UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 29, 2016

Mr. David A. Heacock
President and Chief Nuclear Officer
Dominion Nuclear
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 2 - ISSUANCE OF AMENDMENT REGARDING THE REVISION OF SPENT FUEL POOL DECAY HEAT ANALYSIS DESCRIPTION (CAC NO. MF7333)

Dear Mr. Heacock:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 330 to Renewed Facility Operating License No. DPR-65 for the Millstone Power Station, Unit No. 2 (MPS2), in response to your application dated January 26, 2016, as supplemented on July 14, 2016.

The amendment revises the MPS2 licensing basis to change the spent fuel pool (SFP) heat load analysis description contained in the Final Safety Analysis Report (FSAR). Specifically, the amendment revises MPS2 FSAR Section 9.5 to allow irradiated fuel movement in the reactor vessel to begin 100 hours after reactor subcriticality at an average rate of six fuel assemblies per hour.

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,

RGuzman

Richard V. Guzman, Sr. Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-336

Enclosures:
1. Amendment No. 330 to DPR-65
2. Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

DOMINION NUCLEAR CONNECTICUT, INC.

DOCKET NO. 50-336

MILLSTONE POWER STATION, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 330
Renewed License No. DPR-65

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

   A. The application for amendment by Dominion Nuclear Connecticut, Inc. (the licensee) dated January 26, 2016, as supplemented by letter dated July 14, 2016, 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 Millstone Power Station, Unit 2 (MPS2), Final Safety Analysis Report (FSAR) and, 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. 330, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance, and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Douglas V Pickett

Douglas V. Pickett, Acting Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License No. DPR-65

Date of Issuance: November 29, 2016

MILLSTONE POWER STATION, UNIT NO. 2

ATTACHMENT TO LICENSE AMENDMENT NO. 330

RENEWED FACILITY OPERATING LICENSE NO. DPR-65

DOCKET NO. 50-336

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove	Insert
3	3

Connecticut, in accordance with the procedures and limitations set forth in this renewed operating license;

(2) Pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(3) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form for sample analysis or instrument and equipment calibration or associated with radioactive apparatus or components;

(5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter 1: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) <u>Maximum Power Level</u>

The licensee is authorized to operate the facility at steady-state reactor core power levels not in excess of 2700 megawatts thermal.

(2) <u>Technical Specifications</u>

The Technical Specifications contained in Appendix A, as revised through Amendment No. 330 are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 330

TO RENEWED FACILITY OPERATING LICENSE NO. DPR-65

DOMINION NUCLEAR CONNECTICUT, INC.

MILLSTONE POWER STATION, UNIT NO. 2

DOCKET NO. 50-336

1.0 INTRODUCTION

By letter dated January 26, 2016, as supplemented by letter dated July 14, 2016 (Agencywide Documents Access and Management System (Accession Nos. ML16034A358 and ML16202A040, respectively), Dominion Nuclear Connecticut, Inc. (DNC, the licensee) requested a change to the spent fuel pool (SFP) heat load analysis description contained in the Final Safety Analysis Report (FSAR) for Millstone Power Station, Unit 2 (MPS2). Specifically, the proposed amendment would revise Section 9.5 of the MPS2 FSAR to allow irradiated fuel movement in the reactor vessel to begin 100 hours after reactor subcriticality at an average rate of six fuel assemblies per hour. DNC submitted this license amendment request (LAR) to comply with paragraph 5 of Confirmatory Order EA-13-188 (ADAMS Accession No. ML15236A207) which stated:

> By no later than February 15, 2016, DNC will submit a license amendment request seeking NRC approval of the spent fuel pool heat load analysis and any associated technical specification changes. This will be treated as a high priority review by the NRC.

The supplemental letter dated July 14, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* (FR) on May 24, 2015 (81 FR 32804).

Enclosure 2

2.0 REGULATORY EVALUATION

2.1 Regulatory Discussion

Content of Technical Specifications

As required by Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.36(a)(1), each applicant for an operating license shall include in its application proposed technical specifications in accordance with the requirements of 10 CFR § 50.36. Further, per 50.36(a)(1), a summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications.

