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NL-17-035

April 7, 2017

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

SUBJECT: Proposed License Amendment Regarding Connection of Non-Seismic Boric Acid Recovery System to the Refueling Water Storage Tank
Indian Point Unit No. 2
Docket No. 50-247
License No. DPR-26

REFERENCES:
1) Entergy Letter NL-13-015, "Proposed License Amendment Regarding Connection of Non Seismic Boric Acid Recovery System to the Refueling Water Storage Tank" (April 15, 2013) (ML13116A007)
2) NRC Letter to Entergy, "Request for Additional Information Regarding Proposed License Amendment to Temporarily Connect Seismic to Non-Seismic Piping under Administrative Controls" (TAC NO. MF1440), (August 7, 2013) (ML13207A387)
3) Entergy Letter NL-13-115, "Response to Request for Additional Information Regarding Proposed License Amendment to Temporarily Connect Seismic to Non-seismic Piping under Administrative Controls" (TAC No. MF1440), (September 4, 2013) (ML13253A138)
4) NRC Letter, "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" (TAC No. MF1440) (December 20, 2013) (ML133126A047)
5) NRC Letter, "Indian Point Nuclear Generating Unit No. 2 – Correction Letter to Amendment No. 273 Re: Connection of Non-Seismic Boric Acid Recovery System to the Refueling Water Storage Tank" (TAC No. MF1440) (January 9, 2014) (ML14002A431)
6) Entergy Letter NL-17-021, "Notification of Permanent Cessation of Power Operations, Indian Point Nuclear Generating Unit Nos. 2 and 3" (February 8, 2017)

Dear Sir or Madam:

In Reference 1, Entergy Nuclear Operations, Inc., (Entergy) requested a License Amendment to Operating License DPR-26, Docket No. 50-247 for Indian Point Nuclear Generating Unit No. 2 (IP2). The amendment revised Technical Specifications (TS) 3.5.4, "Refueling Water

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Storage Tank (RWST)," to allow for the temporary connection between the non-seismically qualified piping of the Boric Acid Recovery System (BARS) to the seismically qualified piping of the RWST for the purpose of purifying the contents of the RWST in advance of the Spring 2014 Refueling Outage. The request stated that operation in this mode will be under administrative controls and will only be applicable for limited periods through the end of the Spring 2016 Refueling Outage.

The Commission issued Amendment No. 273 (References 4 and 5), which consisted of changes to the TS in response to Reference 1, supplemented by Reference 3 (also attached as Enclosure 2) in response to the NRC Request for Additional Information (Reference 2).

Entergy had planned to install modifications to the BARS piping in order to qualify them seismically prior to the IP2 Spring 2018 Refueling Outage (2R23). However, due to the permanent cessation of IP2 power operation, as requested in Reference 6, and that the 2R23 refueling outage will be the final IP2 refueling outage, there will be limited benefits for the implementation of the planned modifications, considering the required effort.

Pursuant to 10 CFR 50.90, Entergy hereby requests a License Amendment to Operating License DPR-26, Docket No. 50-247 for IP2. The proposed TS change contained herein would revise 3.5.4, "Refueling Water Storage Tank (RWST)" such that the non-seismically qualified piping of BARS be connected to the RWST seismic piping. As in 2R22, operation of the BARS from the RWST will be under administrative controls for a limited period of time (i.e., 30 days for removal of silica from the RWST water). This change will only be applicable until the end of IP2 Refueling Outage 2R23.

Please note that a similar request was asked for and granted by the NRC for Unit 3 for operation using this Relief up until the end of 3R18. No such change for Unit 3 will be requested by Entergy.

Entergy has evaluated the proposed change in accordance with 10 CFR 50.91(a)(1) using the criteria of 10 CFR 50.92(c) and has determined that this proposed change involves no significant hazards, as described in Attachment 1. The marked up page showing the proposed change is provided in Attachment 2. The associated Bases change is provided in Attachment 3 for information. A copy of this application and the associated attachments are being submitted to the designated New York State official in accordance with 10 CFR 50.91.

Entergy requests approval of the proposed amendment by January 20, 2018 and an allowance of 30 days for implementation. There are no new commitments being made in this submittal. If you have any questions or require additional information, please contact Mr. Robert Walpole, Manager, Licensing at (914) 254-6710.

I declare under penalty of perjury that the foregoing is true and correct. Executed on April 7, 2017.

Sincerely,

AJV/mm

Attachments:
1. Analysis of Proposed Technical Specifications Change Regarding Connection of Non Seismic BARS to Refueling Water Storage Tank
2. Marked Up Technical Specifications Page for Proposed Change Regarding Connection of Non Seismic BARS to Refueling Water Storage Tank
3. Marked Up Technical Specifications Bases Change Associated with the Proposed Change Regarding Connection of Non Seismic BARS to Refueling Water Storage Tank

Enclosure:
1. Indian Point 2 Drawings and Calculation
2 Entergy Letter NL-13-115, "Response to Request for Additional Information Regarding Proposed License Amendment to Temporarily Connect Seismic to Non-seismic Piping under Administrative Controls" (TAC NO. MF1440), (September 4, 2013) (ML13253A138)

cc: Mr. Daniel H. Dorman, Regional Administrator. Region I, NRC
Mr. Douglass Pickett, Senior Project Manager, NRR/DORL, NRC
Ms. Bridget Frymire, New York State Department of Public Service
Mr. John B. Rhodes, President and CEO NYSERDA
NRC Resident Inspector's Office

ATTACHMENT 1 TO NL-17-035

ANALYSIS OF PROPOSED TECHNICAL SPECIFICATIONS CHANGE REGARDING CONNECTION OF NON SEISMIC BARS TO REFUELING WATER STORAGE TANK

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

1.0 DESCRIPTION

Entergy Nuclear Operations, Inc. (Entergy) is requesting an amendment to Operating License DPR-26, Docket No. 50-247 for Indian Point Nuclear Generating Unit No. 2 (IP2). The proposed Technical Specifications (TS) change contained herein would revise 3.5.4, "Refueling Water Storage Tank (RWST)" such that the non-seismically qualified piping of the Boric Acid Recovery System (BARS) may be connected to RWST seismic piping, and isolated by manual operation of RWST seismically qualified boundary valves under administrative controls for a limited period of time (i.e., 30 days for filtration for removal of silica from the RWST water). This change will be applicable for the next and last IP2 Refueling Outage 2R23 (Spring 2018). 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.

The specific proposed change is listed in the following section.

2.0 PROPOSED CHANGE

The proposed TS change is as follows:

Directly under "LCO" add

- 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 for filtration until the end of Refueling Outage 2R23.

In addition, the Technical Specifications Bases will be revised to clarify this issue.

3.0 BACKGROUND

Historically, IP2 was connecting the non-seismic reverse osmosis system, identified as the BARS to the seismic Spent Fuel Pool (SFP) Purification Loop to filter RWST water while in plant conditions and modes for which the RWST was required to be operable. This alignment was utilized to remove silica from the RWST water. Removal of silica is necessary to maintain Reactor Coolant System (RCS) chemistry within fuel requirements and to improve water clarity during refueling to facilitate safe handling of fuel and to prevent delays in fuel movement. The water clarity is both a personnel and equipment safety consideration. Entergy had established the practice of recirculating the RWST for up to 30 days beginning up to about two months prior to a refueling outage for silica removal. Prior to Refueling Outage (RO) 2R21 the RWST was recirculated for a duration of 11 days. After recirculation the total concentration of silica was 1.9 ppm. Prior to RO 2R22, the RWST was recirculated for a duration of 15 days. A sample taken after recirculation had total concentration of silica of 1.05 ppm.

During plant operations 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 (Modes 1 through 4). During cold shutdown and refueling operation (Modes 5 and 6), the RWST may be credited as a borated water supply should the boric acid storage system not be functional. The contents of the RWST are also used to flood the refueling cavity during refueling operation. The water in the RWST is borated to a concentration sufficient to ensure that shutdown margin is maintained when the reactor is at cold shutdown conditions should RWST water be added to the reactor.

It was recognized that alignment to BARS could render the RWST inoperable during a seismic event since the BARS is a non-seismic system. To maintain operability, procedure changes had been made to direct manual operator action to isolate the non-seismic connections to the RWST to ensure adequate inventory during Modes 1 through 4 when the RWST was required to be operable. After reviewing Information Notice (IN) 2012-01, "Seismic Considerations-Principally Issues Involving Tanks," Entergy concluded that manual actions could not be credited for this purpose without prior NRC approval and subsequently discontinued this practice. The SFP Purification Loop is a subsystem of the spent fuel pool cooling system that is connected to portions of the RWST piping. The SFP Purification Loop piping has been upgraded to seismic Class I so that during a seismic event no failure of the SFP Purification Loop piping is considered. However, when the non-seismic BARS is connected to the Purification Loop, there is the possibility that a seismic event could affect the available water in the RWST. For this reason the IN 2012-01 requires that the RWST TS action statement be entered when non-seismic connections are made to the RWST. The completion time of the action statement does not allow time for purification.

Removal of silica by use of the BARS system is preferred to other means. For example, using dilution creates large quantities of liquid radioactive waste, or removing silica from the spent fuel pool has the potential for further deterioration of the Boraflex material in the storage racks. Consequently, this TS change request is being made to credit operator action to close the seismically qualified manual code boundary valves in the event of a seismic or design basis accident.

4.0 Technical Evaluation

This assessment addresses the proposed change to TS 3.5.4, "Refueling Water Storage Tank (RWST)." The TS change would allow voluntary connection of the non-seismic BARS to the seismic piping of the SFP Purification System with a 30 day limit for re-circulating the contents of the RWST for the purpose of silica filtration through the BARS during Modes 1 through 4 when the RWST is required to be operable. The following assessment provides the basis for the acceptability of the proposed change to the TS which provides for operator action to close the seismically qualified manual code boundary valves to assure RWST operability when re-circulating the tank through non-safety related piping.

The non-seismic BARS is connected to the seismic SFP Purification System as follows:

- The BARS suction line is connected to Valve 725 (see Drawing A227781, quadrant F-1 in the Enclosure) on the discharge to the Refueling Water Purification Pump (RWPP) by removing the valve bonnet and valve internals and installing a hose adapter plate.

- The BARS discharge line is connected to 2 inch line #252 upstream of 2 inch valve 350 (see Drawing 9321-F-2736, quadrant E-3 and Drawing 9321-F-2735 (valve 350 only), quadrant I-4 in the Enclosure) by removing the 2"-150 psig flange and installing a hose adapter plate.

The RWPP 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 proposed manual action to isolate the BARS in the event of an actual or potential loss of RWST considered the following:

Operator Action Considerations

Entergy has confidence in the successful completion of manual actions due to the training program completed for all system operators and the specific procedural requirements for the BARS. During use of the BARS, the RWST level, temperature and boron concentration are monitored. A dedicated operator is assigned to remain in the vicinity of BARS at all times when the RWST Silica Cleanup Skid is aligned for operation. The operator has the ability to directly communicate with the IP2 control room, is equipped with an operational flashlight, and is trained on the location and operation of valves and the Refueling Water Purification Pump (Reference 2). If there is a RWST low level alarm received the Unit 2 control room supervisor will direct the operator to isolate the RWST Silica Cleanup System. The RWST Silica Cleanup System would also be isolated if:

- There is a Safety Injection (SI) actuation
- Lights go out in the PAB
- A RWST Silica Cleanup System Hose ruptures or breaks
- An indication of tremors or earthquake is evident

If the BARS has to be isolated for any of the reasons above, the dedicated operator would isolate suction to BARS through valves 845 and 727A, isolate discharge from BARS through valve 350, and secure the RWST Purification pump, if running.

Valves 845, 727A and 350 will be part of the In-service Test Program with a test frequency of two years. Further, by procedure, valves 845, 727A and 350 will be cycled open and closed prior to putting the BARS in operation to provide reasonable assurance that all valves will close.

The allowable time for operator action to isolate the BARS unit has been calculated (Reference 1). This re-analysis was conservatively based on a simultaneous rupture of connections at valve 725 and at the flange upstream of valve 350. Scenarios for rupture with and without an SI signal were evaluated. The current RWST low level alarm is set to 37.01 feet, with the TS limit at 36.83 feet. In order to provide more time for the operator to perform the isolation function in a seismic or SI event during operation of the BARS, the initial level of the RWST

would be raised to 37.43 feet or higher, and a control room Plant Integrated Control System (PICS) alarm setpoint would be set at 37.33 ft (or higher) prior to aligning the BARS. There would then be 4684 gallons of margin to the Technical Specifications limit (345,000 gallons) following a low RWST level alarm. If the RWST purification pump (RWPP) is in service providing flow to the BARS unit, a flow of 180 gallons per minute (gpm) was considered for the break flow through valve 725 and 91 gpm was considered for the break flow through the flange at valve 350. These are maximum flow rates resulting from pump runout and available head in the RWST. The total time available before reaching the TS limit would be 31 minutes, assuming the operator took 10 minutes to close valves 845/727A and trip the RWPP (all in close proximity), and an additional 21 minutes to close valve 350.

