September 18, 2008

Mr. David A. Christian
President and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NOS. 2 AND 3 - ISSUANCE OF AMENDMENT RE: TECHNICAL SPECIFICATIONS REGARDING CONTROL ROOM HABITABILITY (TAC NOS. MD6115 AND MD6116)

Dear Mr. Christian:

The Commission has issued the enclosed Amendment Nos. 305 and 243 to Renewed Facility Operating License No. DPR 65 for the Millstone Power Station, Unit No. 2, and to Renewed Facility Operating License No. NPF-49 for the Millstone Power Station, Unit No. 3, respectively, in response to your application dated July 13, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML071970463), as supplemented by letters dated December 7, 2007, March 5, March 25, April 28, June 9, June 26, and July 28, 2008 (ADAMS Accession Nos. ML073410651, ML080660650, ML080850843, ML081200136, ML081620243, ML081790011, and ML082110280, respectively).

The amendment establishes action, surveillance, and administrative requirements related to ensuring the habitability of the control room envelope in accordance with the Commission-approved Technical Specification Task Force (TSTF) Standard Technical Specification change traveler TSTF-448, Revision 3, “Control Room Habitability.” Additionally, the amendment changes the “irradiated fuel movement” terminology and adopts “movement of recently irradiated fuel assemblies” terminology with TSTF-448, Revision 3.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Carleen Sanders, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-336 and 50-423

Enclosures:
1. Amendment No. 305 to DPR-65
2. Amendment No. 243 to NPF-49
3. Safety Evaluation

cc w/encls: See next page

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cc w/encls: See next page

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Accession Nos: Package/ML082270656; Letter & Amds./ ML082270679;
TS to Amd /ML082270689; TS to Amd /ML082270698 *Via memo

Office	LPL1-2/PM	LPL1-2/LA	SCVB/BC	ITSB/BC
Name	CSanders	ABaxter	RDennig*	RElliot*
Date	08/20/08	08/19/08	08/11/08	07/01/08
Office	AADB	OGC (NLO)	LPL1-2/BC	LPL1-2/PM
Name	RTaylor*	DRoth	HChernoff	CSanders
Date	03/27/08	09/02/08	9/18/08	9/22/08

Official Record Copy

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DOMINION NUCLEAR CONNECTICUT, INC., ET AL.

DOCKET NO. 50-336

MILLSTONE POWER STATION, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 305
Renewed License No. DPR-65

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the applicant dated July 13, 2007, as supplemented by letters dated December 7, 2007, March 5, March 25, April 28, June 9, June 26, and July 28, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-65 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 305, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. Additionally, Renewed Facility Operating License No. DPR-65 is amended to add a new license condition 2.C.(14), to read as follows:

(14) Upon implementation of Amendment No. 305 adopting TSTF-448, Revision 3, the determination of control room envelope (CRE) unfiltered air inleakage as required by SR 4.7.6.1.h, in accordance with TS 6.27.c.(i), the assessment of CRE habitability as required by TS 6.27.c.(ii), and the measurement of CRE pressure as required by TS 6.27.d, shall be considered met. Following implementation:

(a) The first performance of SR 4.7.6.1.h, in accordance with TS 6.27.c.(i), shall be within the specified Frequency of 6 years, plus the 18-month allowance of SR 4.0.2, as measured from November 2, 2006, the date of the most recent successful tracer gas test, or within the next 18 months if the time period since the most recent successful tracer gas test is greater than 6 years.

(b) The first performance of the periodic assessment of CRE habitability, TS 6.27.c.(ii), shall be within 3 years, plus the 9-month allowance of SR 4.0.2, as measured from November 2, 2006, the date of the most recent successful tracer gas test, or within the next 9 months if the time period since the most recent successful tracer gas test is greater than 3 years.

(c) The first performance of the periodic assessment of CRE habitability, TS 6.27.d, shall be within 3 years, plus the 9 month allowance of SR 4.0.2, from the date of the last tracer gas test, or within the next 9 months if the time period since the most recent successful tracer gas test is greater than 3 years.

4. This license amendment is effective as of the date of issuance, and shall be implemented within 180 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the License
and Technical Specifications

Date of Issuance: September 18, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 305

RENEWED FACILITY OPERATING LICENSE NO. DPR-65

DOCKET NO. 50-336

Replace the following pages of the Renewed Facility Operating License with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
Page 3	Page 3
Page 7	Page 7
- - - - -	Page 8

Replace the following pages of the Appendix A Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
XVIII	XVIII
3/4 7-16	3/4 7-16
3/4 7-16a	3/4 7-16a
3/4 7-18	3/4 7-18
3/4 8-7	3/4 8-7
3/4 8-10	3/4 8-10
6-32	6-32
6-33	6-33

DOMINION NUCLEAR CONNECTICUT, INC., ET AL.

DOCKET NOS. 50-423

MILLSTONE POWER STATION, UNIT NO. 3

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 243
Renewed License No. NPF-49

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the applicant dated July 13, 2007, as supplemented by letters dated December 7, 2007, March 5, March 25, April 28, June 9, June 26, and July 28, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-49 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, revised through Amendment No. 243 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto are hereby incorporated into the license. DNC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. Additionally, Renewed Facility Operating License No. NPF-49 is amended to add a new license condition 2.C.(11), to read as follows:

   (11) Upon implementation of Amendment No. 243 adopting TSTF-448, Revision 3, the determination of control room envelope (CRE) unfiltered air inleakage as required by SR 4.7.7.h, in accordance with TS 6.8.4.h.c.(i), the assessment of CRE habitability as required by TS 6.8.4.h.c.(ii), and the measurement of CRE pressure as required by TS 6.8.4.h.d, shall be considered met. Following implementation:

      (a) The first performance of SR 4.7.7.h, in accordance with TS 6.8.4.h.c.(i), shall be within the specified Frequency of 6 years, plus the 18-month allowance of SR 4.0.2, as measured from June 16, 2004, the date of the most recent successful tracer gas test, as identified in the report referenced in the August 31, 2004 letter response to Generic Letter 2003-01, or within the next 18 months if the time period since the most recent successful tracer gas test is greater than 6 years.

      (b) The first performance of the periodic assessment of CRE habitability, TS 6.8.4.h.c.(ii), shall be within 3 years, plus the 9-month allowance of SR 4.0.2, as measured from June 16, 2004, the date of the most recent successful tracer gas test, as identified in the report referenced in the August 31, 2004 letter response to Generic Letter 2003-01, or within the next 9 months if the time period since the most recent successful tracer gas test is greater than 3 years.

      (c) The first performance of the periodic measurement of CRE pressure, TS 6.8.4.h.d, shall be within 24 months, plus the 180 days allowed by SR 4.0.2, as measured from March 23, 2007, the date of the most recent successful pressure measurement test, or within 180 days if not performed previously.

4. This license amendment is effective as of the date of issuance, and shall be implemented within 180 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the License
and Technical Specifications

Date of Issuance: September 18, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 243

RENEWED FACILITY OPERATING LICENSE NO. NPF-49

DOCKET NO. 50-423

Replace the following pages of the Renewed Facility Operating License with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
Page 4	Page 4
Page 6	Page 6
Page 7	Page 7

Replace the following pages of the Appendix A Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
xix	xix
3/4 3-24	3/4 3-24
3/4 3-41	3/4 3-41
3/4 3-44	3/4 3-44
3/4 7-15	3/4 7-15
3/4 7-16	3/4 7-16
3/4 7-17	3/4 7-17
3/4 8-15	3/4 8-15
3/4 8-18a	3/4 8-18a
6-17c	6-17c
- - - - -	6-17d
6-18	6-18

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 305 AND 243

RENEWED FACILITY OPERATING LICENSE NOS. DPR-65 AND NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.

MILLSTONE POWER STATION, UNIT NOS. 2 AND 3

DOCKET NOS. 50-336 AND 50-423

1.0 INTRODUCTION

By letter to the Nuclear Regulatory Commission (NRC) dated July 13, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML071970463), as supplemented by letters dated December 7, 2007, March 5, March 25, April 28, June 9, June 26, and July 28, 2008 (ADAMS Accession Nos. ML073410651, ML080660650, ML080850843, ML081200136, ML081620243, ML081790011, and ML082110280, respectively), Dominion Nuclear Connecticut, Inc. (DNC or the licensee), submitted a request for changes to the Millstone Power Station, Unit Nos. 2 and 3 (MPS2 and MPS3) Technical Specifications (TSs). This proposed amendment would establish more effective and appropriate action, surveillance, and administrative requirements related to ensuring the habitability of the control room envelope (CRE) in accordance with the Commission-approved Technical Specification Task Force (TSTF) Standard Technical Specification change traveler TSTF-448, Revision 3, "Control Room Habitability." Additionally, the proposed amendment would change the "irradiated fuel movement" terminology and adopt "movement of recently irradiated fuel assemblies" terminology with TSTF-448, Revision 3.