Per 10 CFR 50.36(b), each license authorizing operation of a utilization facility will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to 10 CFR 50.34. The analyses submitted under 10 CFR 50.34 include the Preliminary safety analysis report (PSAR), submitted under 50.34(a) as part of the application for a construction permit, and the FSAR submitted under 50.34(b) as part of the application for an operating license. The FSAR shall include information that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole. Last, also per 10 CFR 50.36, the Commission may include such additional technical specifications as the Commission finds appropriate.

Paragraph 50.59(c)(1) of 10 CFR states that a licensee can make changes in the facility or procedures as described in the UFSAR and conduct tests and experiments not described in the UFSAR without obtaining a license amendment pursuant to 10 CFR 50.90 if none of the criteria in 10 CFR 50.92(c)(2) are met. Paragraph 50.59(c)(3) of 10 CFR states that the UFSAR is considered to include FSAR changes resulting from evaluations performed pursuant to 10 CFR 50.59 and analyses performed pursuant to 10 CFR 50.90 since submittal of the last UFSAR pursuant to 10 CFR 50.71.

The Commission's Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, which was published in the *Federal Register* on July 22, 1993 (58 FR 39132), presents the policy of the NRC with respect to the scope and purpose of TSs as required by 10 CFR 50.36 and establishes the guidance for determining which operating restrictions should be included in the TSs. Pursuant to 10 CFR 50.36(c)(2)(ii), a technical specification limiting condition for operation (LCO) of a nuclear reactor must be established for each item meeting one or more of the following criteria:

- Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.
- Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

- Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
- Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

The policy also states that each LCO, action, and surveillance requirement (SR) should have supporting Bases which should at a minimum address questions specified in the Policy Statement and cite references to appropriate licensing documentation (e.g., FSAR, Topical Report) to support the Bases.

As provided in 10 CFR 50.90, whenever a holder of an operating license desires to amend the license, application for an amendment must be filed with the Commission fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

In determining whether an amendment to a license will be issued to the applicant, 10 CFR 50.92(a) states that the Commission will be guided by the considerations that govern the issuance of initial licenses to the extent applicable and appropriate. Considerations common to many licenses and permits that guide the Commission's determination that a license will be issued are provided in 10 CFR § 50.40. The findings that the Commission must make to issue an operating license are given in 10 CFR § 50.57(a). Per 10 CFR 50.36(c), TS will include items in, among other things, the following categories: (1) safety limits, limiting safety system settings, and limiting control settings; (2) LCOs; (3) SRs; (4) design features; and (5) administrative controls.

Spent Fuel Storage and Handling Design Bases

The NRC Standard Review Plan (SRP) for the Review of Safety Analysis Reports (SARs) for Nuclear Power Plants, NUREG-0800, provided guidance for NRC staff review in Section 9.1.3, "Spent Fuel Pool Cooling and Cleanup System," (ADAMS Accession No. ML063190013). The NRC SRP listed specific acceptance criteria derived from applicable General Design Criteria and other NRC regulations and a method acceptable to the staff to demonstrate compliance with those acceptance criteria for various SSCs at commercial Light Water Reactors. The review criteria in Paragraph III.1.H of SRP Section 9.1.3, Revision 2, specified the following SFP cooling system considerations for SFP coolant temperature control:

> The system design provides adequate SFP cooling capacity for routine operations, including refueling. The staff reviews either a bounding evaluation of potential refueling conditions or a method of performing outage-specific evaluations described in the SAR. The largest heat load placed on the SFPCCS [spent fuel pool cooling and cleanup system] heat exchangers is imposed by refueling offloads, which are deliberate, planned evolutions. As a result, if necessary for adequate cooling of the fuel, factors that increase heat load (e.g., power increases, decay time reductions, or storage capacity increases) may be offset by operational factors that reduce heat load (e.g., longer decay times or transfer of fewer fuel assemblies to the SFP) or that increase heat removal

capability (e.g., scheduling offloads for periods of reduced ultimate heat sink temperature or optimizing cooling system performance).

Considering the preceding measures to manage the heat load relative to cooling capability, the staff evaluates the following criteria:

i. The SAR describes a method of performing decay heat load calculations using a conservative model that evaluates multiple fission product groups and considers offload size, decay time, power history, and inventory of previously discharged assemblies.

ii. The SAR describes a method of calculating heat removal capability for a bulk SFP temperature of 60 °C (140°F) and considering ultimate heat sink temperature, cooling system flow rates, and heat exchanger performance (i.e., fouling and tube plugging margin).

iii. The SAR describes appropriate administrative controls in the SAR to ensure that the full heat removal capability at a SFP temperature of 60°C (140°F) will exceed the calculated decay heat load at all times during the refueling offload.

