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

January 11, 2018

Vice President, Operations
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 – ISSUANCE OF AMENDMENT RE: CONNECTION OF NON-SEISMIC BORIC ACID RECOVERY SYSTEM TO THE REFUELING WATER STORAGE TANK (CAC NO. MF9578; EPID L-2017-LLA-0202)

Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 288 to Facility Operating License No. DPR-26 for Indian Point Nuclear Generating Unit No. 2. The amendment consists of changes to the Technical Specifications in response to your application dated April 7, 2017, as supplemented by letter dated August 17, 2017.

The amendment revises Technical Specification Section 3.5.4, "Refueling Water Storage Tank (RWST)," to allow for the temporary connection between the non-seismically qualified piping of the boric acid recovery system to the seismically qualified piping of the RWST for the purpose of purifying the contents of the RWST in advance of the Indian Point Nuclear Generating Unit No. 2 spring 2018 refueling outage. Operation in this mode will be under administrative controls and will only be applicable through the end of the spring 2018 refueling outage.

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

Sincerely,

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

Docket No. 50-247

Enclosures:
1. Amendment No. 288 to DPR-26
2. Safety Evaluation

cc w/Enclosures: Distribution via Listserv

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

ENTERGY NUCLEAR INDIAN POINT 2, LLC

ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-247

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 288
License No. DPR-26

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

   A. The application for amendment by Entergy Nuclear Operations, Inc. (the licensee) dated April 7, 2017, as supplemented by letter dated August 17, 2017, 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 Facility Operating License No. DPR-26 is hereby amended to read as follows:

   (B) Technical Specifications

   The Technical Specifications contained in Appendices A, B and C, as revised through Amendment No. 288, are hereby incorporated in the license. ENO shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Michael J. Marshall for

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the License and
Technical Specifications

Date of Issuance: January 11, 2018

ATTACHMENT TO LICENSE AMENDMENT NO. 288

FACILITY OPERATING LICENSE NO. DPR-26

DOCKET NO. 50-247

Replace the following page of the license with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove Page	Insert Page
3	3

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove Page	Insert Page
3.5.4-1	3.5.4-1

instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) ENO 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 calibration or associated with radioactive apparatus or components; Amdt. 42 10-17-78

(5) ENO 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. Amdt. 220 09-06-01

C. This amended license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; is subject to all applicable provisions of the Act and to 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) Maximum Power Level

ENO is authorized to operate the facility at steady state reactor core power levels not in excess of 3216 megawatts thermal Amdt. 241 10-27-04

(2) Technical Specifications

The Technical Specifications contained in Appendices A, B, and C, as revised through Amendment No. 288, are hereby incorporated in the license. ENO shall operate the facility in accordance with the Technical Specifications.

(3) The following conditions relate to the amendment approving the conversion to Improved Standard Technical Specifications:

1. This amendment authorizes the relocation of certain Technical Specification requirements and detailed information to licensee controlled documents as described in Table R, "Relocated Technical Specifications from the CTS," and Table LA, "Removed Details and Less Restrictive Administrative Changes to the CTS" attached to the NRC staff's Safety Evaluation enclosed with this amendment. The relocation of requirements and detailed information shall be completed on or before the implementation of this amendment.

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.4 Refueling Water Storage Tank (RWST)

LCO 3.5.4 The RWST shall be OPERABLE.

- NOTE -

The RWST isolation valves 350, 727A and 845 connected to non-safety related piping may be opened under administrative controls for up to 30 days per fuel cycle for filtration until the end of Refueling Outage 2R23.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RWST boron concentration not within limits. OR RWST borated water temperature not within limits.	A.1 Restore RWST to OPERABLE status.	8 hours
B. One of the two required channels of the RWST level low low alarm inoperable.	B.1 Restore RWST level low low alarm to OPERABLE status.	7 days
C. RWST inoperable for reasons other than Condition A or B.	C.1 Restore RWST to OPERABLE status.	1 hour
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3. AND --------- NOTE ---------- LCO 3.0.4.a is not applicable when entering MODE 4. ---------- D.2 Be in MODE 4.	6 hours 12 hours

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 288

FACILITY OPERATING LICENSE NO. DPR-26

ENTERGY NUCLEAR OPERATIONS, INC.