The licensee proposed revising ACTION statements and surveillance requirements (SRs) in TS 3/4.7.7, "Control Room Emergency Ventilation System," as well as adding a new administrative controls program TS, Specification 6.8.4.h, "Control Room Envelope Habitability Program." The licensee also proposed changes to terminology used in ACTION statements and table notations of TS 3/4.3, "Instrumentation" and 3/4.8, "Electrical Power Systems" to ensure consistency throughout the TS. The licensee submitted changes to the TS Bases that reflect the proposed TS changes. Finally, the licensee proposed a license condition to support implementation of the proposed TS changes. The purpose of the proposed changes is to ensure that CRE boundary operability is maintained and verified through effective surveillance and programmatic requirements, and that appropriate remedial actions are taken in the event of an inoperable CRE boundary.

The supplements dated June 9, June 26, and July 28, 2008, clarified the application, did not expand the scope of the application as originally noticed in the *Federal Register* (73 FR 28534), dated May 16, 2008, and did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

On August 8, 2006, the commercial nuclear electrical power generation industry owners group Technical Specifications Task Force (TSTF) submitted a proposed change, TSTF-448, Revision 3, to the improved standard technical specifications (STS) (NUREGs 1430-1434) on behalf of the industry (TSTF-448, Revisions 0, 1, and 2 were prior draft iterations). TSTF-448, Revision 3, is a proposal to establish more effective and appropriate action, surveillance, and administrative STS requirements related to ensuring the habitability of the CRE.

In NRC Generic Letter 2003-01 (ADAMS Accession No. ML031620248), licensees were alerted to findings at facilities that existing TS surveillance requirements for the Control Room Emergency Ventilation System (CREVS) may not be adequate. Specifically, the results of American Society of Testing and Materials (ASTM) E741 (ASTM E 741 - 00, "Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution," 2000) tracer gas tests to measure CRE unfiltered inleakage at facilities indicated that the differential pressure surveillance is not a reliable method for demonstrating CRE boundary operability. Licensees were requested to address existing TS as follows:

> *Provide confirmation that your technical specifications verify the integrity [i.e., operability] of the CRE [boundary], and the assumed [unfiltered] inleakage rates of potentially contaminated air. If you currently have a differential pressure surveillance requirement to demonstrate CRE [boundary] integrity, provide the basis for your conclusion that it remains adequate to demonstrate CRE integrity in light of the ASTM E741 testing results. If you conclude that your differential pressure surveillance requirement is no longer adequate, provide a schedule for: 1) revising the surveillance requirement in your technical specification to reference an acceptable surveillance methodology (e.g., ASTM E741), and 2) making any necessary modifications to your CRE [boundary] so that compliance with your new surveillance requirement can be demonstrated.*
>
> *If your facility does not currently have a technical specification surveillance requirement for your CRE integrity, explain how and at what frequency you confirm your CRE integrity and why this is adequate to demonstrate CRE integrity.*

To promote standardization and to minimize the resources that would be needed to create and process plant-specific amendment applications in response to the concerns described in the generic letter, the industry and the NRC proposed revisions to CRE habitability system requirements contained in the STS, using the STS change traveler process. This effort culminated in Revision 3 to traveler TSTF-448, "Control Room Habitability," which the NRC Staff approved on January 17, 2007 (72 FR 2022).

Consistent with the traveler as incorporated into NUREG-1432 for MPS2 and NUREG-1431 for MPS3, the licensee proposed revising action and surveillance requirements in TSs. The purpose of the changes is to ensure that CRE boundary operability is maintained and verified through effective surveillance and programmatic requirements, and that appropriate remedial actions are taken in the event of an inoperable CRE boundary.

MPS2 and MPS3 are Custom Technical Specifications plants. The differences in TS numbering and plant-specific non-STS wording and format, combined with some editorial and plant-specific changes that were incorporated into this safety evaluation (SE) resulted in minor deviations from the model SE text in TSTF-448, Revision 3.

3.0 REGULATORY EVALUATION

3.1 Control Room and Control Room Envelope

NRC Regulatory Guide 1.196, "Control Room Habitability at Light-Water Nuclear Power Reactors," Revision 0, May 2003, (ADAMS Accession No. ML031490611) uses the term "control room envelope" in addition to the term "control room" and defines each term as follows:

> *Control Room: The plant area, defined in the facility licensing basis, in which actions can be taken to operate the plant safely under normal conditions and to maintain the reactor in a safe condition during accident situations. It encompasses the instrumentation and controls necessary for a safe shutdown of the plant and typically includes the critical document reference file, computer room (if used as an integral part of the emergency response plan), shift supervisor's office, operator wash room and kitchen, and other critical areas to which frequent personnel access or continuous occupancy may be necessary in the event of an accident.*
>
> Control Room Envelope*: The plant area, defined in the facility licensing basis, that in the event of an emergency, can be isolated from the plant areas and the environment external to the CRE. This area is served by an emergency ventilation system, with the intent of maintaining the habitability of the control room. This area encompasses the control room, and may encompass other non-critical areas to which frequent personnel access or continuous occupancy is not necessary in the event of an accident.*

NRC Regulatory Guide 1.197, "Demonstrating Control Room Envelope Integrity At Nuclear Power Reactors," Revision 0, May 2003 (ADAMS Accession No. ML031490664), also contains these definitions, but uses the term CRE to mean both. This is because the protected environment provided for operators varies with the nuclear power facility. At some facilities this environment is limited to the control room; at others, it is the CRE. In this SE, consistent with the proposed changes to the STS, the CRE will be used to designate both. For consistency, facilities should use the term CRE with an appropriate facility-specific definition derived from the above CRE definition.

3.2 Control Room Emergency Ventilation System (CREVS)

The CREVS (the term used at Millstone Power Station for the Control Room Envelope Emergency Ventilation System, CREEVS) provides a protected environment from which operators can control the unit, during airborne challenges from radioactivity, hazardous chemicals, and fire byproducts, such as fire suppression agents and smoke, during both normal and accident conditions.

The CREVS is designed to maintain a habitable environment in the CRE for 30 days of continuous occupancy after a Design Basis Accident (DBA) without exceeding a 5 roentgen equivalent man (rem) total effective dose equivalent (TEDE).

The CREVS consists of two redundant trains, each capable of maintaining the habitability of the CRE. The CREVS is considered operable when the individual components necessary to limit operator exposure are operable in both trains. A CREVS train is considered operable when the associated:

- Fans are operable;
- High efficiency particulate air (HEPA) filters and charcoal adsorbers are not excessively restricting flow, and are capable of performing their filtration functions;
- Ductwork, valves, and dampers are operable, and air circulation can be maintained; and
- CRE boundary is operable (the single boundary supports both trains).

The CRE boundary is considered operable when the measured unfiltered air inleakage is less than or equal to the inleakage value assumed by the licensing basis analyses of design basis accident consequences to CRE occupants.

3.3 Regulations Applicable to Control Room Habitability

In Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," General Design Criteria (GDC) 1, 2, 3, 4, 5, and 19 apply to CRE habitability. On February 20, 1971, the Atomic Energy Commission (AEC) published in the *Federal Register* the GDC for Nuclear Power Plants. Prior to this date, proposed GDC for Nuclear Power Plants as issued on July 11, 1967, in the *Federal Register* were in effect. As discussed in MPS2 final safety analysis report (FSAR), Appendix 1A, the design and construction of MPS2 was initiated and completed based upon the 1967 proposed criteria. Since February 20, 1971, the applicant has attempted to comply with the intent of the newer GDC to the extent possible, recognizing previous design commitments. The extent to which this has been possible is reflected in the discussions of the 1971 GDC provided in Appendix 1A of MPS2 FSAR. A summary of the GDCs applicable to the evaluation is as follows:

GDC 1, "Quality Standards and Records," requires that structures, systems, and components (SSCs) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions performed.

GDC 2, “Design Basis for Protection Against Natural Phenomena,” requires that SSCs important to safety be designed to withstand the effects of earthquakes and other natural hazards.

GDC 3, "Fire Protection," requires SSCs important to safety be designed and located to minimize the effects of fires and explosions.

GDC 4, "Environmental and Dynamic Effects Design Bases," requires SSCs important to safety to be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents (LOCAs).

GDC 5, "Sharing of Structures, Systems, and Components," requires that SSCs important to safety not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, the orderly shutdown and cool down of the remaining units.

GDC 19, "Control Room," requires that a control room be provided from which actions can be taken to operate the nuclear reactor safely under normal conditions and to maintain the reactor in a safe condition under accident conditions, including a LOCA. Adequate radiation protection is to be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of specified values.

3.4 Adoption of TSTF-448, Revision 3, Millstone Power Station Unit 2

Adoption of TSTF-448, Revision 3, will assure that the facility's TS limiting condition for operation (LCO) for the CREVS is met by demonstrating unfiltered leakage into the CRE is within limits; i.e., the operability of the CRE boundary. In support of this surveillance, which specifies a test interval (frequency) described in Regulatory Guide 1.197, TSTF-448 also adds TS administrative controls to assure the habitability of the CRE between performances of the ASTM E741 test. In addition, adoption of TSTF-448 will establish clearly stated and reasonable required actions in the event CRE unfiltered inleakage is found to exceed the analysis assumption.

The changes made by TSTF-448 to the STS requirements for the CREVS and the CRE boundary conform to Title 10 of the *Code of Federal Regulations* (10 CFR) Paragraph 50.36(d)(2) and 10 CFR Paragraph 50.36(d)(3). Their adoption will better assure that MPS2 CRE will remain habitable during normal operation and design basis accident conditions. These changes are, therefore, acceptable from a regulatory standpoint.

