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TOKYO, JAPAN

June 19th, 2009

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-09334

Subject: MHI's Responses to US-APWR DCD RAI No. COLP 344-2414 Revision 1

Reference: 1) "Request for Additional Information No. COLP 344-2414 Revision 1, SRP Section: 18 - Human Factors Engineering, Application Section: 18.8 Procedure Development," dated April 23th, 2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No. COLP 344-2414 Revision 1."

Enclosed is the responses to 6 RAIs contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Responses to Request for Additional Information No. COLP 344-2414 Revision 1

CC: J. A. Ciocco
C. K. Paulson

D081
NRO

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Docket No. 52-021
MHI Ref: UAP-HF-09334

Enclosure 1

UAP-HF-09334
Docket No. 52-021

Responses to Request for Additional Information No. COLP 344-2414
Revision 1

June 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/18/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. COLP 344-2414 REVISION 1**
SRP SECTION:	**18 - HUMAN FACTORS ENGINEERING**
APPLICATION SECTION:	**18.8** PROCEDURE DEVELOPMENT
DATE OF RAI ISSUE:	**4/23/2009**

QUESTION NO. 18-37

NUREG-0711, Section 9.4, Criterion 3 states:
A writer's guide should be developed to establish the process for developing technical procedures that are complete, accurate, consistent, and easy to understand and follow. The guide should contain objective criteria so that procedures developed in accordance with it are consistent in organization, style, and content. The guide should be used for all procedures within the scope of this element. It should provide instructions for procedure content and format including the writing of action steps and the specification of acceptable acronym lists and acceptable terms to be used.
The first paragraph of the US-APWR DCD, Section 18.8.2.2 states:
A US-APWR procedures writer's guide has been developed to establish the process for developing technical procedures that are complete, accurate, consistent, and easy to understand and follow. The procedures writer's guide contains objective criteria so that procedures developed in accordance with it are consistent in organization, style, and content. The procedures writer's guide is used for all procedures within the scope of this element. It provides instructions for procedure content and format, including the writing of action steps and the specification of acceptable acronym lists and acceptable terms to be used.
The staff could not determine **how** criterion 3 of NUREG-0711 section 9.4 has been met because the US-APWR DCD essentially restates the NUREG-0711 criteria and does not demonstrate, with sufficient detail a complete process description for the development of the procedures writer's guide. In spite of this, the US-APWR DCD states that a writer's guide has been developed.
This document would aid in the staff review for criterion 3 of section 9.4 in NUREG-0711. Is this available for staff to review at this time? If so, please provide this writer's guide for staff review.

ANSWER:

Each subsection of US-APWR DCD Chapter 18 provides the Implementation Plan for that specific HFE program element. This method of documenting each HFE program element Implementation Plan is consistent with the HFE programs for other certified designs. Since NUREG-0711 provides a method acceptable to the NRC and industry for implementing each program element, the key words from NUREG-0711 have been used in the DCD to document MHI's implementation commitments. The HFE Implementation Plans supplement these words to address unique aspects of the US-APWR, where necessary. The US-APWR procedures writer's guide will be developed in conjunction with Operating procedure development during 2009-2010.

Impact on DCD

The following change will be made to Section 18.8.2.2:

> *A US-APWR procedures writer's guide ~~has been developed to~~ establishes the process for developing technical procedures that are complete, accurate, consistent, and easy to understand and follow.*

The Attachment 1 page 18.8.2.2 shows the above change.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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DATE OF RAI ISSUE:	**4/23/2009**

QUESTION NO. 18-38

NUREG-0711, Section 9.4, Criterion 4 states:
The content of the procedures should incorporate the following elements:

- *title and identifying information, such as number, revision, and date*
- *statement of applicability and purpose*
- *prerequisites*
- *precautions (including warnings, cautions, and notes)*
- *important human actions*
- *limitations and actions*
- *acceptance criteria*
- *checkoff lists*
- *reference material*

The first paragraph of the US-APWR DCD, Section 18.8.2.3 states:
The writing style, format and organization guidance contained in Reference 18.8-3, Attachment A, is incorporated into the US-APWR procedures writer's guide, for operating procedures. The US-APWR procedures writer's guide ensures that the content of the operating procedures incorporates the following elements:

- *Title and identifying information (such as number, revision, and date)*
- *Statement of applicability and purpose*
- *Prerequisites*
- *Precautions (including warnings, cautions, and notes)*
- *Important HAs*
- *Limitations and actions*
- *Acceptance criteria*
- *Check-off lists*

• *Reference material*

The US-APWR DCD essentially restates the NUREG-0711 criteria and does not demonstrate, with sufficient detail, that criterion 4 of NUREG-0711 section 9.4 has been met. The US-APWR DCD states that Reference 18.8-3 gives the writing style, format and organization guidance, but that document has not been provided for staff review. Please provide the document referenced (Reference 18.8-3, Plant Procedures, Inspection Procedure, IP-42700, November 1995) for staff review.

ANSWER:

The Implementation Plan documented in Section 18.8 provides sufficient detail to demonstrate compliance to criterion 4 of NUREG-0711 section 9.4. The US-APWR Procedure Writer's guide, as committed in the Procedure Implementation Plan, will be developed during Phase 2 of the US-APWR HFE program, prior to development of the Operating procedures.

