Entergy

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

NL-13-045

February 15, 2013

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

SUBJECT: Response to Request for Additional Information on Proposed License Amendment Regarding Connection of Non Seismic Purification Line to Refuel Water Storage Tank (TAC No. ME9263)
Indian Point Unit Number 3
Docket No. 50-286
License No. DPR-64

REFERENCES:

1. Entergy Letter NL-12-090 to NRC Regarding Proposed License Amendment Regarding Connection of Non Seismic Purification Line to Refuel Water Storage Tank, dated August 14, 2012

2. Entergy Letter NL-12-143 to NRC Regarding Response to Request for Additional Information on Proposed License Amendment Regarding Connection of Non Seismic Purification Line to Refuel Water Storage Tank (TAC No. ME9263), dated October 25, 2012

3. Entergy Letter NL-12-154 to NRC Regarding Response to Request for Additional Information on Proposed License Amendment Regarding Connection of Non Seismic Purification Line to Refuel Water Storage Tank (TAC No. ME9263), dated November 14, 2012

4. Entergy Letter NL-12-155 to NRC Regarding Response to Request for Additional Information on Proposed License Amendment Regarding Connection of Non Seismic Purification Line to Refuel Water Storage Tank (TAC No. ME9263), dated December 13, 2012

Dear Sir or Madam:

Entergy Nuclear Operations, Inc, (Entergy) requested a License Amendment, Reference 1, to Operating License DPR-64, Docket No. 50-286 for Indian Point Nuclear Generating Unit No. 3 (IP3). Entergy responded to previous requests for information in References 2, 3 and 4. The proposed amendment would revise Technical Specification 3.5.4, to allow the non-seismically qualified piping of the Spent Fuel Pool (SFP) purification system to be connected to the Refueling

A001
NRR

Water Storage Tanks (RWST) seismic piping by manual operation of a RWST seismically qualified boundary valve under administrative controls for a limited period of time. On January 29, 2013 Entergy and the NRC staff discussed the need to provide additional information to support approval of the requested amendment. Entergy is providing the additional information in the Attachment.

There are no new commitments being made in this submittal. If you have any questions or require additional information, please contact Mr. Robert Walpole, IPEC Licensing Manager at (914) 254-6710. A copy of this response is being submitted to the designated New York State official in accordance with 10 CFR 50.91.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 15, 2013.

Sincerely,

JAV/sp

Attachment: Information In Response to Discussion with the NRC Staff Regarding Connection of Non Seismic Purification Line to Refuel Water Storage Tank

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

ATTACHMENT TO NL-13-045

INFORMATION IN RESPONSE TO DISCUSSION WITH THE NRC STAFF

REGARDING CONNECTION OF NON SEISMIC

PURIFICATION LINE TO REFUEL WATER STORAGE TANK

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
DOCKET NO. 50-286

By letter dated August 14, 2012 (Accession No. ML12234A098), and subsequent letters, Entergy Nuclear Operations, Inc, (Entergy) submitted a license amendment request for U.S. Nuclear Regulatory Commission (NRC) review that would revise the Technical Specifications (TSs), for Indian Point Unit No. 3 (IP3). The changes would revise TS 3.5.4, "Refueling Water Storage Tank [RWST]," such that the non seismically qualified piping of the Spent Fuel Pool (SFP) purification system may be connected to the RWST's seismic piping by manual operation of a RWST seismically qualified boundary valve under administrative controls for a limited period of time for filtration for removal of suspended solids from the RWST water. In discussions with the NRC staff, the need for additional confirming information was discussed and is being provided as follows:

Issue 1

The issue was whether a single failure could result in increased leakage. There are no single failures to be taken after the valves are opened for RWST recirculation that result in the leakage exceeding allowable.