3.5 Fuel Handling Accident Radiological Consequence Analyses

The regulatory requirements for which the NRC staff based its acceptance of the fuel handling accident radiological consequence analyses, are the reference values in 10 CFR 50.67, as supplemented by the accident specific dose guidelines in Regulatory Position 4.4 of Regulatory Guide (RG) 1.183, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors,” and Table 1 of Standard Review Plan (SRP) Section 15.0.1, “Radiological Consequence Analysis Using Alternative Source Terms”.

10 CFR 50.67(b)(2) requires that the licensee’s analysis demonstrates with reasonable assurance that:

- An individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 25 rem TEDE.

- An individual located at any point on the outer boundary of the low population zone (LPZ), who is exposed to the radioactive cloud resulting from the postulated fission product release during the entire period of its passage, would not receive a radiation dose in excess of 25 rem TEDE.
- Adequate radiation protection is provided to permit access to and occupancy of the CR under accident conditions without personnel receiving a radiation dose in excess of 5 rem TEDE for the duration of the accident.

Except where the licensee proposed a suitable alternative, the NRC staff used the regulatory guidance provided in the following documents in performing this review.

1. RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors", Revision 0, July 2000.

2. SRP Section 15.0.1, "Radiological Consequence Analysis Using Alternative Source Terms," Revision 0, July 2000.

4.0 TECHNICAL EVALUATION - FUEL HANDLING ACCIDENT DOSE CONSEQUENCES ANALYSES FOR MPS2 AND MPS3

The licensee provided the technical justification for defining the decay time for recently irradiated fuel by reanalyzing the fuel handling accident for MPS2 and MPS3. The new analyses determine the amount of decay time needed to reduce the CR dose to meet the acceptance guideline without credit for CR isolation or credit for the CR emergency ventilation system (CREVS).

The dose consequence analyses were performed by the licensee using the RADTRAD-Numerical Applications, Inc. (NAI) computer code. RADTRAD-NAI estimates the radiological doses at off-site locations and in the CR of nuclear power plants as a consequence of postulated accident conditions. The code considers the timing, physical form and chemical species of the radioactive material released into the environment.

RADTRAD-NAI was developed from the "RADTRAD: Simplified Model for RADionuclide Transport and Removal And Dose Estimation," computer code. NRC sponsored the development of the RADTRAD radiological consequence computer code, as described in NUREG/CR-6604. The RADTRAD code was developed by Sandia National Laboratories for the NRC. The code estimates transport and removal of radionuclides and radiological consequence doses at selected receptors. The NRC staff uses the RADTRAD computer code to perform independent confirmatory dose evaluations as necessary to ensure a thorough understanding of the licensee's methods. The results of the evaluations performed by the licensee, as well as the applicable dose acceptance criteria from RG 1.183, are shown in Table 1 of this SE.

The licensee used the ORIGEN computer code to generate the core radionuclide inventory for use in determining source term releases. The inventory, consisting of 66 isotopes at end of fuel cycle curie levels, formed the input for the RADTRAD-NAI dose evaluation code. The licensee used committed effective dose equivalent and effective dose equivalent dose conversion factors (DCFs) from Federal Guidance Reports (FGR) 11 and 12, as is appropriate for evaluations using the alternative source term (AST). The use of ORIGEN and DCFs from FGR 11 and FGR 12 is in accordance with RG 1.183 guidance is, therefore, acceptable to the NRC staff.

MPS2 Fuel Handling Accident (FHA) Radiological Consequence Analysis

This accident analysis postulates that a spent fuel assembly is dropped during fuel handling. All of the fuel rods in the dropped assembly are conservatively assumed to experience fuel cladding damage, releasing the radionuclides within the fuel rod gap to the spent fuel pool (SFP) or reactor cavity water. The affected assembly is assumed to be the assembly with the highest inventory of fission products of the 217 assemblies in the core. Volatile constituents of the core fission product inventory migrate from the fuel pellets to the gap between the pellets and the fuel rod clad during normal power operations. The fission product inventory in the fuel rod gap of the damaged fuel rods is assumed to be instantaneously released to the surrounding water as a result of the accident. Fission products released from the damaged fuel are decontaminated by passage through the overlaying water in the reactor cavity or the SFP, depending on their physical and chemical form.

The licensee assumed no decontamination for noble gases, a decontamination factor (DF) of 200 for radioiodines, and retention of all particulate fission products. As prescribed in RG 1.183, the FHA is analyzed based on the assumption that 100 percent of the fission products released from the reactor cavity or the SFP are released to the environment within a 2-hour period. The licensee did not credit filtration, holdup, or dilution of the released activity. Since the assumptions and inputs are identical for the FHA within containment and the FHA outside containment, the results of the two events are identical.

The assumptions pertaining to the source term for the FHA have not been changed from those originally approved in Amendment No. 284 issued September 20, 2004 (ADAMS Accession No. ML042360671), for selective implementation of AST methodology, and continued in Amendment No. 298 issued May 31, 2007 (ADAMS Accession No. ML071450053), for the full implementation of the AST. By letter dated August 24, 2004, the licensee proposed a method for developing the gap fractions used in the MPS2 FHA analysis for fuel that exceeds the RG 1.183 criteria for peak rod average burnup and linear heat generation rate. For the MPS 2 fuel rods that exceed the RG 1.183 criteria, the licensee used the more conservative gap fractions provided in RG 1.25, “Assumptions Used for Evaluating the Potential Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors.” The licensee modified the RG 1.25 gap fractions to reflect the conclusions of NUREG/CR-5009, “Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors.” NUREG/CR-5009 concludes that RG 1.25 gives conservative values for non-LOCA fuel gap release fractions for extended burnup fuel, except for iodine 131, which may be up to 20 percent higher.

The licensee provided the technical justification for defining the decay time for recently irradiated fuel by reanalyzing the FHA for MPS2. The new analysis determined the amount of decay time needed to reduce the CR dose to meet the acceptance guideline without credit for CR isolation

or credit for the CREVS. The revised analysis has determined that a decay period of 300 hours is needed to ensure that the resulting dose to CR occupants from the analyzed FHA will be within the applicable dose guideline. The licensee did not provide an estimate for the off-site doses in the reanalyzed MPS2 FHA to determine the decay time for recently irradiated fuel, since the off-site doses are clearly bounded by the current licensing basis (CLB) off-site doses calculated for 100 hours of decay.

The licensee evaluated the radiological consequences resulting from the postulated CLB MPS2 FHA, assuming 300 hours of decay and no credit for CR isolation or the CREVS, and concluded that the radiological consequences in the CR are within the applicable accident dose guideline provided in 10 CFR 50.67. The NRC staff's review finds that the licensee used analysis assumptions and inputs consistent with applicable regulatory guidance identified in Section 2.0 of this SE. The assumptions found acceptable to the NRC staff are presented in Table 4, and the licensee's calculated dose results are given in Table 1. The NRC staff performed independent confirmatory dose evaluations, as necessary, to ensure a thorough understanding of the licensee's methods. The NRC staff finds that the CR dose estimated by the licensee for the CLB MPS2 FHA assuming 300 hours of decay and no credit for CR isolation or the CREVS, meets the applicable accident dose guideline and is, therefore, acceptable.

MPS3 FHA Radiological Consequence Analysis

The MPS3 CLB FHA analysis postulates that a spent fuel assembly is dropped during fuel handling and strikes an adjacent assembly during the fall. All of the fuel rods in the dropped assembly and 50 fuel rods in the struck assembly are conservatively assumed to experience fuel cladding damage, releasing the radionuclides within the fuel rod gap to the fuel pool or reactor cavity water. The affected assemblies are assumed to be those with the highest inventory of fission products of the 193 assemblies in the core. Volatile constituents of the core fission product inventory migrate from the fuel pellets to the gap between the pellets and the fuel rod clad during normal power operations. The fission product inventory in the fuel rod gap of the damaged fuel rods is assumed to be instantaneously released to the surrounding water as a result of the accident. Fission products released from the damaged fuel are decontaminated by passage through the overlaying water in the reactor cavity or the SFP, depending on their physical and chemical form. DNC assumed no decontamination for noble gases, a DF of 200 for radioiodines, and retention of all particulate fission products.

In accordance with RG 1.183, the licensee analyzed the FHA based on the assumption that 100 percent of the fission products released from the reactor cavity or SFP are released to the environment in a 2-hour period. The licensee did not credit filtration, holdup, or dilution of the released activity. The assumptions and inputs are identical for the FHA within containment and the FHA outside containment. Therefore, the results of the two events are identical. The assumptions pertaining to the source term for the MPS3 CLB FHA have not been changed from the FHA assumptions that were approved in Amendment 219, issued March 17, 2004 (ADAMS Accession No. ML040610926), for a selective implementation of the AST, and continued in Amendment No. 232, issued September 15, 2006 (ADAMS Accession No. ML061990135), for the full implementation of the AST.