Regarding IP-42700, please see Attachement-2.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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DATE OF RAI ISSUE:	**4/23/2009**

QUESTION NO. 18-39

NUREG-0711, Section 9.4, Criterion 5 states:
GTGs and EOPs should be symptom-based with clearly specified entry conditions.
The second paragraph of the US-APWR DCD, Section 18.8.2.3 states:
The EOPs are developed incorporating the guidance contained in References 18.8-4 and 18.8-5. Generic technical guidelines and EOPs are symptom-based with clearly specified entry and exit conditions. Transitions between and within the normal operating, alarm response, and abnormal operating procedures and the EOPs are appropriately laid out, well defined, and easy to follow.
The US-APWR DCD incorporates guidance contained in references 18.8-4 and 18.8-5 for the development of EOPs. Reference 18.8-5 is a NUREG document that the staff has access to but reference 18.8-4 has not been provided for staff review. Please provide the document in reference 18.8-4 that gives guidance on the development of the GTGs and EOPs for the US-APWR for staff review. The information within the document(s) should:

- Provide complete process descriptions
- Contain a description of the applicable technical requirements with sufficient quality, to enable the staff to verify that the product conforms to the intent of the methodology

ANSWER:

The Implementation Plan documented in Section 18.8 provides sufficient detail to demonstrate compliance to NUREG-0711, Section 9.4, Criterion 5.

The following will be included in the HFE Program Implementation Procedure which will be submitted by June 30:

> The US-APWR Emergency Response Guidelines (ERGs), which establish the basis of the US-APWR Emergency Operating Procedures (EOP), are being developed by MHI in two phases. Phase 1 will develop a draft ERG that reflects the US-APWR design, and will include US industry input. The Phase 1 draft ERG will be completed by the end of 2009. During Phase 2 (January 2010 to December

2012) MHI will add detailed design-specific bases and add equipment details such as MHI component IDs. During Phase 2 MHI will also develop a draft EOP for use by US-APWR COL applicants.

Regarding IP-42001, please see Attachement-3.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. 18-40

NUREG-0711, Section 9.4, Criterion 6 states:
All procedures should be verified and validated, including:

- *A review should be conducted to verify they are correct and can be carried out.*
- *Their final validation should be performed in a simulation of the integrated system as part of the verification and validation activities described in the Human Factors Verification and Validation element, see Section 11.*
- *When procedures are modified, they should be verified to verify their adequate content, format, and integration. The procedures also should be assessed through validation if a modification substantially changes personnel tasks that are significant to plant safety. The validation should verify that the procedures correctly reflect the characteristics of the modified plant and can be carried out effectively to restore the plant.*

The last paragraph of the US-APWR DCD, Section 18.8.2.3 states:
All procedures are verified and validated, and include the following:

- *Technical reviews to verify that procedures are correct and can be carried out.*
- *Final validation to be performed in a simulation of the integrated system as part of the V&V activities described in the human factors V&V element (see Section 18.10).*
- *Verification of adequate content, format, and integration is performed when procedures are modified. The procedures also are assessed through validation if a modification substantially changes personnel tasks that are significant to plant safety. The validation verifies that the procedures correctly reflect the characteristics of the US-APWR plant, and can be carried out effectively to restore the plant to a safe condition.*

The US-APWR DCD essentially restates the NUREG-0711 criteria and does not demonstrate, with sufficient detail, **how** criterion 6 of NUREG-0711 section 9.4 will be met. The information to meet this criterion should:

- Provide complete process descriptions
- Provide a flow diagram, or similar graphic example, that illustrates the relationship of the different process steps to each other (if applicable)
- Contain a description of the applicable technical requirements with sufficient quality, to

enable the staff to verify that the product conforms to the intent of the methodology

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ANSWER:

The Implementation Plan documented in Section 18.8 provides sufficient detail to demonstrate compliance to criterion 6 of NUREG-0711 section 9.4.

The following will be included in the HFE Program Implementation Procedure which will be submitted by June 30:

> The process of Verification and Validation of procedure development will be conducted as follows;
>
> (1) Plant Designers provide operating procedure guidelines.
>
> (2) Operation procedure writers (who have to have a conventional PWR operation experience and knowledge of the difference between US-APWR and conventional PWR) complete draft operation procedures with above operating procedure guidelines and US-APWR design information.
>
> (3) Plant Designers including plant safety analysis engineers verify those draft procedures from US-APWR design point of view and plant safety.
>
> (4) Integrated HSI verification and validation will be conducted by the HFE V&V team using those draft procedures. Static task support verification will confirm the procedures and displays have the necessary information and controls. Dynamic validation confirms the procedures and displays using the full scope plant simulator. Through these V&V activities, procedure problems will be extracted as Human Engineering Discrepancies (HED) and will be tracked to closure using the HFE issues tracking system.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/18/2009

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DATE OF RAI ISSUE:	**4/23/2009**

QUESTION NO. 18-41

Part 1

NUREG-0711, Section 9.4, Criterion 7 states:

An analysis should be conducted to determine the impact of providing computer-based procedures (CBPs) and to specify where such an approach would improve procedure utilization and reduce operating crew errors related to procedure use…

Section 18.8.2.4 of the US-APWR DCD states:

For the standard Japanese APWR HSI design, an analysis was conducted to determine the impact of providing CBPs and to specify where such an approach improved procedure utilization and reduced operating crew errors related to procedure use. The performance of operating crews utilizing CBPs and paper procedures was evaluated, as described in Reference 18.8-2 Appendix B and the associated references…

a. The US-APWR DCD essentially restates criterion 7 of NUREG-0711, section 9.4. If an analysis was conducted to determine the impact of providing CBPs please provide the results of the analysis for staff review.

b. The US-APWR DCD also mentions that operator performance was evaluated, and references topical report MUAP-07007-P Appendix B, and associated references. Please clarify what the term "associated references" means.

c. Please clarify what specific findings resulted from the evaluation of operator performance for the US-APWR.

Part 2

NUREG-0711, Section 9.4, Criterion 7 also states that:

…The justifiable use of CBPs over paper procedures should be documented. An analysis of alternatives in the event of loss of CBPs should be performed and documented.

Section 18.8.2.4 of the US-APWR DCD further states:

…This evaluation included operator performance during degraded HSI conditions, including the loss of CBPs. The justifiable use of CBPs over paper procedures, and in conjunction with paper procedures, was documented. Feedback from operating crews was incorporated into the CBP and paper procedure designs…

a. The US-APWR DCD states that the justifiable use of CBPs over paper based procedures was documented but does not provide the results of that analysis. Please provide the results of that analysis for staff review.

b. The US-APWR DCD essentially restates criterion 7 of NUREG-0711, section 9.4. If an analysis of the loss of CBPs was conducted, and those results were documented, please provide the results of the analysis for staff review.

