August 15, 2001

EA-01-160

Mr. Robert J. Barrett
Vice President Operations
Entergy Nuclear Operations, Inc.
Indian Point 3 Nuclear Power Plant
PO Box 308
Buchanan, NY 10511

SUBJECT: INDIAN POINT 3 NUCLEAR POWER PLANT
NRC SPECIAL INSPECTION REPORT NO. 05000286/2001-006

Dear Mr. Barrett:

During the period May 14 - 18, 2001, the NRC performed a Special Inspection at the Indian Point 3 Nuclear Power Plant to review the loss-of-spent fuel pool cooling event that occurred May 8, 2001, while using the Backup Spent Fuel Pool Cooling System (BUSFPCS) with a full core off-load in the spent fuel pool. The enclosed report documents the inspection findings which were discussed on June 6, 2001, with Mr. Lee Olivier, Mr. Fred Dacimo and other members of your staff and on July 3, 2001, with Mr. E. Firth.

The charter of the Special Inspection was to determine the facts surrounding the loss-of-spent fuel pool cooling that occurred at Indian Point 3, assess the adequacy of the licensee's investigation and root cause evaluation of the loss-of-spent fuel pool cooling, assess the adequacy of the licensee's corrective actions and extent of condition review for the loss of backup spent fuel pool cooling, and assess the adequacy of the licensee's technical and operational basis for the design and operation of the BUSFPCS. Additionally, the inspectors independently evaluated the risk significance of the loss-of-spent fuel pool cooling, reviewed the reportability of the event, and assessed whether shutdown risk assessment and control activities were appropriate.

Overall, we determined your response to the event was timely and appropriate. We noted that spent fuel pool cooling was restored in less than a hour and neither the spent fuel integrity nor shielding provided by the SFP water were challenged. Nonetheless, we found areas for improvement, such as the reliability of the BUSFPCS makeup water supply, where management attention is warranted and which will minimize the possibility of a similar event in the future.

Based on the results of this inspection, the inspectors identified three findings of very low safety significance (Green). Two of the findings were violations of NRC requirements. However, because of their very low safety significance and because the appropriate issues have been addressed and entered into your corrective action program, the NRC is treating these issues as non-cited violations, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny these non-cited violations, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-001; and the NRC Resident Inspector at the Indian Point 3 facility.

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Sincerely,

/RA/

Wayne D. Lanning, Director
Division of Reactor Safety

Docket No: 05000286
License No: DPR-64

Enclosure: NRC Inspection Report No. 05000286/2001-006

cc w/encl:
J. Yelverton, Chief Executive Officer
M. Kansler, Chief Operating Officer
J. Knubel, Vice President Operations Support
F. Dacimo, General Manager, Plant Operations
H. P. Salmon, Jr., Director of Oversight
D. Pace, Vice President - Engineering
J. Kelly, Director - Licensing
C. D. Faison, Director - Licensing
J. Donnelly, Licensing Manager
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J. McCann, Nuclear Safety and Licensing
C. Donaldson, Esquire, Assistant Attorney General, New York Department of Law
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T. Morra, Executive Chair, Four County Nuclear Safety Committee
Chairman, Committee on Corporations, Authorities, and Commissions
The Honorable Sandra Galef, NYS Assembly
P. D. Eddy, Electric Division, New York State Department of Public Service
W. Flynn, President, New York State Energy Research
and Development Authority
J. Spath, Program Director, New York State Energy Research
and Development Authority
C. Hehl, SRC Consultant
C. Terry, Niagara Mohawk Power Corporation
R. Toole, SRC Consultant
R. Schwarz, SRC Consultant
County Clerk, Westchester County Legislature
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M. Elie, Citizens Awareness Network

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NAME	GCranston		LDoerflein		CCowgill		JTrapp		WLanning	
DATE	07/18/01		07/19/01		07/19/01		07/19/01		08/13/01	

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U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No:	05000286
License No:	DPR-64
Report No:	05000286/2001-006
Licensee:	Entergy Nuclear Northeast
Facility:	Indian Point 3 Nuclear Power Plant
Location:	PO Box 308, Buchanan, NY 10511
Dates:	May 14, 2001 - May 18, 2001
Inspectors:	Gregory V. Cranston, Reactor Inspector, Team Leader Steven R. Jones, Senior Resident Inspector, Millstone Unit 2 James M. Trapp, Senior Reactor Analyst (in-office support)
Approved by:	Lawrence T. Doerflein, Chief Systems Branch Division of Reactor Safety

SUMMARY OF FINDINGS

Inspection Report 05000286/2001-006; on 5/14/2001-5/18/2001; Entergy Nuclear Northeast; Indian Point 3 Nuclear Power Plant; Event Followup. Special Inspection, loss of the backup spent fuel pool cooling system with the core fully offloaded into the spent fuel pool.

The inspection was conducted by a regional inspector and a senior resident inspector, with in office support from a regional senior reactor analyst. This inspection identified three green findings; two of the findings were non-cited violations. The significance of issues is indicated by their color (Green, White, Yellow, Red) using IMC 0609 "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGNT/index.html. Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violation.