The licensee provided the technical justification for defining the decay time for recently irradiated fuel by reanalyzing the CLB FHA for MPS3. The new analysis determined the amount of decay

time needed to reduce the CR dose to meet the acceptance guideline without credit for CR isolation or credit for the CREVS. The revised analysis has determined that a decay period of 300 hours is needed to ensure that the resulting dose to CR occupants from the analyzed FHA will be within the applicable dose guideline. The licensee did not provide an estimate for the off-site doses in the reanalyzed MPS3 CLB FHA analysis to determine the decay time for recently irradiated fuel, since the off-site doses are clearly bounded by the CLB off-site doses calculated assuming 100 hours of decay.

The licensee evaluated the radiological consequences resulting from the postulated CLB MPS3 FHA, assuming 300 hours of decay and no credit for CR isolation or the CREVS, and concluded that the radiological consequences in the CR are within the applicable accident dose guideline provided in 10 CFR 50.67. The NRC staff's review finds that the licensee used analysis assumptions and inputs consistent with applicable regulatory guidance identified in Section 2.0 of this SE. The assumptions found acceptable to the NRC staff are presented in Table 5, and the licensee's calculated dose results are given in Table 1. The NRC staff performed independent confirmatory dose evaluations, as necessary, to ensure a thorough understanding of the licensee's methods. The NRC staff finds that the CR dose estimated by the licensee for the CLB MPS3 FHA assuming 300 hours of decay and no credit for CR isolation or the CREVS, meets the applicable accident dose guideline and is, therefore, acceptable.

Atmospheric Dispersion Estimates

For MPS2, the licensee maintained the CLB χ/Q values that were accepted by the NRC staff in MPS2 License Amendment No. 228 dated March 10, 1999 (ADAMS Accession No. ML9903250121), to qualitatively evaluate the dose consequences for a postulated FHA involving a recently irradiated fuel assembly at the exclusion area boundary (EAB) and the low-population zone (LPZ). Since the CLB analysis assumes a decay time of 100 hours, the licensee asserts, and the NRC staff concurs, that the off-site dose consequences from an FHA involving a recently irradiated fuel assembly with a minimum of 300 hours of decay are clearly bounded by the CLB FHA analysis.

For MPS2, the licensee maintained the CLB χ/Q values that were accepted by the NRC staff in License Amendment No. 298, which approved the AST for MPS2 (ADAMS Accession No. ML071450053) to evaluate the impact of the MPS2 postulated FHA radiological releases to the CR. To define the decay time associated with a recently irradiated fuel assembly for MPS2, the licensee conservatively analyzed the FHA using the most restrictive χ/Q for the potential release points, for the entire duration of the analysis period. The listed value of 3.00E-03 sec/m^3 is the 0 to 2 hour value for a release from the containment enclosure building to the CR.

For the MPS3 CLB FHA analysis, the licensee maintained the CLB χ/Q values that were accepted by the NRC staff in License Amendment No. 211, dated September 16, 2002 (ADAMS Accession No. ML022470399), and November 25, 2002 (ADAMS Accession No. ML023290568) to qualitatively evaluate the dose consequences for a postulated FHA involving a recently irradiated fuel assembly at the EAB and the LPZ. Since the CLB analysis assumes a decay time of 100 hours, the licensee asserts, and the NRC staff concurs, that the off-site dose consequences from an FHA involving a recently irradiated fuel assembly with a minimum of 300 hours of decay are clearly bounded by the CLB FHA analysis.

The licensee maintained the MPS3 CLB χ/Q values that were accepted by the NRC staff in License Amendment No. 232, issued September 15, 2006, which approved the AST for MPS3 (ADAMS Accession No. ML061990135) to evaluate the impact of the MPS3 postulated FHA radiological releases to the CR. To define the decay time associated with a recently irradiated fuel assembly for MPS3, the licensee conservatively analyzed the FHA using the most restrictive χ/Q for the potential release points, for the entire duration of the analysis period. The listed value of 2.82E-03 sec/m^3 is the 0 to 2 hour value for a release from the Turbine Building Ventilation Vent to the CR.

Summary

The NRC staff finds that the licensee used analysis methods and assumptions consistent with the conservative regulatory requirements and guidance identified in Section 3 above. The NRC staff compared the doses estimated by the licensee to the applicable dose guidelines identified in Section 3. The NRC staff also finds, with reasonable assurance, that the licensee's estimates of the EAB, LPZ, and CR doses will comply with these guidelines. The NRC staff further finds reasonable assurance that the licensee, as modified by this license amendment, will continue to provide sufficient safety margins with adequate defense-in-depth to address unanticipated events and to compensate for uncertainties in accident progression and analysis assumptions and parameters. Therefore, the proposed license amendment is acceptable with respect to the radiological consequences of DBA FHAs described herein.

5.0 TECHNICAL EVALUATION FOR MPS2

The NRC staff reviewed the proposed changes against the corresponding changes made to the STS by TSTF-448, Revision 3, which the NRC staff has found to satisfy applicable regulatory requirements, as described above in Section 3.0. The emergency operational mode of the CREVS at MPS2 isolates but does not pressurize the CRE to minimize unfiltered air inleakage. The proposed changes are consistent with this design.

Proposed Changes

The proposed amendment would strengthen CRE habitability TS requirements by changing TS 3/4.7.6, "Control Room Emergency Ventilation System," and adding a new TS administrative controls program on CRE habitability. The staff reviewed the TS Bases provided by the licensee and did not have any concerns.

Editorial Changes

The licensee proposed editorial changes to TS 3/4.7.6, "CREVS," to establish standard terminology, such as "control room envelope (CRE)" in place of "control room," except for the plant-specific name for the CREVS, and "radiological, chemical, and smoke hazards" in place of various phrases to describe the hazards that CRE occupants are protected from by the CREVS. The licensee also proposed to modify the applicability of TS 3.7.6.1 for consistency with TSTF-448 and STS.

The licensee also proposed to modify the current phrase "irradiated fuel movement within containment or the spent fuel pool" in the applicability of TS 3/4.7.6.1 to "movement of recently

irradiated fuel assemblies." The proposed change is consistent with STS as revised by TSTF-448, Revision 3. The licensee also proposed similar modifications to other references to movement of fuel in TS 3.8.2.2 and TS 3.8.2.4.

The licensee also added “Section, 6.27 Control Room Habitability Program” to the “Index” of the TS.

These changes improve the usability and quality of the presentation of the TS, have no impact on safety, and therefore, are acceptable.

TS 3.7.6.1, “Control Room Emergency Ventilation System”

The licensee proposed to revise the action requirements of TS 3.7.6.1, “CREVS,” to acknowledge that an inoperable CRE boundary, depending upon the location of the associated degradation, could cause just one, instead of both trains to be inoperable in MODES 1, 2, 3, and 4. This is accomplished by revising the condition in ACTION “a” to exclude the condition in ACTION “c,” and revising the condition in ACTION “c” to address the inoperability of one or more CREVS trains, as follows:

- ACTION “a” With one CREVS train inoperable except as specified in ACTION “c”

- ACTION “c” With one or more CREVS trains inoperable due to inoperable CRE boundary

This change clarifies how to apply the action requirements in the event just one CREV train is unable to ensure CRE occupant safety within licensing basis limits because of an inoperable CRE boundary. It enhances the usability of ACTIONs “a” and “c” with a presentation that is more consistent with the intent of the existing requirements. This change is an administrative change because it neither reduces nor increases the existing action requirements, and, therefore, is acceptable.

The licensee proposed to replace existing required ACTION “c”, "Restore control room boundary to OPERABLE status," which has a 24-hour completion time, with required ACTION “c.1”, to immediately initiate action to implement mitigating actions; required ACTION “c.2,” to verify, within 24 hours, that in the event of a DBA, CRE occupant radiological exposures will not exceed the calculated dose of the licensing basis analyses of DBA consequences, and that CRE occupants are protected from hazardous chemicals and smoke; and required ACTION “c.3,” to restore CRE boundary to operable status within 90 days.

The 24-hour completion time of new required ACTION “c.2” is reasonable based on the low probability of a DBA occurring during this time period, and the use of mitigating actions as directed by required ACTION “c.1.” The 90-day completion time of new required ACTION “c.3” is reasonable based on the determination that the mitigating actions will ensure protection of CRE occupants within analyzed limits while limiting the probability that CRE occupants will have to implement protective measures that may adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a DBA. The 90-day completion time is a reasonable time to diagnose, plan and possibly repair, and test most anticipated problems with the CRE boundary. Therefore, proposed ACTIONS “c.1,” “c.2,” and “c.3” are acceptable.

The licensee also proposed to revise ACTIONS “d” and “e” of TS 3.7.6.1, which apply during plant operation in “MODES 5 and 6 or during movement of recently irradiated fuel assemblies.” The licensee proposed to add a new condition to ACTION “e” that states, “One or more Control Room Emergency Ventilation trains inoperable due to an inoperable CRE boundary." The specified required action proposed for this condition is the same as for the existing condition of ACTION “e” (revised as discussed previously), “With both Control Room Emergency Ventilation Trains inoperable.” Accordingly, the new condition is stated with the other condition in ACTION “e“ using the logical connector "or." The new condition in ACTION “e” is needed because proposed ACTION “c” will only apply in MODES 1, 2, 3, and 4. As such, this change will ensure that the actions continue to specify a condition for an inoperable CRE boundary during MODES 5 and 6 or during movement of recently irradiated fuel assemblies. Therefore, this change is administrative and acceptable. To distinguish revised condition in ACTION “e” from the existing condition in ACTION “d” for one CREVS train inoperable, condition in ACTION “d” is revised to state, “One Control Room Emergency Ventilation Train inoperable EXCEPT DUE TO AN INOPERABLE CRE BOUNDARY.” The changes to existing condition in ACTION “d” are less restrictive because this condition will no longer apply in the event one CREVS train is inoperable due to an inoperable CRE boundary. This is acceptable because the revised ACTION “e” establishes adequate remedial measures in this condition.