ANSWER:

Part 1

a.

The Implementation Plan documented in Section 18.8 will be supplemented as shown below to demonstrate compliance to criterion 7 of NUREG-0711 section 9.4.

b. "associated references" means the documents referenced in topical report MUAP-07007-P Appendix B:

"The Development and Validation of Standardized Main Control Boards for full digital PWR I & C system", Trans. At. Energy Soc. Japan, Vol.2, No.3, pp. 307 ~ 35. (2003)

"The advanced main control console for next Japanese PWR plants", Proc. ICONE-9, Nice, (2001)

Part 2

Based on differences between US and Japanese operating methods, the use of CBP and the transition between CBP and paper procedures is being reevaluated in the US-APWR HFE program, as described in the revision to Section 18.8.2.4 defined below. The results of initial evaluations conducted with US operators during the Phase 1 V&V are documented in the HFE Technical Report, which will be submitted June 30. Additional evaluations with US operators will be conducted during Phase 2 V&V. This phased evaluation procedure is documented in the HFE Implementation Procedure which will be submitted by June 30. Therefore, additional NRC review of the Japanese CBP evaluation results is unnecessary.

Impact on DCD

Section 18.8.2.4 will be supplemented as follows:

> Both CBPs and paper procedures are included in the V&V program, including transition for degraded HSI conditions, as described in Section 18.10. The V&V program evaluates the performance of operating crews utilizing CBPs under normal and abnormal operating conditions, and using paper procedures under the following degraded HSI conditions:
>
> - Degraded operations based on loss of non safety HSI.
> - Degraded operations based on loss of safety and non safety HSI due to common cause failure.
> - Degraded operations based on evacuation of the MCR.

The Attachment 1 page 18.8-4 shows the above change.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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DATE OF RAI ISSUE:	**4/23/2009**

QUESTION NO. 18-42

NUREG-0711, Section 9.4, Criterion 9 states:
The physical means by which operators access and use procedures, especially during operational events, should be evaluated as part of the HFE design process. This criterion generally applies to both hard-copy and computer-based procedures, although the nature of the issues differs somewhat depending on the implementation. For example, the process should address the storage of procedures, ease of operator access to the correct procedures, and laydown of hard-copy procedures for use in the control room, remote shutdown facility, and local control stations.
Section 18.8.2.5 of the US-APWR DCD states:
The physical means by which operators access and use procedures, especially during operational events, is evaluated as part of the HFE design process. This criterion generally applies to both paper procedures and CBPs, although the nature of the issues differs somewhat depending on the implementation. For example, the process addresses the storage of procedures, the ease of operator access to the correct procedures, and the lay down of paper procedures for use in the MCR, RSR, TSC, and LCSs.
The US-APWR DCD restates the NUREG-0711 criteria and does not demonstrate, with sufficient detail, **how** criterion 9 of NUREG-0711 section 9.4 will be met. The information to meet this criterion should:

- Provide complete process descriptions
- Provide a flow diagram, or similar graphic example, that illustrates the relationship of the different process steps to each other (if applicable)
- Contain a description of the applicable technical requirements with sufficient quality, to enable the staff to verify that the product conforms to the intent of the methodology

Please provide detailed information to satisfy criterion 9 of NUREG-0711, section 9.4.

ANSWER:

The Implementation Plan documented in Section 18.8 will be supplemented as shown below to demonstrate compliance to criterion 9 of NUREG-0711 section 9.4. The following will be added to Section 4.2.2 of MUAP-07007:

- working area for reading paper based documentation,
- facilities for storing paper-based documentation.

Phase 2 V&V in US-APWR HFE process will evaluate the means by which operators access and use CBP and paper procedures.

Impact on DCD

Section 18.8.2.5 will be supplemented as follows:

> Section 4.8 of Reference18.8-2 describes the access methods for CBP. Section 4.2 of Reference 18.8-2 describes storage and lay down of paper procedures in the MCR and RSR.

The Attachment 1 page 18.8-4 shows the above change.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

18.8.2.1 Procedure Development Bases

The basis for procedure development includes the following:

- Plant design bases
- System-based technical requirements and specifications
- Task analyses results
- Risk-important HAs identified in the HRA/PRA
- Initiating events to be considered in the EOPs, including those events in the design bases
- Generic technical guidelines for EOPs, system operations procedures (including startup, power, and shutdown operations), test and maintenance procedures

The process of the procedure development is described in Reference 18.1-1 Subsection 5.8.2.

18.8.2.2 Procedure Writer's Guide Content Development

A US-APWR procedures writer's guide ~~has been developed to~~ establishes the process for developing technical procedures that are complete, accurate, consistent, and easy to understand and follow. The procedures writer's guide contains objective criteria so that procedures developed in accordance with it are consistent in organization, style, and content. The procedures writer's guide is used for all procedures within the scope of this element. It provides instructions for procedure content and format, including the writing of action steps and the specification of acceptable acronym lists and acceptable terms to be used.

The US-APWR procedures writer's guide is based on the procedures writer's guide for the standard Japanese PWR. Changes accommodate conformance to U.S. regulatory requirements discussed in subsections below and cross-cultural issues such as Japanese-to-English language conversion and Metric-to-English units conversion.

18.8.2.3 Procedure Logic and Content Development

The writing style, format and organization guidance contained in Reference 18.8-3, Attachment A, is incorporated into the US-APWR procedures writer's guide, for operating procedures. The US-APWR procedures writer's guide ensures that the content of the operating procedures incorporates the following elements:

- Title and identifying information (such as number, revision, and date)
- Statement of applicability and purpose

procedures, with changes primarily for plant process systems, this evaluation is applicable to the US-APWR.