Inspector Identified Findings

Cornerstone: Mitigating Systems

- **Green.** Licensee management did not take appropriate actions to minimize the risk associated with loss of the Backup Spent Fuel Pool Cooling System (BUSFPCS) for the given plant conditions, which included unavailability of the normal spent fuel pool (SFP) cooling system, reduced reliability of the BUSFPCS makeup water system, and the high decay heat load and SFP temperature associated with the full core offload. These included ensuring an adequate electrical power supply for the makeup water system trailer, and establishing an appropriate frequency for operator checks of the BUSFPCS. Additionally, the inspectors found that the licensee did not recognize that there was less time to recover SFP cooling to prevent boiling when using the BUSFPCS as compared to using the normal SFP cooling system. The finding was of very low safety significance because spent fuel pool cooling was restored in less than a hour, backup makeup water sources were available, and barrier integrity was not challenged. (Section 4OA3.1)

- **Green.** The licensee failed to adequately maintain procedures associated with operation of the SFP and its associated systems. These failures had a credible impact on safety in that they reduced the likelihood that operators would identify and effectively recover from a loss of SFP cooling. This violation of Technical Specification 5.4.1 is being treated as a non-cited violation. The finding was of very low safety significance because the time available for recovery from a loss of cooling was long and several sources of makeup water for the SFP were available. (Section 4OA3.2)

- **Green.** The licensee made a change to the SFP cooling system as described in the FSAR Update, which resulted in an increase in the probability of a malfunction of equipment important to safety, without requesting commission approval prior to implementation as specified in 10 CFR 50.59. This violation of 10 CFR 50.59 was categorized at Severity Level IV and is being treated as a non-cited violation. The finding was of very low safety significance because the time available for recovery from a loss of cooling was long and several sources of makeup water for the SFP were available. (Section 4OA3.3)

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Report Details

Summary of Plant Status

The plant was shutdown on April 27, 2001, and was in refueling outage R11 during this inspection. The licensee completed a full core offload to the spent fuel pool (SFP) on May 6, 2001, in order to conduct maintenance activities on the reactor coolant pumps during the outage. Shortly after completing the full core offload, and in conjunction with planned maintenance activities, the normal SFP cooling system was taken out of service. Consequently, for about 20 hours during R11 and during the loss of SFP cooling event on May 8, 2001, all SFP cooling was being provided by the backup spent fuel pool cooling system (BUSFPCS).

Background

The BUSFPCS was installed in 1999 to enable Indian Point 3 to remove the normal SFP cooling system (or its associated cooling water support) from service for maintenance activities. The BUSFPCS was designed and installed as a permanent, independent cooling water source for the SFP, capable of operation during all plant modes and capable of removing the same heat load as the normal SFP cooling system. Prior to refueling outage R11, the BUSFPCS was used during the 1999 refueling outage R10 and in early 2001 during plant operation while the normal SFP cooling system was taken out of service for maintenance related activities.

The BUSFPCS has a primary and secondary loop, connected by a flat plate heat exchanger. The primary system pumps water from the SFP through the heat exchanger and back to the SFP. There are two 100% redundant primary pumps. The secondary system pumps water from the BUSFPCS cooling tower through the flat plate heat exchanger and back to the cooling tower. There are two 100% redundant secondary pumps. The cooling tower has two fans which are not redundant, with one or two fans operating depending on the heat removal requirements. Makeup water to the BUSFPCS cooling tower, to make up for evaporation, was provided from the plant primary water system (PWS), using a contractor water treatment (CWT) system. The CWT system normally supplies primary grade makeup water to the primary water storage tank for use in the plant. During R11, at the time of the event, the CWT system was supplying primary grade water directly to the BUSFPCS cooling tower using a portion of the permanent plant primary water system piping and temporary piping/hoses. Prior to R11, reliability problems (electrical and water quality related) periodically caused loss of the CWT system makeup water supply to the PWS, one of which caused a temporary loss of BUSFPCS during refueling outage R10, temporarily interrupting SFP cooling. The plant's fire water system was the backup source of makeup water to the cooling tower.

On April 27, 2001, Indian Point 3 was taken off line to commence R11. Prior to the plant shutdown, the BUSFPCS had been placed in service in accordance with SOP-SFP-003, "Operation of the Backup Spent Fuel Pool Cooling System." As a result, both the normal SFP cooling system and the BUSFPCS were initially in operation. The full core offload was completed at about 3:00 a.m. on May 6. With both the normal and the BUSFPCS operating in parallel, the SFP bulk water temperature at the time of reactor shutdown was about 80 degrees Fahrenheit (^{o}F) and increased to about 104^{o}F by the time core was fully offloaded. About 18 hours after full core offload, the normal SFP cooling system was removed from service in order to conduct planned maintenance on the component cooling water (CCW) system which supplies cooling water to the normal SFP heat exchanger. With only the BUSFPCS in operation the SFP temperature continued to increase, as expected. The calculated equilibrium SFP temperature was about 150°F.

On May 7, at about 4:45 a.m., the SFP reached the pool temperature alarm setpoint of 135°F. The SFP high temperature alarm in the control room alarmed at the setpoint and was left in the alarm status. The licensee initiated the action items required by Alarm Response Procedure, ARP-013, “Spent Fuel Pit High Temperature,” which instituted 2 hour nuclear plant operator (NPO) rounds to record SFP temperature. Consequently, the control room operators had no direct indication in the control room should SFP temperature increase significantly, indicating a loss of SFP cooling for example, other than from operator rounds. By midnight of May 7, the SFP temperature reached and stabilized at 151°F. The calculated time to boil in this configuration was 5 hours.

