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August 6, 2012

NL-12-106

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

SUBJECT: Response to Request For Additional Information Regarding Proposed License Amendment to Allow Use of the Backup Spent Fuel Pool Cooling System While the Spent Fuel Pool Cooling System is Out of Service (TAC No. ME8097)
Indian Point Unit Number 3
Docket No. 50-286
License No. DPR-64

REFERENCES:

1. Entergy Letter, NL-12-029, to NRC regarding Proposed License Amendment to Allow Use of the Backup Spent Fuel Pool Cooling System While the Spent Fuel Pool Cooling System is Out of Service, dated February 6, 2012

2. Entergy Letter, NL-12-062, to NRC Supplementing the Proposed License Amendment to Allow Use of the Backup Spent Fuel Pool Cooling System While the Spent Fuel Pool Cooling System is Out of Service, dated May 2, 2012 (TAC No. ME8097)

2. NRC Letter to Entergy Requesting Additional Information Regarding Proposed License Amendment to Allow Use of the Backup Spent Fuel Pool Cooling System While the Spent Fuel Pool Cooling System is Out of Service (TAC No. ME8097), dated June 26, 2012

Dear Sir or Madam:

Entergy Nuclear Operations, Inc, (Entergy) requested a License Amendment, Reference 1, to revise the Indian Point 3 (IP3) Updated Final Safety Analysis Report (UFSAR) to allow use of the Backup Spent Fuel Pool Cooling System (BSFPCS) when the Spent Fuel Pool Cooling System (SFPCS) is out of service. The request was supplemented on May 2, 2012 (Reference 2). On June 26, 2012 the NRC staff identified the need for additional information to complete their review (Reference 3). The Entergy response to this request for additional information is addressed in the Attachment.

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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.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 6, 2012.

Sincerely,

Patrick W. Conway, acting for John A. Ventosa

JAV/sp

Attachment: 1. Response to Request for Additional Information on Proposed Updated Final Safety Analysis Report Change Regarding Backup Spent Fuel Pool Cooling System

cc: Mr. Douglas Pickett, Senior Project Manager, NRC NRR DORL
Mr. William Dean, Regional Administrator, NRC Region 1
NRC Resident Inspector, IP3
Mr. Francis J. Murray, Jr., President and CEO, NYSERDA
Ms. Bridget Frymire, New York State Dept. of Public Service

ATTACHMENT TO NL-12-106

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON PROPOSED UPDATED FINAL SAFETY ANALYSIS REPORT CHANGE REGARDING BACKUP SPENT FUEL POOL COOLING SYSTEM

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

The proposed revision to the Updated Final Safety Analysis Report (UFSAR) Regarding Backup Spent Fuel Pool Cooling System was submitted to the NRC on February 6, 2012. On April 18, 2012 the NRC staff identified the need for additional information to complete their acceptance review and this was provided on May 2, 2012. The NRC staff requested additional information on June 26, 2012 and the following are the response to that request for information:

Question 1

1. The licensee's response regarding the reliability of the BSFPCS versus normal SFPCS did not address measures to resolve the difference in reliability between the two systems. As described in the licensee's supplement to the license amendment request, the only physical modifications to the BSFPCS have been the hard piping of makeup water and backup fire protection water to the BSFPCS cooling tower basin. No other improvements to the capability or reliability of the BSFPCS were identified. The BSFPCS is more susceptible to external events and single failures than the normal SFPCS, and the BSFPCS cannot be returned to service once the pool temperature exceeds approximately 196°F. As such, operation with the normal SFPCS out of service results in an increase in the potential and duration for which SFP boiling and makeup would be the method of heat removal. In addition, the NRC staff notes that the primary source of makeup to the SFP as currently approved is not fully seismic Class I, contrary to the regulatory position in Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis."

   Provide a description of the measures to be put in place to compensate for the reduced reliability of the BSFPCS versus normal SFPCS and ensure the availability of SFP makeup. This would include modifications or administrative controls intended to improve the availability and reliability of the makeup system when the BSFPCS is the only available means of forced SFP cooling."