As in the Japanese APWR HSI design, the US-APWR HSI design includes backup paper procedures to accommodate degraded CBP conditions. The US-APWR procedures writer's guide includes requirements that ensure consistency and ease of transition between CBPs and paper procedures. Both CBPs and paper procedures are included in the V&V program, including transition for degraded HSI conditions, as described in Section 18.10. The V&V program evaluates the performance of operating crews utilizing CBPs under normal and abnormal operating conditions, and using paper procedures under the following degraded HSI conditions:

- Degraded operations based on loss of non safety HSI.
- Degraded operations based on loss of safety and non safety HSI due to common cause failure.
- Degraded operations based on evacuation of the MCR.

18.8.2.5 Ergonomics Issues in Procedure Usage

The physical means by which operators access and use procedures, especially during operational events, is evaluated as part of the HFE design process. This criterion generally applies to both paper procedures and CBPs, although the nature of the issues differs somewhat depending on the implementation. For example, the process addresses the storage of procedures, the ease of operator access to the correct procedures, and the lay down of paper procedures for use in the MCR, RSR, TSC, and LCSs. Section 4.8 of Reference18.8-2 describes the access methods for CBP. Section 4.2 of Reference 18.8-2 describes storage and lay down of paper procedures in the MCR and RSR.

18.8.3 Results

The US-APWR procedure system report lists operating and emergency procedures developed for the US-APWR, with a brief descriptive summary for each procedure. Additionally, the report contains a summary of the content of the US-APWR procedure writer's guide.

Maintenance and control of updates to paper procedures and CBP are managed under the configuration control program of the US-APWR Quality Assurance Plan, as discussed in Section 18.1. Normal changes to CBPs, such as changes to procedure steps, do not affect the basic CBP software. Therefore, these changes are considered data changes and do not undergo software V&V, in accordance with the software life cycle management program (see Section 7.1). Changes to the basic CBP software do undergo V&V in accordance with the Software Lifecycle Management Program.

NRC INSPECTION MANUAL

INSPECTION PROCEDURE 42700

PLANT PROCEDURES

PROGRAM APPLICABILITY: 2515

SALP FUNCTIONAL AREA: PLANT OPERATIONS (OPS)

42700-01 INSPECTION OBJECTIVES

01.01 To verify that plant procedures are reviewed and approved in accordance with technical specifications and regulatory requirements.

01.02 To verify that the technical adequacy of procedures is consistent with desired actions and modes of operation.

01.03 To verify the usability of procedure content and format by determining the degree to which accepted human factors principles have been incorporated.

01.04 To verify that temporary procedure changes were made in accordance with plant administrative procedures and technical specification requirements.

42700-02 INSPECTION REQUIREMENTS

02.01 Sample Selection. Select a sample of at least 15 procedures for review. The sample should reflect any instances where problems with procedures have been documented in LERs, NRC inspection reports, or licensee assessments or audits. Other significant activities that may also initiate a procedure review include major design modifications and procedure upgrade programs.

The procedures selected for review may focus on a single work group or procedure type. However, if problems are evident in several work groups, the sample should be selected from three or more of the following categories of procedures:

a. General Plant Operating Procedures. Procedures identified in Regulatory Guide 1.33, Appendix A, Paragraph 2.

b. Startup, Operation, and Shutdown of Safety-Related System Procedures. Startup, operation, or shutdown procedures identified in Regulatory Guide 1.33, Appendix A, Paragraphs 3 and 4 for PWRs and BWRs, respectively.

c. Abnormal (Alarm) Condition Procedures. Abnormal condition procedures for alarms associated with the systems identified in category b, above.

d. Emergency and Other Significant Event Procedures. Procedures identified in Regulatory Guide 1.33, Appendix A, Paragraph 6.

e. Maintenance Procedures. Mechanical, electrical, or instrument and control maintenance procedures associated with the systems identified in category b, above.

f. Administrative Procedures. Procedures identified in Regulatory Guide 1.33, Appendix A, Paragraph 1.

02.02 Process for Initial Review and Approval of Procedures. Examine the sample of procedures to verify that the review and approval of procedures are in accordance with technical specifications.

02.03 Adequacy of Procedures. Examine the sample of procedures to verify overall procedure content consistent with technical specification requirements.

a. Technical Content of Procedures. Examine the technical content of the procedures selected and verify that they are adequate to control safety-related operations within applicable regulatory requirements.

b. Procedure Maintenance. Verify that selected procedures and their related forms, attachments, and referenced documents in plant working files are current with respect to revision and temporary change.

02.04 Usability of Procedures. Review the sample of procedures to verify that procedures are usable by assessing the degree to which accepted human factors principles have been incorporated into each type of procedure.

02.05 Changes to Procedures. Review the sample of procedures to verify that procedure changes are made in accordance with the licensee's processes and regulatory requirements.

a. Changes Due to Technical Specification or License Revision. Verify that procedure changes made within the last six months reflect technical specification or license revisions.

b. Procedure Change Conformance to 10 CFR 50.59(a).

1. Verify that changes made to procedures during the past year were in conformance with 10 CFR 50.59(a) requirements.

2. Verify that records of changes in procedures made pursuant to 50.59(a) are maintained as described in 10 CFR 50.59(b).

c. Temporary Procedures and Temporary Procedure Changes. Verify that temporary procedures written or temporary procedure changes made during the past year were properly approved and did not conflict with technical specifications requirements.

d. Procedure Backlog. Verify that the backlog of procedure change requests has been evaluated to ensure that safety-significant changes are acted upon in a timely manner.

42700-03 INSPECTION GUIDANCE

General Guidance

NRC Inspection Procedure (IP) 42001, "Emergency Operating Procedures," and the NUREGs referenced in it provide additional guidance for reviewing, developing, implementing, changing and maintaining emergency operating procedures. Observing procedures being performed is recommended. Observing walkthru simulations of procedures, either in the plant or the simulator may also be of value.