On May 8, at about 2:10 a.m., a ground fault interrupter (GFI) in the circuit supplying power to the CWT trailer tripped opened resulting in the loss of the makeup water supply to the BUSFPCS cooling tower basin. Without makeup water, the operating secondary pump, which takes suction from the cooling tower basin, lost net positive suction head (NPSH) causing secondary pump discharge pressure to drop. Consequently, approximately 20 minutes later, the BUSFPCS operating primary pump tripped per design, due to low differential water pressure between the secondary and primary side loops, causing a loss of SFP cooling. Just prior to loss of the primary pump, a NPO on rounds monitoring BUSFPCS operation (not the same rounds as the 2 hour rounds required by ARP-013) noticed that makeup water to the cooling tower had been lost. The CWT operator was contacted and at 2:42 a.m. power was restored to the CWT trailer reestablishing makeup water to the cooling tower. The BUSFPCS was returned to service at 2:50 a.m. During the time SFP cooling was lost the SFP temperature increased from 151°F to 155°F.

The SFP temperature remained at about 155°F until about 5:00 p.m. on May 8, at which time the normal SFP cooling system was restored to service and operated in parallel with the BUSFPCS. At that time SFP temperature began to trend down and by 8:00 p.m. on May 8, the temperature of the SFP was reduced to 118°F.

The NRC dispatched a Special Inspection team to the Indian Point Unit 3 on May 14, 2001, to inspect and assess the loss of SFP cooling event. The charter for the special inspection is included as Attachment 4 to this report. A chronology of the loss of SFP cooling event developed by the inspection team is included as Attachment 3 to this report.

4. OTHER ACTIVITIES [OA]

4OA3 Event Follow-up (93812)

.1 Loss-of-Spent Fuel Pool Cooling System

a. Inspection Scope

The inspectors reviewed the loss of the BUSFPCS that occurred on May 8, 2001. As outlined in the charter for the Special Inspection, and using the guidance specified in Inspection Procedure 93812, the inspectors determined the facts surrounding the loss-of-spent fuel pool cooling that occurred at Indian Point 3, assessed the adequacy of the licensee's investigation and root cause evaluation of the loss-of-spent fuel pool cooling, assessed the adequacy of the licensee's corrective actions and extent of condition review for the loss of backup spent fuel pool cooling, and assessed the adequacy of the licensee's technical and operational basis for the design and operation of the BUSFPCS. Additionally, the inspectors independently evaluated the risk significance of the loss-of-spent fuel pool cooling, reviewed the reportability of the event, and assessed whether shutdown risk assessment and control activities were appropriate. The loss of the BUSFPCS affected the Mitigating Systems Cornerstone and was evaluated by the NRC using the Significance Determination Process (SDP).

The inspectors reviewed the BUSFPCS deficiency/event reports, operational history, support system performance, design basis documents, and licensing and design basis data (Final Safety Analysis Report Update and Technical Specifications). In evaluating Entergy's response to this event, the inspectors interviewed plant and contractor personnel, attended management meetings, and reviewed the root cause evaluation report.

b. Findings

The inspectors found that licensee management did not take appropriate actions to minimize the risk associated with loss of the BUSFPCS for the given plant conditions, which included unavailability of the normal SFP cooling system, reduced reliability of the BUSFPCS makeup water system, and the high decay heat load and SFP temperature associated with the full core offload. Additionally, the inspectors found that the licensee did not recognize that there was less time to recover SFP cooling to prevent boiling when using the BUSFPCS as compared to using the normal SFP cooling system. The finding was of very low safety significance (Green) because spent fuel pool cooling was restored in less than a hour, backup makeup water sources were available, and barrier integrity was not challenged.

The licensee's nuclear safety evaluation (NSE) for the modification that installed the BUSFPCS, states that, "The addition of this backup system adds a line of defense against SFP boiling that was not present before, and thus can only increase the margin of safety present with the existing system." By removing the normal SFP cooling system from service and relying solely on the BUSFPCS for SFP cooling the licensee removed that added line of defense against SFP boiling and provided a less reliable system as the sole source of SFP cooling with a decay heat load significantly higher than previously seen by either the normal SFP cooling system or the BUSFPCS.

The licensee's NSE stated that the alarm setpoint may need to be revised when the heat load in the pool approaches the design value of 35 MBTU/hr or the existing setpoint value, regardless of whether the normal cooling system or the BSFPCS is in service and that the SFP bulk temperature calculation will provide guidance as to what value the SFP high temperature alarm may need to be adjusted during a particular System use. Based on core offload decay heat calculations, completed prior to the R11 full core offload, the licensee determined that the SFP equilibrium water temperature would stabilize at about 145°F - 150°F, a temperature higher than the alarm setpoint of 135°F. The Indian Point 3 FSAR Update, Section 9.3, stated that "Temperature and level indicators in the spent fuel pit warn the operator of the loss of cooling." However, the licensee elected not to adjust the SFP temperature alarm setpoint but entered ARP-013, Alarm Response Procedure, Spent Fuel Pit High Temp., which established operator rounds at a 2 hour frequency to record SFP temperature, thereby depriving the control room of early indication that the SFP cooling system may have failed. Additionally, the licensee did not provide any guidance to the control room operators designating a new SFP temperature that, if reached, would require any corrective action.