There are two possible scenarios where sump fluid leakage could be seen after an accident. One is when using the recirculation pumps for low head to high head recirculation and the second is when using the residual heat removal pumps for cold leg or hot leg recirculation. The first method, using the recirculation pumps, is preferred and is at issue here. The low head to high head injection using the recirculation pumps is the normal low head to high head pathway following the cold leg recirculation phase of a large break Loss of Coolant Accident (LOCA). During the cold leg recirculation phase (after about 20 minutes) the internal recirculation pumps keep all fluid inside containment for the large break LOCA and do not send fluid outside containment until hot leg recirculation (recirculation pumps send fluid from containment to the suction of the high head safety injection pumps). This flow path is isolated from the Refueling Water Storage Tank suction line (16-SI-151R, line #155 on drawing 9321-F-27503) by check valve SI-847 and motor operated valve SI-1810. Valve SI-1810 and valve AC-727A are boundary valves when performing leakage test 3-PT-R178. Valves SI-847 and SI-1810 are also subjected to external leakage testing by 3-PT-R067 which pressurizes the SI pumps and piping for detection of leakage per Technical Specification 5.5.2 and uses these valves as a boundary.

Test 3-PT-R178 is intended to measure the potential for leakage through valve SI-846. During RWST purification, a single failure of valve AC-727A to close could occur and provide an additional leakage path (this would be restricted by the refueling water purification pump and valve AC-725 which are downstream and seismic but not leak tested). Therefore, when using the refueling water storage purification loop, the potential exists for leakage of sump fluid (during low head to high head recirculation) through boundary valves SI-847 and SI-1810 equivalent to the allowable leakage of test 3-PT-R178. This can then be postulated to leak out solely through failed open valve AC-727A but would be limited to 5.0 gallons per hour (gph) since that is the test 3-PT-R178 acceptance criteria. If valve SI-1810 were assumed to fail the system leakage would be bounded by test 3-PT-R178 because valve AC-727A would not fail to close.

Requested information on valves for proposed amendment is:

Valve	Safety related	Required to be operable by TS & TS number	Leak tested	Powered by emergency power	Automatically actuated	Credited in DBA analysis
SI-847	Yes	TS 5.5.2	3-PT-R067 (as discussed)	check	By flow	Yes (open on suction from RWST)
SI-1810	Yes	TS 5.5.2	3-PT-R067 and 3-PT-R178	MOV powered	Manual	Yes (closed during transfer to high head recirculation)
SI-842	Yes	TS 5.5.2	3-PT-R182	MOV powered	Manual	Yes (closed during transfer to high head recirculation)
SI-843	Yes	TS 5.5.2	3-PT-R182	MOV powered	Manual	Yes (closed during transfer to high head recirculation)
AC-727A	Yes	TS 5.5.2	3-PT-R178	Manual	Manual	Yes - closed
AC-725	Yes	No	No	Manual	Manual	No - closed

Further, it should be noted that prior to operation for purification, valves AC-727A and AC-725 will be cycled (open – close). This provides reasonable assurance of operability.

Issue 2

The second issue was to explain the apparent contradiction between the 2 gph leakage postulated from the ECCS boundary and the 7 gph leakage from the RWST (or 9 gph from the RWST and SI-842/843 in ML12335A616). Also compare the valve AC-727A leakage doses (e.g., release point to the release points in the calculation of leakage from the ECCS boundary) to the allowable.

RG 1.183 (Appendix A "Assumptions for Evaluating the Radiological Consequences of a LWR Loss-of Coolant Accident," Section 5) requires "ESF systems that recirculate sump water outside of the primary containment are assumed to leak during their intended operation. This release source includes leakage through valve packing glands, pump shaft seals, flanged connections, and other similar components. This release source may also include leakage through valves isolating interfacing systems (Ref. A-7). The radiological consequences from the postulated leakage should be analyzed and combined with consequences postulated for other fission product release paths to determine the total calculated radiological consequences from the LOCA."