Personnel performance problems in the area of procedures may also reflect a corrective action program that does not deal effectively with procedure issues. A review of the corrective action program using IP 92720, "Corrective Action," may also be appropriate.

The Human Factors Assessment Branch (NRR/HHFB) is the technical lead for issues related to the development, maintenance, and usability of procedures. Any questions related to implementing this procedure should be referred to HHFB.

Specific Guidance

03.01 Sample Selection. No inspection guidance provided.

03.02 Process for Review and Approval of Procedures. If the titles of facility procedures do not conform exactly with titles noted in Regulatory Guide 1.33, relate specific facility procedures to the systems and the associated activities noted in the regulatory guide.

Documents, such as vendor manuals, equipment operating and maintenance instructions, or approved drawings with acceptance criteria, may by reference be part of a procedure. If these documents are so used, the documents (or applicable portions) require the same level of review and approval as the procedure that references it.

03.03 Adequacy of Procedures. Facility technical specifications may not have specific requirements with respect to overall procedure content. Nonetheless, the inspector should review selected procedures and compare them with ANSI 18.7-1976.

a. Technical Content of Procedures. Determine whether the procedures will accomplish the activity within the design characteristics and the safety review considerations. During this evaluation, the review may include technical specifications, limiting condition for operation, FSAR

descriptions, vendor manuals, design information, piping and instrumentation drawings (P&IDs), and instrumentation and electrical wiring and control diagrams.

Verify that appropriate technical specification and vendor or design operating limitations such as heatup/cooldown rates, pressure/temperature limits, reactivity limits, safety limits, LCOs, and limiting safety system settings have been incorporated into the procedures.

b. Procedure Maintenance. Review a sufficient number of procedures (a sampling of 5-10 is suggested) to provide assurance that the procedures (including checklists, and related forms) in the plant working files are current. Plant working files are usually kept in the control room, and in mechanical, electrical, instrumentation, or radiochemistry offices. ANSI N18.7-1976, Section 5.2.15, states that administrative controls shall assure that documents are distributed in accordance with current distribution lists and are used by those who perform the prescribed activity, and that administrative control must be provided to prevent the inappropriate use of outdated documents.

03.04 Usability of Procedures. Review and evaluate procedures to ensure that they are usable. Determine usability by evaluating the procedures against the writing style and format standards established in the licensee's Writer's Guide. Using the guidance in Attachment A, "Procedure Usability," to this procedure, determine the quality of the Writer's Guide. If a Writer's Guide is not available, evaluate the procedures directly against the characteristics listed in Attachment A to determine the degree to which accepted human factors principles have been incorporated to make the information in the procedure clear and understandable to users. If the procedures were not prepared according to the guidance in the Writer's Guide, or if several characteristics from Attachment A are not evident in the initial sample of procedures, select an additional sample of 5-10 procedures for further review to determine the degree to which usability may be an issue.

03.05 Changes to Procedures

a. Changes Due to Technical Specification or License Revisions. Verify the adequacy of all procedure changes which resulted from recent (within the last year) license change or a revision to a technical specification.

b. Procedure Change Conformance to 10 CFR 50.59(a)

1. This item applies only to changes to procedures which are described or summarized in the FSAR, normally a small portion of the procedures in use at the facility. General guidance and contrasting examples relating to the procedure changes which can be made by the licensee are described in NRC Inspection Manual Part 9900, "Guidance on 10 CFR 50.59 -- Changes to Facilities, Procedures, and Tests (or Experiments)."

2. Specific record requirements and retention periods are described in 10 CFR 50.59(b).

c. Temporary Procedures and Temporary Procedure Changes. Review a sample of temporary procedures and temporary procedure changes issued during the past year to determine that the approval and subsequent review requirements of the technical specifications are being followed. Depending on the number of temporary procedure changes issued, a sampling of 10-20 is suggested. Determine whether the licensee has procedural limitations on how long a temporary procedure or a temporary procedure change can be in effect, and compare this with observed practices. Note that, according to technical specifications, temporary procedure changes cannot change the intent of the basic procedure. A "change in intent" means changing what is accomplished by the basic procedure or changing the method by which it is accomplished has safety significance.

Review the method by which the licensee incorporates temporary changes to emergency or significant event procedures. The method used should not be so complicated as to preclude proper and timely operator action during abnormal plant conditions. The NRC position concerning control of procedural adherence is described in NRC Inspection Manual Part 9900, "Technical Guidance, Operations -- Procedural Adherence."

42700-04 RESOURCE ESTIMATES

On the average, 24 hours of direct onsite inspection effort are required to perform a limited scope procedure review within any single work group. A more detailed review of procedures for any single work group requires approximately 40 hours.

42700-05 REFERENCES

10 CFR 50.59, "Changes, tests, and experiments."

Regulatory Guide 1.33, Rev. 2, "Quality Assurance Program Requirements," February 1978.

ANSI N18.7-1976, "Administrative Controls for Power Plants."

NUREG-1977, "Guidelines for Preparing Emergency Procedures for Nuclear Power Plants," April, 1981. (NUDOCS Fiche Address 08514/008)

NUREG/CR-4613, "Evaluation of Nuclear Power Plant Operating Procedures Classifications and Interfaces," February 29, 1987. (NUDOCS Fiche Address 39983 /256)

NUREG/CR-3632, "Methods for Implementing Revisions to Emergency Operating Procedures," May 1984. (NUDOCS Fiche Address 24534/208)

NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures," August 1982. (NUDOCS Fiche Address 15513/286)

NUREG/CR-2005, Rev.1, "Checklist for Evaluation Emergency Operating Procedures Used in Nuclear Power Plants," April 1983. (NUDOCS Fiche Address 08790/355)

NUREG/CR-3177, Vols. 1, 2, and 3, "Methods for Review and Evaluation of Emergency Procedure Guidelines," March 1983. (NUDOCS Fiche Address 21119/138, 17863/033, and 17862/227)

NUREG/CR-5228, "Techniques for Preparing Flowchart-Format Emergency Operating Procedures," January 1989. (NUDOCS Fiche Address 49670/141)

END

ATTACHMENT A

PROCEDURE USABILITY

Incorporating accepted human factors principles about format and writing style into procedures increases the likelihood that the procedures will be easier to use and follow. Standards for format and writing style can usually be found in the licensee's writer's guide. Usability should be determined by evaluating the degree to which procedures follow the guidance outlined in the writer's guide.