The emergency operational mode of the CREVS at MPS2 isolates but does not pressurize the CRE. The MPS2 control room ventilation system is designed to be at a neutral pressure. In the emergency radiation state of operation (post-accident operation), the CREVS is switched to full recirculation mode by automatically switching the necessary dampers and controls, such that outside air is not introduced into the CRE. Outside air is introduced into the CRE over the long-term post-accident scenario only to provide fresh air for personnel safety. The licensee proposed to delete the SR 4.7.6.1.e.3 and replace it with a new SR 4.7.6.1.h. Specifically, the licensee proposes to replace the existing control room air in-leakage surveillance with an in-leakage measurement SR and a new TS 6.27, “Control Room Envelope Habitability Program” (see below), in accordance with the approved version of TSTF-448, Revision 3. The performance of unfiltered air in-leakage testing past the CRE boundary into the CRE will be in accordance with the testing methods and at the frequencies specified in the CRE Habitability Program. Based on the adoption of TSTF-448, Revision 3, the licensee's proposal to delete the existing SR 4.7.6.1.e.3 and replace it with a new SR 4.7.6.1.h is acceptable.

TS 6.27 CRE Habitability Program

The proposed administrative controls program TS is consistent with the model program TS in TSTF-448, Revision 3. In combination with SR 4.7.6.1.h, this program is intended to ensure the operability of the CRE boundary, which as part of an operable CREVS will ensure that CRE habitability is maintained such that CRE occupants can control the reactor safely under normal conditions and maintain it in a safe condition following a radiological event, hazardous chemical release, or a smoke challenge. The program shall ensure that adequate radiation protection is provided to permit access and occupancy of the CRE under DBA conditions without personnel receiving radiation exposures in excess of 5 rem TEDE for the duration of the accident.

A CRE Habitability Program TS acceptable to the NRC staff requires the program to contain the following elements:

Definitions of CRE and CRE boundary

This element is intended to ensure that these definitions accurately describe the plant areas that are within the CRE, and also the interfaces that form the CRE boundary, and are consistent with the general definitions discussed in Section 3.1 of this SE. Establishing what is meant by the CRE and the CRE boundary will preclude ambiguity in the implementation of the program.

Configuration control and preventive maintenance of the CRE boundary

This element is intended to ensure the CRE boundary is maintained in its design condition. Guidance for implementing this element is contained in Regulatory Guide 1.196 (ADAMS Accession No. ML063560144), which endorsed, with exceptions, NEI 99-03 (Revision 0), "Control Room Habitability Assessment Guidance," (ADAMS Accession No. ML020600236). Maintaining the CRE boundary in its design condition provides assurance that its leak-tightness will not significantly degrade between CRE inleakage determinations.

Assessment of CRE habitability at the frequencies stated in Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0 (ADAMS Accession No. ML031490664), and measurement of unfiltered air leakage into the CRE in accordance with the testing methods and at the frequencies stated in Sections C.1 and C.2 of Regulatory Guide 1.197

This element is intended to ensure that the plant assesses CRE habitability consistent with Sections C.1 and C.2 of Regulatory Guide 1.197 and NRC-approved exceptions. In the proposed TS Section 6.27.c associated with this program element, the licensee proposed the following exception to Section C.1 of Regulatory Guide 1.197:

1. Appropriate application of ASTM E741 shall include the ability to take minor exceptions to the test methodology. These exceptions shall be documented in the test report. This exception is necessary because the required testing methodology, ASTM E741, was not originally intended for nuclear power plant control room envelope testing. Some minor exceptions from the standard are necessary and are usually determined by the test vendor. NEI 99-03, Revision 1, Appendix EE discusses exceptions typically taken by ASTM E741 test vendors. While not an all-inclusive list, the exceptions listed in Appendix EE provide examples of the type of exceptions that will be allowed by the proposed Control Room Envelope Habitability Program.

In a plant-specific discussion related to MPS2, the licensee further stated that unfiltered inleakage testing at MPS2 is conducted per ASTM E741-83, rather than ASTM E741-00, as referenced in Section 2.3 of the model SE text in TSTF-448, Revision 3. The licensee also stated that this version of the standard reflected the current procedure and licensing basis for conducting unfiltered air inleakage testing at MPS2.

In a letter dated January 28, 2008, (ADAMS Accession No. ML080020300) the staff requested the licensee to identify plant-specific ASTM E741 exceptions and provide a detailed explanation justifying the acceptability of these exceptions. In addition, the licensee was requested to provide a detailed comparison between the ATM E741-83 (1990) and ASTM E741-00 (2000)

versions and provide justification as to why the 1990 version chosen by the licensee is acceptable.

The response to the NRC staff request is contained in licensee's letters dated March 5, March 26, June 9, and June 26, 2008. The letter dated June 26, 2008, further clarified the licensee's responses in the letters dated March 5 and March 26, 2008. In the letter dated June 26, 2008, the licensee stated that the exceptions referenced in their application dated July 13, 2007, are limited to those exceptions necessary to meet the intent of the ASTM E741 methodology when applying it to nuclear power plant control room envelope testing and assured the NRC staff that NEI 99-03, Revision 1 is not relied upon in claiming any exceptions to the ASTM E741 test method.

The NRC staff reviewed the licensee's rationale for requesting the ability to take minor exceptions to the test methodology. The exception is considered acceptable because the required testing methodology, ASTM E741, was not originally intended for nuclear power plant control room envelope testing. The licensee has stated that exceptions to the test methodology will be documented in the test report to ensure that testing is performed in accordance with the CRE Habitability Program requirements of proposed TS 6.27.

The licensee's response to the NRC staff's request to provide a detailed comparison between the two ASTM E741 revisions (1983 and revision 2000) is contained in the March 5, 2008, letter. The licensee provided examples of the differences between the two versions of ASTM E741. One of them pertains to the details of the testing technique. The ASTM E741-83 (1990) focuses on one technique (i.e. Concentration Decay technique), whereas ASTM E741-00 provides details of three testing techniques, which includes Concentration Decay. The licensee stated that MPS2 uses Concentration Decay techniques and the details provided for this technique in both the versions of the standard is comparable. Another difference between the two versions noted by the licensee pertains to the test duration. The licensee stated that MPS2 in-leakage procedure utilizes the regression method noted in E741-83 (1990) version. The ASTM E741-00 version notes that when using the regression method, the minimum test duration is often less than the values in Table 2 entitled, "Examples of Minimum Duration between the Initial and Final Samples for the Above Assumptions." The licensee, however, also stated that the regression method employed at MPS2 insures adequate test duration and also results in a greater number of data points which serves to reduce uncertainty.

The NRC staff reviewed the licensee's reasoning for conducting the in-leakage testing per ASTM E741-83, rather than ASTM E741-00. The licensee has been performing tracer gas in-leakage test of the control room boundary at MPS2 on a refueling frequency since 1992 and the standard at the time was ASTM E741-83 (1990), and therefore, this version is referenced in the MPS2 test procedure. As requested by the NRC staff, the licensee made a comparison of the ASTM E741-83 and ASTM E741-00 versions and concluded that testing performed per ASTM E741 -83 (1990) will provide comparable results to that noted in ASTM E741-00, as it relates to the MPS2 in-leakage test. Based on the information presented by the licensee, the NRC staff finds it acceptable for MPS2 to continue conducting the in-leakage test per ASTM E741-83.

In the proposed TS Section 6.27.c associated with this program element, the licensee proposed the following exception to Section C.2 of Regulatory Guide 1.197:

2. Vulnerability assessments for radiological, hazardous chemical and smoke, and emergency ventilation system testing were completed as documented in the UFSAR and other licensing basis documents. The exceptions to the Regulatory Guides (RG) referenced in RG 1.196 (i.e., RG 1.52, RG 1.78, and RG 1.783), which were considered in completing the vulnerability assessments, are documented in the UFSAR/current licensing basis. Compliance with these RGs is consistent with the current licensing basis as described in the UFSAR and other licensing basis documents.

The licensee stated that this exception identifies how the MPS2 control room habitability licensing basis was developed, which is consistent with the intent of RG 1.196 and the RGs referenced therein, but is not in verbatim compliance with the regulatory positions established in each RG.

In response to an NRC staff request for additional information, the licensee in a letter dated March 25, 2008, further clarified that the intent of the exception is to identify that adopting TSTF-448 will not change the degree of compliance currently documented in the MPS2 licensing basis documents for compliance with RGs 1.52, 1.78, 1.95, and 1.83, and that the differences between RG 1.196 and the current licensing basis of MPS2 related to differences in version numbers associated with the RGs. The licensee also provided a list of licensing basis documents and the versions of the RGs, where MPS2 commitments are described. Based on the vintage of MPS2 and the supporting information provided by licensee regarding the current licensing basis, the NRC staff finds the licensee's exceptions to the RGs referenced in RG 1.196 is acceptable.