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2

DOCKET NO. 50-247

1.0 INTRODUCTION

By letter dated April 7, 2017 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML17104A039), as supplemented by letter dated August 17, 2017 (ADAMS Accession No. ML17234A320), Entergy Nuclear Operations, Inc. (Entergy, the licensee) submitted a license amendment request (LAR) for the Indian Point Nuclear Generating Unit No. 2 (Indian Point 2) Technical Specifications (TSs). The proposed change would revise TS Section 3.5.4, "Refueling Water Storage Tank (RWST)," so that the non-seismically qualified piping of the boric acid recovery system (BARS) may be temporarily connected to the RWST seismic piping. Operation of the BARS from the RWST will be under administrative controls for a limited period of time (i.e., 30 days for RWST filtration until the end of the Indian Point 2 spring 2018 refueling outage (RFO) 2R23. This change is only applicable until the end of RFO 2R23.

Historically, Indian Point 2 periodically connected the non-seismic reverse osmosis system, known as the BARS, to the seismic spent fuel pool (SFP) purification loop to filter the RWST water while in plant conditions and modes for which the RWST was required to be operable. The licensee used this alignment prior to RFOs to remove silica and filter the RWST water. During RFOs, RWST water is used to flood the refueling cavity to support fuel movement. Filtering the RWST water in advance of the RFO is highly desirable in order to remove suspended solids and improve water clarity so that refueling bridge operators can clearly identify fuel assemblies prior to fuel movement. Filtering the RWST contents can also reduce the activity and reduce accumulated dose to plant personnel. As indicated by the licensee in its LAR, prior to RFO 2R22, the RWST was recirculated to the reverse osmosis system for a total of 15 days, resulting in a silica concentration of 1.05 parts per million (ppm). Similarly, prior to RFO 2R20, the RWST was recirculated for a total of 13 days, resulting in a silica concentration of less than 1.1 ppm.

This operation was discontinued following the issuance of U.S. Nuclear Regulatory Commission (NRC or the Commission) Information Notice (IN) 2012-01 "Seismic Considerations – Principally Issues Involving Tanks," on January 26, 2012 (ADAMS Accession No. ML11292A175). IN 2012-01 provides examples and references to events in which licensees failed to recognize

various seismic considerations and system alignment issues that could impact safety. Examples are identified where licensees failed to recognize that aligning non-seismic piping to the RWST would require TS limiting conditions for operation action statement entry, system modifications, or license amendments. The IN noted that the TSs would not allow applying compensatory measures, such as manual operator actions in place of the closed boundary valve, for periods longer than the TS completion time for restoring the RWST to operable status, unless the TSs expressly permit operation under such measures.

The licensee recognized the circumstances described in IN 2012-01, including the need to apply for an amendment of TS 3.5.4 so that the TS would expressly permit operation under the specific circumstances of RWST recirculation for filtration to improve the quality of the water for refueling activities. Accordingly, the licensee submitted an LAR dated April 15, 2013 (ADAMS Accession No. ML13116A007), to seek NRC approval to permit non-seismically qualified piping of the BARS to be connected to the refueling water storage tank seismic piping under administrative controls for a limited period of time in order to purify the contents of the RWST. This would be accomplished by realigning manual valves that are designated as American Society of Mechanical Engineers (ASME) Code boundary valves. The piping configuration would only be permitted for a maximum of 30 days prior to the spring 2014 and 2016 RFOs for Indian Point 2. The NRC approved the amendment request and issued License Amendment No. 273 to Facility Operating License No. DPR-26 (ADAMS Accession No. ML13326A047), dated December 20, 2013. The amendment was effective up to the end of RFO R22 in spring 2016.

Following the spring 2016 RFO, the licensee intended to install a permanent modification so that connection of seismic and non-seismic piping would not be necessary to filter the RWST water. However, due to the planned permanent cessation of Indian Point 2 power operation in April 2020, as requested in Entergy letter NL-17-021, dated February 8, 2017 (ADAMS Accession No. ML17044A004), and considering that RFO 2R23 will likely be the final RFO for Indian Point 2, there would be limited benefits for the planned modification.

The licensee has proposed to add the following note to TS 3.5.4:

> The RWST isolation valves 350, 727A and 845 connected to non-safety related piping may be opened under administrative controls for up to 30 days per fuel cycle for filtration until the end of Refueling Outage 2R23.

The supplemental letter dated August 17, 2017, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 18, 2017 (82 FR 32881)

2.0 REGULATORY EVALUATION

The following explains the applicability of General Design Criteria for Nuclear Power Plants (GDC) for Indian Point 2. The construction permit for Indian Point 2 was issued by the Atomic Energy Commission on October 14, 1966, and the operating license was issued on September 28, 1973. The plant GDC are discussed in the Updated Final Safety Analysis Report (UFSAR) Chapter 1.3, "General Design Criteria," with more details given in the applicable UFSAR sections. The Atomic Energy Commission published the final rule that added Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," in the *Federal Register* (36 FR 3255) on February 20, 1971,

with the rule effective on May 21, 1971. In accordance with an NRC staff requirements memorandum from S. J. Chilk to J. M. Taylor, "SECY-92-223 – Resolution of Deviations Identified During the Systematic Evaluation Program," dated September 18, 1992 (ADAMS Accession No. ML003763736), the Commission decided not to apply the Appendix A GDC to plants with construction permits issued prior to May 21, 1971. Therefore, the GDC that constitute the licensing bases for Indian Point 2 are those in the UFSAR.