For the same break(s) scenario, and considering actuation of SI, the RWPP would receive a trip signal, and the corresponding total flow through the two break locations would be less limiting than the above scenario with no SI signal.

The refueling water purification pump is located on the 68 foot elevation of the Primary Auxiliary Building (PAB) with the pump control switch on an adjacent wall. Valves 845 and 727A are within about twelve feet of each other on opposite sides of the pump. The return line isolation valve 350 is located on the PAB 98.0 foot elevation. There is a card reader at the entry point to the PAB on the 80 foot elevation, but once inside there are no restrictions to reach valve 350 from valves 845 and 727A. A simulation performed by Operations, with an operator dispatched from the control room resulted in closure of valves 845 and 350 in a total of 5 minutes. An additional 2 minutes is conservatively estimated for tripping the RWPP and closing valve 727A, resulting in a total of 7 minutes. This time would be even shorter since there would be a dedicated operator for the BARS. This provides substantial margin to the total calculated time of 31 minutes to shutdown the BARS and maintain the RWST within the TS value following a control room alarm indication of 37.33 feet for RWST level.

Dose consequences associated with the operation of the BARS

The dose consequences in the highly unlikely event of a Loss of Coolant Accident (LOCA) when BARS is in operation are discussed below.

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 the 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 the 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 surveillance tested by 2-PT-R048 and have an acceptance criterion of 0.5 gallons per hour (gph). These valves and their acceptance criteria are also governed by the 2.0 gph limit for Emergency Core Cooling System (ECCS) leakage, so there would be no impact on dose.

The IP2 design is fairly unique in having internal recirculation pumps as well as residual heat removal (RHR) pumps. Use of the RHR is the secondary means of achieving hot leg recirculation by drawing water from the containment sump and delivering via the RWST suction line. This leakage pathway is not postulated because it would require a passive failure, which is not postulated to occur for 24 hours. The leakage associated with this pathway is not part of the TS 5.5.2 program, because that program does not assume the single passive failure. Likewise, the Regulatory Guide (RG) 1.183 guidance does not impose any additional single failure to determine this leakage path.

Thus, in the highly unlikely event of a LOCA during the operation of the BARS, there will be no impact on accident dose consequences.

Operating Experience

The BARS has been in use at IP2 since prior to refueling outage 2R16 in 2006, and Reference 1 captures operator actions for isolation of BARS for any of the conditions discussed above. A search of Condition Reports since 2006 identified only logistic issues such as security clearance of the BARS equipment, manpower scheduling, tripping hazard due to BARS hoses, etc. There have been no seismic events during the use of the BARS and no problems identified in the installation, use and removal of BARS.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

Entergy Nuclear Operations, Inc. (Entergy) has evaluated the safety significance of the proposed change to the Indian Point 2 Technical Specifications (TS) which revise TS 3.5.4, "Refueling Water Storage Tank (RWST)," to allow administrative control of the seismic RWST/non-seismic BARS interface. The proposed change has been evaluated according to the criteria of 10 CFR 50.92, "Issuance of Amendment". Entergy has determined that the subject change does not involve a Significant Hazards Consideration, as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No. The use of the non-seismic Boric Acid Recovery System (BARS) to re-circulate and filter the RWST water does not involve any changes or create any new interfaces with the reactor coolant system or main steam system piping. Therefore, the connection of the BARS Purification Loop to the RWST would not affect the probability of these accidents occurring. The BARS is not credited for safe shutdown of the plant or accident mitigation. Administrative controls ensure that the BARS can be isolated as necessary and in sufficient time to assure that the RWST volume will be adequate to perform the safety function as designed. Since the RWST will continue to perform its safety function and overall system performance is not affected, the consequences of the accident are not increased.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No. The design of the RWST and the SFP Purification Loop has been revised to allow recirculation and purification using the BARS for a short period of time (not to exceed 30 days per fuel cycle) for the next fuel cycle. The BARS takes RWST water in and processes it out without additional connections that could affect other systems and without an impact from its installation. Procedures for the operation of the plant, including the BARs, will not create the possibility of a new or different type of accident. Contingent upon manual operator action, a BARS line break will not result in a loss of the RWST safety function. Similarly, an active or passive failure in the BARS will not affect safety related structures, systems or components.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No. The SFP Purification Loop and recirculation and purification of the RWST water using the BARS is not credited for safe shutdown of the plant or accident mitigation. RWST volume will be maximized prior to purification and timely operator action can be taken to isolate the non-seismic system from the RWST to assure it can perform its function. This will result in no significant reduction in the margin of safety.

Therefore the proposed change does not significantly reduce the margin of safety.

Based on the above, Entergy concludes that the proposed amendment to the IP2 TS presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of 'no significant hazards consideration' is justified.

5.2 Applicable Regulatory Requirements / Criteria

The NRC Order of February 11, 1980 required an evaluation of the degree of compliance with the GDC at the time. This section discusses continued compliance with certain of those criteria.

The plant will continue to meet Criterion 1 of 10 CFR 50 Appendix A which says "Structures, systems and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems and components important to safety shall be maintained by or under the control of the nuclear power plant licensee throughout the life of the unit" and Criterion 2 which says "Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability

to perform their safety functions. The design bases for these structures, systems and components shall reflect: (1) appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed."

The purification of the RWST will use the seismic piping meeting these criteria but will also use the non-seismic piping which does not. Manual action will be used until the end of the next two refuel outages to assure isolation of the seismic piping from the non-seismic piping during any condition requiring the RWST volume to be intact and threatening to reduce the RWST level below the TS allowable. This will assure continued compliance with these criteria.

The plant will continue to meet Criterion 35 which says "A system to provide abundant emergency core cooling shall be provided. 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." The RWST provides a support function for this criterion since it supplies the water which is injected following an event and must contain the amount of water required by analysis. Manual action will be used until the end of the next refuel outage to assure isolation of the seismic piping from the non-credited non-seismic piping to assure RWST level meets the TS allowable. This will assure continued compliance with this criterion.

5.3 Environmental Considerations

The proposed changes to the IP2 TS do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 PRECEDENCE

- Joseph M. Farley Units 1 and 2 received approval for taking manual action to isolate the RWST from the non-seismic SFP lines in Amendments 188 and 183, respectively (Reference 3).
- Indian Point 3 received approval for taking manual action to isolate the RWST from the non-seismic SFP lines in Amendment 250 (Reference 4).
- Indian Point 2 received approval to isolate the RWST from the non-seismic SFP lines in Amendment 273 (Reference 5 and 6).

7.0 REFERENCES

1. 2-OSP-10.1.1, Support Procedure – Safety Injection Accumulators and Refueling Water Storage Tank Operations.

2. IP-CALC-13-00005, Rev 1, "Engineering Evaluation of Postulated RWST Inventory Loss During the Reverse Osmosis Clean-up Skid Process in Accordance to 2-TAP-001-ROS due to a seismic Event" , March 2013.

3. NRC Letter to Southern Nuclear Operating Company, Inc., "Joseph M. Farley Nuclear Plant, Units 1 and 2, Issuance of Amendments regarding Refueling Water Storage Tank (TAC NOS. ME8005 AND ME8006)", dated March 24, 2012.

4. NRC letter to Entergy, "Indian Point Nuclear Generating Unit No. 3 – Issuance of Amendment Re: Connecting Non-Seismic Purification System Piping to the Refueling Water Storage Tank (TAC NO. ME9263)" (February 22, 2013) (ML13046A166)

5. NRC Letter, "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" (TAC No. MF1440) (December 20, 2013) (ML133126A047)

6. NRC Letter, "Indian Point Nuclear Generating Unit No. 2 – Correction Letter to Amendment No. 273 Re: Connection of Non-Seismic Boric Acid Recovery System to the Refueling Water Storage Tank" (TAC No. MF1440) (January 9, 2014) (ML14002A431)

ATTACHMENT 2 TO NL-17-035

MARKED UP TECHNICAL SPECIFICATIONS PAGE FOR PROPOSED CHANGE REGARDING CONNECTION OF NON SEISMIC BARS TO REFUELING WATER STORAGE TANK

Unit 2 Affected Page:

3.5.4-1

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

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 ~~r~~Refueling ~~e~~Outage ~~22~~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

ATTACHMENT 3 TO NL-17-035

MARKED UP TECHNICAL SPECIFICATION BASES CHANGE ASSOCIATED WITH THE PROPOSED CHANGES REGARDING CONNECTION OF NON SEISMIC BARS TO REFUELING WATER STORAGE TANK

Unit 2 Affected Page:

3.5.4-4

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

BASES

APPLICABLE SAFETY ANALYSES (continued)

the low low alarm setpoint and sufficient coolant inventory to support pump operation in recirculation mode is verified to be in the containment.

The RWST level low low alarm setpoint has both upper and lower limits. The upper limit is set to ensure that switchover does not occur until there is adequate water inventory in the containment to provide ECCS pump suction. (This is confirmed by recirculation and/or containment sump level indication.) The lower limit is set to ensure switchover occurs before the RWST empties, to prevent ECCS pump damage.

Requiring 2 channels of RWST level low low alarm ensures that the alarm function will be available assuming a single failure of one channel.

The RWST satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The RWST ensures that an adequate supply of borated water is available to cool and depressurize the containment in the event of a Design Basis Accident (DBA), to cool and cover the core in the event of a LOCA, to maintain the reactor subcritical following a DBA, and to ensure adequate level in the recirculation and containment sump to support ECCS operation in the recirculation mode.

To be considered OPERABLE, the RWST must meet the water volume, boron concentration, and temperature limits established in the SRs.

RWST OPERABILITY requires OPERABILITY of two channels of the RWST level low low alarm. This is required because the IP2 ESFAS design does not include automatic switchover from the safety injection mode to the recirculation mode of operation based on low level in the RWST coincident with a safety injection signal. This function is performed manually by the operator who must be alerted by redundant alarms that annunciate RWST level low low. The switchover to the cold leg recirculation phase is manually initiated when the RWST level has reached the low low alarm setpoint and sufficient coolant inventory to support pump operation in recirculation mode is verified to be in the containment.

A note allows the RWST valves that isolate non-seismic piping to be opened under administrative control for filtration until the end of Refueling Outage 2R23.~~RO 22.~~