When a writer's guide is not available or if the writer's guide is in question, procedure usability can be determined by evaluating the elements of writing style and format and organization. The bulleted list that follows each element describes characteristics that increase the likelihood that a procedure will be performed successfully.

WRITING STYLE The information in a procedure is presented in a manner that increases the likelihood that the task will be performed successfully.

Procedures are more likely to be performed successfully if

- Writing style is consistent among procedures within a department and within the same procedure type.

- Level of detail is appropriate for the complexity of the task and the expected ability of the users.

- Descriptions of actions to be taken are easy to understand and unambiguous.
  - Action instructions are written as separate and positive commands.
  - Short, simple sentences are used.
  - Multiple actions are written in order of sequence and clearly identify when actions must be completed in order of occurrence.
  - Acronyms and other abbreviations are used consistently and are defined explicitly.
  - Quantitative words are used in instructions.

- References to equipment or documents contain complete identification information, including plant unit applicability, and exactly match equipment labels.

- Numerical units used in procedures correspond to the units on the related instrumentation.

- Conditional statements are presented using the appropriate format.
  - IF and WHEN are used to present a condition.
  - THEN is used to present an action.
  - IF NOT is used in combination with THEN to present an alternative.

- NOT is used to emphasize an opposite condition (NOT running).
- AND is used to present all conditions that must be met before taking action.
- OR is used to present one or more conditions that must be met before taking action.

FORMAT AND ORGANIZATION An uncluttered appearance and clear structure of the information in a procedure increase the likelihood that the task will be performed successfully.

Procedures are more likely to be performed successfully if

- Organization is hierarchical, logical, and consistent, and reveals the organization to users through the use of headings.
- Step numbering and structure is not overly complex.
- Appendices and attachments provide explicit guidance for their allowed use and present relevant information that would be difficult to integrate into the procedure.
- Figures and charts are explicitly and uniquely identified so they are easy to find within the procedure.
- Procedure identification information is adequate to ensure the procedure is complete and current.
- Procedure is legible in the worst expected conditions for use. Type is readable (1) at an expected distance within which the procedure is used, (2) after copying and (3) under degraded lighting.
- Aids are used to help users to track their progress through a procedure where appropriate.
- Warnings, cautions and notes (WCNs) are consistent within a department and within a procedure type.
  - WCNs are obvious and address a single topic.
  - WCNs are linked to the related procedure step.
  - WCNs contains no actions.
  - WCs identify the consequence of wrong action.
  - Ns supply only supplemental information.
- Procedure clearly indicates the final step.
- Checklist information reflects the sequence of information in the steps of the procedure.

END

NRC INSPECTION MANUAL

LHFB

INSPECTION PROCEDURE 42001

EMERGENCY OPERATING PROCEDURES

PROGRAM APPLICABILITY: 2515

42001-01 INSPECTION OBJECTIVES

01.01 To follow up on inspection issues, events, or allegations concerning the licensee's Emergency Operating Procedure (EOP) Program.

01.02 To determine whether significant changes to the licensee's EOPs since the last inspection meet commitments and regulatory requirements.

01.03 To assess the impact of the changes to the licensee's EOPs on the licensee's EOP program and overall plant safety.

42001-02 INSPECTION REQUIREMENTS

02.01 Review of EOPs and Supporting Procedures

a. Conduct an in-depth human factors adequacy review of EOPs where significant human factors changes have been made.

b. Where significant changes have been made, verify that the procedures are technically correct and accurately incorporate the most recent owner's group generic technical guidance and that any deviation(s) warranted by the plant-specific design are adequately justified and incorporated into the EOPs as required.

c. Verify that entry and exit points are easily followed, and that transitions between and within the Normal Operating, Alarm and Abnormal Operating Procedures and EOPs are appropriate, well defined, and easy to follow.

d. Evaluate the procedures and the licensee writer's guide relative to significant human factors issues raised by changes to structure and format.

e. Determine the extent of deviations in the procedures from the current licensee writer's guide and evaluate the licensee's justification for the deviations.

f. Evaluate decision points in the procedures to determine if they can be easily discriminated and understood.

g. Verify that the use of notes and cautions is consistent and correct in the procedures.

02.02 Use of EOPs and Supporting Procedures. Where significant changes have been made, verify that the EOPs and supporting procedures can be physically and correctly performed both inside and outside the control rooms including simulator exercises if appropriate.

02.03 Knowledge and Performance of Duties

a. Verify that the control room staff is aware of and understands all significant changes to the EOPs.

b. Verify that operators receive training on revised EOPs before the revised EOPs are implemented.

c. Evaluate operator concerns regarding the EOPs.

02.04 Review of Licensee EOP Programmatic Controls

a. Verify that the licensee's administrative procedures adequately govern the program for controlling changes to the EOPs, the supporting procedures and associated operator training.

b. Verify that the licensee's documentation reflects adequate conduct of activities required by administrative procedures that control the EOPs, and that EOP changes are incorporated, as appropriate, into the licensee's operator training program.

c. Verify that the licensee's staff possesses the required understanding of administrative procedures governing EOPs and correctly implements them.

d. Verify that the licensee conducts independent audits of the EOP program, as required, and has provisions for document control that are commensurate with NRC requirements, including facility licensing requirements.