Response

The BSFPCS provides a less reliable SFP cooling source than the normal SFP cooling system given a single active failure because there is less time to recover a loss of SFP cooling. The SFPCS can operate at any SFP temperature up to boiling (212°F). The BSFPCS can only operate up to a SFP temperature of about 196°F, at which time the primary pump loses NPSH, with the resultant loss of SFP cooling and continued heat up to boiling. Physical modifications to the BSFPCS since the special NRC inspection of the BSFPCS (05000286/2001-006) are the hard piping of the makeup water and the backup fire protection water discussed in the original submittal. No other physical modifications have been made.

The BSFPCS is more susceptible to external events because components are outside the protection of the SFP Building and portions of the BSFPCS are not designed seismic class II. However, neither the SFPCS nor the BSFPCS are designed for tornadoes or tornado missiles.

Indian Point 3 was not licensed to Regulatory Guide 1.13. Revision 1 dated December 1975 said "A seismic Category I makeup system should be provided to add coolant to the pool. Appropriate redundancy or a backup system for filling the pool from a reliable source, such as a lake, river, or onsite seismic Category I water-storage facility, should be provided. If a backup system is used, it need not be a permanently installed system. The capacity of the makeup systems should be such

that water can be supplied at a rate determined by consideration of the leakage rate that would be expected as the result of damage to the fuel storage pool from the dropping of loads, from earth-quakes, or from missiles originating in high winds." Spent fuel pool leakage has not been identified from tornado missile, dropped load, or seismic analyses. However, there are sources of makeup water identified in the next paragraph.

The primary source of makeup water to the spent fuel pit is the Primary Makeup Water Storage Tank, which is a seismic Class I component. The pumps and most of the piping associated with this tank are also seismic Class I. The 2 inch makeup water loop to the spent fuel pit is seismic Class II from the primary water system flash evaporator inlet (check valve PW-26) to the spent fuel pit cooling loop return from the SFPHX which is also class II. The same line also connects to the cleanup equipment (which is class III) but is isolated by normally closed valve 629. Additional backup can be provided from the RWST through the demineralizers or from the Fire Water Tank through the seismic standpipes. License Conditions require the capability to use portable pumps to provide water to the SFP taking suction from a pressurized fire header or the non pressurized city water hydrants.

Administrative controls will be the measures used to compensate for the reduced reliability to improve the availability and reliability of the BSFPCS and its makeup system when the BSFPCS is the only means of forced cooling. A specific Defense in Depth Plan will be implemented in accordance with station procedures and authorized by senior site management to ensure actions are taken. These, including past proposed controls, are as follows:

1. Work will be scheduled when the SFP heat load is at a reduced value rather than the design value.

2. A backup diesel generator will be tested and made available to power the BSFPCS where the scheduled work exceeds the time to raise the temperature to boiling without cooling.

3. The SFP will be brought to a temperature as low as reasonable, but not lower than the design temperature, prior to starting the work.

4. The ambient wet bulb temperature will be assured to be at or below the temperature, with 5°F of margin, which is calculated to keep the SFP below 150°F (for online work) and 175°F (for core offload work) given the residual heat load at the time work starts. Additional margin will be provided by keeping recovery times within the time the SFP would reach 190°F. The recovery time is the time to detect BSFPCS failure (i.e., based on monitoring times) added to the time to restart the main or redundant pumps on the backup diesel (assumes offsite power lost) given the residual heat load at the time work starts. The time to start the diesel and pumps will be demonstrated in the field in order to determine time required. The wet bulb temperature will be taken about noon on the day work is to commence (or the day before) in order to allow for daily temperature swings.

5. The approximate time for recovery actions defined for normal types of events (e.g., loss of power, loss of makeup water, pump failure, loss of suction, etc) will be identified and, if there is a loss of BSFPCS, those which could be implemented before 196°F is reached will be used. The response to question 2 performs a failure analysis to define these.

6. Monitoring of the wet bulb temperature, BSFPCS operation and contractor water system supply will be performed at a frequency consistent with the time for the SFP to rise by 5°F if the BSFPCS were to be lost. For example, if the SFP temperature rise was 10°F per hour, then the wet bulb temperature will be taken every 30 minutes and the proper operation of the BSFPCS and the makeup water supply will be validated every 30 minutes.