ENCLOSURE 1 TO NL-17-035

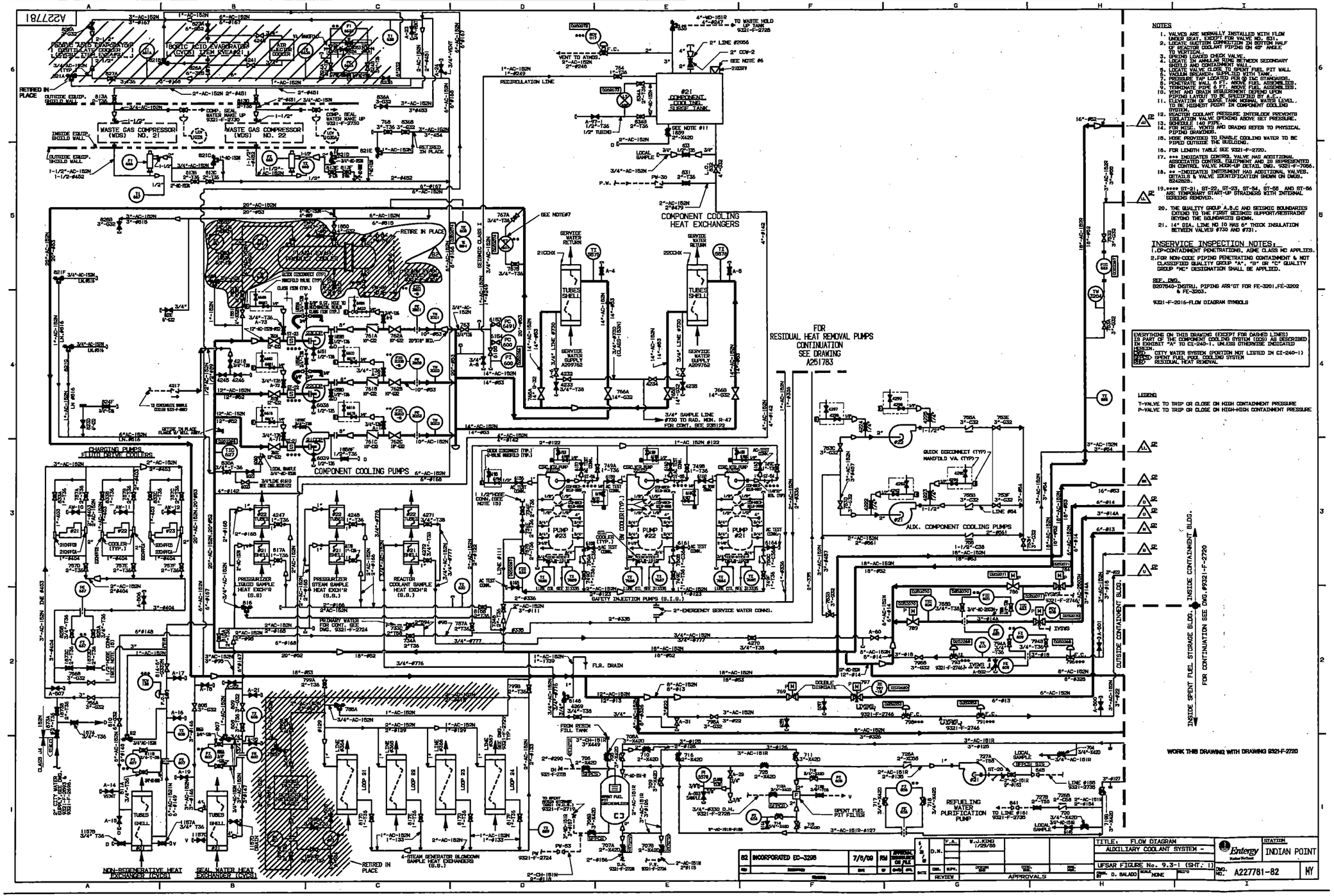
INDIAN POINT 2 DRAWINGS AND CALCULATION

Unit 2 Documents:

Drawing 227781
Drawing 9321-F-2735
Drawing 9321-F-2736
Calculation IP-CALC-13-00005, Rev 1

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

A227781



NOTES

1. VALVES ARE NORMALLY INSTALLED WITH FLOW UNDER SEAT, EXCEPT FOR VALVE NO. 831.
2. LOCATE SUCTION CONNECTION IN BOTTOM HALF OF REACTOR COOLANT PIPING ON 45° ANGLE TO VERTICAL.
3. SPRING LOADED CHECK VALVE.
4. LOCATE IN ANNULAR RING BETWEEN SECONDARY SHIELD AND CONTAINMENT WALL.
5. LOCATE VALVE CLOSE TO SPENT FUEL PIT WALL
6. VACUUM BREAKER; SUPPLIED WITH TANK.
7. PRESSURE TAP LOCATED PER ASME STANDARDS.
8. PENETRATE WALL 6 FT. ABOVE FUEL ASSEMBLIES.
9. TERMINATE PIPE 6 FT. ABOVE FUEL ASSEMBLIES.
10. VENT AND DRAIN REQUIREMENT DEPEND UPON PIPING LAYOUT TO BE SPECIFIED BY A-E.
11. ELEVATION OF SURGE TANK NORMAL WATER LEVEL TO BE HIGHEST POINT IN COMPONENT COOLING SYSTEM.
12. REACTOR COOLANT PRESSURE INTERLOCK PREVENTS ISOLATION VALVE OPENING ABOVE SET PRESSURE.
13. SCHEDULE 140 PIPE.
14. FOR MISC. VENTS AND DRAINS REFER TO PHYSICAL PIPING ARRANGER.
15. HOSE PROVIDED TO ENABLE COOLING WATER TO BE PIPED OUTSIDE THE BUILDING.
16. FOR LENGTH TABLE SEE 9321-F-2720.
17. *** INDICATES CONTROL VALVE HAS ADDITIONAL ASSOCIATED CONTROL EQUIPMENT AND IS REPRESENTED ON CONTROL VALVE HOOK-UP DETAIL DWG. 9321-F-7056.
18. ** -INDICATES INSTRUMENT HAS ADDITIONAL VALVES. DETAILS & VALVE IDENTIFICATION SHOWN ON DWGS. 8242625.
19. **** ST-21, ST-22, ST-23, ST-54, ST-55 AND ST-56 ARE TEMPORARY START-UP STRAINERS WITH INTERNAL SCREENS REMOVED.
20. THE QUALITY GROUP A,B,C AND SEISMIC BOUNDARIES EXTEND TO THE FIRST SEISMIC SUPPORT/RESTRAINT BEYOND THE BOUNDARIES SHOWN.
21. 14" DIA. LINE NO TO HAS 6" THICK INSULATION BETWEEN VALVES #720 AND #731.

INSERVICE INSPECTION NOTES:

1. CP-CONTAINMENT PENETRATIONS, ASME CLASS MC APPLIED.
2. FOR NON-CODE PIPING PENETRATING CONTAINMENT & NOT CLASSIFIED QUALITY GROUP "A", "B" OR "C" QUALITY GROUP "MC" DESIGNATION SHALL BE APPLIED.

SEE DWG. B207640-INSTRU. PIPING ARR'GT FOR FE-3201, FE-3202 & FE-3203.

9321-F-2016-FLOW DIAGRAM SYMBOLS

EVERYTHING ON THIS DRAWING (EXCEPT FOR DASHED LINES) IS PART OF THE COMPONENT COOLING SYSTEM (CCS) AS DESCRIBED IN EXHIBIT "A" TO CI-240-1, UNLESS OTHERWISE INDICATED HEREON.

- BLUE - CITY WATER SYSTEM (PORTION NOT LISTED IN CI-240-1)
- GREEN - SPENT FUEL POOL COOLING SYSTEM
- RED - RESIDUAL HEAT REMOVAL

LEGEND

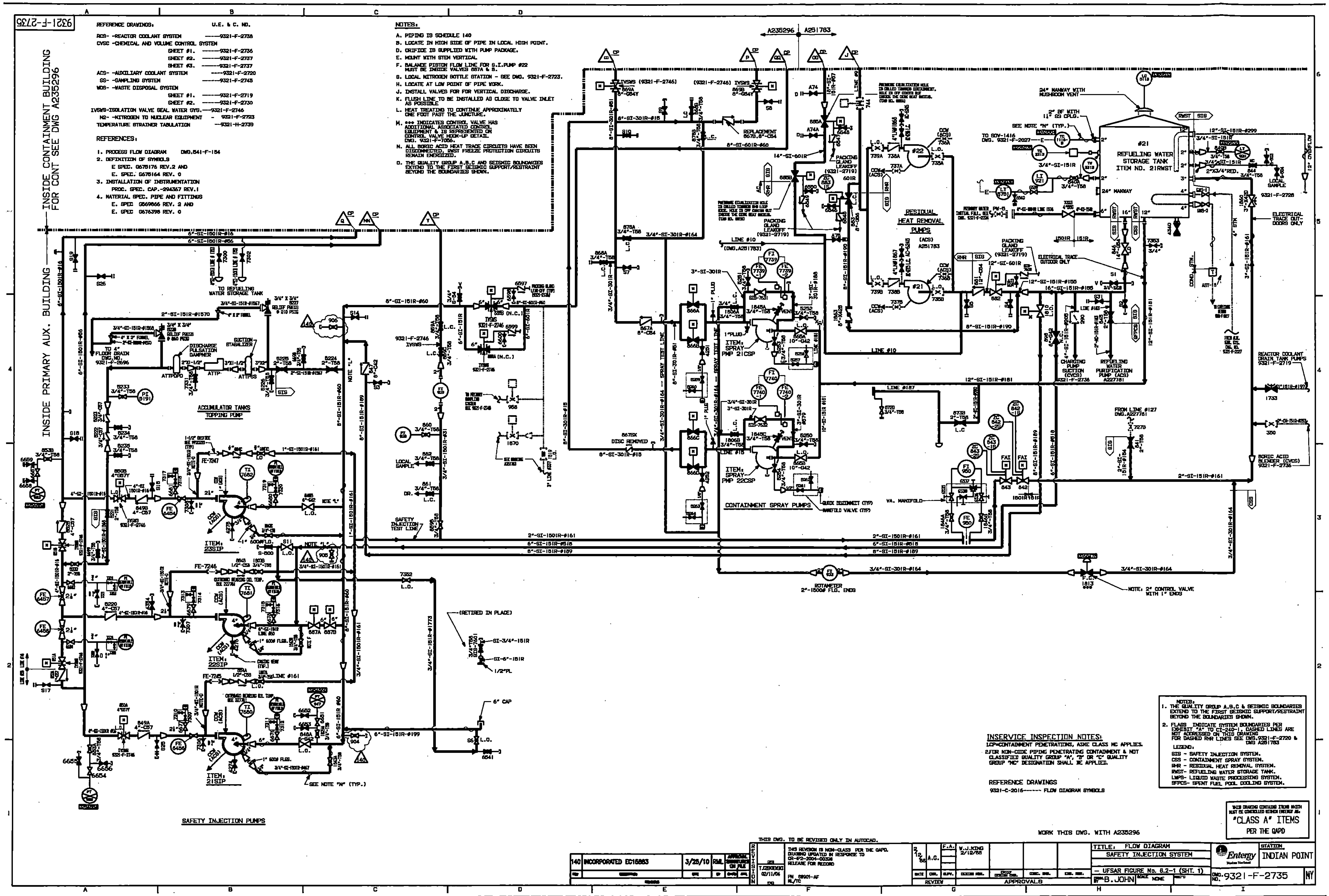
T-VALVE TO TRIP OR CLOSE ON HIGH CONTAINMENT PRESSURE
P-VALVE TO TRIP OR CLOSE ON HIGH-HIGH CONTAINMENT PRESSURE