Thus, the NRC staff has accepted control of SFP temperature through methods that credit lower cooling water temperature at higher heat loads resulting from shorter decay times.

Other considerations related to increased heat load include ensuring sufficient heat-up time would be available to align permanently-installed make-up water systems or to configure temporary systems for make-up in the event of a loss of forced cooling. The staff has generally accepted heat-up times of two hours or more as adequate for this purpose.

2.2 System Description

The MPS2 reactor discharges fuel to a single SFP to allow for refueling. Preparation for refueling of the reactor involves the following activities: reactor shutdown and cooldown, detensioning of the reactor vessel head, removal of the flange covering the fuel transfer path through the containment wall, flooding of the refueling cavity, and removal of the reactor head and upper internals. Once preparations are complete and the minimum in-reactor decay time has been satisfied, operators may begin the transfer of fuel through the flooded refueling cavity and fuel transfer path to the SFP.

The MPS2 FSAR considers the decay time of irradiated fuel in two analyses. Section 14.7.4, "Radiological Consequences of a Fuel Handling Accident (FHA)," lists decay time among many assumptions used to determine the radiological consequences of FHAs in the SFP and inside containment during reactor refueling. Section 9.5, "Spent Fuel Pool Cooling (SFPC) system," includes in-reactor decay time as an assumption used to determine the decay heat rate of the

fuel most recently discharged to the SFP. Both of these analyses had been included in TS Bases Section 3/4.9.3.[1]

The MPS2 safety analysis for the FHA assumes that the accident results in damage to the cladding of all fuel pins in one assembly. This damage allows release of the gap fission product activity. The analysis also assumes a minimum decay time as an initial condition that establishes the reduction in short-lived fission product activity after reactor shutdown.

The current design basis analyses for FHAs in containment and in the SFP applies a 100-hour decay time as an initial condition to establish the inventory of radioactive fission products within the gap of the fuel pins of the limiting fuel assembly. The design basis analysis used assumptions derived from Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," (ADAMS Accession No. ML003716792), and the NRC staff approved the analysis for implementation at MPS2 as part of License Amendment No. 284, "Issuance of Amendment Re: Selective Implementation of Alternate Source Term (TAC No. MB6479)," dated September 20, 2004 (ADAMS Accession No. ML042650362). The full implementation of the alternative source term in subsequent License Amendment No. 298, "Issuance of Amendment Regarding Alternate Source Term," dated May 31, 2007 (ADAMS Accession No. ML071450053) did not alter the assumptions and initial conditions used in the FHA analyses. The staff notes that the only design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier applicable to fuel movement from the reactor vessel to the SFP is the FHA. The FHA analysis includes assumptions for initial plant conditions and may credit systems as part of the success path in maintaining radiological dose within prescribed limits.

The SFPC system removes decay heat from the SFP. The spent fuel cooling system consists of one seismically qualified cooling train, which includes two full-capacity pumps and two heat exchangers in parallel. Heat is removed from the spent fuel cooling system heat exchangers by the safety-related Component Cooling Water (CCW) system.

The Shutdown Cooling (SDC) system design permits operator alignment of the system to supplement or replace the SFP cooling provided by the SFPC system. The SDC system heat removal capacity greatly exceeds that of the SFPC system, and use of the SDC system for SFP cooling may be necessary to maintain SFP temperature within design limits during and immediately following refueling when the SFP decay heat load is highest. In the refueling mode of operation with the refueling cavity flooded, operators may split flow from one train of the SDC system to cool both the reactor vessel water and the SFP. The CCW system removes heat from the SDC system heat exchangers.

2.3 <u>Background and Description of Proposed Changes</u>

In an application dated July 21, 2010 (ADAMS Accession No. ML102240064), DNC submitted an LAR to revise TS 3/4.9.3.1, "Decay Time," and a corresponding change to SR 4.9.3.1 for

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[1] The requirements of 10 CFR 50.36(c)(2)(ii) specify that LCOs be established for equipment or conditions satisfying any one of the four criteria. As an initial condition of a DBA analysis (the FHA analysis) that assumes the failure of a fission product barrier (the fuel cladding), the decay time is applicable to Criterion 2 of 10 CFR 50.36(c)(2)(ii).