7. The SFP High Temperature alarm set point will assure that the alarm alerts the control room that the calculated temperature is exceeded.

8. The normal water supply and backup water supply to the secondary loop of the BSFPCS and the sources of SFP makeup (Primary Water Storage Tank, RWST through the plant demineralizers and from the Fire Water Tank) will be protected when the BSFPCS is the only source of cooling.

The proposed FSAR revision Section 9.13.3 in the February 6, 2012 letter will be modified to reflect the above.

Potential maintenance activities have been identified:

1. Planned maintenance to repair or replace service water valves SWN-35-1 and SWN-35-2. This will be required every 10 years with the core offloaded.

   The planned maintenance work during 3R17 is to replace or repair the SWN-35-1 and SWN-35-2 valves. A final decision has not been made yet whether these valves will be replaced or repaired. The current work duration to repair the valves is 36 hours which includes time to drain the system prior to the start of the work and the fill and vent after the valve work is complete. No plans have been developed at this time on how to back out of this work. The work orders numbers for this work are 51463634 and 51558271.

2. Planned inspections of the SFPHX to meet relicense commitments. This will be done online when the heat load in the spent fuel pool is low (just before refueling).

   This shell and tube heat exchanger has not been opened and inspected since the plant went into operations in 1975. The inspection will consist of a visual and eddy current inspection of the tube side and will be done just prior to the Unit 3 Refueling outage when Spent Fuel heat load is at a minimum. The conservative total duration of this task will be about 61 hours (Isolate SFP Purification Loop, secure SFPC Pumps and drain SFPHX piping - 2 hours; unbolt and open HX end bells - 15 hours; set up and perform Eddy Current Testing - 32 hours; re-install HX end bells - 10 hours; and fill and vent SFP piping and restore SFPC Pumps - 2 hours). Restoration activities would conservatively be about 13 hours (remove eddy current equipment – 1 hour; re-install HX end bells - 10 hours; and fill and vent SFP piping and restore SFPC Pumps - 2 hours).

3. In the past the maintenance and repair of Component Cooling Water valves has required dependence on the BSFPCS. Nothing is currently scheduled.

Question 2

The licensee's response states that recovery actions for the BSFPCS will be evaluated for time of implementation in order to assess what actions may be performed before the SFP temperature reached 196°F. However, a minimum available time for recovery actions following a loss of BSFPCS is not identified in the response. The design basis for the normal SFPCS is that following a single failure of an active component, a redundant component could be placed in service and restore full cooling capacity. Therefore, the time required to heat the pool to approximately 196°F should be long enough to allow detection of a loss or degradation of the BSFPCS, reasonable actions to restore BSFPCS function, and implementation of actions to align SFP makeup or to restore the normal SFPCS.

Explain what limits would be placed on the available recovery time and how the available recovery time would be determined.

Response

The actions to recover the backup SFPCS will be based on the type of failure that occurs (see Table 1 failure analysis). The single failure of an active component in the SFPCS is the failure of the SFPCS pump. The BSFPCS has redundant pumps for both the primary and secondary loops that can be restored to operation in less than one hour. The remaining active failure can be associated with the cooling tower fans with their controls. No single failure of the cooling towers is postulated because both towers are required at 190°F in order to prevent further temperature rise. In this case the procedure for loss of spent fuel pool cooling would be entered while working to try to restore the fans (if feasible) and to back out of the maintenance work to restore SFPCS.

The minimal failure response time for full core offload and online activities will be determined by:

1. Assuring the wet bulb temperature is at or below the temperature, with 5°F of margin, which will keep the SFP below 175°F. The wet bulb temperature will be taken about noon on the day work is to commence (or the day before) in order to allow for daily temperature swings.
2. Assuring that the time to restart the main or redundant pumps on the backup diesel for the residual heat load at the time work starts will not allow the SFP to exceed 190°F. That time shall take into consideration the temperature rise associated with the time to detect BSFPCS failure and the wet bulb temperature at that time. The time to restart the pumps and the diesel will be demonstrated in the field.