R2	INCORPORATED EC-3298	7/6/09	RM	APPROVED DRAWING NOT ON FILE	
NO.	REVISION	DATE	BY	CHKD	APPD

D.N. | D.M. | DES. SUPV. | REVIEW | F.A. | W.J.JEDRZ 1/20/09 | APPROVALS

TITLE: FLOW DIAGRAM AUXILIARY COOLANT SYSTEM -
UFSAR FIGURE No. 9.3-1 (SHT. 1)
DRWN BY D. SALADO | SCALE NONE | SHEET

STATION: Entergy Nuclear Northeast — INDIAN POINT
DWG. NO. A227781-82 | NY


9321-F-2735
INSIDE CONTAINMENT BUILDING FOR CONT SEE DWG A235296
INSIDE PRIMARY AUX. BUILDING
REFERENCE DRAWINGS: U.E. & C. NO.
RCS- -REACTOR COOLANT SYSTEM -----9321-F-2738
CVSC -CHEMICAL AND VOLUME CONTROL SYSTEM
SHEET #1. -----9321-F-2736
SHEET #2. -----9321-F-2737
SHEET #3. -----9321-F-2737
ACS- -AUXILIARY COOLANT SYSTEM ----9321-F-2720
SS- -SAMPLING SYSTEM -----9321-F-2745
WDS- -WASTE DISPOSAL SYSTEM
SHEET #1. -----9321-F-2719
SHEET #2. -----9321-F-2730
IVSWS-ISOLATION VALVE SEAL WATER SYS.---9321-F-2746
N2- -NITROGEN TO NUCLEAR EQUIPMENT - 9321-F-2723
TEMPERATURE STRAINER TABULATION --9321-H-2739
REFERENCES:
1. PROCESS FLOW DIAGRAM DWG.541-F-154
2. DEFINITION OF SYMBOLS
E SPEC. G675176 REV.2 AND
E. SPEC. G675164 REV. 0
3. INSTALLATION OF INSTRUMENTATION
PROC. SPEC. CAP.-294367 REV.1
4. MATERIAL SPEC. PIPE AND FITTINGS
E. SPEC G569866 REV. 2 AND
E. SPEC G676398 REV. 0
NOTES:
A. PIPING IS SCHEDULE 140
B. LOCATE IN HIGH SIDE OF PIPE IN LOCAL HIGH POINT.
D. ORIFICE IS SUPPLIED WITH PUMP PACKAGE.
E. MOUNT WITH STEM VERTICAL
F. BALANCE PISTON FLOW LINE FOR S.I.PUMP #22 MUST BE INSIDE VALVES 887A & B.
G. LOCAL NITROGEN BOTTLE STATION - SEE DWG. 9321-F-2723.
H. LOCATE AT LOW POINT OF PIPE WORK.
J. INSTALL VALVES FOR FOR VERTICAL DISCHARGE.
K. FLUSH LINE TO BE INSTALLED AS CLOSE TO VALVE INLET AS POSSIBLE
L. HEAT TREATING TO CONTINUE APPROXIMATELY ONE FOOT PAST THE JUNCTURE.
M. ●●● INDICATES CONTROL VALVE HAS ADDITIONAL ASSOCIATED CONTROL EQUIPMENT & IS REPRESENTED ON CONTROL VALVE HOOK-UP DETAIL DWG. 9321-F-7056.
N. ALL BORIC ACID HEAT TRACE CIRCUITS HAVE BEEN DISCONNECTED, RWST FREEZE PROTECTION CIRCUITS REMAIN ENERGIZED.
O. THE QUALITY GROUP A,B,C AND SEISMIC BOUNDARIES EXTEND TO THE FIRST SEISMIC SUPPORT/RESTRAINT BEYOND THE BOUNDARIES SHOWN.
A235296 | A251783
#21 REFUELING WATER STORAGE TANK ITEM NO. 21RWST
24" MANWAY WITH MUSHROOM VENT
24" MANWAY
RESIDUAL HEAT REMOVAL PUMPS (ACS) A251783
ACCUMULATOR TANKS TOPPING PUMP
CONTAINMENT SPRAY PUMPS
ITEM: SPRAY PMP 21CSP
ITEM: SPRAY PMP 22CSP
ITEM: 23SIP
ITEM: 22SIP
ITEM: 21SIP
SAFETY INJECTION PUMPS
CHARGING PUMP SUCTION (CVCS) 9321-F-2736
REFUELING WATER PURIFICATION PUMP (ACS) A227781
REACTOR COOLANT DRAIN TANK PUMPS 9321-F-2719
BORIC ACID BLENDER (CVCS) 9321-F-2736
ELECTRICAL TRACE OUT-DOORS ONLY
ROTAMETER 2"-1500# FLG. ENDS
NOTE: 2" CONTROL VALVE WITH 1" ENDS
(RETIRED IN PLACE)
SEE NOTE "H" (TYP.)
NOTES:
1. THE QUALITY GROUP A,B,C & SEISMIC BOUNDARIES EXTEND TO THE FIRST SEISMIC SUPPORT/RESTRAINT BEYOND THE BOUNDARIES SHOWN.
2. FLAGS INDICATE SYSTEM BOUNDARIES PER EXHIBIT "A" TO CI-240-1. DASHED LINES ARE NOT ADDRESSED ON THIS DRAWING FOR DASHED RHR LINES SEE DWG.9321-F-2720 & DWG A251783
LEGEND:
SIS - SAFETY INJECTION SYSTEM.
CSS - CONTAINMENT SPRAY SYSTEM.
RHR - RESIDUAL HEAT REMOVAL SYSTEM.
RWST- REFUELING WATER STORAGE TANK.
LWPS- LIQUID WASTE PROCESSING SYSTEM.
SFPCS- SPENT FUEL POOL COOLING SYSTEM.
INSERVICE INSPECTION NOTES:
1.CP=CONTAINMENT PENETRATIONS, ASME CLASS MC APPLIES.
2.FOR NON-CODE PIPING PENETRATING CONTAINMENT & NOT CLASSIFIED QUALITY GROUP "A", "B" OR "C" QUALITY GROUP "MC" DESIGNATION SHALL BE APPLIED.
REFERENCE DRAWINGS
9321-C-2016------ FLOW DIAGRAM SYMBOLS
THIS DRAWING CONTAINS ITEMS WHICH MUST BE CONTROLLED WITHIN ENTERGY AS:
"CLASS A" ITEMS
PER THE QAPD
WORK THIS DWG. WITH A235296
THIS DWG. TO BE REVISED ONLY IN AUTOCAD.
140 INCORPORATED EC15863 3/25/10 RML
T.CZBOENSKI 02/11/04
THIS REVISION IS NON-CLASS PER THE QAPD. DRAWING UPDATED IN RESPONSE TO CR-IP2-2004-00356 RELEASE FOR RECORD
PN 69901-AF
A.G.
W.J.KING 2/12/68
REVIEW
APPROVALS
TITLE: FLOW DIAGRAM
SAFETY INJECTION SYSTEM
- UFSAR FIGURE No. 6.2-1 (SHT. 1)
B.JOHN
SCALE NONE
Entergy
STATION
INDIAN POINT
DWG. NO. 9321-F-2735
NY

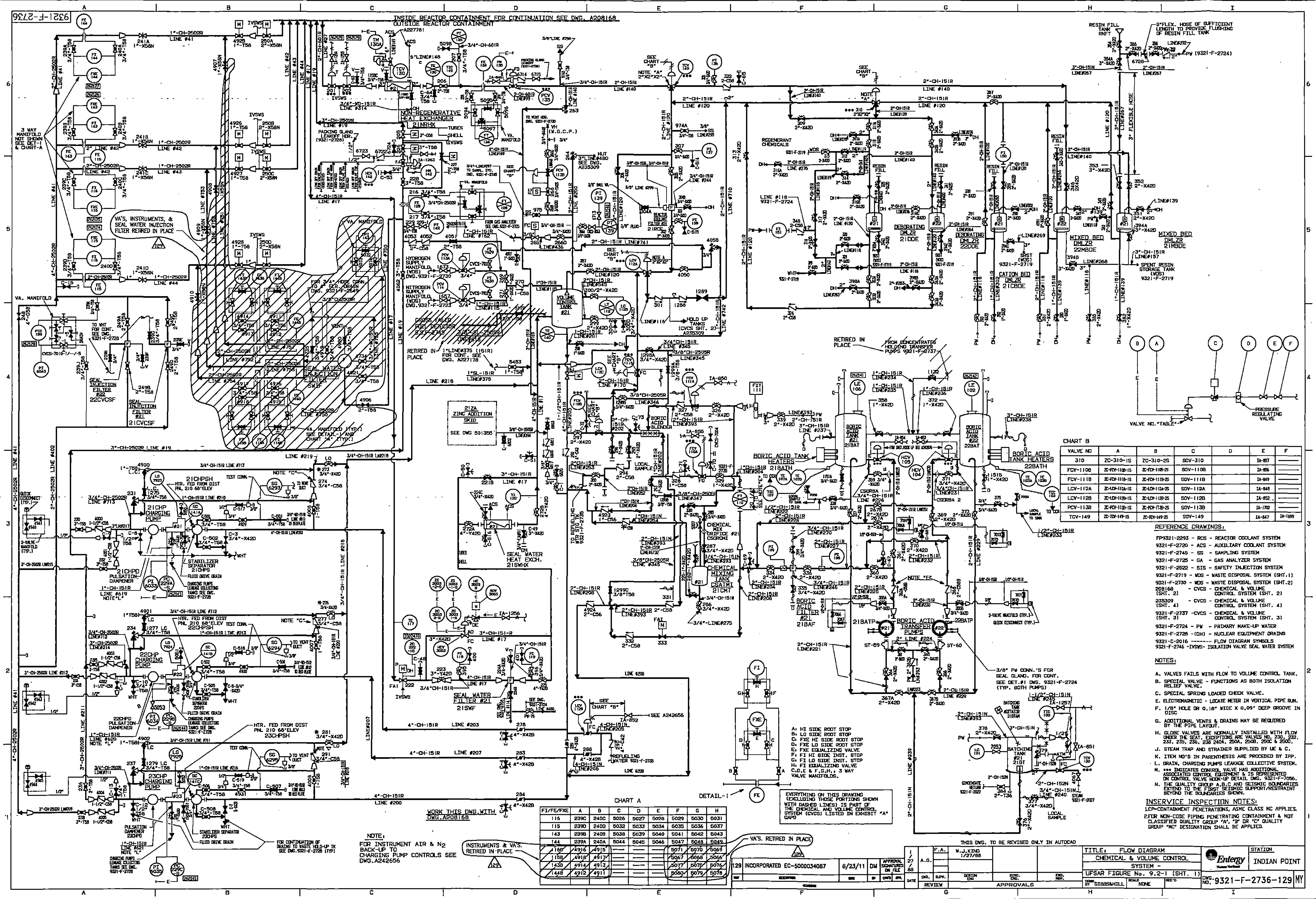

9321-F-2736
INSIDE REACTOR CONTAINMENT FOR CONTINUATION SEE DWG. A208168
OUTSIDE REACTOR CONTAINMENT
NON-REGENERATIVE HEAT EXCHANGER
21NRHX
VOLUME CONTROL TANK #21
SEAL WATER INJECTION FILTER
BORIC ACID TANK HEATERS
21BATH
22BATH
BORIC ACID TRANSFER PUMPS
BORIC ACID FILTER #21
21BAF
CHEMICAL MIXING TANK
21CMT
SEAL WATER HEAT EXCH.
21SWHX
SEAL WATER FILTER #21
21SWF
21CHP CHARGING PUMP
22CHP CHARGING PUMP
23CHP CHARGING PUMP
DEBORATING DMLZR
21DDE
22DDE
CATION BED DMLZR
21CBDE
MIXED BED DMLZR
21MBDE
22MBDE
21ZA ZINC ADDITION SKID
SEE DWG 501355
RETIRED IN PLACE
DETAIL-1
A: HI SIDE ROOT STOP
B: LO SIDE ROOT STOP
C: FXE HI SIDE ROOT STOP
D: FXE LO SIDE ROOT STOP
E: FXE EQUALIZING VALVE
F: FI HI SIDE INST. STOP
G: FI LO SIDE INST. STOP
H: FI EQUALIZING VALVE
C,D,E & F,G,H; 3 WAY VALVE MANIFOLDS.
WORK THIS DWG.WITH DWG.A208168
NOTE: FOR INSTRUMENT AIR & N2 BACK-UP TO CHARGING PUMP CONTROLS SEE DWG.A242656
INSTRUMENTS & VA'S. RETIRED IN PLACE
VA'S. RETIRED IN PLACE
EVERYTHING ON THIS DRAWING (EXCLUDING THOSE PORTIONS SHOWN WITH DASHED LINES) IS PART OF THE CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LISTED IN EXHIBIT "A" GAPD
VALVE NO. "TABLE"
PRESSURE REGULATING VALVE
THIS DWG. TO BE REVISED ONLY IN AUTOCAD

CHART A

FI/FE/FXE	A	B	C	D	E	F	G	H
116	239C	240C	5026	5027	5028	5029	5030	5031
115	239D	240D	5032	5033	5034	5035	5036	5037
143	239B	240B	5038	5039	5040	5041	5042	5043
144	239A	240A	5044	5045	5046	5047	5048	5049
116B	4916	4915	—	—	—	5071	5070	5069
115B	4918	4917	—	—	—	5067	5068	5066
143B	4914	4913	—	—	—	5077	5075	5076
144B	4912	4911	—	—	—	5080	5079	5078

CHART B

VALVE NO	A	B	C	D	E	F
310	ZC-310-1S	ZC-310-2S	SOV-310		IA-857	—
FCV-110B	ZC-FCV-110B-1S	ZC-FCV-110B-2S	SOV-110B		IA-856	—
FCV-111B	ZC-FCV-111B-1S	ZC-FCV-111B-2S	SOV-111B		IA-849	—
LCV-112A	ZC-LCV-112A-1S	ZC-LCV-112A-2S	SOV-112A		IA-848	—
LCV-112B	ZC-LCV-112B-1S	ZC-LCV-112B-2S	SOV-112B		IA-852	—
PCV-113B	ZC-PCV-113B-1S	ZC-PCV-113B-2S	SOV-113B		IA-1702	—
TCV-149	ZC-TCV-149-1S	ZC-TCV-149-2S	SOV-149		IA-847	IA-1699

REFERENCE DRAWINGS:

FP9321-2293 - RCS - REACTOR COOLANT SYSTEM
9321-F-2720 - ACS - AUXILIARY COOLANT SYSTEM
9321-F-2745 - SS - SAMPLING SYSTEM
9321-F-2725 - GA - GAS ANALYZER SYSTEM
9321-F-2522 - SIS - SAFETY INJECTION SYSTEM
9321-F-2719 - WDS - WASTE DISPOSAL SYSTEM (SHT.1)
9321-F-2730 - WDS - WASTE DISPOSAL SYSTEM (SHT.2)
208168 (SHT. 2) - CVCS - CHEMICAL & VOLUME CONTROL SYSTEM (SHT. 2)
235309 (SHT. 4) - CVCS - CHEMICAL & VOLUME CONTROL SYSTEM (SHT. 4)
9321-F-2737 (SHT. 3) -CVCS - CHEMICAL & VOLUME CONTROL SYSTEM (SHT. 3)
9321-F-2724 - PW - PRIMARY MAKE-UP WATER
9321-F-2728 -(DH) - NUCLEAR EQUIPMENT DRAINS
9321-C-2016 ------- FLOW DIAGRAM SYMBOLS
9321-F-2746 -IVSWS- ISOLATION VALVE SEAL WATER SYSTEM

NOTES:

A. VALVES FAILS WITH FLOW TO VOLUME CONTROL TANK.
B. SPECIAL VALVE - FUNCTIONS AS BOTH ISOLATION RELIEF VALVE.
C. SPECIAL SPRING LOADED CHECK VALVE.
E. ELECTROMAGNETIC - LOCATE METER IN VERTICAL PIPE RUN.
F. 1/8" HOLE OR 0.18" WIDE X 0.09" DEEP GROOVE IN DISC
G. ADDITIONAL VENTS & DRAINS MAY BE REQUIRED BY THE PIPE LAYOUT.
H. GLOBE VALVES ARE NORMALLY INSTALLED WITH FLOW UNDER THE SEAT. EXCEPTIONS ARE VALVES NO. 230, 232, 233, 235, 236, 238 240A, 250A, 250B, 250C & 250D.
J. STEAM TRAP AND STRAINER SUPPLIED BY UE & C.
K. ITEM NO'S IN PARENTHESIS ARE PROCEDED BY IPP.
L. DRAIN, CHARGING PUMPS LEAKAGE COLLECTIVE SYSTEM.
M. ••• INDICATES CONTROL VALVE HAS ADDITIONAL ASSOCIATED CONTROL EQUIPMENT & IS REPRESENTED ON CONTROL VALVE HOOK-UP DETAIL DWG. 9321-F-7056.
N. THE QUALITY GROUP A,B,C AND SEISMIC BOUNDARIES EXTEND TO THE FIRST SEISMIC SUPPORT/RESTRAINT BEYOND THE BOUNDARIES SHOWN.