The CRE Habitability Program is intended to ensure that the plant assesses CRE habitability consistent with Sections C.1 and C.2 of Regulatory Guide 1.197. The licensee has presented sufficient reasoning and justification for the exceptions taken to Sections C.1 and C.2 of Regulatory Guide 1.197. Assessing CRE habitability at the NRC-accepted frequencies provides assurance that significant degradation of the CRE boundary will not go undetected between CRE inleakage determinations. Determination of CRE inleakage using test methods acceptable to the NRC staff assures that test results are reliable for ascertaining CRE boundary operability. Determination of CRE inleakage at the NRC-accepted frequencies provides assurance that significant degradation of the CRE boundary will not occur between CRE inleakage determinations.

Measurement of CRE pressure with respect to all adjacent areas to the CRE boundary is made at designated locations for use in assessing the CRE boundary

This element is intended to ensure that changes in the condition of the CRE boundary are identified and that significant degradation of the CRE boundary will not go undetected between CRE inleakage determinations. To satisfy this element, the "Programs and Manuals" section of the STS as modified by TSTF-448 revision 3, paragraph (d) of Section 5.5.18, "Control Room Envelope Habitability Program," specifies a differential pressure (dp) test to be conducted between performances of inleakage testing for the purpose of providing input to a periodic assessment of the CRE boundary. The NRC staff recognizes that non-pressurized CREs such as MPS2, may not be able to conduct a dp test, nevertheless, it is the NRC staff's position that all plants requesting the adoption of TSTF-448 should include in their request, a method to

collect data that will serve as input to a periodic assessment of the CRE boundary. In a letter dated January 28, 2008, the NRC staff requested the licensee provide a method to collect data that can be used as input to a periodic assessment of the MPS2 CRE boundary, and an explanation of how the licensee intends to use the data. In a letter dated March 5, 2008, the licensee provided the following response:

> In lieu of a pressurization test, MPS2 conducts preventative maintenance (PM) and surveillance tests which give assurance that the boundary is maintained in a manner that will provide protection for the operators. PMs are performed on the dampers (both air-operated and motor-operated) to check for proper operation. The dampers are also inspected to verify the integrity of the sealing devices (e.g., blade seals and other similar devices) and checked to assure the dampers stroke properly. This set of dampers includes CRE boundary dampers. Fan flows are also obtained on a periodic basis. The flows are maintained within allowable limits of the design flow rates. The charcoal filter flow rates are maintained within the TS limits. Maintaining the proper flow rates will reduce the possibility of the control room pressure changing and thereby affecting unfiltered in-leakage. Additionally, MPS2 has a penetration seal program. Penetration found it acceptable because seals are inspected in accordance with the penetration seal program. The doors are also inspected on a periodic basis.
>
> Any criteria that are not met while performing any of these activities are documented and resolved in accordance with the Millstone Station Corrective Action Program. Appropriate actions are identified and implemented to restore the degraded conditions and assess impact on the CRE boundary. These processes ensure that the MPS2 CRE boundary can perform its safety function in a similar manner as performing a pressurization test and trending the test data.

The staff reviewed the licensee's justification and found it acceptable because the licensee's controlled programs will be used to verify the integrity of the CRE boundary. Conditions that identify any relevant criteria being unachieved will be documented and resolved in accordance with the MPS2 corrective action program. In response to NRC staff letter dated July 22, 2008 (ADAMS Accession No. ML081930974), the licensee has agreed to revise the language previously proposed in their application dated July 13, 2007, for MPS2, TS Section 6.27.d. In a letter dated July 28, 2008 (ADAMS Accession No. ML082110280), the licensee has stated that the words "Not applicable due to neutral pressure CRE" will be replaced by "Licensee controlled programs will be used to verify the integrity of the CRE boundary. Conditions that generate relevant information from those programs will be entered into the corrective action process and shall be trended and used as part of the 36 month assessment of the CRE boundary in accordance with 6.27c(ii)." The use of programs to verify the integrity of the CRE boundary, the use of the corrective action program, and trending of relevant information as part of the assessment program, will provide additional assurance that significant degradation of the CRE boundary will not go undetected between CRE inleakage determinations.

Quantitative limits on unfiltered inleakage

This element is intended to establish the CRE inleakage limit as the CRE unfiltered infiltration rate assumed in the CRE occupant radiological consequence analyses of design basis

accidents. Having an unambiguous criterion for the CRE boundary to be considered operable in order to meet LCO 3.7.6.1 will ensure that associated action requirements will be consistently applied in the event of CRE degradation resulting in inleakage exceeding the limit.

Consistent with TSTF-448, Revision 3, the program states that the provisions of SR 4.0.2 are applicable to the program frequencies for performing the activities required by program paragraph number c, parts (i) and (ii) (assessment of CRE habitability and measurement of CRE inleakage), and paragraph number d (licensee controlled programs to verify the integrity of the CRE boundary). This statement is needed to avoid confusion. SR 4.0.2 is applicable to the surveillance that references the testing in the CRE Habitability Program. However, SR 4.0.2 is not applicable to Administrative Controls unless specifically invoked. Providing this statement in the program eliminates any confusion regarding whether SR 4.0.2 is applicable, and is acceptable.

Consistent with TSTF-448, Revision 3, proposed TS 6.27 states that: (1) a CRE Habitability Program shall be established and implemented; (2) the program shall include all of the NRC-staff-required elements, as described above; and (3) the provisions of SR 4 .0.2 shall apply to program frequencies. Therefore, TS 6.27, which is consistent with the model program TS approved by the NRC Staff in TSTF-448, Revision 3, is acceptable.

Implementation of New Surveillance and Assessment Requirements by the Licensee

The licensee has proposed license conditions regarding the initial performance of the new surveillance and assessment requirements. The new license conditions adopted the conditions in Section 2.3 of the model application published in the *Federal Register* on January 17, 2008 (72 FR 2022) except Paragraph 2.3.c, since this paragraph applies to a pressurized control room envelope. Plant-specific changes were made to these proposed license conditions. The proposed plant-specific license conditions are consistent with the model application, and are acceptable.

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Summary

The NRC staff approves the TS changes for MPS2 based on the considerations discussed above.

6.0 TECHNICAL EVALUATION FOR MPS3

The NRC staff reviewed the proposed changes against the corresponding changes made to the STS by TSTF-448, Revision 3, which the NRC staff has found to satisfy applicable regulatory requirements, as described above in Section 3.0. The emergency operational mode of the CREVS at MPS3 pressurizes the CRE to minimize unfiltered air inleakage. The proposed changes are consistent with this design.

Proposed Changes

The proposed amendment would amend CRE habitability TS requirements by changing TS 3/4.7.7, “CONTROL ROOM EMERGENCY VENTILATION SYSTEM,” and adding a new TS administrative controls program on CRE habitability.

The NRC staff compared the proposed TS changes to the STS and the STS markups and evaluations in TSTF-448. The staff verified that differences from the STS were adequately justified on the basis of plant-specific design or retention of current licensing basis.

Editorial Changes

The licensee proposed editorial changes to TS 3/4.7.7 to establish standard terminology, such as "control room envelope (CRE)" in place of "control room," except for the plant-specific name for the CREVS, and "radiological, chemical, and smoke hazards" in place of various phrases to describe the hazards that CRE occupants are protected from by the CREVS. These changes improve the usability and quality of the presentation of the TS, have no impact on safety, and therefore, are acceptable.

TS 3/4.7.7, CREVS

The licensee proposed changes to action requirements and surveillance requirements for TS 3/4.7.7. The proposed changes adopt the content of changes made to STS by TSTF-448.

The licensee proposed establishing new action requirements for an inoperable CRE boundary. The existing TS 3.7.7 actions are more restrictive than would be appropriate for situations in which CRE occupant implementation of compensatory measures or mitigating actions would temporarily afford adequate CRE occupant protection from postulated airborne hazards. To account for such situations in MODES 1, 2, 3, and 4, the licensee proposes to modify TS 3.7.7 ACTION c, to apply when one or more Control Room Emergency Air Filtration Systems are inoperable due to an inoperable CRE boundary. In such cases, the licensee is required to immediately initiate action to implement mitigating actions (ACTION c.1), and verify, within 24 hours, mitigating actions ensure CRE occupant exposures to radiological and chemical hazards will not exceed limits, and mitigating actions are taken for exposure to smoke hazards (ACTION c.2), and restore CRE boundary to OPERABLE status within 90 days (ACTION c.3). If the licensee can not meet the requirements of ACTIONS c.1, c.2, and c.3, then the licensee must have the plant in HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours. To distinguish the revised TS 3.7.7 ACTION c. from the existing ACTIONS for the CREVS inoperable, the licensee proposed revising TS 3.7.7 ACTION a, in Operational

MODES 1, 2, 3, and 4, to state, “With one Control Room Emergency Ventilation Train inoperable except as specified in ACTION c.”

The 24-hour completion time of new ACTION c.2 is reasonable based on the low probability of a DBA occurring during this time period, and the use of mitigating actions. The 90-day completion time of ACTION c.3 is reasonable based on the determination that the mitigating actions will ensure protection of CRE occupants within analyzed limits while limiting the probability that CRE occupants will have to implement protective measures that may adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a DBA, and is a reasonable time to diagnose, plan and possibly repair, and test most anticipated problems with the CRE boundary. Therefore, proposed ACTIONS c.1, c.2, and c.3 are acceptable.