The back out time for the SWS valves has not been established since the work scope is not finalized. The SFPCHX work is scheduled for the end of cycle which can be evaluated by the heat load at 600 days of 7.47 MBTU/hr and a heatup rate of 3.1°F/hr. Therefore, when the dry bulb temperature is 70°F, the initial SFP temperature must be about 41°F below 190°F (3.1°Fper hr x 13hr = 40.3°F) to allow 13 hours for backing out of the SFPHX work before reaching the 190°F.

Question 3

The licensee's response regarding the improvement to risk management actions includes the administrative control that "work will be scheduled when the SFP heat load is at a reduced value rather

than the design value." The heat load in the SFP decreases with the time after shutdown, posing less of a challenge to the capabilities of the BSFPCS as time goes on. A minimum elapsed time after shutdown should be identified and included in administrative controls for removing the normal SFPCS from service. This minimum elapsed time should be sufficient to preclude reliance on the BSFPCS during the highest heat loads in the SFP and should ensure that the heat load is low enough to ensure that the minimum available time for recovery actions can be met. Daily variations in the wet-bulb temperature will impact the heat removal capacity of the BSFPCS; therefore a justified margin should exist between the current heat load in the SFP and the heat removal capacity of the BSFPCS at the time that normal SFPCS is removed from service.

Explain how the reduced heat load value would be limited and how this heat load would be determined.

Response

Work will be scheduled when the SFP heat load is at a reduced value because the heat load will determine the time to reach 196°F, the temperature at pump suction would be lost when there is no heat removal. However, the determination of when to do the work must also consider wet bulb temperature because during a cooler spell, the heat removal capability of the BSFPCS is greater and this allows the SFP to be maintained at a lower temperature. In the response to Question 2 the criteria for using the BSFPCS to assure that heat load is sufficiently low is established. This criterion includes margin for the heat removal capacity of the BSFPCS by using a wet bulb temperature 5°F lower than the measured temperature.

Table 1
Single Failure Analysis – Backup Spent Fuel Pit Cooling (BSFPC)

Component	Malfunction	Consequences/ Comments	How to fix/ How long to fix	How to limit pool temp <196°F
Primary BU SFP Pump (31-BSFPP Pri.) (32-BSFPP Pri.)	1. Fails to start 2. Fails to run 3. Inadequate flow 4. Loss of power 5. Interlock intervention	1-3. Should this pump fail to operate, a second primary pump is available as a backup. 4. MCC E1 is the normal power supply. If this fails, an auxiliary diesel generator can be utilized. 5. This will prevent either primary pump from operating to prevent contamination of the environment through the cooling towers.	1-3. Switch to the other primary pump. (Note 1) 4. Transfer power to the auxiliary diesel generator through the transfer switch. 5. BSFPC is not available. Normal SFPC would have to be put back in service. (Note 2)	1-5. Once the backup pump or power supply is in service, the pool will no longer be in any additional danger to approach 196°F. Should neither pump be available, utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.
Secondary BU SFP Pump (31-BSFPP Sec.) (32-BSFPP Sec.)	1. Fails to start 2. Fails to run 3. Inadequate flow 4. Loss of power	1-3. Should this pump fail to operate; a second secondary pump is available as a backup. 4. MCC E2 is the normal power supply. If this fails, an auxiliary diesel generator can be utilized.	1-3. Switch to the other secondary pump. 4. Transfer power to the auxiliary diesel generator through the transfer switch.	1-4. Once the backup pump or power supply is in service, the pool will no longer be in any additional danger to approach 196°F. Should neither pump be available, utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.
Heat Exchanger (BSFP Plate HX)	1. Tube Rupture	1. A tube rupture in this heat exchanger would create a leakage path for contaminated SFP water to leak to the environment.	1. BSFPC is not available. Normal SFPC would have to be put back in service. (Note 2)	1. Utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.