INSERVICE INSPECTION NOTES:

1. CP=CONTAINMENT PENETRATIONS, ASME CLASS MC APPLIES.
2. FOR NON-CODE PIPING PENETRATING CONTAINMENT & NOT CLASSIFIED QUALITY GROUP "A", "B" OR "C" QUALITY GROUP "MC" DESIGNATION SHALL BE APPLIED.

129	INCORPORATED EC-5000034087	6/23/11	DM	APPROVAL SIGNATURES ON FILE		
REV	DESCRIPTION	DATE	BY	CHK'D	APR.	

1/27/88 — A.G. — F.A. — W.J.KING 1/27/88

REVIEW | APPROVALS

TITLE: FLOW DIAGRAM CHEMICAL & VOLUME CONTROL SYSTEM -
UFSAR FIGURE No. 9.2-1 (SHT. 1)

DRWN BY GIBBS&HILL — SCALE NONE

Entergy — STATION: INDIAN POINT

DWG. NO. 9321-F-2736-129 MY

ENCLOSURE 2 TO NL-17-035

Entergy Letter NL-13-115, "Response to Request for Additional Information Regarding Proposed License Amendment to Temporarily Connect Seismic to Non-seismic Piping under Administrative Controls" (TAC NO. MF1440), (September 4, 2013) (ML13253A138)

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

Entergy Nuclear Northeast
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249
Tel 914 254 6700

John A Ventosa
Site Vice President
Administration

NL-13-115

September 4, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: Response to Request for Additional Information Regarding Proposed License Amendment to Temporarily Connect Seismic to Non-seismic Piping under Administrative Controls (TAC NO. MF1440)
Indian Point Unit Number 2
Docket No. 50-247
License No. DPR-26

REFERENCES:
1. Entergy Letter NL-13-015 to NRC, Proposed License Amendment Regarding Connection of Non Seismic Boric Acid Recovery System to the Refueling Water Storage Tank, dated April 15, 2013
2. NRC Letter to Entergy, Request for Additional Information Regarding Proposed License Amendment to Temporarily Connect Seismic to Non-Seismic Piping under Administrative Controls (TAC NO. MF1440), dated August 7, 2013

Dear Sir or Madam:

Entergy Nuclear Operations, Inc (Entergy) requested a License Amendment, Reference 1, for Indian Point Nuclear Generating Unit No. 2 (IP2). The proposed amendment would revise Technical Specification 3.5.4, to allow connection of the non-seismically qualified piping of the temporary Boric Acid Recovery System to the Refueling Water Storage Tank under administrative controls for a limited period of time. On August 7, 2013, the NRC staff identified the need for additional information to complete their review (Reference 2). Entergy is providing additional information in response to this request in Attachment 1 and Enclosure 1.

A copy of this response is being submitted to the designated New York State official in accordance with 10 CFR 50.91.

There are no new commitments being made in this submittal. If you have any questions or require additional information, please contact Mr. Robert Walpole, Manager, Licensing at (914) 254-6710.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 4, 2013.

Sincerely,

JAV/ai

Attachment: 1. Response to Request for Additional Information Regarding Proposed License Amendment to Temporarily Connect Seismic to Non-Seismic Piping under Administrative Controls

Enclosure: 1. Indian Point Calculation IP-CALC-11-00091, AST Analysis of IP2 to address the impact of Containment sump solution back-leakage to the RWST after LOCA

cc: Mr. Douglas Pickett, Senior Project Manager, NRC NRR DORL
Mr. William Dean, Regional Administrator, NRC Region 1
NRC Resident Inspector Office
Mr. Francis J. Murray, Jr., President and CEO, NYSERDA
Ms. Bridget Frymire, New York State Dept. of Public Service

ATTACHMENT 1 TO NL-13-115

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING PROPOSED LICENSE AMENDMENT TO TEMPORARILY CONNECT SEISMIC TO NON-SEISMIC PIPING UNDER ADMINISTRATIVE CONTROLS

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

Response To Request For Additional Information

Accident Dose Branch Questions and Responses

Question 1

Final Safety Analysis Report (FSAR) Section 14.3.6.6, "External Recirculation," provides a description of the analyses used to justify the proposed change (2.0 gallon per hour limit for Emergency Core Cooling System (ECCS) leakage).

FSAR Section 14.3.6.6 states:

> *Since the leakage is initiated at 6.5 hours after the LOCA* [loss of coolant accident], *it does not contribute to the 2 hour site boundary dose* [exclusion area boundary dose or EAB].

Standard Review Plan (SRP) 15.0.1, "Radiological Consequence Analyses Using Alternative Source Terms," states:

> *The methodology and assumptions for calculating the radiological consequences should reflect the regulatory positions of RG-1.183* [Regulatory Guide 1.183].

Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," Regulatory Position 4.1.5, states:

> *The TEDE should be determined for the most limiting person at the EAB. The maximum EAB TEDE for any two-hour period following the start of the radioactivity release should be determined and used in determining compliance with the dose criteria in 10 CFR50.67.[14] The maximum two-hour TEDE should be determined by calculating the postulated dose for a series of small time increments and performing a "sliding" sum over the increments for successive two-hour periods. The maximum TEDE obtained is submitted. The time increments should appropriately reflect the progression of the accident to capture the peak dose interval between the start of the event and the end of radioactivity release (see also Table 6).*

This is consistent with Title 10 of the *Code of Federal Regulations* [10 CFR], Section 50.67, "Accident Source Term," that states:

> *An individual located at any point on the boundary of the exclusion area for* ***any*** [emphasis added] *2-hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 0.25 Sv (25 rem)[2] total effective dose equivalent (TEDE).*

a) Please confirm whether the dose due to ECCS leakage is excluded from the FSAR Section 14.3.6.6 EAB dose calculation.

b) If so, please explain how this is consistent with 10 CFR 50.67. SRP 15.0.1 and 10 CFR 50.67 both state that the worst dose for any 2 hour period is to be used to determine the EAB dose. This would typically mean the ECCS dose should be added to the time dependent EAB dose and the worst 2 hour dose should be determined from this time dependent dose profile. Please justify why the ECCS leakage is not considered in the determination of the EAB dose, or include the ECCS leakage in the EAB dose calculation.

Response to Question 1

a) Any ECCS leakage for the first 6.5 hours following a LOCA is internal to the containment and inherently accounted for in the offsite dose contribution for containment leakage. In order to identify the worst two hour period, the computer runs included time steps to provide EAB 2-hour doses at 0.2 hour intervals. As shown below, the worst two-hour dose is 16.91 rem over the 0.6 to 2.6 hour interval (this dose was increased by a factor of 1.05 for conservatism and rounded to 17.8 rem as reported in FSAR Section 14.3.6.8). The dose gets reduced to16.47 rem in the 0.8 to 2.8 hour period, and further reduced in the 1.0 to 3.0 hour period. After 6.5 hours, when ECCS leakage begins outside of containment, the EAB dose rate from containment airborne leakage is so low that the added radiological contribution from the ECCS leakage pathway is not sufficient to change the maximum 2-hour dose from the peak value set earlier in the accident.

Exclusion Area Boundary Dose (rem TEDE)

0.4 – 2.4 hr	0.6 – 2.6 hr	0.8 – 2.8 hr	1.0 – 3.0 hr
16.59	16.91	16.47	15.36

b) See response to a) above.

Question 2

UFSAR Section 14.3.6.6 states:

> The releases would be subject to filtration by the filtered ventilation system *provided for the primary auxiliary building which houses the portions of the ECCS located outside containment. However, filtration of the releases is not credited in the analysis.*

a) Are releases from non-seismic piping (postulated to fail) subject to the filtered ventilation system in the primary auxiliary building?

Response to Question 2

a) Any break in non-seismic piping in the primary auxiliary building would be subject to the filtered ventilation system.

Question 3

The Nuclear Regulatory Commission's safety evaluation, which reviewed the conversion to 10 CFR 50.67, reviewed an analysis which appears to have different assumptions than those provided in FSAR Section 14.3.6.6.

a) Has the NRC staff reviewed the analysis provided in FSAR Section 14.3.6.6 or were these changes made using 10 CFR 50.59, "Changes, tests and experiments"? If a staff evaluation of this analysis has not been performed, please provide the inputs, assumptions, methodology and results of the analysis that is to be used to support the proposed change.
b) FSAR Section 14.3.6.6 provides design basis dose values for two different assumptions (assuming a boundary layer effect and assuming no boundary layer effect). Which assumption is used for the licensing basis calculation?

Response to Question 3

a) FSAR Section 14.3.6.6 was revised using 10 CFR 50.59, "Changes, tests and experiments", to include potential ECCS back-leakage to the RWST. A copy of the calculation used to support the change is provided in Enclosure 1 as requested.

b) The licensing basis calculation is based on no boundary layer effect resulting in a Control Room Dose of 4.9 rem. This was reviewed and approved by the NRC in the Safety Evaluation for SPU (NRC Letter to Entergy, Indian Point Nuclear Generating Unit No. 2- Issuance of Amendment Re: 3.26 Percent Power Uprate (TAC NO. MC1865), October 27, 2004).

Question 4

Page 3 of 8 of the submittal states:

> *The RWPP [Refueling Water Purification Pump] will take suction through manual isolation valve 855 on line ...*

a) Please confirm whether this sentence should state valve 845 or whether valve 855 is correct.

Response to Question 4

a) The sentence on page 3 of 8 of the submittal contains a typographical error and should state:

> *The RWPP [Refueling Water Purification Pump] will take suction through manual isolation valve **845** on line ...*

Question 5

RG 1.183, Regulatory Position 5.1.2 states:

> *5.1.2 Credit for Engineered Safeguard Features*
>
> *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. Assumptions regarding the occurrence and timing of a loss of offsite power should be selected with the objective of maximizing the postulated radiological consequences.*

a) Please describe how the valves credited to isolate the non-seismic pathways after a design basis accident meet the above regulatory position. For those valves that do not meet the regulatory position please explain the differences between the design features, analytical techniques and procedural methods proposed and the regulatory position and justify how the proposed alternatives to the regulatory position proved an acceptable method for complying with the NRC regulations (10 CFR 50.67).

Response to Question 5

a) As noted in the submittal, a dedicated operator would isolate suction from the RWST to BARS by closing valves 845 and 727A. This pair of valves is seismic 1 and in series and the single failure of one of the valves would be mitigated by the other valve. The dedicated operator would also isolate the return line from the BARS to the RWST by closing valve 350. Any leakage through valve 350 would be limited to leakage past MOV 842/843. This pair of valves is in series and tested with a leakage limit of 0.5 gph, which is accounted for in the radiological analysis.

Question 6

Page 4 of 8 of the submittal states:

> *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).*

a) Are MOV 842/843 always closed when the potential for this leakage pathway exists? If not, explain the timing involved for closing MOV 842/843 and valve 350. Can the

timing of the closure of these valves cause the 0.5 gph leakage limit to the non-seismic piping to be exceeded for any time period after the start of the postulated accident.

