Analysis Report (UFSAR) for CoC 1004, "no DSC drop event can occur in conjunction with a blocked vent event, the maximum fraction of fuel pins that can be ruptured is limited to 10%." This approach, approved by NRC, was used for the DSC internal pressure evaluation for 24PTH, 61BTH, 32PTH1, 69BTH, and 37PTH DSCs as described in Sections P.4.6.7.5, T.4.6.8.5, U.4.6.7.4, Y.4.7, and Z.4.7 of the UFSAR for CoC 1004, respectively.

For the 32PHB DSC, the 10% fuel rod rupture assumption is applicable for the DSC internal pressure calculation for the storage accident blocked vent case.

RAI 9-2:

Provide an accurate description of the confinement boundary in the proposed FSAR pages in order to provide a complete description of the NUHOMS® 32PHB DSC system.

a) The confinement boundary is a critical component of the NUHOMS® 32PHB DSC system. As requested in the previously submitted requests for supplemental information (RSI) 9-2 and 9-3, a description of the confinement boundary was presented, in text and figure formats. This description should be provided in proposed FSAR pages.

b) The RAI 9-3 response sketch of the confinement boundary appears to be different than the actual NUHOMS® 32PHB DSC system, as denoted in drawing NUH32PHB-30-3. The extent of the confinement boundary, especially near the shielding plug assembly and shell, is uncertain and therefore, an updated sketch should be provided.

This information is needed to determine compliance with 10 CFR 72.24.

CCNPP RESPONSE RAI 9-2:

Marked up Updated Safety Analysis Report (USAR) pages are provided in Enclosure 5. The insert consists of information previously provided in RAI responses. The previously provided sketch of the confinement boundary has been updated and is in included with the markup.

RAI 9-3:

Provide draft FSAR pages that clearly define that the confinement boundary, which includes the base metal of the components provided in the RSI 9-2 and 9-3 responses and the welds associated with those components, will be helium leak tested to the application's stated 1E-7 atm cc/sec acceptance criterion of "leaktight", as defined by ANSI N14.5.

As stated in the staff's RAI 1 request, helium leakage testing of the entire confinement boundary to a 1E-7 ref cc/sec acceptance rate is necessary to demonstrate a "leaktight" system so that release/leakage analyses would be unnecessary. However, parts of the supplied FSAR pages, such as page 13.1-63, indicate that only certain parts of the confinement boundary (e.g., closure welds) are tested to meet a "leaktight" criterion.

This information is needed to determine compliance with 10 CFR 72.122.

CCNPP RESPONSE RAI 9-3:

Enclosure 5 contains the appropriate marked up USAR pages. Note that an additional statement is included in the USAR markup as follows,

> "The identified confinement boundary, including all base metal components and welded sections, is leak tested to leaktight criteria to verify the integrity of the confinement boundary."

RAI 9-4:

Clarify that the procedures for the helium leak tests in the field, such as during closure, are developed and implemented by an American Society of non-Destructive Testing (NDT) (ASNT) Level III certified in leakage testing.

Exelon's response to RSI 9-2 indicated that an ASNT non-destructive testing (NDT) Level III procedure would be developed to implement the helium leakage tests during fabrication but that did not address the helium leakage tests required to be performed in the field.

This information is needed to determine compliance with 10 CFR 72.122.

CCNPP RESPONSE RAI 9-4:

Exelon uses the services of Leak Test Specialists, who utilizes qualified Level III ASNT personnel to write the procedures as well as to execute the leakage testing in the field. They have written all field usage leak test procedures used at Calvert Cliffs as well as other plants in the fleet. Exelon will continue to use qualified Level III ASNT personnel to write the field leakage testing procedures for the 32PHB system. In addition, Exelon will also continue to use qualified Level III ASNT personnel to execute the leakage testing in the field.

RAI 9-5:

Confirm that a non-reactive environment will exist within the NUHOMS-32PHB DSC system during the proposed 40-year license period and specify the fraction and the number of moles of volatile gases, fission gases, and fill gases used in the calculation spreadsheet.

a) The spreadsheet presented in Enclosure 5 of the RSI 9-4 response indicated a helium backfill pressure of 18.2 psia, but there was no analysis to verify that a non-reactive environment would be maintained during the proposed 40-year license period.

b) The previously submitted RSII 9-4 requested justification for the volatile and gas release fractions for the high burnup fuel but the explanation, and corresponding spreadsheet, did not discuss the differences associated with high burnup fuels.

This information is needed to determine compliance with 10 CFR 72.122.

CCNPP RESPONSE RAI 9-5:

a) As described in USAR Section 4.3.1, the vacuum drying system is used to remove water and water vapor from the DSC and backfill the DSC with helium of 18.2 psia and ensure that the fuel is stored in an inert atmosphere in the DSC cavity for long-term maintenance of the fuel cladding integrity. As described in USAR Section 3.3.2, the DSC is designed and fabricated with double closure seal welds at DSC ends and verified by helium leak testing to maintain leak tightness during storage. Since the DSC cavity is leaktight and over-pressurized with inert helium backfill, a non-reactive environment would be maintained in the 32PHB DSC cavity during the proposed 40-year license period.

b) The primary difference associated with the analysis for high burnup fuel is the method used to obtain the moles of fission gas in the fuel rod gap.

As described in ISFSI USAR Section 8.2.9, the Calvert Cliffs NUHOMS-24P DSC, which has a burnup limit of 47 GWd/MTU, the moles of fission gas were based on 30% release of the total fission gas moles in an assembly with an average burnup of 50 GWd/MTU. Additional detail on the source of the total fission gas moles is not described in the ISFSI USAR, however review of the original calculation indicates that it was based on the amount of Kr-85 and Xe-131m in a 50 GWd/MTU assembly linearly interpolated off Tables 7-4h and 7-4i of DOE/ET/34014-10 ("Extended Fuel Burnup Demonstration Program," September 1983, ADAMs Accession No. ML022000209) for a Combustion Engineering, Inc. (CE) 14x14 assembly at burnup intervals of 35, 45, and 55 GWd/MTU. The method used by the Department of Energy report to obtain this data is not defined in the report. The moles of fill gas were based on an assumed initial helium fill gas pressure of 465 psia.

As described in the response to the previously submitted RSI 9-4, the moles of fission and fill gas available for release to the NUHOMS-32PHB DSC cavity were taken from fuel vendor calculations of end-of-life rod internal pressure using the fuel performance code FATES3B for CE 14x14 fuel designs used at Calvert Cliffs. The FATES3B code is described in Combustion Engineering Topical Report CEN-161(B)-P Supplement 1-P, which was approved by the NRC on February 4, 1987 for Calvert Cliffs (Legacy ADAMS Accession No. 8702130199), and generically for other CE plants on November 6, 1991 (NRC TAC No. M81769). This method was chosen because it was benchmarked against high burnup fuel data and approved by the NRC for the intended application for the burnup range being requested for the NUHOMS-32PHB DSC, and specifically considered later CE 14x14 fuel design characteristics that could impact fuel rod pressure such as higher assembly uranium mass (Value Added Pellet fuel) and ZrB_2 pellet coatings (IFBA burnable absorber), as well as Calvert Cliffs specific fuel rod operating history limits used in fuel design. As such, direct comparison with the previously assumed 30% bounding gas gap fraction is not possible. The FATES3B calculation results were determined by Exelon to be bounding for AREVA fuel.