Also, the NSE stated that the BUSFPCS is capable of removing 35 MBTU/hr, while keeping the SFP temperature below 190°F, as long as the wet bulb temperature is less than 77°F. However, the wet bulb temperature was neither monitored nor recorded to know if any limits were being approached or exceeded that could prevent the BUSFPCS from meeting its design requirement.

The licensee's Defense-in-Depth Plan (DID)-R11-008, C8-Core Cooling, required that when the normal SFP cooling system was removed from service the contractor water treatment (CWT) system water supply be available to supply makeup water to the BUSFPCS cooling tower. Loss of makeup water results in loss of net positive suction head (NPSH) to the secondary pumps, and resultant loss of SFP cooling, in about 20 minutes. Should the CWT system fail, the licensee had established a makeup water backup supply from the station fire water system in accordance with standard operating procedure (SOP) SFP-003, Operation of the Backup Spent Fuel Pool Cooling System (a fire hose was pre-staged at a nearby fire hydrant that could be hooked up to the cooling tower fill connection). During R11 the water treatment contractor used a portable trailer in conjunction with the CWT system to supply water to the BUSFPCS cooling tower. However, the adequacy of the electric power supply to the portable trailer was not verified by the licensee. Loss of electric power to the trailer due to circuit overload caused the loss of SFP cooling event.

In accordance with SOP-SFP-003, the licensee had established normal operator rounds at a 4 hour frequency to monitor BUSFPCS operation, which included verifying that there was an adequate supply of makeup water to the cooling tower basin. However, the inspection interval was inappropriate to prevent a loss of SFP cooling since about 20 minutes after loss of makeup water to the cooling tower the BUSFPCS secondary pump would lose NPSH with the resultant loss of SFP cooling. Even though there were concerns about makeup water reliability, the licensee did not establish any requirements for the contractor to monitor the CWT system on a frequency that was commensurate with preventing loss of SFP cooling due to loss of makeup water.

The inspectors found that due to NPSH limitations on the BUSFPCS primary pump, should SFP cooling be lost, there was less time to recover the BUSFPCS to prevent SFP boiling than there was to recover the normal SFP cooling system, which the licensee failed to recognize. The normal SFP cooling system can operate at any SFP temperature up to boiling (212°F). The BUSFPCS 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. The licensee calculated the time to boil for the existing conditions to be about 5 hours, based on the calculated full core offload SFP heat up rate of about 12°F/hour and a SFP water equilibrium temperature of about 150°F. Five hours was also used in the licensee's probabilistic risk assessment (PRA) that was done on May 10, 2001, for the loss of SFP cooling event.

However, basing any corrective action response time regarding restoring the BUSFPCS on a 5 hour time to boil was inappropriate due to the BUSFPCS primary pump NPSH limitations described above. The calculated time for the SFP to reach 196°F was about 3.75 hours, which is the time limit the licensee should have used as the time available for recovery from a loss of the BUSFPCS and should have used for their PRA. Though using 3.75 hours instead of 5 hours did not significantly increase the licensee's PRA results (increased frequency from about 2.7E-7 to 3.5E-7), the time available to recover the BUSFPCS was less than thought by the licensee.

<u>Independent NRC Risk Assessment of the Loss of the BUSFPCS</u>

The loss of the BUSFPCS affected the Mitigating Systems Cornerstone and was evaluated by the NRC using the Significance Determination Process (SDP). The temporary loss of SFP cooling was more than minor because there was a credible impact on safety. A prolonged loss of SFP cooling without recovery and the failure to provide an inventory makeup source to the SFP would result in a loss of SFP water inventory and fuel damage.

The NRC performed a Phase 3 SDP risk assessment of a loss of SFP cooling at Indian Point 3. The mitigation of loss of SFP cooling events is highly dependant upon the success of operator actions. The methodologies to estimate the success probabilities for these types of operator actions have considerable uncertainty. The operator action success probabilities used for this risk analysis were estimated using the NRC's accident sequence precursor (ASP) human error worksheets.

The following are important qualitative factors which influenced the risk significance determination for this event:

- If the BUSFPCS was lost, approximately 3.75 hours were available for operators to recover the system prior to the temperature in the SFP exceeding the system design temperature. An additional 1 hour was available prior to bulk boiling occurring in the SFP.
- The control room high SFP temperature annunciator was in the alarm status, since the SFP water temperature had exceeded its setpoint and, therefore, was

unavailable to warn operators of a loss of SFP cooling. To compensate for the lack of SFP temperature indication in the control room, and in accordance with the alarm response procedure, operator rounds to verify SFP temperature were conducted once every 2 hours. (These rounds were in addition to the normal 4 hour rounds conducted per SOP-SFP-003.) This allowed a minimum of about 2 hours to restore the BUSFPCS prior to exceeding the design temperature of the system. The low SFP water level alarm and the fuel storage building radiation monitors were available and would have provided control room indication of a SFP cooling problem if boiling in the pool had occurred.