MPS2. Specifically, DNC proposed to reduce the minimum decay time for irradiated fuel prior to movement in the reactor vessel from 150 hours to 100 hours. On June 4, 2013, the NRC approved the LAR under License Amendment No. 315 (ADAMS Accession No. ML13072B341).

On April 29, 2015, the NRC informed DNC of apparent violation pertaining to changes made by DNC under 10 CFR 50.59 to support the July 21, 2010 LAR. Specifically, the NRC informed DNC that changes made to the MPS2 FSAR Section 9.5 and MPS2 TS Bases Section 3/4.9.3 should not have been made without obtaining a license amendment.

As a result of the apparent violation, Confirmatory Order EA-13-188 was issued on August 25, 2015, requiring DNC in part, to submit an LAR requesting NRC approval of the SFP heat load analysis and any associated TS changes. In response to the confirmatory order, DNC submitted its application dated January 26, 2016, requesting NRC approval of proposed changes to FSAR Section 9.5 and TS Bases Section 3/4.9.3. The SFP heat load analyses which supported the proposed FSAR and TS Bases changes were also submitted as Attachment 4 to the LAR.

The licensee provided the mark-up of the 2010 revision to the MPS2 FSAR Section 9.5 that described conditions for movement of irradiated fuel with 100 hours of decay, which had been implemented pursuant to 10 CFR 50.59. The SFPC system design basis described in the MPS2 FSAR specifies that the pool temperature will be maintained at no more than 150°F. The design basis analyses included normal refueling partial core discharges with cooling provided by the SFPC system only and normal refueling full core discharges with cooling provided by the SFPC system assisted by the SDC system. The revised version of Section 9.5 to the MPS2 FSAR included analyses of discharges with both 100 hours and 150 hours of decay. The analyses of SFP temperature for discharges with 150 hours decay indicated adequate cooling would be provided at CCW temperatures no higher than 85°F at a fuel transfer rate of 6 assemblies per hour. The analyses of SFP temperature for discharges with 100 hours decay indicated that adequate cooling would be provided at CCW temperatures no higher than 75°F at a fuel transfer rate of 6 assemblies per hour. The licensee provided the mark-up of the 2010 change to Section 9.5 of the MPS2 FSAR as Attachment 3 to the LAR letter dated January 26, 2016. In response to a staff request for additional information, the licensee provided revisions to the markup of three of the pages in MPS2 FSAR Section 9.5 as Attachment 2 to the letter dated July 14, 2016.

3.0 TECHNICAL EVALUATION

3.1 Safety Analysis Report Revision

The licensee indicated that upon approval of the amendment request, procedures would be modified to administratively control decay time after 100 hours based on the CCW temperature. This approach has been accepted by the NRC staff as an appropriate means to control SFP temperature, as specified among the review criteria in SRP Section 9.1.3. These review criteria include the following elements:

- A method to determine the decay heat rate
- A method to determine the heat removal rate of the cooling system
- Administrative controls to ensure the heat removal rate at the pool design temperature would exceed the decay heat rate.

In Attachment 4 to the LAR, the licensee provided three proprietary SFP analyses in support of the revision to Section 9.5 of the MPS2 FSAR. These analyses were prepared by Holtec International and consisted of the following proprietary reports:

- HI-971778, Revision 2, "Heat Load from the Spent Fuel Pool for 3 Core Unload Scenarios," 2009.
- HI-981901, Revision 0, "SFP Thermal-Hydraulic Analysis for Millstone Unit 2," 1998 (analysis of heat exchanger performance and scenarios with150-hour decay time).
- HI-2094491, Revision 0, "Thermal-Hydraulic Analysis of Millstone Point Unit 2 Spent Fuel Pool with Increased Fuel Transfer Rate and reduced In-Core Hold Time," 2010.

The first report, HI-971778, evaluated the decay heat resulting from the current inventory of irradiated fuel, projected discharges to fill all storage locations except those required for refueling, and the refueling discharge that results in the pool storage locations becoming completely filled. The decay heat calculation used the ORIGEN-2 model to determine decay heat levels. The output provided the total SFP decay heat as a function of time following the beginning of fuel transfer for various refueling batch sizes and refueling scenarios.