02.05 Follow-up of Licensee Corrective Actions Involving EOPs

a. Verify that the licensee's documentation identifies and prioritizes EOP weaknesses and that timely corrective actions are implemented.

b. Evaluate the effectiveness of the licensee's corrective actions by control room and in-plant walkdowns, simulator scenarios, and plant staff interviews as applicable.

42001-03 INSPECTION GUIDANCE

General Guidance. This procedure is intended primarily for use in implementing regional discretionary resources for Regional Initiatives or Reactive Inspection to inspect the significant changes to the licensee's EOPs and associated programs. These

inspection activities include the examination of licensee programs to follow up on corrective actions, to review programmatic controls, and to follow up on identified issues requiring licensee resolution relative to EOP program deficiencies, weaknesses, or implementation.

This procedure is also intended for use in conjunction with NRC Manual Chapter 0517, "Management of Allegations," to examine elements of the licensee's EOP Program as appropriate to follow up on allegations concerning the program. It is not intended that each inspection requirement be covered during an inspection. Rather, inspection requirements should be selected or modified, as appropriate, to address the issue or event that prompted the inspection. Preparation for the inspection should include a review of issues identified during previous inspections or operator licensing examination reports that would be indicative of weaknesses in the EOP Program, policy, or implementation. Significant events with a root cause related to EOPs should also be reviewed in preparation for inspection. During onsite inspection, all major changes, including those related to the resolution of identified issues, the bases for the changes, and the effect of the changes on program effectiveness, should be discussed by the team leader with licensee management.

By reference to the appropriate revision of Regulatory Guide 1.33, "Quality Assurance Program Requirements," Section 6.8 of the Standard Technical Specifications requires that Emergency Operating Procedures be established, implemented, and maintained. In addition, the licensee should review the EOPs to evaluate the safety review functions and the responsibilities of the onsite safety review organization. Further, 10 CFR 50 Appendix B, Criterion VI, requires that quality related documents, and changes thereto, be reviewed for adequacy and approved for release by authorized personnel. In general, technical inadequacies or failures to properly implement and maintain EOPs are violations of these requirements.

The NRC evaluates the owner's group Generic Technical Guidelines (GTGs) for safety and approves them. Where licensees elect to deviate from the NRC-approved GTGs, they need to implement correctly the 10 CFR 50.59 process to ensure safe plant operation, particularly for design basis events. Insufficient or incorrect use of the 10 CFR 50.59 process to evaluate deviations from the NRC-approved GTGs may constitute a violation.

Specific Guidance

03.01 Review of EOPs

a. The review for human factors adequacy determines whether the EOPs are adequate for the intended use and whether the licensee has accurately incorporated the guidance of the GTGs. Plant staff interviews should be conducted with cognizant licensee personnel to assist in determining whether the GTGs remain appropriately incorporated in the EOPs. Significant changes to the EOPs and supporting procedures should be reviewed by inspectors with experience in human factors

evaluation. See NUREG-0899, NUREG-1358 and NUREG/CR-5228. See Section 42001-05 of this procedure for full reference.

b. Operator comments on the technical aspects of significant changes to the EOPs, given during interviews with the plant staff, procedure walkdowns, and simulator exercises, should be evaluated and addressed in the inspector's EOP technical adequacy review. Particular attention should be given to the following:

   1. Comparison of the GTG table of contents to the table of contents of plant-specific EOPs and evaluation of the differences.

   2. Review of licensee documentation addressing the development of plant EOPs from GTGs.

   3. Evaluation of responses to questions about the incorporation of GTGs into the EOPs from interviews with cognizant licensee personnel.

   4. Verification that the licensee has an appropriately prioritized accident mitigation strategies in the procedures and that recommended GTG step sequences are followed.

   5. Verification that the licensee has an adequate technical justification for identified deviations between the plant-specific EOPs and the generic technical guidelines. See Generic Letter 82-33. Full reference may be found in Section 42001-05 of this procedure.

   6. Assessment of the safety significance of identified deviations. A sample of deviations should be examined to determine if the licensee has reported safety significant deviations to the NRC. These deviations should be verified to be in accordance with 10 CFR 50.59.

c. The use of walkthroughs and simulator scenarios provides a practical means to verify that the procedures are well defined and easy to follow for entry and exit points and for transitions.

d. For specific program guidance, see NUREG-0899, NUREG-1358, and NUREG/CR-5228.

e. Significant deviations from the licensee's writer's guide for the EOPs should be reviewed for adequacy. A significant number of minor deviations should raise questions about the consistency of EOP structure.

f. A newly qualified operator should be able to properly implement the decision points in the EOPs without needing further guidance. The logic points should have clear questions that solicit yes or no answers. See NUREG-0899, NUREG-1358, and NUREG/CR-5228.

g. The caution statements should identify potential hazards, and the notes and caution statements should not contain action statements. See NUREG-0899, NUREG-1358 and NUREG/CR-5228.

03.02 Use of EOPs and Supporting Procedures. Where major changes have been made or concerns have been previously identified, walkdowns, simulator exercises on EOPs and supporting procedures and interviews with plant staff should be conducted. Focus on whether:

a. The changes made to the procedures can be physically implemented and whether operators physically interfere with each other while performing the changed procedures.

b. The changed procedures can be implemented within the time allotted considering the actual accident, the course of events, and the availability of the necessary operating locations involved under those conditions.

c. Environmental conditions (such as temperature, steam, flooding, and radiological hazards) that would exist during the event would prevent items 03.02a. and 03.02b. above from being accomplished.

d. Plant personnel can effectively use the EOPs and supporting procedures in the control room and other parts of the plant as necessary. An evaluation of the consistency of instrument and control designations as compared with installed equipment labels and procedural descriptions should be included. Also, the indicators, annunciators, and controls referenced in the procedures are available to the operators.

e. EOP activities that would occur outside of the control room can be performed with equipment on hand.

f. The licensee has validated and verified the procedures. A documented, comprehensive review should have been conducted by an independent, multidisciplinary team, including a human factors analysis of the procedural changes and a walkdown of the procedures in the plant. See NUREG-1358, NUREG/CR 2005, and NUREG-3632 which are fully referenced in Section 42001-05 of this procedure.

g. The latest revision to the procedures is in the control room, the Technical Support Center, and the Emergency Operation Facility.