As discussed in the UFSAR, the licensee for Indian Point 2 has made some changes to the facility over the life of the unit that have committed to some of the GDC from 10 CFR Part 50, Appendix A. The extent to which the Appendix A GDC have been invoked can be found in specific sections of the UFSAR and in other Indian Point 2 licensing basis documentation, such as license amendments.

The regulatory requirements and guidance that the NRC staff considered in its review of the LAR are as follows:

Section 50.36, "Technical specifications," of 10 CFR, which establishes the regulatory requirements related to the contents of the TSs. Pursuant to 10 CFR 50.36, TSs are required to include items in the following specific categories related to station operation: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation (LCOs); (3) surveillance requirements; (4) design features; and (5) administrative controls. In accordance with 10 CFR 50.36(c)(2), LCOs are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When an LCO of a nuclear reactor is not met, the licensee must shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met.

Section 50.67, "Accident source term," paragraph (b)(2) of 10 CFR, which states:

> (i) 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 0.25 Sv [Seiverts] (25 rem [roentgen equivalent man]) total effective dose equivalent (TEDE).
>
> (ii) An individual located at any point on the outer boundary of the low population zone, 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 0.25 Sv (25 rem) total effective dose equivalent (TEDE).
>
> (iii) Adequate radiation protection is provided to permit access to and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 0.05 Sv (5 rem) total effective dose equivalent (TEDE) for the duration of the accident.

Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," GDC 19, "Control room," which states:

> A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving

> radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident. Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.

GDC 2, "Design bases for protection against natural phenomena," which requires, in part, that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches, without the loss of the capability to perform their safety functions.

GDC 35, "Emergency core cooling," which requires, in part, that a system provide abundant emergency core cooling. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal-water reaction is limited to negligible amounts.

Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors" (ADAMS Accession No. ML003716792), July 2000, which provides the methodology for analyzing the radiological consequences of several design-basis accidents to show compliance with 10 CFR 50.67. RG 1.183 provides guidance to licensees on acceptable application of alternate source term (AST) submittals,[1] including acceptable radiological analysis assumptions for use in conjunction with the accepted AST.

NUREG-1764, Revision 1, "Guidance for the Review of Changes to Human Actions" (ADAMS Accession No. ML072640413), which provides guidance for NRC staff for the level of review for LARs.

The Indian Point 2 UFSAR Section 1.3.1, "Overall Plant Requirements (GDC1-GDC5)," which states, in part:

> All systems and components designated Class I are designed so that there is no loss of function in the event of the maximum potential ground acceleration acting in the horizontal and vertical directions simultaneously. The working stresses of both Class I and Class II items are kept within code allowable values for the operational basis earthquake.

IN 2012-01, which communicates operating experience involving operability of the RWST at the Shearon Harris Nuclear Power Plant. The seismically qualified RWST was aligned to the non-seismically qualified fuel pool purification system for purification of the RWST contents, creating a breach of the seismically qualified boundary and resulting in the inoperability of the RWST. The plant credited operator action, if needed, to close the open valve at the seismically qualified boundary and declared the RWST operable for the duration of the planned purification

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[1] License Amendment 241, dated October 27, 2004 (ADAMS Accession No. ML042960007), "Indian Point Nuclear Generating Unit No. 2 – Issuance of Amendment Re: 3.26 Percent Power Uprate," used an AST methodology for analyzing the radiological consequences of seven design-basis accidents using RG 1.183.

activity. It was determined by the NRC staff that, while entry into a TS action statement is allowable for maintenance or surveillances, the TS does not allow compensatory measures to be credited for periods longer than the TS completion time unless the TS expressly allows operation in that condition.

3.0 TECHNICAL EVALUATION

As discussed above, the proposed change would revise TS 3.5.4 such that the non-seismically qualified piping of the skid-mounted BARS may be temporarily connected to the RWST seismic piping. Operation of the BARS from the RWST will be under administrative controls for a limited period of time (i.e., 30 days for RWST filtration prior to each fuel cycle). This change is only applicable until the end of RFO 2R23. The proposed change would add the following note to TS 3.5.4:

> The RWST isolation valves 350, 727A and 845 connected to non-safety related piping may be opened under administrative controls for up to 30 days per fuel cycle for filtration until the end of Refueling Outage 2R23.