The original calculation assumed discharge of fuel for refueling at a rate of 4 assemblies per hour after a 150-hour in-core hold time with a total fuel inventory exceeding the actual SFP storage capacity. Each assembly in projected discharges was assumed to have an average burnup of 60 gigawatt-days/metric-ton uranium (GW-d/MTU) for fuel with a 5.0-percent enrichment; the decay heat for older fuel was determined using actual burnup and enrichment values. The first supplement modified these assumptions to limit the fuel inventory to the actual capacity of the SFP, and for projected discharges, assumed an average burnup of 56 GW-d/MTU for fuel with a 4.5% enrichment. The second supplement to the calculation, which was added by the second revision in 2009, evaluated the decay heat rate as a function of time after reactor shutdown assuming an in-core hold time of 100 hours and fuel offload at a rate of 6 assemblies per hour for the following cases: (1) a normal refueling batch offload, (2) an emergency full-core offload, and (3) a full core offload in conjunction with a normal refueling.

The staff evaluated the effect of the proposed changes for in-core hold time and fuel transfer rate on the SFP decay heat load. Since the refueling contribution to the total SFP decay heat load is greatest for the full core offload in conjunction with a normal refueling, the staff focused on that refueling scenario. The results of the decay heat analyses indicated that the contribution from a full core offload in conjunction with a normal refueling at the peak decay heat load would increase from 25.47 million British Thermal Unit (BTU) per hour (MBTU/hr) (150 hour in-core hold time with fuel transfer at 4 assemblies per hour) to 30.18 MBTU/hr (100 hour in-core hold time with fuel transfer at 6 assemblies per hour). The staff determined that this increase of about 18 percent was consistent with results obtained by use of simplified methods of estimating decay heat provided in Branch Technical Position ASB 9-2, "Residual Decay Energy for Light-Water Reactors for Long term Cooling," contained in Revision 2 to Section 9.2.5, "Ultimate Heat Sink," of NUREG-0800. For the same conditions, the licensee calculated that the total SFP decay heat load would increase from 29.88 MBTU/hr to 34.59 MBTU/hr, which is an increase of 15.8 percent. Since the ORIGEN-2 model used in the report considers multiple

fission product groups, has been previously accepted by the NRC staff, and provided results consistent with simplified methods, the staff finds the method used to calculate the increase in decay heat to be acceptable.

The staff also evaluated the thermal-hydraulic response of the SFP to the increased decay heat load. The Report HI-981901 provided an analysis of heat exchanger performance and SFP temperature response to scenarios with150-hour decay time. In Report HI-2094491, the licensee provided an update to the earlier report reflecting the decrease in allowable in-core hold time and the increase in the fuel transfer rate. In addition to evaluating the SFP response to various fuel offload scenarios and cooling system operational configurations, the updated report included evaluations of the effect of CCW inlet temperature changes on the SFP temperature response. The analysis results indicated that a decrease in CCW temperature from 85°F to 75°F would allow the SFPC system to maintain SFP temperature below 150°F for the normal batch refueling following a 100 hour in-core hold time assuming only one of the two installed pumps was operating. Similarly, the analysis indicated that a decrease in CCW temperature from 85°F to 75°F would allow one train of the SDC system to maintain SFP temperature below 150°F for a full core offload as part of either a normal refueling or emergency offload assuming the SDC flow to the SFP was increased from 1000 gallons per minute (gpm) to 1900 gpm at 120 hours after reactor shutdown, which is approximately halfway through the assumed fuel offload.

The staff compared the maximum increase in calculated decay heat rate resulting from the reduced decay time to the increased cooling capability provided by the specified reduction in CCW temperature. Using the temperature effectiveness method of heat exchanger performance analysis, the staff determined that the decrease in CCW temperature from 85°F to 75°F would increase the heat removal capability by about 15 percent when the SFP temperature is at its design maximum of 150°F and all other parameters (e.g., flow rates and physical properties of water) are unchanged. Thus, the staff finds the additional heat removal capability provided by the CCW temperature reduction would be comparable to the maximum increase in decay heat generation rate resulting from the proposed decrease in decay time. Therefore, the staff has reasonable assurance that the licensee's analysis results were correct and the higher decay heat from the proposed decrease in decay time would be adequately compensated by increased heat removal capacity provided by the specified lower CCW temperatures.