WCAP-16212-P was submitted to the NRC (Reference ML041620506) and addressed this issue. Section 6.11.9.7.1 says "The analysis considered the release of activity from the damaged core to the containment via containment leakage. In addition, it was assumed that once external recirculation of the ECCS was established, activity in the sump solution would be released to the environment by means of leakage from the ECCS equipment outside containment in the Auxiliary Building. The total offsite and control room doses are the sum of the doses resulting from each of the postulated release paths." The same section discusses that leakage: "Initially, the ECCS recirculation would be internal to the containment and there would be no potential for leakage outside containment. However, the switch to external recirculation was assumed to occur at 6.5 hours because of the need to switch from cold-leg recirculation mode to hot-leg recirculation mode. With external ECCS recirculation established following the LOCA, leakage was assumed to occur from ECCS equipment outside containment. The leakage goes into the Auxiliary Building and no filtration or holdup was credited with this release. The ECCS leakage was modeled as 4.0 gallons per hour which, consistent with RG 1.183 (Reference 5), is double the plant allowable leakage value of 2.0 gallons per hour."

The above ECCS leakage is determined per Technical Specification 5.5.2 and includes the following systems:

a. Residual Heat Removal System;
b. Cross Connect Between Low Head Recirculation System and High Head Safety Injection System;
c. High Head Safety Injection system (partial);
d. Reactor Coolant Sampling System;
e. Post Accident Containment Air Sampling System;
f. Volume Control Tank (including Reactor Coolant Pump seal return line);
g. Containment Hydrogen Monitoring system.

As noted earlier, the RWST isolation valve (846) is tested by procedure 3-PT-R178 and the current acceptance criterion is 5.0 gph. The SI-842 and SI-843 valves are tested by 3-PT-R182 and the current acceptance criterion is 1.0 gph - these valves and their acceptance criteria are governed by the 2.0 gph limit for ECCS leakage. The details of this are explained below.

1. RG 1.183 Appendix A stated that "Consideration should also be given to design leakage through valves isolating ESF recirculation systems from tanks vented to atmosphere, e.g., emergency core cooling system (ECCS) pump miniflow return to the refueling water storage tank." The submittal to comply with RG 1.183 was based on the conclusion that the dose consequences of this leakage was insignificant. The secondary means of achieving hot leg recirculation is using the RHR pumps to draw suction from the reactor sump and delivering water through the RWST suction line. This requires 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 failure. Likewise, the RG 1.183 guidance does not impose any additional single failure to determine this leakage path. The IP3 design is fairly unique in having internal recirculation pumps as well as residual heat removal (RHR) pumps. In a design with just the RHR pumps to perform the low head to high head recirculation pathway, the suction line to the RWST would likely be used and would be part of this leakage program. The program for testing the ECCS leakage to the 2.0 gph criteria from the low head to high head lineup is found in procedure 3-PT-R067 and 3-PT-R182.

2. Although not required by RG 1.183 or the TS 5.5.2, the plant design includes the capability to provide hot leg (low head to high head) recirculation using the RHR pumps and pumping sump

fluid to the suction of the high head safety injection pumps using the suction line from the RWST. Therefore an analysis was done and this was added to the FSAR using the 10 CFR 50.59 process to consider a 5.0 gph ECCS back-leakage to the RWST via valve 846. This dose is in addition to the dose from the containment leakage / shine and the leakage from ECCS that was included in the prior analyses. The release point for the ECCS back-leakage through the 846 valve is from the RWST.

To evaluate the case postulated in the first issue, a dose assessment was done of the correction factors that would have to be applied to the RWST dose analysis if it was to be performed for leakage through failed open valve AC-727A (this would be restricted by the refueling water purification pump and valve AC-725 which are downstream and seismic but they are not credited since they are not leak tested). This evaluation is discussed below.

The Indian Point Unit 3 (IP3) dose consequences licensing basis includes the Emergency Core Cooling System (ECCS) back-leakage of 5.0 gallons per hour (gph) through Valve 846 to the Refueling Water Storage Tank (RWST) during the external recirculation phase of a large break loss-of-coolant accident (LOCA). For purposes of when the purification loop is used, it may be postulated that this 5.0 gph is conservatively assumed to leak from AC-727A. This leakage would be in the Primary Auxiliary Building (PAB) and the dose consequences would be released through the containment vent. The release through the containment vent is the same release point as the ECCS leakage, and so it is appropriate to use the PAB χ/Q for the purification loop release as discussed below. The impact of this release through the PAB instead of the RWST may be evaluated by accounting for differences in atmospheric dispersion factors (χ/Q's) between the PAB and the RWST and by accounting for iodine release fractions as shown below.