This change supports recirculation of the contents of the RWST through the BARS during Modes 1 through 4 for the purpose of silica filtration. This safety evaluation addresses the systems review, component performance and testing, impact of the proposed change on planned operator actions to appropriately maneuver the plant during this configuration, and previously analyzed design-basis accident radiological consequences.

3.1 Systems Review

During plant operation in Modes 1 through 4, the RWST is required to be operable to maintain a borated water supply for accident mitigation purposes. The RWST is aligned to the suction of the high head safety injection pumps, the residual heat removal pumps, and the containment spray pumps during normal operation in Modes 1 through 4. The suction of the charging pumps is automatically aligned to the RWST on a safety injection signal. During refueling operation in Modes 5 and 6, the RWST is required to be operable as a borated water supply, should the boric acid storage system not be operable. The contents of the RWST are also used to flood the refueling cavity during refueling operations. The water in the RWST is borated to a concentration sufficient to ensure shutdown margin is maintained when the reactor is at cold shutdown conditions, should RWST water be added to the reactor.

The BARS is a non-seismic skid-mounted unit that is temporarily connected to seismic-designed piping for the purpose of removing silica that has accumulated from the gradual deterioration of Boraflex inserts in the Unit No. 2 SFP. System operation of the BARS is initiated by opening normally-closed 2-inch manual valves 845 and 727A that allow RWST water to flow from the 16-inch emergency core cooling system (ECCS) header to the refueling water purification pump. A temporary alignment permits the BARS to take suction from manual valve 725, which is located on the discharge side of the refueling water purification pump. The temporary alignment is created by removing the bonnet and internals from valve 725 and installing a hose adapter plate. The piping and manual valves 845, 727A, and 725 leading to the BARS suction line are all seismically designed. The BARS discharge line is connected to 2-inch manual valve 350 by temporarily removing a 2-inch flange and installing a hose adapter plate. Manual valve 350 is also seismically designed and leads directly back to the RWST.

As described in Section 9.3.2 of the Indian Point 2 UFSAR, water from the RWST can be purified by pumping it via the refueling water purification pump to the SFP demineralizer and filter. However, the licensee will use the BARS to filter the RWST. Before installation of the BARS, the licensee will procedurally isolate the SFP from the SFP demineralizer by shutting valves 719A and 719B and isolate the BARS from the SFP by danger tagging shut valves 705 and 709. Therefore, the proposed system alignment will not interfere with the seismically designed SFP cooling system and will not create the possibility to drain the SFP to an unsafe level. As a result, the NRC staff finds that the proposed system alignment will not impact the SFP or SFP cooling system as described in the Indian Point 2 UFSAR.

The licensee proposes to add a note to TS 3.5.4 to allow the BARS to be aligned to the RWST to filter the RWST water for up to 30 days per fuel cycle until the end of RFO 23. The note would allow this alignment under administrative controls. Administrative controls include procedures to isolate the BARS based on events or direction from the control room. Methods of communication between the operator and the control room are discussed in the procedures.

The licensee justifies the connection of the non-seismic BARS to the seismic SFP system by raising the level in the RWST and assigning a dedicated operator to isolate the BARS in the event of a BARS break. The licensee shows that the operator can isolate the BARS well before the minimum RWST level, as specified in the TS, would occur, thereby assuring the RWST can perform its safety function. The licensee verified by walkdown that BARS isolation would be achieved within 7 minutes, which is less than the calculated time (i.e., 31 minutes), to reach the RWST TS minimum level. This methodology is explained as follows.

The licensee has proposed to assign a dedicated operator (i.e., one who has no other responsibilities during this system alignment) to isolate the non-seismic BARS from the seismic RWST piping by closing the manual operated valves if necessary. The operator will be trained to perform this function and will have the ability to communicate directly with the control room. Procedures will require the dedicated operator to isolate the BARS following an RWST low level alarm if a safety injection signals, if lights go out in the primary auxiliary building, if a hose connecting either the suction or discharge lines of the BARS ruptures, or if an indication of tremors or earthquake is apparent. If any of these conditions occur, or upon direction from the control room, the dedicated operator would (1) isolate the BARS suction line by closing valves 845 and 727A, (2) isolate the BARS discharge line by closing valve 350, and (3) secure the refueling water purification pump if running. Valves 845, 727A, and 350 are seismic Class 1 valves and will be part of the inservice testing program with a test frequency of 2 years. By procedure, these valves will be cycled open and closed prior to placing the BARS in operation to provide reasonable assurance that the valves can be closed to isolate the non-seismic BARS if necessary.