- A backup source of makeup water to the BUSFPCS cooling tower was available. The equipment was pre-staged and procedures were available for the operator action to hook up a fire hose to supply the water. In addition to the normal offsite power source, a portable diesel-driven electrical generator was installed to provide a backup power source to all equipment necessary to operate the BUSFPCS. The backup makeup water was supplied from a diesel driven fire water pump.
- If SFP cooling was lost and not restored in approximately 5 hours (3.75 hours for BUSFPCS as described above), bulk boiling of the SFP would occur. There is a large volume of water in the SFP allowing considerable time to establish a makeup source of water to compensate for the inventory loss due to boiling. If water was not added to the SFP to compensate for water loss due to boiling, it would take approximately 27 hours before the SFP level dropped to five feet above the stored fuel and radiation levels would limit access to the fuel storage building. Several sources of water were available to makeup to the SFP if boiling were to occur. Plant operators could have opened the fuel transfer valve to allow passive makeup from the refueling cavity. Other sources of makeup were from the primary water system or the fire protection system. Procedures and equipment availability for these makeup water sources were verified by the inspectors (procedure deficiencies noted in Section .2 of this report would not have adversely affected the ability to provide makeup water to the SFP). Over one day was available to initiate one or more of the makeup water sources to make up water to the SFP if the BUSFPCS was lost and could not be recovered. Given the availability of the diverse SFP inventory makeup sources and the significant amount of time available to initiate makeup water to the SFP, the probability of not providing some form of inventory makeup was determined to be extremely low.
- The risk assessment used an estimated failure frequency for the loss of the BUSFPCS based on system performance during the past two outages.
- It was assumed that any release of radiation would result in a late release because of the considerable time available to implement emergency plan actions.

The Phase 3 SDP risk assessment determined that the delta-core damage frequency (CDF) for (1) the decrease in reliability of the BUSFPCS over the normal SFP cooling system, and (2) the failure to provide SFP temperature indication in the control room, were less than 1E-6/yr, but greater than 1E-7/yr. The risk assessment results are provided as a band to demonstrate the inherent uncertainty in estimating the human error rate probabilities. Based on this result, combined with the fact that SFP cooling was restored in less than an hour, backup makeup water sources were available, and barrier integrity was not challenged, the findings regarding the loss-of-spent fuel pool cooling were determined to be of very low safety significance (Green). This included the performance issue regarding management oversight. The licensee has entered this issue in their corrective action program as DER No. 01-02517. **(FIN 05000286/2001-006-01).**

.2 Procedure Control and Implementation

a. Inspection Scope

The inspector reviewed the following procedures related to the spent fuel pit and associated systems and components:

(1) ARP-013, Alarm Response Procedure, Rev. 28, TIC-651, "Spent Fuel Pit High Temp."
(2) ONOP-SFP-1, Rev. 11, "Loss-of-Spent Fuel Pit Cooling," 9/27/99.
(3) SOP-SFP-001, Rev. 15, "Spent Fuel Pit Cooling and Purification System Operation," 2/28/01.
(4) SOP-SFP-003, Rev. 3, "Operation of the Backup Spent Fuel Pool Cooling System," 5/3/01.

The inspector evaluated the adequacy of the procedure content against the system design basis as described in the licensee's design basis documentation and against functions and limits described in the Indian Point 3 FSAR Update. The inspector also evaluated the consistency of planned conditions and actions described in the control room operators' log with the procedures. The inspectors also reviewed the licensee's root cause evaluation and identified corrective actions for the loss of SFP cooling event on May 8, 2001, which were documented in DER No. 01-01878.

b. Findings

The NRC found that the licensee did not adequately identify or evaluate problems with maintenance of the alarm response procedure for high SFP temperature and the operating procedure for the normal SFP cooling system. The NRC identified several examples where the licensee failed to adequately maintain procedures associated with operation of the SFP and its associated systems. These procedural problems had a credible impact on safety in that they reduced the likelihood that operators would identify and effectively recover from a loss of SFP cooling. However, this condition was of very low safety significance (Green) because the time available for recovery from a loss of cooling was long and several sources of makeup water for the SFP were available. The failure to maintain the procedures was treated as a non-cited violation.

Also, the inspectors noted that the licensee, in their root cause analysis (DER-01-01878), identified one procedural deficiency with the off-normal procedure for loss of SFP cooling and identified a need for an assessment to confirm that the extent of condition was accurately characterized and consistent with the attributes and elements of the licensee's process. However, based on the number of procedural problems found by the licensee and by the NRC, the inspectors determined that the licencee's corrective action program failed to specifically assign an action item for an extent of condition review for plant procedures.

During the planning for refueling, the licensee identified that planned maintenance and refueling activities would result in the SFP reaching an equilibrium temperature between 145°F and 150°F. However, the licensee did not revise procedures to be consistent with the expected plant conditions. For example, procedure SOP-SFP-001, Rev. 15, “Spent Fuel Pit Cooling and Purification System Operation,” contained the following restrictions on SFP temperature: (1) Step 4.2.1 stated that SFP temperature be maintained between 70°F and 100°F by adjusting SFP cooling system and component cooling water flow; and (2) Precaution 2.8 and Step 4.2.9 stated that, during refueling, SFP temperature be maintained less than 120°F. Nonetheless, with the BUSFPCS in operation, the operators secured the normal SFP cooling system at 9:13 p.m. on May 6, 2001, allowing the SFP temperature to increase above 120°F.