The staff reviewed the proposed markup of Section 9.5 of the MPS2 FSAR and found that the following statements did not clearly describe how operation of the cooling systems would be managed:

> In the event of a full core offload, the spent fuel pool water temperature will be limited to 150°F. This would utilize one train of the shutdown cooling system for the limiting emergency full core offload. Under less limiting full core offload conditions, the Spent Fuel Pool Cooling system or Spent Fuel Pool Cooling supplemented by the Shutdown Cooling system may be used, provided that a Spent Fuel Pool temperature of less than 150°F is maintained.

and:

> While the above analysis is for the limiting heat load case at end of plant life, it is acceptable to use SFP cooling, or SFP cooling supplemented by lesser amounts of SDC, during any portion of the core offload, provided that spent fuel pool bulk water temperature can be maintained below 150°F.

To clarify these statements, the staff requested that the licensee explain how operating procedures control SFP cooling to ensure the SFP temperature does not exceed the operating temperature limit of 150°F. In the licensee response dated July 14, 2016, the licensee provided the following explanation:

> During normal plant operation, temperature in the SFP is typically below 100°F and plant operating procedures limit SFP temperature to a conservative temperature of 120°F. SFP temperatures increase during fuel movement from the reactor to the SFP. Prior to reaching the 120°F limit, operators begin the transition from SFP Cooling to SDC. When the majority of the fuel remains in the reactor, operators augment SFP Cooling with up to 500 gpm of SDC. As more fuel is moved to the SFP and the reactor coolant temperature decreases, the operators secure SFP Cooling and re-align SDC to provide up to 1900 gpm to the SFP.

In Attachment 2 to the letter dated July 14, 2016, the licensee indicated the following statement would be added to MPS2 FSAR Section 9.5 in the text describing a full core offload during normal refueling:

> During the refueling evolution, cooling is transitioned from the spent fuel pool cooling system to the shutdown cooling system when the temperature in the spent fuel pool is observed to rise. This transition begins before challenging the conservatively established normal operating pool temperature limit of 120°F.

The staff reviewed these clarifying statements and find the statements are sufficient to clarify management of SFP cooling during the high decay heat loads associated with a full core offload. The staff finds that the licensee appropriately includes measures to manage the heat load relative to cooling capability and the licensee's SAR describes the appropriate administrative controls to ensure that the full heat removal capability is greater than the calculated decay heat load at all times during the refueling offload. Therefore, the staff concludes that the licensee demonstrates compliance with the review criteria in paragraph III.1.H of SRP Section 9.1.3.

The staff reviewed the proposed markup of Section 9.5 of the MPS2 FSAR, as supplemented by the proposed changes in Attachment 2 to the letter dated July 14, 2016, to verify consistency with the analyses. Based on the above evaluation, the staff finds that the information provided in proposed FSAR Section 9.5 is reasonably complete and accurate with respect to the results of the revised analyses. Therefore, the staff concludes that the proposed FSAR changes are acceptable and satisfy the requirements of 10 CFR 50.34(b) which specifies the content requirements for the UFSAR.

3.2 Technical Specification Bases Change

The licensee proposed changes to the basis of TS 3/4.9.3.1 (by revising TS Bases Section 3.4.9.3 "Decay Time") that would retain the reference to the decay of short-lived fission products and remove reference to the SFP decay heat load (i.e., the bases of TS 3.9.3 would only reflect the assumed fuel decay time used in evaluating the consequences of the design basis FHA). Per 10 CFR 50.36(a)(1), each applicant for a license authorizing operation of a utilization facility shall include in its application proposed technical specifications in accordance with the requirements of 10 CFR 50.36. Further, a summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications.

The decay time of irradiated fuel is used as an initial condition in the FHA dose consequence analysis to determine the extent of decay of short-lived fission products. Therefore, the TS LCO for refueling decay time (i.e., TS 3/4.9.3.1) must be consistent with or bound the value used in the FHA dose consequence analysis. As noted above, the NRC approved the FHA analysis of record at MPS2 as part of License Amendment No. 284 dated September 20, 2004. This analysis used a decay time of 100 hours as the initial condition of the analysis, and TS LCO 3/4.9.3.1 specifies that the reactor be subcritical for a minimum of 100 hours prior to movement of irradiated fuel in the reactor pressure vessel.