The TS limit of 345,000 gallons of water for the RWST corresponds to an RWST level of 36.83 feet. The current RWST low level alarm is generated when the level reaches 37.01 feet. In order to maximize the time available for the dedicated operator to take action, the licensee has proposed to raise the initial RWST level to a minimum level of 37.43 feet and raise the RWST low level alarm to 37.33 feet prior to placing the BARS into service. For the case where the refueling water purification pump is running and both the BARS suction and discharge connections rupture simultaneously, the licensee's analysis assumes a break flow of 180 gallons per minute (gpm) at valve 725 and 91 gpm at valve 350. These values are considered to be maximum flow rates based upon pump runout conditions and available RWST head. The licensee has calculated the maximum time allowable for operator action to isolate the non-seismic BARS from the seismic RWST piping. The analysis assumes the simultaneous

rupture of the BARS suction connection at valve 725 and the BARS discharge connection at valve 350. The analysis assumes simultaneous ruptures with and without an accompanying safety injection signal.

Under these conditions, the licensee concludes that it would take 31 minutes before the RWST drains down to the minimum allowed TS level. This is the bounding case because the case involving a safety injection signal would generate an automatic trip of the refueling water purification pump, which would limit the respective break flows at the BARS suction and discharge connections.

The licensee performed a verification walkdown to demonstrate the feasibility of control room operators to manually isolate the BARS. Manual valves 845 and 727A on the BARS suction side are located within approximately 12 feet of the refueling water purification pump in the primary auxiliary building. Manual valve 350 on the BARS discharge side is also in the primary auxiliary building but at a different elevation. During the verification walkdown, the operator proceeded at a normal pace from the control room and completed the tasks of closing valves 845 and 350 in a total time of 5 minutes. An additional 2 minutes was estimated for tripping the refueling water purification pump and closing valve 727A, resulting in a total time of 7 minutes. This verification walkdown provides reasonable assurance that the seismic RWST will be isolated from the non-seismic BARS within the 31 minutes of time calculated before the RWST water level reaches the TS minimum required level, such that there will be sufficient margin to the TS required RWST level. The estimated operator action time of 7 minutes should reasonably be reduced when considering that a dedicated operator will be present to perform these duties.

Since isolation of the non-seismic BARS from the seismic RWST piping can be accomplished by closing manual seismic valves and tripping the refueling water purification pump by a dedicated operator who is trained to perform these duties as necessary, the NRC staff has concluded that there is reasonable assurance that the dedicated operator will be able to perform these required functions within the required 31-minute completion time. As a result, the current TS required RWST water level and the current accident analysis remain valid.

Systems Review Conclusion

The NRC staff has reviewed the proposed change to TS 3.5.4 that will permit non-seismically qualified piping of the BARS to be connected to the RWST seismic piping by manual operation of seismically qualified ASME boundary valves under administrative controls for limited time periods. The limited time period is up to 30 days per fuel cycle for filtration of the RWST water. The change is to be applied only up to the end of fuel cycle 2R23.

The staff has concluded that there is reasonable assurance that the dedicated operator will be able to perform the required functions within the required 31-minute completion time. Furthermore, the staff has found that there is reasonable assurance that the RWST level will remain above the TS minimum required level in the event of a seismic event. Therefore, the NRC staff has concluded that the proposed TS change is acceptable and meets the intent of UFSAR Section 1.3.1 for a 30-day period up to the end of RFO 2R23.

3.2 Component Performance and Testing

As noted in the licensee's letter dated April 7, 2017, manual valves 845, 727A, and 350 will be added to the Indian Point 2 inservice testing program as manual, active valves, and will be

exercise-tested in the future according to the applicable requirements of the ASME Operation and Maintenance Code (OM Code) of record. The licensee further identified that only manual valves 845 and 727A will be subject to leakage testing and that this testing will also be performed in the future according to the applicable requirements of the ASME OM Code of record. The Indian Point 2 ASME OM Code of record is currently the OM Code 2004 Edition through OMb-2006 Addenda. Under the applicable OM Code and 10 CFR 50.55a requirements, these valves will be exercise-tested and leakage-tested at a frequency of no longer than 2 years. The staff finds that inclusion of the subject valves in the Indian Point 2 inservice testing program and performance of the proposed testing is sufficient to ensure the operational readiness of these valves.