The SFP temperature continued to increase, and, at 4:45 a.m. on May 7, 2001, the control room operators received the SFP high temperature alarm, which was set at 135°F. ARP-013 was modified on September 21, 1999 (Rev. 27), to specify the following actions if a high temperature condition existed in the SFP with the BUSFPCS in service: (1) initiate a special log and record SFP temperature every 2 hours; and, (2) contact system engineering for resolution if SFP temperature reaches 150°F. The basis for this revision was that SFP temperatures up to 150°F were acceptable for an extended period and SFP temperatures of up to 200°F were acceptable during full-core offloads as analyzed in the structural evaluation of the spent fuel storage building and SFP. However, this procedure was not adequately maintained in that Revision 27 and the subsequent Revision 28 (no significant change from Rev. 27) rendered the function of the high temperature alarm ineffective. Although the licensee monitored SFP temperature, the procedure neither directed a verification of BUSFPCS operation nor establishment of a higher alarm temperature to provide timely indication to control room operators of a loss of the SFP cooling function.

The inspectors observed that procedure ONOP-SFP-1 was revised September 27, 1999 (Rev. 11), to add loss of the BUSFPCS as an additional entry condition and include operation of the BUSFPCS as a recovery measure. However, the procedure did not include recovery measures to restore the BUSFPCS to operation if its loss was the cause of the loss of SFP cooling. This off normal procedure was not adequately maintained in that the procedure did not include effective recovery actions when the BUSFPCS was the only available cooling system for the SFP. The licensee identified this problem with their off-normal procedure for loss of SFP cooling during their evaluation of DER No. 01-01878.

In addition, procedure ONOP-SFP-1 was not revised to be consistent with planned conditions for refueling nor were all procedure action statements followed in conjunction with the loss of SFP cooling event. The procedure lists receipt of the SFP high temperature alarm as an entry condition (even though the licensee knew that the alarm setpoint would be exceeded), but the operators did not implement the off normal operating procedure at the time the SFP High Temp alarm was received. When the BUSFPCS was lost, the operators did implement applicable steps of ONOP-SFP-1 to recover the BUSFPCS. In order to exit ONOP-SFP-1, Section 5.0, “Subsequent Action,” of the procedure specifies that operators "VERIFY Spent Fuel Pit temperature less 120^{o}F AND stable OR decreasing." However, operators exited the procedure with SFP temperature at 154.5^{o}F with the BUSFPCS restored to service, as documented in the control room operators' log. This constitutes a second example where a procedure was inadequate for the expected and actual conditions, but was not changed.

Indian Point Unit 3 Technical Specification 5.4.1.a, "Operating Procedures, Content and Review," requires that written procedures be established, implemented, and maintained for the activities described in Appendix A of Regulatory Guide (RG) 1.33, "Quality Assurance Program Requirements (Operation)." Section 3.h of RG 1.33, Appendix A, describes a procedure for startup, operation, and shutdown of the fuel storage pool purification and cooling system for pressurized water reactors. Section 5 of RG 1.33, Appendix A, describes procedures for abnormal, off-normal, or alarm conditions.

The inspectors found that procedures were not adequately maintained as required by the Technical Specification. They include: the revision to procedure ARP-013 rendered the design function of the SFP high temperature alarm ineffective; procedure SOP-SFP-001 was not adequately maintained to reflect expected conditions, which resulted in operators exceeding specified administrative limits on SFP temperature; and, the revision to procedure ONOP-SFP-1 did not include recovery steps for loss of the BUSFPCS, did not reflect the expected condition of the SFP temperature reaching an equilibrium temperature above 120^{o}F, and did not reflect the expected condition of the SFP temperature reaching an equilibrium temperature above the current high temperature alarm setting.

The inspector and the Region I Senior Reactor Analyst evaluated the effect of the above procedural issues using the NRC Significance Determination Process (SDP) as described in Section in 4OA3.1.b. of this report. This finding did have a credible impact on safety. However, based on the results of the SDP, combined with the fact that SFP cooling was restored in less than an hour, backup makeup water sources were available, and barrier integrity was not challenged, the performance issues regarding procedure deficiencies were determined to be of very low safety significance (Green). The licensee has entered this issue in their corrective action program as DER-01-02518. This violation of Technical Specification 5.4.1.a is being treated as a non-cited violation **(NCV 05000286/2001-006-02)**, consistent with Section VI.A.1 of the NRC Enforcement Policy.

.3 Safety Evaluation for the Backup Spent Fuel Pool Cooling System

a. Inspection Scope

The inspection team reviewed the nuclear safety evaluation, NSE 98-3-019, “Backup Spent Fuel Pool Cooling System,” that was prepared in conjunction with Modification Package, MOD 98-3-019 SFPC, “Backup Spent Fuel Pool Cooling System.” The review was conducted to verify that changes to the facility or to the procedures as described in the Indian Point 3 Final Safety Analysis Report (FSAR) Update were reviewed and documented by the licensee in accordance with 10 CFR 50.59, "Changes, Tests and Experiments".

b. Findings

The inspectors found that the licensee made a change to the SFP cooling system as described in the FSAR Update, which resulted in an increase in the probability of a malfunction of equipment important to safety previously evaluated in the safety analysis report, without requesting commission approval prior to implementation. This issue was determined to be of very low safety significance (Green) because the time available for recovery from a loss of cooling was long and several sources of makeup water for the SFP were available. The violation of 10 CFR 50.59 was treated as a non-cited violation.