31/32-BSFP Cooling Towers 31/31-BSFP Fan Cooling	1. Fan failure 2. Loss of power 3. Loss of 1 cooling tower. 4. Loss of both cooling towers. 5. Makeup water unavailable.	1,2. The fans are set to run when the ambient air temperature reaches certain set points. If these fans were to fail, the heat removal capabilities would be limited. 3. The cooling towers are both rated for 50% capacity. Therefore, they cannot be utilized independently with full cooling capacity intact. Losing 1 tower, while still operable, would greatly reduce the cooling capacity. 4. Loss of both cooling towers would render the BSFPCS system inoperable. 5. Normal makeup is provided through from the PW system. If this is unavailable, Fire water, taken from FPS and the FWST is available as a backup for makeup water.	1,2,3. The SFP temperature would have to be monitored and the normal SFPC system would have to be put back in service eventually. 4. BSFPCS is not available. Normal SFPC would have to be put back in service. (Note 2) 5. The water flow rates and temp/press would have to be monitored, eventually requiring the normal SFPC system to be placed back in service.	1-5. Utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.
DPIS-4469	1. Fails to indicate <10 psid.	1. Upon indication of <10 psid, indicating a potential leak in the heat exchanger, this unit sends a trip signal to the primary pumps. This prevents contaminated water on the primary side from leaking to the secondary side. The secondary pump remains in operation to prevent this leakage.	1. This switch takes signal from pressure indicators on the primary and secondary sides. Comparing these local gauges would indicate a problem with the switch, and would require manual trip of the primary pump. Normal SFPC would have to be put back in service. (Note 2)	1. Utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.
Secondary Side Strainers (AC-ST-1946) (AC-ST-1945)	1. Too much debris causing a >5 psid drop. 2. DPI-4473/4472	1,2. AC-ST-1945 / AC-ST-1946 are the strainers located upstream of the primary secondary-side pumps. If this were to cause a large enough	1,2. The baskets should be cleaned out repeatedly until the pressure drop is satisfactory. If this cant be	1,2. These strainers are only used on startup to remove any damaging particles that could

	fail to indicate the pressure drop.	pressure drop, cavitation could occur.	achieved, a backup secondary-side pump is available. If they cannot be cleaned out to a satisfactory level, normal SFPC would have to be kept in service or restored.	have built up. If they cannot be cleaned out to a satisfactory level, utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.
Check Valves (AC-1900) (AC-1901) (AC-1957) (AC-1958)	1. Failing to close. 2. Failing to open.	1. On sections with redundant equipment, a check valve that doesn't close properly can allow backflow into the unused section. This can affect performance of the system. Typically, this system has normally closed valves on the upstream sides of the unused redundant pumps, which would limit the performance loss. 2. A check valve failing to open would stop flow in the correct direction.	1,2. An evaluation of the loss of performance would determine if the malfunctioning check valve will cause BSFPCS to become inoperable. If it is determined to be inoperable, normal SFPC would have to be put back in service. (Note 2)	1,2. If performance isn't affected by a lot, the system can function but at a reduced capacity. If the condition becomes too degraded, utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.
Gate Valves (AC-1923) (AC-1924) (AC-1939) (AC-1940) Butterfly valve (AC-1947)	1. Failing to open. (Pump isolation) 2. Throttling valve failure (AC-1947)	1. Gate valves are supplied to stop flow through redundant pumps. These valves are all manipulated manually. If one were to fail, it would render the backup redundant pumps inoperable. 2. AC-1947 is a butterfly valve that is used to achieve the 2500 gpm necessary by throttling the flow downstream of the heat exchanger. If this were to fail, the flow rate would have to be maintained by throttling some other valve, as long as this valve didn't fail closed.	1. These normally closed gate valves are used to isolate the backup pumps. If they cannot be opened, the evolution would not be started. 2. If another valve could be throttled and this valve doesn't hinder flow, BSFPCS would be operable. If flow cannot be throttled, the heat exchanger capacity must be determined at the available flow rate.	1,2. As long as these valves don't challenge flow of the system, BSFPCS can be run at limited capacity with proper oversight. If one of these valves fails leaving BSFPCS inoperable, utilize 3-AOP-SF-01 Loss of Spent Fuel Pit Cooling.

Note 1: Transferring pumps is a short term process (10-60 minutes)

Note 2: The time to place the normal SFPC depends on the maintenance activity that is being performed.

- SFPC Heat Exchanger: 13 Hours
- SW Valves: Not yet defined because repair of replace not decided.