1) The information for the χ/Q's from the PAB and RWST releases to the Control Room (CR) is shown in Table 1. [Appendix A shows details of input parameters to χ/Q for the RWST releases]. The information for the χ/Q's from the PAB release to the CR is from Reference 1 and was previously reviewed by the NRC [Reference 3]. [Appendix B shows details of input parameters to χ/Q for the PAB releases]. A comparison of the χ/Q's is shown in the last column of Table 1, which shows that the atmospheric dispersion factors from the PAB releases bound those from the RWST releases. Consequently the dose from the RWST release for the 5.0 gph leakage of 0.0096 rem is multiplied by the highest ratio of χ/Q's (i.e., 1.89) and resulted in a dose of 0.01814 rem if released from the PAB.
2) This dose is then adjusted to account for the iodine release fraction from the RWST (2%) and the PAB (10%) resulting in a CR dose of 0.0907 rem (= 0.01814 x 10% / 2%).
3) Since all the ECCS back-leakage is assumed to be from AC-727A in the PAB, the dose component of the ECCS back-leakage to the RWST is removed from the total CR dose. The total large break LOCA CR dose is 4.98 rem [Reference 2], which is rounded up from 4.9733 rem, and subtracting the contribution from the ECCS back-leakage to the RWST of 0.0096 rem, the total CR dose is 4.9637 rem. By adding the CR dose from above to this, the total CR dose is 5.0 rem. Therefore, the CR dose still meets the acceptance criterion set forth in 10 CFR 50.67.
4) The ECCS leakage to the Primary Auxiliary Building and the ECCS back-leakage to the Refueling Water Storage Tank occur during the external recirculation phase of a large break LOCA, which is 6.5 hours into the event. In this evaluation, the worst 2-hour Exclusion Area Boundary (EAB) dose contribution from the ECCS back-leakage to the

RWST, which is 0.006 rem, is conservatively added to the existing EAB dose. The EAB dose due to the ECCS back-leakage to RWST is adjusted to 0.057 rem (= 0.006 x 1.89 x 10% / 2%) accounting for the χ/Q ratio and the iodine release fraction ratio. Since the large break LOCA EAB dose is reported as 23.6 rem, the worst 2-hour EAB dose is 23.7 rem. Therefore the worst 2-hour EAB dose is still below the 25 rem limit of 10 CFR 50.67. Further, the low population zone (LPZ) dose is reported as13.0 rem, which is well below the 25 rem limit in 10 CFR 50.67. Similar to the CR dose above, the LPZ dose is also adjusted based on the χ/Q ratio (i.e., 1.89) and the iodine release fraction ratio (i.e., 10% / 2%) to account for the PAB release. The LPZ dose from the ECCS back-leakage to the RWST is 0.0116 rem, and is adjusted to 0.1096 rem (= 0.0116 x 1.89 x 10% / 2%). Therefore, the LPZ dose is 13.1 rem and meets the 10 CFR 50.67 acceptance criterion.

Table 1. Comparison of Atmospheric Dispersion Factors

Time Interval	Control Room Atmospheric Dispersion Factors [sec/m^3]		
	PAB Release	RWST Release	Ratio [1)]
0-2 hours	6.00E-04	4.84E-04	1.24
2-8 hours	5.20E-04	2.92E-04	1.78
8-24 hours	2.12E-04	1.12E-04	1.89
1-4 days	1.76E-04	1.00E-04	1.76
4-30 days	1.30E-04	8.05E-05	1.61