In 1999, the licensee modified the plant by installing a BUSFPCS, to be periodically used as the sole source of SFP cooling when the normal SFP cooling was removed from service for maintenance. Spent fuel pool cooling is a system that is important to safety based on its intended design function as described in the FSAR. The licensee stated in their NSE that the BUSFPCS was provided to perform similar functions to the normal SFP cooling system during limited time periods and usage to allow normal SFP cooling system maintenance. However, the inspectors determined that the BUSFPCS provides a less reliable SFP cooling source when compared to the normal SFP cooling system and, unlike the normal SFP cooling system, has the potential to not be recoverable on loss of SFP cooling at elevated SFP water temperatures, which increases the probability of the malfunction of equipment important to safety.

Unlike the normal SFP cooling system, which has a heat exchanger cooled by the reliable, safety-related component cooling water (CCW) system, the non-safety related BUSFPCS heat exchanger is cooled by a cooling tower which requires a continuous supply of makeup water to make up for evaporation. Makeup water to the secondary cooling loop was provided from the primary water system (PWS) which, in turn, was supplied from a less reliable contractor water treatment (CWT) system. The licensee identified a history of problems associated with the reliability of the makeup water to the BUSFPCS. For example, deviation/event report (DER) 99-02017 described a loss of makeup water supply that caused the loss of the BUSFPCS while providing SFP cooling on September 23, 1999. DER 00-00796 described a loss of makeup water due to electrical problems on April 4, 2000. The cause of this event was an electrical problem associated with the CWT system. Additional problems were documented by the licensee in their corrective action program and are identified in the list of DERs in Attachment 2 of this inspection report. The licensee did provide a backup source or makeup water from the plant's fire water system. Hoses were pre-staged but not hooked up.

The BUSFPCS has limitations regarding the time and ability to recover from a loss of SFP cooling. Should normal SFP cooling be lost (with the BUSFPCS out of service) and then restored, cooling can be restored to the SFP at any pool temperature up to boiling (212°F). However, should SFP cooling be lost when the BUSFPCS is in operation (with the normal SFP cooling system out of service) and then restored to service, SFP cooling can be only be restored if the SFP temperature does not exceed about 196°F due to NPSH limitations of the primary pump that takes a suction from the SFP.

Consequently, the inspectors found, considering that heat removal from the spent fuel pool is important to safety and utilizing the revision of 10 CFR 50.59 that was applicable at the time the system was installed, that the change resulted in the increased probability of a malfunction of equipment important to safety previously evaluated in the safety analysis report and, therefore, constituted an unreviewed safety question and was a violation of 10 CFR 50.59.

Additionally, the inspectors determined that the unreliability of the makeup water system, combined with the requirement for a continuous makeup water supply, and the reduced time to recover the BUSFPCS if lost, resulted in a more than minimal increase in the likelihood of occurrence of a malfunction of the BUSFPCS as compared to the normal SFP cooling system.

In accordance with the NRC's Enforcement Policy, violations of 10 CFR 50.59 are normally dispositioned outside of the significance determination process because these violations of 10 CFR 50.59 are considered to impact the regulatory process. However, the use of the BUSFPCS with its significant limitations when compared to the normal SFP cooling system, created a credible impact on safety in that it was more susceptible to failure, as discussed in Section 4OA3.1.b. of this report, and could increase the probability or severity of a loss of SPF cooling event. Nonetheless, the use of the BUSFPCS was found to be of very low safety significance (Green) because makeup water was available to the SFP (including appropriate procedures, training and pre-staged equipment), to prevent uncovering the spent fuel bundles, should SFP boiling occur.

In accordance with the current revision of 10 CFR 50.59, a licensee shall obtain a license amendment prior to implementing a proposed change if the change would result in more than a minimal increase in the likelihood of occurrence of a malfunction of a system important to safety previously evaluated in the FSAR. Since this change did result in a more than minimal increase as describe above, this violation of 10 CFR 50.59 was categorized at Severity Level IV and was treated as a non-cited violation **(NCV 05000286/2001-006-03)** consistent with Section VI.A.1 of the NRC Enforcement Policy. The licensee has entered this 10 CFR 50.59 issue in their corrective action program as DER-01-02796 and plans to improve the reliability of the BUSFPCS prior to using it again.

4OA6 <u>Meetings, Including Exit</u>

.1 Exit Meeting Summary

The team presented the preliminary inspection results to Mr. Lee Olivier, Mr. Fred Dacimo and other members of your staff on June 6, 2001. On July 3, 2001, Mr. E. Firth was informed of the inspection results of the additional review of the 10 CFR 50.59 issue. The e-mails from the NRC to Entergy requesting information or documents to conduct the inspection, the Entergy responses, and the exit notes regarding the 10 CFR 50.59 issue have been placed in the Public Document Room (ADAMS Accession No. ML012070119).