03.03 Knowledge and Performance of Duties

a. The control room staff should understand how to perform the current EOPs. To determine whether the operators are aware of recent changes to the EOPs and understand the changes, limited plant-specific simulator scenarios should be conducted on at least one fully staffed shift crew. The simulator scenario should reflect relevant abnormal operating conditions that require the use of two or more of the EOPs in which significant changes have been made. Each procedural step should be observed to determine that the correct procedures

are used with proper transitions, and that each step is correctly implemented. Where concerns are identified, the sample size should be expanded. Walkdowns should be conducted to further assess the operator's understanding of the EOPs, the supporting procedures, and recent changes to the procedures. During the control room and in-plant walkdowns direct observation should be made of selected operators in the simulated performance of selected tasks required by the EOPs. Such tasks include simulated handling of equipment, interpretation of instrument readings, following procedures, proper sequencing of actions, and an understanding of information flow patterns related to a specific task. Plant-referenced simulators, as required by 10 CFR 55.45 should be used for walkdowns to allow hands-on performance for certain tasks. See SECY 90-337 which is fully referenced in Section 42001-05 of this procedure.

b. EOP training is covered under Inspection Procedure 41500.

c. Operator concerns regarding the EOPs may be identified by the review of inspection reports, operator licensing examination reports, operator responses to licensee training, procedural review documentation, Licensee Event Reports (LERs), discussions with the Resident Inspectors, and interviews with operators. Operators' concerns may be evaluated by EOP desktop reviews, procedure walkdowns, and simulator exercises.

03.04 Review of Licensee EOP Programmatic Controls

a. The licensee's administrative procedures should provide controls to ensure that all changes such as changes to the Technical Specifications, setpoints, and those resulting from instrument and equipment modifications, are reflected in a timely manner, in the EOPs, the setpoint documents, and the operator training lesson plans. An active licensee program should provide for the long-term evaluation of EOPs as recommended in Section 6.2.3 of NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures." The licensee's EOP evaluation program should be technically adequate and the EOPs should be structured to incorporate operational experience and use, training experience, simulator exercises, control room and in-plant walkdowns and changes in plant design, technical specifications, technical guidelines, Writer's Guide, or other plant procedures. (See Regulatory Guide 1.33, Rev 2. which is fully referenced in Section 42001-05 of this procedure).

b. No guidance is necessary.

c. Interview the licensee's staff and management involved in the performance of administrative procedures governing EOPs to determine if they understand the procedures and if the procedures are implemented consistently among users.

d. See NUREG-1358.

03.05 Follow-up of Licensee Corrective Actions with Regard to EOP Concerns. No guidance is necessary.

42001-04 RESOURCE ESTIMATES

For planning purposes, direct inspection effort to accomplish this procedure should be established by the Regional office, consistent with the scope of planned regional initiatives or reactive inspections to be performed. Individuals having experience in evaluating human factors should accomplish the parts of this inspection that deal with human factors issues. Direct inspection effort for reactive inspection or regional initiatives should be recorded on RITS against Inspection Procedure 42001. If the procedure is used to follow up allegations in conjunction with NRC Manual Chapter 517, the actual time expended should be recorded on RITS against BJ1.

42001-05 REFERENCES

10 CFR Part 50, Appendix B, Criteria V and VI.

10 CFR 50.54(x) and (y).

10 CFR 50.9.

10 CFR Part 2, Appendix C, Criterion VI.

10 CFR 50.34(f)(2)(ii) and (v).

10 CFR 50.36(c)(5).

10 CFR 50.59.

Site-Specific Technical Specifications, Chapter 6.

Generic Letter 82-33, "Supplement 1 to NUREG - 0737, Requirements for Emergency Response Capability," December 17, 1982. (NUDOCS Fiche Address 16681/208)

SECY-90-337, "Procedural Adherence Requirements," October 3, 1990. (NUDOCS Fiche Address 70497/142)

Regulatory Guide 1.33, Rev.2, "Quality Assurance Program Requirements (Operation)," 1978. (NUDOCS Fiche Address 00125/155)

NUREG-1358, "Lessons Learned From the Special Inspection Program for Emergency Operating Procedures," April 1989. (NUDOCS Fiche Address 49726/209)

NUREG-1977, "Guidelines for Preparing Emergency Procedures for Nuclear Power Plants," April, 1981. (NUDOCS Fiche Address 08514/008)

NUREG/CR-4613, "Evaluation of Nuclear Power Plant Operating Procedures Classifications and Interfaces," February 29, 1987. (NUDOCS Fiche Address 39983 /256)

NUREG/CR-3632, "Methods for Implementing Revisions to Emergency Operating Procedures," May 1984. (NUDOCS Fiche Address 24534/208)

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NUREG/CR-5228, "Techniques for Preparing Flowchart-Format Emergency Operating Procedures," January 1989. (NUDOCS Fiche Address 49670/141)

"Supplement 3, Safety Evaluation for CEN-152, `Combustion Engineering Emergency Procedure Guidelines,'" November 5, 1986.

"Combustion Engineering Emergency Procedure Guidelines," Submittal 2 of Revision 3, August 6, 1986.

"Supplement Safety Evaluation Report for `Westinghouse Owners Group Emergency Response Guidelines, Revision 1,'" July 7, 1986.

"Westinghouse Owners Group Emergency Response Guidelines, Revision 1," November 30, 1983.

"Safety Evaluation of `BWR Owners Group Emergency Procedure Guidelines, Revision 4, March 1987,'" NEDO 31331, August 1, 1988.

"BWR Emergency Procedure Guidelines, Revision 4," March 1987.

END