3.3 Human Performance

Description of Operator Action(s) and Assessed Safety Significance

The proposed change would revise TS 3.5.4 to allow the non-seismically qualified piping of the temporary BARS to be connected to, and isolated from, the RWST's seismically qualified piping by manual operation of RWST seismically qualified boundary valves. This action would be performed under administrative controls for limited periods of time (i.e., 30 days per fuel cycle for filtration of suspended solids from the RWST water). This action will be performed by a qualified, dedicated crew member to be available to isolate the RWST in a timely manner so that the RWST retains its safety function of being a source of reactor coolant during transients and accidents.

This change was previously approved until the end of the Indian Point 2 spring 2016 outage to allow time to install modifications to the BARS piping in order to qualify them seismically prior to the Indian Point 2 RFO 2R22. However, as indicated by the licensee in its LAR, due to the planned permanent cessation of Indian Point 2 power operation, and because RFO 2R23 will likely be the final Indian Point 2 RFO, there will be limited benefits for the implementation of the planned modifications, considering the required effort. As stated by the licensee:

> If Unit 2 operates past 2020, Entergy will address this issue either through a modification or water processing. Entergy will not ask for additional relief.

In accordance with the generic risk categories established in Appendix A to NUREG-1764, this task sequence is considered "risk-important" due to the fact that its failure would jeopardize the ECCS injection and recirculation phases of a loss-of-coolant accident (LOCA). Because of its risk importance, the NRC staff performed a "Level One" review (i.e., the most stringent of the graded reviews possible) under the guidance of NUREG-1764.

Operating Experience Review

The licensee performed an operating experience review for the proposed manual actions. Currently, the proposed operator actions have been used in the plant since 2006. There have been no seismic events that would require operators to isolate the RWST from the non-seismic piping and no failures by operators to properly recirculate the RWST volume in the purification mode. The licensee's search of condition reports since 2006 identified only logistic issues such as security clearance for the BARS equipment, manpower scheduling, and tripping hazards. The licensee also correctly identified Joseph M. Farley Nuclear Plant and Indian Point 3 as approved precedents for this LAR. Based on Indian Point 2's operating history of successful

implementation of the proposed manual actions, the NRC staff finds the Indian Point 2 operating experience review acceptable.

Functional Requirements Analysis and Function Allocation

Because the proposed operator action is not a new action, functional requirements analysis and function allocation are not necessary. Prior experience has shown that operators, when assigned this task, have sufficient time and resources available to perform it reliably. The proposed actions are guided by a controlled procedure. The NRC staff agrees that functional requirements analysis and function allocation are not necessary based on the licensee's long-term use of a controlled procedure, demonstration of adequate margin to proposed time constraints (see human factors verification and validation, below), their characterization of the action as a time-critical action (see human performance monitoring strategy, below), and their intent to monitor the feasibility and reliability of the action (see human performance monitoring strategy, below, for discussion of long-term monitoring), during the spring 2018 RFO 2R23.

Task Analysis

Because the proposed operator manual actions are not new, the only aspect requiring reanalysis is the establishment of time constraints for the action sequence. The licensee established the design value of 31 minutes and an operational value of 7 minutes for the time to close the valves that isolate the RWST from the non-seismic BARS. The ability of operators to isolate the RWST within the design and operational values for the timing of the action sequence were validated (see human factors verification and validation, below). The walkthrough testing demonstrated adequate margin to the operational time limit. The NRC staff finds the Entergy update to the task timing acceptable based on its validation of adequate margin to proposed time constraints.

Staffing

Staffing and qualification are not affected by the proposed LAR. No new or additional crew members are required, nor are there any new or additional qualifications required to perform the action sequence within the time constraints established. The licensee stated in its submittal that each crew will have a dedicated operator who is trained on the symptoms of a seismic event and his or her specific responses required to protect the volume of the RWST in accordance with procedure 2-OSP-10.1.1. These actions will only be required when the RWST is connected to non-seismic piping (i.e., 30 days or less per fuel cycle). The NRC staff finds that the licensee's staffing plans for dedicating an operator to manually isolate the RWST acceptable as an interim action until the end of the spring 2018 RFO 2R23.

Human-System Interface Design

Human-system interface design, including the design of the safety parameter display system, will not be affected by the proposed LAR.

Procedure Design

No changes are required to the Emergency Operating Procedures. Because the proposed actions are not new actions, the existing procedure, 2-OSP-10.1.1, does not require any changes. The NRC staff finds the existing procedure acceptable based on (1) the staff's confirmation that the required actions are described in the procedure and (2) the licensee's

validation and verification of the procedure to confirm its effectiveness (see human performance monitoring strategy, below).

Training Program and Simulator Design

The Indian Point 2 simulator is not capable of modeling the proposed task sequences and will not, therefore, be used in training. Based on the fact that the proposed action has a long history of successful implementation and is supported by written procedures, the licensee concluded that additional training is not necessary. Based on the above, the NRC staff finds that the training already provided is acceptable.