Response to Question 6

a) MOV 842/843 would always be closed when the potential for this leakage pathway exists. For hot leg recirculation, Procedure 2-ES-1.4, "Transfer to Hot Leg Recirculation", requires SI pump mini-flow valves MOV-842/843 to be closed. Similarly, for cold leg recirculation with the SI pumps taking suction from the recirculation pumps, 2-ES-1.3, "Transfer to Cold leg Recirculation", requires verifying MOV-842/843 are closed.

Question 7

Page 4 of 8 of the submittal states:

> *Following the injection phase of a large break LOCA (about 20 minutes) the* ***preferred*** [emphasis added] *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 6.5 hours].
>
> RG 1.183, Regulatory Position 5.1.3 states:
>
> *The numeric values that are chosen as inputs to the analyses required by 10 CFR 50.67 should be selected with the objective of determining a conservative postulated dose.*

a) Confirm that plant procedures do not allow the recirculation of sump fluids outside containment prior to 6.5 hours.
b) If plant procedures do allow the recirculation of sump fluids outside of containment prior to 6.5 hours why aren't these methods of recirculation considered in the determination of the ECCS leakage dose calculation?
c) RG 1.183, Regulatory Position 1.3 defines the scope of required analyses which include post accident access shielding (NUREG-0737, "Clarification of TMI Action Plan Requirements," Action Item II.B.2, "Post-Accident Access Shielding"). If plant procedures do allow the recirculation of sump fluids outside of containment prior to 6.5 hours please state whether vital area access (Action Item II.B.2) necessary to close valves 845, 727A and 350 and trip the refueling water storage tank (RWST) purification pump is maintained.

Response to Question 7

a) Plant procedure 2-ES-1.3, "Transfer to Cold leg Recirculation", provides instructions for transferring the safety injection system and containment spray system to the recirculation mode. The Procedure requires manually starting one internal recirculation

pump, and if it cannot be started then manually starting the other internal recirculation pump. If neither internal recirculation pump can be started then the procedure requires establishing cold leg recirculation using RHR pumps which results in sump fluid going outside containment. It should be noted that Emergency Operating Procedures address all potential contingencies to mitigate an accident.

b) The IP2 design is fairly unique in having two internal recirculation pumps as well as two RHR pumps. There is no single active failure that would require using RHR pumps. Further, IP2 licensing basis does not postulate a passive failure to occur for 24 hours. Consequently, recirculation of sump fluid outside containment would only occur at 6.5 hours for hot leg recirculation. RG 1.183 guidance does not impose postulating a passive failure and consequently ECCS leakage dose is not calculated prior to 6.5 hours.

c) Not Applicable - see response to b) above.

Response To Request For Additional Information

Component Performance, NDE, and Testing Branch

RAI 1

In the referenced letter it is indicated that valves 845, 727A and 350 will be part of the Inservice Test Program with a test frequency of two years. Will these valves be classified as manual, active valves and, therefore, be subject to ASME OM Code exercise testing requirements? Will these valves be further classified as Category A and, therefore, be subject to ASME OM Code leakage testing requirements? (The discussion of post-accident dose consequences indicates that these valves could be exposed to sump fluid.)

Response to RAI 1

Valves 845, 727A and 350 will be classified as manual active valves with open and close ASME OM Code exercise stroke requirements on a two year frequency. Valves 845 and 727A will be classified as Category A, therefore requiring leak testing every two years. Valve 350 will not require leak testing. The potential for sump fluid leakage to impact BARS through valve 350 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 in series and tested by Procedure 2-PT-R048, "Leak Test of 842 and 843", and have an acceptance criterion of 0.5 gallons per hour, and accounted for in the radiological analysis.

Response To Request For Additional Information

Health Physics and Human Performance Branch

Question 1

1.0 INTRODUCTION

By letter dated April 15, 2013 (ADAMS Accession Number ML13116A007), Entergy Nuclear Northeast (Entergy), licensee for Indian Point Nuclear Generating Unit 2 (IP2), submitted a license amendment request (LAR) to revise Technical Specification (TS) 3.5.4, "Refueling Water Storage Tank (RWST)". The proposed change would revise the TS to allow the non-seismically qualified piping of the temporary Boric Acid Recovery System (BARS) to be connected to, and isolated from, the RWST's seismically qualified piping by manual operation of RWST seismically qualified boundary valves. This would be done under administrative controls and only for limited periods of time. These limited periods are specified as up to 30 days per fuel cycle for filtration for removal of suspended solids from the RWST water. This change will only be applicable until Refueling Outage R22 (Spring 2016) ends. Manual connection of the RWST seismically qualified piping to non-seismically qualified piping shall not be allowed after the end of R22. The Health Physics and Human Performance Branch (AHPB) has done a preliminary review of the LAR regarding the operator performance aspects and finds that the following additional information is required to complete the review.

1. As described in Section 2 of the licensee's submittal, the change requested for TS 3.5.4 is a proposed Note, that states," 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 refuel outage 22." Later in Section 3, it is stated that, "Prior to refueling outage (RO) 2R20 the RWST was recirculated for a duration of 13 days. After recirculation the total concentration of silica was less than 1.1 ppm. Prior to RO 2R19 the RWST was recirculated for a duration of 11 days. A sample taken after recirculation had total concentration of silica of 1.3 ppm." Based on this statement the NRC staff assumes that clarity was sufficient after, at most, 13 days, and at a silica concentration of 1.3 ppm.

    a. What concentration of silica/clarity is acceptable for operators to perform their required tasks during shutdown? Why isn't this criterion included in the proposed TS? How will operators know when it is okay to disengage the BARS?
    b. If prior to the previous two refueling outages, it only took 11 days and 13 days to achieve acceptable clarity, why is the licensee requesting allowance for up to 30 days? In order to minimize the time spent in a seismically vulnerable configuration, why wouldn't a duration of 15 days be sufficient?

Response to Question 1

a. The fuel vendor has specified guidelines for implementing zinc addition. For IP2, Chemistry Procedures specify a silica concentration of ≤ 2 ppm to reduce zinc silicate precipitation on fuel surfaces. This is a fuel vendor guidance value, and not a limiting condition for operation. Exceeding this limit would result in fuel exams. Chemistry

monitors silica and boron every six hours during the clean up, and is able to predict completion time a day or two ahead of reaching the target value.

b. The 11 days and 13 days in the prior two outages was BARS system operation time. Time is also required for setup and removal of the BARS skid, which is typically one or two days each. Plus there is a period when the BARS unit is secured but still connected to allow the vendor some time off. The 30 days request provides margin in consideration of any delays or equipment issues that might arise with the vendor skid. Since the BARS skid is rented, typically for 21 days, it is only used for the amount of time it is needed.

Question 2

Does IP2 have a Time-critical Action Program to protect high-risk, time-limited actions from inadvertent change? If yes, is the proposed task sequence included in that program? If no, what controls are used to prevent inadvertent changes to the proposed operator actions or the time available to perform them? Does the licensee's configuration control system have a way to identify Tech-Spec-related actions in procedures?

Response to Question 2

IPEC has a Time-critical Action Program, OAP-115,"Operations Commitments and Policy Details". Specific IP2 actions are listed in Attachment 4, however, the proposed task sequence is currently not included in that program. Licensing Request LR-LAR-2013-00113 CA#12 has been initiated to update OAP-115 prior to implementing BARS to include an action to isolate BARS in 31 minutes in the event of a seismic occurrence or an accident requiring injection from the RWST. Further, a CAUTION in 2-OSP-10.1.1, "Support Procedure – Safety Injection Accumulators and Refueling Water Storage Tank Operations", specifies the time available to the dedicated operator to isolate the RWST Silica Cleanup System in the event of a failure such that RWST level will be maintained above the Technical Specification limit. Revisions to Procedures require a Process Applicability Determination be performed which would evaluate the affect or potential affect of the change.

Question 3

In the general discussion of the ingress/egress paths taken by the operators to accomplish the isolation of seismic from non-seismic systems, the licensee states that a card reader is in the intended path.

a. Does this card reader require a different card than an operator would have for plant access? If yes, will the dedicated operator routinely keep this other card on his person? If no, where will it be stored?
b. Did the simulation that was performed to ascertain required time vs. available time include accessing the card reader?
c. Is the card reader designed to work under seismic conditions? SBO? How much additional time would be involved if the operator had to deal with a non-operational card reader?

Response to Question 3

a. No. The card reader uses the employee ID card (security badge), which is the same card as an operator would have for plant access. When at work, company policy requires all employees to wear their ID card on the outside clothing, between the neck and waist.

b. Yes. The simulation included accessing the card reader.

c. No. The security access card reader system is not seismic and will not work under SBO. Operators have keys in their possession to provide manual override in the event of a non-functional card reader and would result in minimal additional time to open the door. As noted in the submittal, a simulation performed by Operations demonstrated substantial margin in the time available to shutdown the BARS and maintain RWST level within the TS value.

Question 4

What method(s) will be used to monitor the continuing effectiveness and safety of the current method of purification of reactor water until the final resolution is implemented in 2016? Will the Corrective Action Program be used to track the status and effectiveness of current process?

Response to Question 4

The continuing effectiveness and safety of the current method of purification of reactor water is monitored by the work control and temporary alteration processes. The Corrective Action Program is used to document and resolve issues that may arise during the campaign.

ATTACHMENT 9.1 **DESIGN INPUT RECORD**

Sheet 1 of 1

Design Input Revision: 0 | Page 1 of 9

DESIGN INPUT RECORD

Document Type: Calculation

Document Number: IP-CALC-11-00091 MC Document
Revision: 0

Problem Summary: (Attach additional sheets as required)

The high head safety injection (HHSI) system and the low head injection/residual heat removal (RHR) system are connected to the refueling water storage tank (RWST) through multiple valves. The potential doses resulting from leakage of the emergency core cooling system (ECCS) back to the RWST through these valves need to be quantified based on alternate source term (AST) analyses for a large break loss-of-coolant accident (LOCA).

Design Objective: (Attach additional sheets as required)

This analysis will calculate the Indian Point Unit 2 (IP2) Control Room (CR), offsite and the Technical Support Center (TSC) doses resulting from the identified emergency core cooling system (ECCS) back leakage to the IP2 Refueling Water Storage Tank (RWST) during a large break Loss-Of-Coolant Accident (LOCA). The calculated dose due to the ECCS back leakage to the RWST will be combined with the calculated dose resulting from releases via the containment leakage and the ECCS recirculation leakage pathways.

Discipline Review:
Contributing Disciplines:

	Prepared By	Reviewed By:		Prepared By	Reviewed By:
☐ Mechanical			☐ Electrical		
☐ I & C			☐ Civil/Structural		
■ Other (Nuclear)	M. Golshani	J.E. Chang	☐ Engineering Programs		

Outside Design Agency _____ ODA Responsible Engineer (Print/Sign/Date) _____

The contributing discipline engineer shall provide his/her name beside the appropriate block.

Lead Discipline Analysis Fuels & Nuclear
RE: (Print/Sign) Mehdi Golshani 10/31/11 Date

Engineering Supervisor: Ardesar Irani Date 10/31/11

Input	Value	Input Source (Source Document)
ECCS Back Leakage to the RWST – start of leakage	6.5 hours	Reference: CN-LIS-03-8, Rev. 0, "Indian Point Unit 2 (IPP) Uprate Post-LOCA Calculations."
Sump Water Volume	374,000 gallons	From Page 56 of Reference , CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
Density of RWST water	61.86 lb/ft^3	Density of water at maximum temperature of 110 °F, from Reference CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03), Page 56
Flow Rate of ECCS Back Leakage to the RWST – below the water level	20 & 29 gallons per hour (gph)	Calculate allowable back leakage to remain below the FSAR CR TEDE dose limit. Also calculate value which does not result the dose acceptance limit.
Flow Rate of ECCS Back Leakage to the RWST – above the water level	Not Applicable	The ECCS back leakage to the RWST above the water level will be considered as part of the ECCS leakage in the Primary Auxiliary Building via the containment vent in CN-CRA-03-55, Revision 0. Note that the RWST releases are bounded by the Primary Auxiliary Building releases since the atmospheric dispersion factors of the PAB releases (via containment vent) are greater than those of the RWST releases. [See inputs for atmospheric dispersion factors (χ/Q's)]
Volume of Water Associated with ECCS Back Leakage to the RWST	1,880 gallons	Reference: IP-CALC-11-00063, Table 2. The minimum water volume is estimated to be 2,094 (1943 + 151) gallons between the high head safety injection pump suction and the valve 846 to the RWST 2094 gallons × 0.9 (10% margin) = 1,884.6 gallons ≈ 1,880 gallons
Mass of iodine in sump	26,121 g	Reference: CN-CRA-11-25, "Indian Point 3 LOCA Doses including Contribution from Back-Leakage to RWST," IP-CALC-11-00080, (9/23/2011) Both plants IP2 and IP3 have the same rated thermal power and the source inventory of the core is almost the same. Therefore the amount of iodine source in the core for both plants IP2 and IP3 should be almost the same.