1) Ratio = PAB Release / RWST Release

References

1. Letter from Fred R. Dacimo (Entergy) to the NRC, "Reply to RAI Regarding Indian Point 3 License Amendment Requests for Stretch Power Uprate (TAC MC3552) and Alternate Source Term (TAC MC3551)," NL-05-020, dated February 11, 2005 (NRC Agencywide Documents Access and Management System accession No. ML050550202).
2. Letter from Fred R. Dacimo (Entergy) to the NRC, "Additional Information Regarding Indian Point 3 License Amendment Request Alternate Source Term (TAC MC3551)," NL-05-036, dated March 14, 2005 (NRC Agencywide Documents Access and Management System accession No. ML050810450).
3. Letter from Patrick D. Milano (NRC) to Michael Kansler (Entergy), "Indian Point Nuclear Generating Unit No. 3 – Issuance of Amendment RE: Full Scope Adoption of Alternative Source Term (TAC No. MC3351)," dated March 22, 2005 (NRC Agencywide Documents Access and Management System accession No. ML050750431).

Appendix A. Control Room χ/Q Input Parameters from RWST Release

Parameter	Value	
IPEC Met. Data	(1995-1997)	
Position (ft)	North	East
RWST	6033.0	1704.4
IP3 CR	5783.8	1476.0
TSC	6312.0	1373.25
Source Distance		
IP3 CR	103.05 m	
TSC	131.98 m	
Source Direction		
IP3 CR	81.07^0	
TSC	168.67^0	
Building Wake Area		
RWST	169.65 m^2	
Release Elevation		
RWST	128.7 ft	
Grade	18 ft	
CR Intake Elevation	25.5 ft	
TSC Intake Elevation	79.83 ft	
Release Height		
RWST	33.74 m	
CR Intake Height	2.29 m	
TSC Intake Height	18.85 m	
Surface Roughness Length	0.1 m	
Averaging Sector Width Constant	4.0	

Parameter	Value	
Initial diffusion coefficients	σ_{y0}	σ_{z0}
RWST	2.03 m	0.0 m
Minimum Wind Speed	0.5 m/sec	
Wind Direction Window	90^0	
North Adjustment	38.56^0	
RWST Diameter	40'	

Appendix B. Control Room χ/Q Input Parameters
(Excerpt from Attachment 2 of Reference 1)

Location	Position, ft		
	N	E	Elevation
Containment Surface	5997.0	1475.1	150.1
Containment Vent	6023.0	1475.0	268.0
Auxiliary Boiler Feed Building Side	5991.7	1410.1	66.5
Auxiliary Boiler Feed Building Organ Pipes	5995.5	1395.6	97.0
Auxiliary Boiler Feed Building Silencers	6012.9	1390.1	113.1
Control Room Intake	5783.8	1476.0	25.5

Table 1. Source and receptor locations on plant grid.

Location	Distance to Receptor m	Intake Height m	Direction to Source °	Release Type Flag	Release Height m	Building Area m^2
Containment Surface	65.01	2.29	38.32	1	40.25	3059.33
Containment Vent	72.92	2.29	38.32	1	76.21	3059.33
Auxiliary Boiler Feed Building Side	66.49	2.29	20.98	1	14.78	3059.33
Auxiliary Boiler Feed Building Organ Pipes	68.88	2.29	17.76	1	24.08	3059.33
Auxiliary Boiler Feed Building Silencers	73.76	2.29	18.01	1	29.00	3059.33

Table 2. ARCON96 geometric input data.

Location	Vertical Velocity m/s	Stack Flow m^3/s	Stack Radius m	Initial Plume Dimensions m σ_y	σ_z
Containment Surface	0.00	0.00	0.00	7.32	13.31
Containment Vent	0.00	0.00	0.00	0.26	0.00
Auxiliary Boiler Feed Building Side	0.00	0.00	0.00	0.96	2.39
Auxiliary Boiler Feed Building Organ Pipes	0.00	0.00	0.00	0.00	0.00
Auxiliary Boiler Feed Building Silencers	0.00	0.00	0.00	0.00	0.00

Table 3. ARCON96 flow and plume dimension data.

Reference Information	
Grade, feet	18
North Adjustment, °	38.5611
Wind Speed Units	2
Lower Met Height	10
Upper Met Height	60
Roughness Length	0.1
Minimum Wind Speed, m/s	0.5
Averaging Sector Width	4
Wind Direction Window, °	90
Elevation Difference	0

Table 4. ARCON96 miscellaneous data.