Human Factors Verification and Validation

Time testing of the proposed action was performed by the licensee to demonstrate sufficient margin to the established design values. The results of the licensee's study indicate that operators are able to isolate RWST flow to the non-seismic piping of the BARS. The licensee found that the operator action is achievable as directed by procedure and can be done within 7 minutes, providing substantial margin to the 31-minute design value available. Based on the results of these walkthrough demonstrations, the NRC staff finds that the actions are feasible and can be reliably performed by Indian Point 2 operators within the calculated time constraint established (31 minutes) using existing, controlled procedures.

Human Performance Monitoring Strategy

The procedures and actions proposed by this LAR have been included in the licensee's time critical operator actions program as controlled by procedure OAP-115. This will ensure that subsequent changes to the plant, procedures, or programs will not invalidate the established action times. Based on the administrative protection against inadvertent change and the cyclical validation required by OAP-115, the NRC staff finds the licensee's long-term monitoring strategy acceptable.

Human Performance Conclusion

Based on the review of the licensee's LAR and the discussion above, the NRC staff finds the proposed amendment is acceptable from the human factors perspective.

3.4 Accident Dose

Background

The NRC issued License Amendment No. 273, which approved the proposed TS change in response to the licensee's LAR dated April 15, 2013, as supplemented by letter dated September 4, 2013. The amendment was effective through the end of the spring 2016 Indian Point 2 RFO 2R22.

The NRC staff reviewed the current LAR requesting temporary connection of the non-seismic BARS piping to seismically qualified RWST piping until the end of the spring 2018 RFO (2R23) to confirm that the proposed change does not affect the dose consequence analysis as previously reviewed in the prior submittal.

Accident Dose Review

In its review per Safety Review Plan 15.0.1, the NRC staff evaluated the proposed change against the guidance in RG 1.183. RG 1.183, Regulatory Position 5.0, states:

> ESF [engineered safety features] systems that recirculate sump water outside of the primary containment are assumed to leak during their intended operation. This release source includes leakage through valve packing glands, pump shaft seals, flanged connections, and other similar components. This release source may also include leakage through valves isolating interfacing systems (Ref. A-7) [Information Notice 91-56, "Potential Radioactive Leakage to Tank Vented to Atmosphere," dated September 19, 1991]. The radiological consequences from the postulated leakage should be analyzed and combined with consequences postulated for other fission product release paths to determine the total calculated radiological consequences from the LOCA.

RG 1.183, Regulatory Position 5.1.2, states, in part:

> Credit may be taken for accident mitigation features that are classified as safety-related, are required to be operable by technical specifications, are powered by emergency power sources, and are either automatically actuated or, in limited cases, have actuation requirements explicitly addressed in emergency operating procedures. The single active component failure that results in the most limiting radiological consequences should be assumed.

After the end of the post-LOCA injection phase, the ECCS and containment spray systems (ESF systems that recirculate sump water) are switched to the recirculation phase. This requires that water from the containment sump replace the RWST as the ESF systems water supply. This is accomplished by realigning several system valves that interface between the ECCS and sprays systems and the RWST and the pathways leading back to the RWST. If these system valves are allowed to leak by design or the leakage of these valves is unknown, a leakage path between the containment sump and the RWST and any interfacing piping may exist due to valve seat leakage.

For the design-basis LOCA radiological analyses, it is assumed that 40 percent of the core iodine inventory is mixed homogeneously and instantaneously in the primary containment sump water at the time of release from the core. Because the ECCS takes suction from the sump, and the sump water is assumed to be radioactive, the consequences of any ECCS leakage are considered in the radiological dose analyses. According to the Indian Point 2 UFSAR, Revision 25 (2014), the dose resulting from 4.0 gallons per hour leakage from the ECCS is considered in the Indian Point 2 design-basis accident analyses.

The LAR dated April 7, 2017, states, in part:

> The RWPP [refueling water purification pump] will take suction through manual isolation valve 845 on line 2"-AC-151R#183 which is connected to the 16 inch line from the RWST downstream of isolation valve 846. Normally closed isolation valve 845 will be opened (Drawing A227781, quadrant I-1), and the RWPP will take suction through valve 727A and discharge to valve 725 (Drawing A227781 quadrants G-1 to E-1). Flow through valve 725 adapter plate is to the non-seismic BARS since the spent fuel pit demineralizer is isolated. The flow from valve 725 is through a 2 inch hose adapter plate to the BARS which

> discharges to seismic line #253 upstream of valve 350. Flow will be through valve 350 and return line 3"-SI-151R#161 to the RWST. Flow would not be diverted back to the boric acid makeup system due to check valve 294 and normally closed manual valve 295 (see Drawings 9321-F-2736, quadrant E-3 and Drawing 9321-F-2735 (valve 350 only), quadrant I-4).