Input	Value	Input Source (Source Document)
ECCS Back Leakage to the RWST – time delay of the sump water reaching the RWST. Based on 20 and 29 gph assumption	75 hours 60 hours	Reference: IP-CALC-11-00063, Table 2. The horizontal section volume of the piping associated with the ECCS back leakage to the RWST is estimated to be 1,931 gallons between the high head safety injection pump suction and the valve 846 to the RWST. Since the sump water temperature is higher than the RWST and its associated piping temperatures, and the sump water is located at lower elevation, the vertical sections of piping are neglected due to the buoyancy-driven thermal mixing. Therefore, the time delay of the ECCS back leakage of 20 or 29 gallons per hour (gph) to reach the RWST is conservatively estimated to be 75 or 60 hours after the start of ECCS external recirculation. Horizontal Sections of 1A and 1B: 429 + 51 + 1304 + 78 + 3 +3 + 40 + 25 + 30 + 19 + 10 gallons = 1992 gallons Horizontal Sections of 2A and 2B: 429 + 51 + 1304 + 78 + 36 + 283 + 47 + 217 + 17 gallons = 2462 gallons 1992 gallons × 0.9 (10% margin) = 1,792.8 gallons ≈ 1,750 gallons 1,750 gallons / 20 gph (assume)= 87.5 hours ≈ 75 hours 1,750 gallons / 29 gph (assume)= 60.3 hours ≈ 60 hours
Iodine species in containment sump water Elemental: Organic: Particulate:	 0 0 100	All iodine is assumed to have converted to stable form in the sump water.

Input	Value	Input Source (Source Document)
Volume of Water Remaining in the RWST after Recirculation Switchover	13900 gallons	Lowest RWST Water Level = 1.49 ft Reference: CR-IP2-2002-04498 Per IP-PRT-09-00014, Rev. 1, page 45 shows the actual lowest RWST water level is 1.74 and page 42 of this reference says "if RWST level decreases to less than 1.5 ft then stop all pumps taking suction from the RWST." Therefore, using 1.49 is conservative. RWST volume: H= 41'-3" Dia.= 40.0' Drawing No: F.P. No. 9321-01-20339-4 Thickness = 0.227" =0.018917' Volume= $\prod R^2 h = 3.14 \times (20 - 0.018917)^2 \times 41.25 = 51738.27$ ft3 = 387054.0 gal RWST Water Volume per Foot = 387054.0 / 41.25 = 9383 gal/ft Remaining Water Volume = 1.49 ft × 9383 gal/ft = 13980 gallons ≈ 13,900 gallons
RWST Minimum Temperature	40°F	SR 3.5.4.1 Section 3.5.4 "Refueling Water Storage Tank (RWST)" of Indian Point Unit 2, Improved Technical Specifications (ITS).
RWST Maximum Temperature	110 °F	SR 3.5.4.1 Section 3.5.4 "Refueling Water Storage Tank (RWST)" of Indian Point Unit 2, Improved Technical Specifications (ITS).
Post-LOCA RWST Maximum Temperature due to the ECCS Back Leakage to the RWST	114 °F	Reference: CN-CRA-11-25, "Indian Point 3 LOCA Doses including Contribution from Back-Leakage to RWST," IP-CALC-11-00080, (9/23/2011) The post-LOCA maximum RWST temperature was estimated in Appendix B (pages 79 and 80) of CN-CRA-11-25 for IP3. A review of the IP2 containment sump temperature and the estimated ECCS back-leakage rate concluded that 114 °F is still bounding.

Input	Value	Input Source (Source Document)
Volume of Air in the RWST after Recirculation Switchover	386,000 gallons	Height of the RWST = 41' – 3" Drawing No: F.P. No. 9321-01-20339-4 RWST Volume at 41' – 3" = 13820 gallons + (41' – 3") × 9383 gallons/ft = 400,874 gallons Remaining Air Volume = 400,874 gallons – 13,980 gallons = 386,894 gallons ≈ 386,000 gallons
Maximum Boron Concentration of RWST	2600 parts per million [ppm]	SR 3.5.4.3 Section 3.5.4 "Refueling Water Storage Tank (RWST)" of Indian Point Unit 2, Improved Technical Specifications (ITS).
Minimum Boron Concentration of RWST	2400 parts per million [ppm]	SR 3.5.4.3 Section 3.5.4 "Refueling Water Storage Tank (RWST)" of Indian Point Unit 2, Improved Technical Specifications (ITS).
Maximum Diurnal Temperature Variation	40 °F	A review of the four (4) year Indian Point meteorological data shows the maximum diurnal temperature variation does not exceed 40 °F. [See page 81 of IP-CALC-11-00080, Revision 0, (CN-CRA-11-25, Revision 0), "Indian Point 3 LOCA Doses including Contribution from Back-Leakage to RWST."]
Minimum Sodium Tetraborate Decahydrate for Post-LOCA pH Control	8,096 pounds [lbm]	SR 3.6.7.1.b Section 3.6.7 "Recirculation pH Control System" of Indian Point Unit 2, Improved Technical Specifications (ITS).

Input	Value	Input Source (Source Document)
Atmospheric Dispersion Factors [χ/Q] for the IP2 Control Room (CR) Air Intake Associated with the IP2 RWST Release [sec/m^3] 0 – 2 hours: 2 – 8 hours: 8 – 24 hours: 1 – 4 days: 4 – 30 days:	 5.62E-04 3.72E-04 1.35E-04 1.10E-04 9.02E-05	Table 2.1 of IP-CALC-11-00060, Revision 0, "Analysis of IP2 Control Room and Technical Support Center Atmospheric Dispersion Factors due to Releases from the IP2 FSB & RWST." (9/28/11)
Control Room Volume	102,400 ft^3	Consistent with analysis in Reference , CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
CR Normal Operation flow rates (cfm) Filtered Makeup: Filtered Recirculation: Unfiltered Makeup: Unfiltered inleakage:	 0 0 920 700	Consistent with analysis in Reference , CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
Time to switch CR HVAC to emergency operation mode	60 sec.	Consistent with analysis in Reference, CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
CR HVAC emergency operation flow (cfm) Filtered Makeup: Unfiltered Makeup: Unfiltered inleakage:	 1800 0 700	Consistent with analysis in Reference, CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)

Input	Value	Input Source (Source Document)
CR HVAC Filter efficiencies (%) Elemental iodine: Organic iodine: Particulates:	 95 90 99	Consistent with analysis in Reference, CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
CR Breathing rate (m^3/sec)	3.5E-04	Ref. Reg. Guide 1.183 and also consistence with analysis in Reference, CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
CR Occupancy Factors 0-2 hours: 1-4 days: 4-30 days:	 1.0 0.6 0.4	Ref. Reg. Guide 1.183 and also consistence with analysis in Reference, CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
Offsite Meteorological Dispersion Factors (sec/m^3) EAB 0-2 hours: LPZ 0-8 hours: 8-24 hours: 1-4 days: 4-30 days:	 7.5E-04 3.5E-04 1.2E-04 4.2E-05 9.3E-06	Consistence with analysis in Reference, CN-CRA-03-55, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
Offsite breathing rate (m^3/sec) 0-8 hours: 8-24 hours: 1-30 days:	 3.5E-04 1.8E-04 2.3E-04	Ref. Reg. Guide 1.183 and also consistence with analysis in Reference, "Indian Point 2 – LOCA Doses for Stretch Power Uprate Program," Revision 0, (10/31/03)
Technical Support Center (TSC) Net-free Volume	860.9 m^3	Page 11 of NEA-00023, Revision 0, "Unit 2 TSC Personnel doses from RG 1.183/NUREG-1456 Design Basis Loss-of-Coolant Accident."

Input	Value	Input Source (Source Document)
Atmospheric Dispersion Factors [χ/Q] for the Technical Support Center (TSC) Air Intake Associated with the IP2 RWST Release [sec/m^3] 0 – 2 hours: 2 – 8 hours: 8 – 24 hours: 1 – 4 days: 4 – 30 days:	 3.58E-04 1.24E-04 5.66E-05 4.77E-05 3.94E-05	Table 2.2 of IP-CALC-11-00060, Revision 0, "Analysis of IP2 Control Room and Technical Support Center Atmospheric Dispersion Factors due to Releases from the IP2 FSB & RWST." (9/28/11)
Technical Support Center (TSC) Unfiltered Intake Flow Rate [Normal Operation]	12,870 cfm	8620 cfm + 4250 cfm = 12,870 cfm This value is greater than 11,230 cfm [damper flow rate] and 12,500 cfm [air-handling fan flow rate] for conservatism. A226586, Revision 6, "Technical Support Center HVAC Flow Diagram Elev. 72'-0", Elev. 88'-6" (Unit #2)." A226587, Revision 3, "Technical Support Center HVAC Flow Diagram El. 33'-0", 37'-0" & 53'-0" (Unit #2)."
Technical Support Center (TSC) Ventilation Mode [Incident Operation]	Filtered pressurized intake	Page 11 of NEA-00023, Revision 0, "Unit 2 TSC Personnel doses from RG 1.183/NUREG-1456 Design Basis Loss-of-Coolant Accident."
Technical Support Center (TSC) Filtered Intake Flow Rate [Incident Operation]	3400 standard cubic feet per minute (scfm) [conservatively lowered from 3492 cfm]	3492 to 4268 cfm: 2-PT-EM001, Revision 0, "TSC Filtration System." 3770 scfm: Page 11 of NEA-00023, Revision 0, "Unit 2 TSC Personnel doses from RG 1.183/NUREG-1456 Design Basis Loss-of-Coolant Accident."

Input	Value	Input Source (Source Document)
Technical Support Center (TSC) Recirculation Flow Rate [Both Normal and Incident Operation]	0 scfm [No Recirculation]	Page 11 of NEA-00023, Revision 0, "Unit 2 TSC Personnel doses from RG 1.183/NUREG-1456 Design Basis Loss-of-Coolant Accident."
Technical Support Center (TSC) Ventilation Mode Change from Normal to Incident Operation	60 minutes [maximum delay time for conservatism]	The Technical Support Center (TSC) and the Operations Support Center (OSC) will be staffed within 60 minutes, and the OSC Radiation Protection Coordinator will request the Control Room to align the TSC ventilation system for incident operation. IP-EP-210, Revision 9, "Central Control Room." IP-EP-220, Revision 10, "Technical Support Center." IP-EP-230, Revision 7, "Operations Support Center."
Technical Support Center (TSC) Unfiltered Inleakage Flow Rate [Both Normal and Incident Operation]	500 scfm	Page 11 of NEA-00023, Revision 0, "Unit 2 TSC Personnel doses from RG 1.183/NUREG-1456 Design Basis Loss-of-Coolant Accident."
Technical Support Center (TSC) Exhaust Flow Rate [Incident Operation]	3900 scfm	3400 scfm [filtered intake] + 500 scfm [unfiltered inleakage] = 3900 scfm
Technical Support Center (TSC) Filter Efficiencies [Incident Operation] Particulate: Inorganics (elemental): Organics: Noble gases:	 99% 95% 90% 0%	Page 11 of NEA-00023, Revision 0, "Unit 2 TSC Personnel doses from RG 1.183/NUREG-1456 Design Basis Loss-of-Coolant Accident."