The Licensee proposed to modify TS 3.7.7 ACTION e. to also apply when one or more Control Room Emergency Ventilation Trains are inoperable due to an inoperable CRE boundary. This modification to TS 3.7.7 ACTION e. is needed because the proposed modification to TS 3.7.7 ACTION c. requirements will only apply in MODES 1, 2, 3, and 4. The modification of TS 3.7.7 ACTION e. will ensure that an ACTION is specified for an inoperable CRE boundary during all MODES of applicability. Therefore, this change is administrative and acceptable.

The Licensee proposed deleting the MPS3 CRE pressurization Surveillance Requirement (SR) 4.7.7.e.2 that requires verification that the system can maintain a positive pressure of at least 1/8 inches water gauge relative to the adjacent areas during the filtered pressurization mode of operation at a pressurization flow rate of ≤ 230 cfm. The deletion of this SR is proposed because measurements of unfiltered air inleakage into the CRE at numerous reactor facilities has demonstrated that a basic assumption of this SR, an essentially leak-tight CRE boundary, was incorrect for most facilities. Hence, meeting this SR by achieving the required CRE pressure is not necessarily a conclusive indication of CRE boundary leak tightness (i.e., CRE boundary operability). The licensee proposed replacing the existing TS control room pressurization surveillance, TS SR 4.7.7.e.2, with an inleakage measurement SR and CRE Habitability Program in TS (described below), in accordance with the approved version of TSTF-448, Revision 3. In place of the pressurization SR, the licensee proposed adding a new SR 4.7.7.h that will require performance of CRE unfiltered air inleakage testing in accordance with the Control Room Envelope Habitability Program, proposed TS 6.8.4.h (described below). The performance of unfiltered air inleakage testing past the CRE boundary into the CRE will be in accordance with the testing methods and at the frequencies specified in the CRE Habitability Program. Based on the adoption of the content of TSTF-448, Revision 3, the licensee’s proposal to delete SR 4.4.7.e.2 and add SR 4.7.7.h is acceptable.

TS 6.8.4.h, CRE Habitability Program

The proposed administrative controls program TS is consistent with the model program TS in TSTF-448, Revision 3. In combination with SR 4.7.7.h, this program is intended to ensure the operability of the CRE boundary, which as part of an operable CREVS will ensure that CRE habitability is maintained such that CRE occupants can control the reactor safely under normal conditions and maintain it in a safe condition following a radiological event, hazardous chemical release, or a smoke challenge. The program shall ensure that adequate radiation protection is provided to permit access and occupancy of the CRE under design basis accident (DBA)

conditions without personnel receiving radiation exposures in excess of 5 rem TEDE for the duration of the accident.

A CRE Habitability Program TS acceptable to the NRC staff requires the program to contain the following elements:

Definitions of CRE and CRE boundary

This element is intended to ensure that these definitions accurately describe the plant areas that are within the CRE, and also the interfaces that form the CRE boundary, and are consistent with the general definitions discussed in Section 3.1 of this safety evaluation. Establishing what is meant by the CRE and the CRE boundary will preclude ambiguity in the implementation of the program.

Configuration control and preventive maintenance of the CRE boundary

This element is intended to ensure the CRE boundary is maintained in its design condition. Guidance for implementing this element is contained in Regulatory Guide 1.196, which endorsed, with exceptions, NEI 99-03. Maintaining the CRE boundary in its design condition provides assurance that its leak-tightness will not significantly degrade between CRE inleakage determinations.

Assessment of CRE habitability at the frequencies stated in Sections C.1 and C.2 of Regulatory Guide (RG) 1.197, Revision 0, and measurement of unfiltered air leakage into the CRE in accordance with the testing methods and at the frequencies stated in Sections C.1 and C.2 of RG 1.197

The licensee proposed the following exceptions to Sections C.1 and C.2 of RG 1.197, to be listed in the TS with this program element:

1. Appropriate application of ASTM E741 shall include the ability to take minor exceptions to the test methodology. These exceptions shall be documented in the test report.

2. Vulnerability assessments for radiological, hazardous chemical and smoke, and emergency ventilation system testing were completed as documented in the UFSAR and other licensing basis documents. The exceptions to the Regulatory Guides (RG) referenced in RG 1.196 (i.e., RG 1.52, RG 1.78, and RG 1.183), which were considered in completing the vulnerability assessments, are documented in the UFSAR current licensing basis. Compliance with these RGs is consistent with the current licensing basis as described in the UFSAR and other licensing basis documents.

The licensee provided justification for exception 1 in its LAR, dated July 13, 2007 (ADAMS Accession No. ML071970463), and in a supplemental letter, dated June 26, 2008 (ADAMS Accession No. ML081790011). The licensee provided justification for exception 2 in its LAR, dated July 13, 2007, and in a supplemental letter, dated March 25, 2008 (ADAMS Accession No. ML080850843). The staff reviewed the justifications for the exceptions and found them to be

adequate on the basis that exception 1 is necessary to meet the intent of ASTM E741 methodology when applied to nuclear power plant CRE testing, and exception 2 is necessary to maintain consistency with the current licensing basis of MPS3. Therefore, exceptions 1 and 2 listed above are acceptable. This element is intended to ensure that the plant assesses CRE habitability consistent with Sections C.1 and C.2 of Regulatory Guide 1.197. Assessing CRE habitability at the NRC-accepted frequencies provides assurance that significant degradation of the CRE boundary will not go undetected between CRE inleakage determinations. Determination of CRE inleakage using test methods acceptable to the NRC staff assures that test results are reliable for ascertaining CRE boundary operability. Determination of CRE inleakage at the NRC-accepted frequencies provides assurance that significant degradation of the CRE boundary will not occur between CRE inleakage determinations.

Measurement of CRE pressure with respect to all areas adjacent to the CRE boundary at designated locations for use in assessing the CRE boundary at a frequency of 18 months on a staggered test basis (with respect to the CREVS trains)

This element is intended to ensure that CRE differential pressure is regularly measured to identify changes in pressure warranting evaluation of the condition of the CRE boundary. Obtaining and trending pressure data provides additional assurance that significant degradation of the CRE boundary will not go undetected between CRE inleakage determinations. The frequency of 18 months was selected based on a standard refueling interval. The licensee presented justification for a 48-month frequency in its LAR dated July 13, 2007. For the Control Room Envelope Habitability Program description of the measurement frequency for CRE pressure relative to external areas adjacent to the CRE boundary during the pressurization mode of operation given in new TS 6.8.4.h,the stated frequency will be “48 months on a STAGGERED TEST BASIS” versus the TSTF-448 value of 18 months. This variance is due to the difference between the MPS3 TS definition of STAGGERED TEST BASIS and the definition used by Standard Technical Specifications (STS), as well as the existing MPS3 24-month surveillance interval. The MPS3 definition of STAGGERED TEST BASIS is: “A STAGGERED TEST BASIS” shall consist of a test schedule for (n) systems, subsystems, trains, or other designated components obtained by dividing the specified test interval into (n) equal subintervals. The testing of one system, subsystem, train, or other designated component at the beginning of each subinterval. The STS definition is: “A STAGGERED TEST BASIS” shall consist of the testing of one of the systems, subsystems, channels, or other designated components during the interval specified by the Surveillance Frequency, so that all systems, subsystems, channels, or other designated components are tested during n Surveillance Frequency intervals, where n is the total number of systems, subsystems, channels, or other designated components in the associated function. Therefore, in order to prescribe testing one of the subsystems every 24 months as stated in TSTF-448, the frequency must be stated as “48 months on a STAGGERED TEST BASIS,” for MPS3. The staff found that, for MPS3, a frequency of “48 months on a STAGGERED TEST BASIS” is equivalent to the STS requirement, and is, therefore, acceptable.

Quantitative limits on unfiltered inleakage

This element is intended to establish the CRE inleakage limit as the CRE unfiltered infiltration rate assumed in the CRE occupant radiological consequence analyses of design basis accidents. Having an unambiguous criterion for the CRE boundary to be considered operable in

order to meet LCO 3.7.7 will ensure that associated action requirements will be consistently applied in the event of CRE degradation resulting in inleakage exceeding the limit.

Consistent with TSTF-448, Revision 3, the program states that the provisions of SR 4.0.2 are applicable to the program frequencies for performing the activities required by program paragraph number c, parts (i) and (ii) (assessment of CRE habitability and measurement of CRE inleakage), and paragraph number d (measurement of CRE differential pressure)

This statement is needed to avoid confusion. SR 4.0.2 is applicable to the surveillance that references the testing in the CRE Habitability Program. However, SR 4.0.2 is not applicable to Administrative Controls unless specifically invoked. Providing this statement in the program eliminates any confusion regarding whether SR 4.0.2 is applicable, and is acceptable.

Consistent with TSTF-448, Revision 3, proposed TS 6.8.4.h states that: (1) a CRE Habitability Program shall be established and implemented; (2) the program shall include all of the NRC-staff-required elements, as described above; and (3) the provisions of SR 4.0.2 shall apply to program frequencies. Therefore, TS 6.8.4.h, which is consistent with the model program TS approved by the NRC staff in TSTF-448, Revision 3, is acceptable.