The LAR proposes to temporarily use manual actions to isolate the BARS in the event of an actual or potential loss of RWST.

The licensee also provided a technical assessment of the impact of the proposed change on the dose consequences of a LOCA when the BARS is in operation. Specifically, the licensee stated the following:

> Following the injection phase of a large break LOCA (about 20 minutes), the preferred means of cold leg recirculation is to use the internal recirculation pumps. This results in the fluid being kept inside containment until hot leg recirculation. At about 6.5 hours, the recirculation pumps send fluid from the containment to the suction of the high head safety injection pumps, with the potential for sump fluid leakage to leak back to the RWST and impact BARS. This flow path is isolated from the RWPP by check valve 847 and motor operated valve 1810 (8"-SI-189R, line#155 on drawing 9321-F-2735). It is possible for any leakage past these valves to migrate to the refueling water purification loop, however, this would be contained as the dedicated operator would close valves 845 and 727A.
>
> Another potential for sump fluid leakage to impact BARS would be leakage through the 2 inch SI mini-flow line back to the RWST that is connected to valve 350. However, this would be limited to leakage through MOV 842/843, which are tested by 2-PT-R048 and have an acceptance criterion of 0.5 gallons per hour (gph). These valves and their acceptance criterion are also governed by the 2.0 gph limit for Emergency Core Cooling System (ECCS) leakage and so there would be no impact on dose.

The licensee stated that external recirculation of ECCS fluids occurs after 6.5 hours. To show that the valves proposed to be open (845, 350, and 727A) could be closed before external recirculation occurred (prior to radioactive fluids reaching these valves), the licensee performed a simulation in which an operator dispatched from the control room closed valves 845 and 350 in a total of 5 minutes. An additional 2 minutes was estimated to trip the purification pump and valve 727A, resulting in a total of 7 minutes. The licensee further stated that this time would be even shorter since there would be a dedicated operator for the BARS.

Accident Dose Summary

The NRC staff noted that the licensee's dose consequence analysis, as previously reviewed in the prior submittal, indicated acceptable results with regard to the radiological consequences of design-basis accidents. The staff verified there were no changes from the Indian Point 2 specific dose consequence analysis information that would warrant additional staff review or invalidate the staff's previous safety conclusion. Additionally, the staff confirmed that the current LAR only changes the end point of the note for TS LCO 3.5.4 (i.e., until the end of RFO 2R23) and does not impact the dose consequence analysis. Therefore, the staff's findings and conclusion as stated in the safety evaluation for the previous review (ADAMS

Accession No. ML133126A047, dated December 20, 2013) remain applicable and are unchanged, as provided below.

Based upon the information provided by the licensee, including the previously presented information in its April 15, 2013 LAR; supplemental letter dated September 4, 2013; and the discussion above, the NRC staff finds that the proposed crediting of the 727A, 845, and 350 valves for the design-basis dose analysis meets the intent of Regulatory Position 5.1.2 of RG 1.183.

The NRC staff also reviewed the assumptions, inputs, and methods used by the licensee to assess the radiological impacts of the proposed TS change. The staff finds that the licensee used analysis methods and assumptions consistent with the analysis provided in the UFSAR. The staff compared the doses estimated by the licensee in the UFSAR to the applicable acceptance criteria. Based upon the licensee's results, the staff finds with reasonable assurance that the licensee's estimates of the total effective dose due to design-basis accidents comply with the requirements of 10 CFR 50.67 and the guidance of RG 1.183.

Accident Dose Conclusion

The NRC staff reviewed the analysis used by the licensee to assess the radiological impacts of the proposed change to TS 3.5.4. For the proposed change, the staff finds that the licensee used methods consistent with regulatory requirements and guidance. The staff finds with reasonable assurance that the licensee's estimates of the exclusion area boundary, low-population zone, and control room doses will continue to comply with these criteria. Therefore, the staff finds the proposed change acceptable regarding the radiological consequences of postulated design-basis accidents.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New York State official was notified of the proposed issuance of the amendment on December 1, 2017. 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 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 (82 FR 32881). 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.

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Date: January 11, 2018

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 – ISSUANCE OF AMENDMENT RE: CONNECTION OF NON-SEISMIC BORIC ACID RECOVERY SYSTEM TO THE REFUELING WATER STORAGE TANK (CAC NO. MF9578; EPID L-2017-LLA-0202) DATED JANUARY 11, 2018

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