ATTACHMENT 9.1 **DESIGN VERIFICATION COVER PAGE**

Sheet 1 of 1

DESIGN VERIFICATION COVER PAGE

☐ ANO-1	☐ ANO-2	☒ IP-2	☐ IP-3	☐ JAF	☐ PLP
☐ PNPS	☐ VY	☐ GGNS	☐ RBS	☐ W3	☐ NP

Document No.: IP-CALC-11-00091	Revision No.: 0	Page 1 of 10
Title: AST Analysis of IP2 to Address the Impact of Containment Sump Solution Back-Leakage to the RWST after LOCA		
☒ Quality Related ☐ Augmented Quality Related DV Method: ☒ Design Review ☐ Alternate Calculation ☐ Qualification Testing		

VERIFICATION REQUIRED	DISCIPLINE	VERIFICATION COMPLETE AND COMMENTS RESOLVED (DV print, sign, and date)
☐	Electrical	
☐	Mechanical	
☐	Instrument and Control	
☐	Civil/Structural	
☒	Nuclear	Jong E. Chang / 11/16/11
☐		
☐		

Originator:	Mehdi Golshani / 11/16/11 Print/Sign/Date After Comments Have Been Resolved

ATTACHMENT 9.6 **DESIGN VERIFICATION CHECKLIST**

Sheet 1 of 3

IDENTIFICATION:				DISCIPLINE:
Document Title: AST Analysis of IP2 to Address the Impact of Containment Sump Solution Back-Leakage to the RWST after LOCA				☐ Civil/Structural ☐ Electrical ☐ I & C ☐ Mechanical ☒ Nuclear ☐ Other
Doc. No.: IP-CALC-11-00091		Rev. 0	QA Cat.	
Verifier:	Jong E. Chang (Print)	(Sign)	11/16/11 (Date)	
Manager authorization for supervisor performing Verification. ☒ N/A	(Print)	(Sign)	(Date)	

METHOD OF VERIFICATION:

Design Review ☒ Alternate Calculations ☐ Qualification Test ☐

The following basic questions are addressed as applicable, during the performance of any design verification. [ANSI N45.2.11-1974] [NP QAPD, Part II, Section 3] [NP NQA-1-1994, Part I, BR 3, Supplement 3S-1]

NOTE The reviewer can use the "Comments/Continuation sheet" at the end for entering any comment/resolution along with the appropriate question number. Additional items with new question numbers can also be entered.

1. Design Inputs – Were the inputs correctly selected and incorporated into the design?

   (Design inputs include design bases, plant operational conditions, performance requirements, regulatory requirements and commitments, codes, standards, field data, etc. All information used as design inputs should have been reviewed and approved by the responsible design organization, as applicable.

   All inputs need to be retrievable or excerpts of documents used should be attached.

   See site specific design input procedures for guidance in identifying inputs.)

   Yes ☒ No ☐ N/A ☐

2. Assumptions – Are assumptions necessary to perform the design activity adequately described and reasonable? Where necessary, are assumptions identified for subsequent re-verification when the detailed activities are completed? *Are the latest applicable revisions of design documents utilized?*

   Yes ☒ No ☐ N/A ☐

3. Quality Assurance – Are the appropriate quality and quality assurance requirements specified?

   Yes ☒ No ☐ N/A ☐

4. Codes, Standards and Regulatory Requirements – Are the applicable codes, standards and regulatory requirements, including issue and addenda properly identified and are their requirements for design met?
Yes ☒ No ☐ N/A ☐

5. Construction and Operating Experience – Have applicable construction and operating experience been considered?
Yes ☐ No ☐ N/A ☒

6. Interfaces – Have the design interface requirements been satisfied and documented?
Yes ☒ No ☐ N/A ☐

7. Methods – Was an appropriate design or analytical (for calculations) method used?
Yes ☒ No ☐ N/A ☐

8. Design Outputs – Is the output reasonable compared to the inputs?
Yes ☒ No ☐ N/A ☐

9. Parts, Equipment and Processes – Are the specified parts, equipment, and processes suitable for the required application?
Yes ☐ No ☐ N/A ☒

10. Materials Compatibility – Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?
Yes ☐ No ☐ N/A ☒

11. Maintenance requirements – Have adequate maintenance features and requirements been specified?
Yes ☐ No ☐ N/A ☒

12. Accessibility for Maintenance – Are accessibility and other design provisions adequate for performance of needed maintenance and repair?
Yes ☐ No ☐ N/A ☒

13. Accessibility for In-service Inspection – Has adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?
Yes ☐ No ☐ N/A ☒

14. Radiation Exposure – Has the design properly considered radiation exposure to the public and plant personnel?
Yes ☒ No ☐ N/A ☐

15. Acceptance Criteria – Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?
Yes ☒ No ☐ N/A ☐

16. Test Requirements – Have adequate pre-operational and subsequent periodic test requirements been appropriately specified?
Yes ☐ No ☐ N/A ☒

ATTACHMENT 9.6 **DESIGN VERIFICATION CHECKLIST**

Sheet 3 of 3

17. Handling, Storage, Cleaning and Shipping – Are adequate handling, storage, cleaning and shipping requirements specified?
Yes ☐ No ☐ N/A ☒

18. Identification Requirements – Are adequate identification requirements specified?
Yes ☐ No ☐ N/A ☒

19. Records and Documentation – Are requirements for record preparation, review, approval, retention, etc., adequately specified? Are all documents prepared in a clear legible manner suitable for microfilming and/or other documentation storage method? Have all impacted documents been identified for update as necessary?
Yes ☒ No ☐ N/A ☐

20. Software Quality Assurance- ENN sites: For a calculation that utilized software applications (e.g., GOTHIC, SYMCORD), was it properly verified and validated in accordance with EN- IT-104 or previous site SQA Program?
ENS sites: This is an EN-IT-104 task. However, per ENS-DC-126, for exempt software, was it verified in the calculation?
Yes ☒ No ☐ N/A ☐

21. *Has adverse impact on peripheral components and systems, outside the boundary of the document being verified, been considered?*
Yes ☐ No ☐ N/A ☒

ATTACHMENT 9.7 **DESIGN VERIFICATION COMMENT SHEET**

Sheet 1 of 1

Comments / Continuation Sheet

Question #	Comments	Resolution	Initial/Date
1	Various editorial comments were identified and addressed. No response required.	N/A	MG JZL 11/16/11
2	[Section 6.2] The potential ECCS back-leakage flow to the RWST via Valve 846 is below the RWST water level as identified in Attachment C, Design Inputs (page 2 of 9). Hence, the flow to "air" is an artificial flow path to match the iodine partition factor between the RWST water and the RWST air. This is not the potential ECCS leakage to the RWST via MOV-842 and MOV-843, which is above the RWST water level. No response required.	N/A	MG JZL 11/16/11
3	[Section 6.3] The equivalent mole of sodium hydroxide (NaOH) was used to determine the delivered sump water. Then the titration curve of boric acid/trisodium phosphate (TSP) was used to estimate the RWST pH. However, the actual sump solution is based on sodium tetraborate (STB), which is also a weak base. Therefore, it is not obvious that the titration curve using TSP is always conservative to estimate the RWST pH for the elemental iodine fraction. The following post-LOCA sump pH values are found based on TSP and STB: • 12,000 lbm of TSP (trisodium phosphate dodecahydrate, TSP-10H_2O) in the post-accident IP2 containment sump at 2000 ppm boron resulted in pH of 7.61 (page 10 of CN-CRA-96-005, Revision 2). If the mass is adjusted to 10,000 lbm of TSP, the resulting pH is approximately 7.53. • 10,000 lbm of STB (sodium	N/A	MG JZL 11/16/11

Question #	Comments	Resolution	Initial/Date
	tetraborate decahydrate, STB-12H_2O) in the post-accident IP2 containment sump at 2000 ppm born resulted in pH of 7.4 (Figure 3 of IP-CALC-07-00129, Revision 2). The molar mass of TSP-10H_2O is 380.1234 g/mol and STB-12H_2O is 381.38 g/mol so they are very comparable in weight. Thanks to the TSP titration curve, the estimated RWST pH could be higher as much as pH = 0.13, which is non-conservative. While determining the elemental iodine fraction in page 31 of the calculation, the elemental iodine fraction in the RWST was selected based on pH of 6.04 instead of 5.2, which gives a margin of pH = 0.84. Therefore, although the TSP titration curve results in slightly non-conservative RWST pH, the elemental iodine fraction was chosen such that the inputs to RADTRAD are still conservative. No response required.		
4	[Design Inputs] The maximum RWST temperature was reviewed not just for the final temperature but for the whole accident duration, i.e., 30 days. As shown in the following Attachment 1, the maximum RWST temperature maintains below 114 °F at 20 gph of the back-leakage flow rate. No response required.	N/A	MG JZL 11/16/11

Attachment 1. Maximum RWST Water Temperature due to the Sump Water Back-Leakage

INPUTS

t_initial = start of ECCS leakage to RWST

6.5	hours	: Section 2.0 of CN-LIS-30-8, Revision 0
23,400	seconds	: Section 3.1 of CN-CRA-03-55, Revision 0

t_final = accident duration

30	days	: Regulatory Guide 1.183
2,592,000	seconds	

V_pipe = piping volume

1880	gallons	: Design Input : RHR Suction Line

V_rwst = RWST water volume

13900	gallons	: Design Input

T_rwst = RWST water temperature

110	deg F	: SR 3.5.4.1 of IP3 Improved Technical Specifications

Q_leakage = ECCS leakage to RWST

20	gallons per hour	: Design Input

Maximum ECCS Temperature
: Minimum ECCS w/ NUREG-1465

Time [sec]	ECCS Temperature [deg F]	
		: pages 61 - 63, CN-CRA-03-12, Revision 0
		: Sump Temperature
23,199	196.31	
25,599	191.26	
26,799	188.97	
29,199	184.86	
31,599	191.28	
36,399	175.45	
41,599	170.68	
61,199	160.83	
80,799	156.51	
85,599	155.78	

90,399	155.11
99,999	153.84
101,999	151.64
104,999	148.76
106,999	147.11
109,999	144.94
114,999	142.05
119,999	139.84
128,999	137.05
138,999	135.06
158,999	132.81
199,999	130.53
201,999	129.66
206,999	127.71
216,999	125.11
236,999	122.59
275,999	120.89
314,999	120.09
353,999	119.46
401,999	118.54
411,999	117.4
431,999	116.32
470,999	115.67
548,999	115.21
626,999	114.87
782,999	114.27
1,008,999	111.09
1,094,999	107.04
1,251,999	106.82
1,854,999	106.62
3,750,999	106.09

CALCULATION

ECCS Back Leakage to RWST

[sec]	[deg F]	[gallon-deg F]	[gallon-deg F]	[gallons]	[deg F]
23400	196.31	2398.3	2398.3	12.2	110.1
25599	191.26	1275.1	3673.3	18.9	110.1
26799	188.97	2519.6	6192.9	32.2	110.2
29199	184.86	2464.8	8657.7	45.6	110.2
31599	191.28	5100.8	13758.5	72.2	110.4
36399	175.45	5068.6	18827.1	101.1	110.5
41599	170.68	18585.2	37412.2	210.0	110.9

61199	160.83	17512.6	54924.8	318.9	111.2
80799	156.51	4173.6	59098.4	345.6	111.3
85599	155.78	4154.1	63252.6	372.2	111.4
90399	155.11	8272.5	71525.1	425.6	111.5
99999	153.84	1709.3	73234.4	436.7	111.6
101999	151.64	2527.3	75761.8	453.3	111.6
104999	148.76	1652.9	77414.7	464.4	111.6
106999	147.11	2451.8	79866.5	481.1	111.7
109999	144.94	4026.1	83892.6	508.9	111.7
114999	142.05	3945.8	87838.4	536.7	111.8
119999	139.84	6992.0	94830.4	586.7	111.9
128999	137.05	7613.9	102444.3	642.2	111.9
138999	135.06	15006.7	117451.0	753.3	112.1
158999	132.81	30251.2	147702.2	981.1	112.4
199999	130.53	1450.3	149152.5	992.2	112.4
201999	129.66	3601.7	152754.2	1020.0	112.4
206999	127.71	7095.0	159849.2	1075.6	112.5
216999	125.11	13901.1	173750.3	1186.7	112.5
236999	122.59	26561.2	200311.4	1403.3	112.7
275999	120.89	26192.8	226504.3	1620.0	112.8
314999	120.09	26019.5	252523.8	1836.7	112.9
353999	119.46	31856.0	284379.8	2103.3	113.0
401999	118.54	6585.6	290965.3	2158.9	113.0
411999	117.4	13044.4	304009.8	2270.0	113.0
431999	116.32	25202.7	329212.4	2486.7	113.0
470999	115.67	50123.7	379336.1	2920.0	113.1
548999	115.21	49924.3	429260.4	3353.3	113.2
626999	114.87	99554.0	528814.4	4220.0	113.2
782999	114.27	143472.3	672286.8	5475.6	113.3
1008999	111.09	53076.3	725363.1	5953.3	113.2
1094999	107.04	93362.7	818725.8	6825.6	113.0
1251999	106.82	357847.0	1176572.8	10175.6	112.2
1854999	106.62	436550.3	1613123.0	14270.0	111.4
2592000	106.09				

V_total = total water volume

Back Leakage	14270	gallons	1613123	gallon-deg F
Piping	1880	gallons	206800	gallon-deg F
RWST	13900	gallons	1529000	gallon-deg F
Total =	30050	gallons	3348923	gallon-deg F

T_final = final RWST temperature

111.445 deg F

112 deg F

The final RWST temperature is conservatively increased to 114 °F.