Implementation of New Surveillance and Assessment Requirements by the Licensee

The licensee has proposed license conditions regarding the initial performance of the new surveillance and assessment requirements. The new license conditions adopted the conditions in Section 2.3 of the model application published in the *Federal Register* on January 17, 2007 (72 FR 2022). Plant-specific changes were made to these proposed license conditions. The proposed plant-specific license conditions are consistent with the model application, and are acceptable.

Use of the term "recently irradiated fuel assemblies"

The licensee proposed replacing the term "fuel" with "recently irradiated fuel assemblies" in references to fuel movement operations in the following locations: TABLE NOTATIONS for Tables 3.3-3, 4.3-3, and 3.3-6, in TS 3/4.3, "INSTRUMENTATION;" TSs 3/4.7.7, "CONTROL ROOM EMERGENCY VENTILATION SYSTEM," 3/4.8.2.2, "DC SOURCES," and 3/4.8.3.2, "ONSITE POWER DISTRIBUTION." The licensee provided data and technical justification for the use of the proposed terminology in a letter dated December 7, 2007 (ADAMS Accession No. ML073410651). The licensee stated that the proposed meaning for the term "recently irradiated fuel" for MPS3 is fuel that has occupied part of a critical reactor core within the previous 300 hours. The staff evaluated the data and justification provided by the licensee against the applicable regulatory and technical requirements. The staff performed independent calculations to verify the licensee's data and determined the licensee's justification was adequate. Therefore, the use of the term "recently irradiated fuel assemblies" in the noted locations in MPS3 TS is acceptable.

Summary of Adoption of TSTF-448, Revision 3, by MPS3

The licensee is not proposing to adopt the STS format used by TSTF-448 because MPS3 TS use a format that predates STS and licensees are not required to adopt the format of STS.

Instead, the licensee proposes adoption of TSTF-448 content. The changes to MPS3 TS will assure the facility's TS LCO for the CREVS is met by demonstrating CRE operability at a test interval (frequency) described in Regulatory Guide 1.197. The changes also add TS administrative controls to assure the habitability of the CRE between tests. In addition, changes to MPS3 TS based on TSTF-448 content will establish clearly stated and reasonable required actions in the event CRE unfiltered inleakage exceeds the analysis assumption.

TSTF-448 made changes to the STS for the CREVS and the CRE boundary that meet the requirements of 10 CFR 50.36(d)(2), 10 CFR 50.36(d)(3), and the other regulatory requirements described in Section 3.0. The licensee proposed adopting TSTF-448 content to address plant-specific design issues while retaining the current licensing basis of MPS3. The staff review concluded the changes meet the regulatory requirements outlined above, address MPS3 plant-specific design issues, and allow for retention of the current licensing basis. The proposed plant specific adoption of TSTF-448 content will assure that MPS3's CRE will remain habitable during normal operation and design basis accident conditions. These changes are, therefore, acceptable.

7.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Connecticut State official was notified of the proposed issuance of the amendment. The State official’s comments have been addressed in this SE.

8.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (73 FR 28534). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

9.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that the proposed changes maintain adequate safety, and that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: September 18, 2008

Table 1
MPS2 and MPS3 FHA Radiological Consequences Expressed as TEDE [1]
(rem)

Design Basis Accidents	Decay time hours	EAB [2]	LPZ [3]	CR
MPS2 CLB FHA	100	1.5E+00	2.0E-01	3.1E+00
MPS2 FHA for recently irradiated fuel [4]	300	[5]	[5]	4.9E+00
MPS3 CLB FHA (3636 MWt)	100	2.4E+00	1.3E-01	4.9E+00
MPS3 FHA for recently irradiated fuel [4]	300	[5]	[5]	4.7E+00
MPS3 SPU FHA (3723 MWt)	100	2.7E+00	1.5E-01	4.8E+00
MPS3 SPU FHA for recently irradiated fuel [4]	350	[6]	[6]	4.8E+00
Dose guidelines		6.3E+00	6.3E+00	5.0E+00

Note: Licensee's results are expressed to a limit of two significant figures

[1] Total effective dose equivalent
[2] Exclusion area boundary
[3] Low population zone
[4] No credit for CR isolation or CREVS operation
[5] Bounded by CLB analysis
[6] Bounded by MPS3 SPU FHA with 100 hours of decay

Table 2
MPS2 CR Data and Assumptions

CR effective volume		35,656 ft^3
Normal CR intake flow rate prior to isolation		800 cfm
CR occupancy factors		
	0 - 24 hours	1.0
	24 – 96 hours	0.6
	96 - 720 hours	0.4
Breathing rate for CR dose analyses		3.5E-04 m^3/sec
Containment free air volume		2.35E+06 ft^3
Containment wall thickness		3 ft 9 in concrete
Control building wall thickness		2 ft concrete
Control building roof thickness		2 ft concrete

Table 3
MPS3 CR Data and Assumptions

CR effective volume		2.38E+05 ft^3
Normal CR intake flow rate prior to isolation		1595 cfm
CR occupancy factors		
	0 - 24 hours	1.0
	24 – 96 hours	0.6
	96 - 720 hours	0.4
Breathing rate for CR dose analyses		3.5E-04 m^3/sec
Containment free air volume		2.35E+06 ft^3
Containment wall thickness		4.5 ft concrete
Containment dome thickness		2.5 ft concrete
Distance from containment to CR		228 ft
Containment inner radius		70 ft
Control building wall thickness		2 ft concrete
CR ceiling thickness		8 inches concrete
Control building roof thickness		1 ft -10 in concrete

Table 4
MPS2 Inputs for the FHA to Define Recently Irradiated Fuel Decay Time

Core thermal power for FHA analysis	2754 MWt: 2700 MWt + 2% uncertainty
Number of assemblies in full core	217
Fuel clad damage	All rods in one assembly

Noble gas inventory	Curies
Xe-131m	8.615E+05
Xe-133m	4.808E+06
Xe-133	1.569E+08
Xe-135m	3.104E+07
Xe-135	5.658E+07
Xe-137	1.316E+08
Xe-138	1.316E+08
Kr-83m	1.080E+07
Kr-85	1.194E+06
Kr-85m	2.451E+07
Kr-87	4.860E+07
Kr-88	6.865E+07
Kr-89	8.593E+07

Iodine inventory	Curies
I-130	5.101E+06
I-131	7.719E+07
I-132	1.105E+08
I-133	1.504E+08
I-134	1.666E+08
I-135	1.407E+08

Assumed percentage of high burnup fuel rods		100% exceed values in RG 1.183, note 11
Gap Fractions assumed in high burnup rods		
	I-131	0.12
	Kr-85	0.30
	Remainder of noble gases	0.10
	Remainder of halogens	0.10
Pool decontamination factor		
	Noble gases	1
	Halogens (effective DF)	200
Release points		Turbine Building Ventilation Stack Enclosure Building / Containment Ground
0 to 8 hour CR χ/Q [(1)]		3.00E-03 sec/m^3
Recently Irradiated Fuel Decay Time		**300 hours**
Radial peaking factor		1.83
Duration of release to the environment		2 hours
CR ventilation timing:		CR isolation and CREVS not credited
	T= 0 seconds	Normal CR unfiltered intake flow of 800 cfm persists throughout the analysis period

(1) The licensee conservatively analyzed this event using the most restrictive χ/Q for the potential release points, for the entire duration of the analysis period. The listed value of 3.00E-03 sec/m^3 is the 0 to 2 hour value for a release from the containment enclosure building to the CR.

Table 5
MPS3 CLB Inputs for the FHA to Define Recently Irradiated Fuel Decay Time

Core thermal power for FHA analysis	3636 MWt: conservative margin above rated power level of 3411 MWt
Number of assemblies in full core	193
Number of rods in an assembly	264
Fuel clad damage	1 assembly plus 50 rods; 314 rods total

Noble gas inventory	Curies	Iodine inventory	Curies
Xe-133	1.980E+08	I-131	9.710E+07
Xe-135m	3.589E+07	I-132	1.416E+08
Xe-135	6.440E+07	I-133	2.008E+08
Xe-138	8.610E+07	I-134	2.146E+08
Kr-85	1.075E+06	I-135	1.864E+08
Kr-85m	2.590E+07		
Kr-87	4.755E+07		
Kr-88	7.060E+07		

Gap Fractions assumed		
	Noble gases	0.10
	Halogens	0.08
Pool decontamination factor		
	Noble gases	1
	Halogens (effective DF)	200
Release points		Turbine Building Ventilation Stack or Enclosure Building / Containment Ground
0 to 8 hour CR χ/Q[(1)]		2.82E-03 sec/m^3
Recently Irradiated Fuel Decay Time		**300 hours**
Radial peaking factor		1.7
Duration of release to the environment		2 hours
CR ventilation timing:		CR isolation and CREVS not credited
	T= 0 seconds	Normal CR unfiltered intake flow of 1595 cfm persists throughout the analysis period

(1) The licensee conservatively analyzed this event using the most restrictive χ/Q for the potential release points, for the entire duration of the analysis period. The listed value of 2.82E-03 sec/m^3 is the 0 to 2 hour value for a release from the Turbine Building Ventilation Vent to the CR.