The decay time is also used as an input to determine the decay heat load from discharged fuel in the transient analyses of SFP temperature during refueling. However, the SFP temperature transient analysis neither assumes the failure of, nor presents a challenge to, the integrity of a fission product barrier because the pool temperature remains well within the design of the fuel cladding regardless of the decay time. Therefore, the decay time used in the SFP temperature transient analysis is not among those operating constraints which should be included in the TSs in accordance with the Commission's policy statement at 58 FR 39132.

As discussed in Section 3.1 of this safety evaluation (SE), the NRC staff determined that the proposed FSAR changes are acceptable and satisfy the requirements of 10 CFR 50.34(b) which specifies the content requirements for the UFSAR. In accordance with 10 CFR 50.36(b), the TSs are to be derived from the analyses and evaluation included in the FSAR. In addition to the changes to the FSAR, the licensee provided the mark-up changes to the TS Bases Section 3/4.9.3 based on the 2010 revision in effect when the changes were performed under 10 CFR 50.59. As described in TS Section 6.23, the licensee maintains a TS Bases Control Program. TS Section 6.23.c states that the Bases Control Program shall contain provisions to ensure that the Bases are maintained consistent with the FSAR. Accordingly, the NRC expects the licensee to update its TS Bases in a manner consistent with the information provided in the LAR dated January 26, 2016, as supplemented by letter dated June 14, 2016.

3.3 NRC Staff Conclusion

The staff has reviewed the licensee's proposed changes to the bases for TS 3/4.9.3.1 and MPS2 FSAR Section 9.5. Based on the considerations discussed above, the NRC staff concludes that the proposed reduction of in-core hold time from 150 hours to 100 hours under specific conditions, as described in the proposed revision to Section 9.5 of the MPS2 FSAR, is

adequately supported by analyses demonstrating that the additional decay heat could be accommodated by the improved cooling system performance under the specified conditions. As indicated in Section 3.2 of this SE, the licensee did not propose a revision to TS 3/4.9.3.1, "Decay Time," as previously approved by License Amendment No. 315. The NRC staff notes that its conclusions documented in the June 4, 2013, SE, remain valid and are consistent with the staff's findings for this license amendment request. The staff concludes that the licensee has proposed an acceptable method to accommodate the increased SFP decay heat generation rate by specifying administrative controls on CCW temperature and cooling system operation to ensure adequate heat removal capability would be available.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Connecticut State official was notified on October 5, 2016, of the proposed issuance of the amendment. The State official had no comments.

5.0 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. The NRC staff has determined that no significant change in the types or significant increase in the amounts 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 (81 FR 32804). 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.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, 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) there is reasonable assurance that 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.

Principal Contributor: Steve Jones

Date: November 29, 2016

November 29, 2016

Mr. David A. Heacock
President and Chief Nuclear Officer
Dominion Nuclear
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 2 - ISSUANCE OF AMENDMENT REGARDING THE REVISION OF SPENT FUEL POOL DECAY HEAT ANALYSIS DESCRIPTION (CAC NO. MF7333)

Dear Mr. Heacock:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 330 to Renewed Facility Operating License No. DPR-65 for the Millstone Power Station, Unit No. 2 (MPS2), in response to your application dated January 26, 2016, as supplemented on July 14, 2016.

The amendment revises the MPS2 licensing basis to change the spent fuel pool (SFP) heat load analysis description contained in the Final Safety Analysis Report (FSAR). Specifically, the amendment revises MPS2 FSAR Section 9.5 to allow irradiated fuel movement in the reactor vessel to begin 100 hours after reactor subcriticality at an average rate of six fuel assemblies per hour.

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/

Richard V. Guzman, Sr. Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-336

Enclosures:
1. Amendment No. 330 to DPR-65
2. Safety Evaluation

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Accession No.: ML16277A680 * See memo dated August 24, 2016

OFFICE	DORL/LPL1-1/PM	DORL/LPL1-1/LA	DSS/SBPB/BC*	DSS/STSB/BC
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DATE	10/11/16	10/11/16	8/24/16	11/22/16
OFFICE	OGC	DORL/LPL1-1/BC	DORL/LPL1-1/PM	
NAME	DRoth	DPickett	RGuzman	
DATE	11/22/16	11/29/16	11/29/16	

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