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. None was identified.

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee
F. Dacimo, General Manger Plant Operations
J. Comiotes, Director Safety Assurance
P. Rubin, Operations Manager
A. Galati, Sr. Engineer, Design Engineering
L. Lee, System Engineer
J. DeRoy, Director of Engineering
P. Kokolalis, Licensing Manager (acting)
J. Russel, Manger of Projects
E. Firth, Licensing
S. Prussman, Licensing
F. Gumble, Reactor Engineer
M. Kerns, Chemistry General Supervisor
J. Kristensen, Chemistry Supervisor
J. Lazar, Mechanical Design Engineer
M. Sylstra, Contractor (Water Treatment Contractor)

NRC Personnel
P. Drysdale, Senior Resident Inspector
W. Ruland, Acting Deputy Director, DRS
L. Doerflein, Chief, Systems Branch, DRS

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

FIN	05000286/2001-006-01	Increased risk and credible impact on safety associated with how and when the BUSFPCS was utilized, support system unreliability, and associated management oversight.

Opened and Closed

NCV	05000286/2001-006-02	Licensee failed to adequately maintain procedures associated with operation of the spent fuel pool (SFP) and its associated systems.
NCV	05000286/2001-006-03	Licensee made a change in the facility as described in the safety analysis report without requesting commission approval prior to implementation.

LIST OF ACRONYMS USED

ARP	Alarm Response Procedure
BUSFPC	Backup Spent Fuel Pool Cooling
BSFPCS or BUSFPCS	Backup Spent Fuel Pool Cooling System
CCW	Component Cooling Water
CDP	Core Damage Probability
CWT	Contractor Water Treatment
DER	Deviation Event Report
DID	Defense-in-Depth
^{o}F	Degrees Fahrenheit
FSAR	Final Safety Analysis Report
FSAR Update	Updated Final Safety Analysis Report
FSB	Fuel Storage Building
GFI	Ground Fault Interrupter
GL	Generic Letter
INPO	Institute of Nuclear Power Operations
MBTU/hr	Million British Thermal Units per Hour
NPO	Nuclear Plant Operator
NPSH	Net Positive Suction Head
NSE	Nuclear Safety Evaluation
OD	Operability Determination
ONOP	Off Normal Operating Procedure
PRA	Probabilistic Risk Assessment
PWS	Primary Water System
R10	Refueling Outage 10
R11	Refueling Outage 11
SDP	Significance Determination Process
SFP	Spent Fuel Pit or Spent Fuel Pool
SFPCS	Spent Fuel Pool Cooling System
SOP	Standard Operating Procedure
TS	Technical Specifications

ATTACHMENT 2

PARTIAL LIST OF DOCUMENTS REVIEWED

Root Cause Analysis

1. Investigative Critique Package (Root Cause Analysis) for DER 01-01878, Loss of Backup Spent Fuel Pool Cooling (BUSFPC) System, dated 5/16/01.

Corrective Action Program Deficiency Event Reports

1. DER-99-01777, On several occasions during mod acceptance testing the back up spent fuel pool cooling system testing was held up because makeup demin water was not available from Con Ed, 9/2/99.
2. DER-99-01983, System engineer observed SFP temperatures higher than expected and affected alarm setpoint, 9/21/99.
3. DER-99-02017, PWS water supply out of service caused loss of BUSFPCS, 9/23/99.
4. DER-00-00076, Water Treatment Contractor equipment problems regarding supplying water, 1/11/00.
5. DER-00-00520, Water Treatment Contractor problems regarding supplying water, 3/4/00.
6. DER-00-00522, Water Treatment Contractor problems regarding supplying water, 3/5/00.
7. DER-00-00625, Procedural deficiencies regarding retirement of Water Factory and use of Water Treatment Contractor for supplying water, 3/16/00.
8. DER-00-00796, Water Treatment Contractor water supply out of service due to electrical problems, 4/4/00.
9. DER-00-01338, Water Treatment Contractor reduced water supply due to quality problems and did not notify operations, 6/4/00.
10. DER-01-00467, Water Treatment Contractor problems regarding supplying water, 2/7/01.
11. DER-01-00792, Definition, tracking and basis of “limited use” of BUSFPCS, 3/2/01.
12. DER-01-00980, Water Treatment Contractor problems regarding supplying water, 3/17/01.
13. DER-01-01423, Water Treatment Contractor Operator cannot be contacted in a timely fashion, 4/19/01.
14. DER-01-01459, Water Treatment Contractor Operator cannot be contacted in a timely fashion and identified this as a potential impact to the outage since Water Treatment Contractor was needed to supply the BUSFPCS makeup water, 4/21/01.
15. DER-01-01878, Momentary Loss of BUSFPC System, 5/8/01.
16. DER-01-01946, Inadequate Documentation in Calculation (SFP Heat Load with BUSFPCS), 5/10/01.

17. DER-01-01990, Mis-information in Daily IP3 Outage Status Report (regarding extension cord for Contractor Water Treatment facility), 5/9/01.
18. DER-01-02003, GFCI circuits tripping, 5/11/01.
19. DER-01-02146, 15 amp GFI discovered on the Water Treatment Contractor 20 amp circuit, 5/16/01.
20. DER-01-02168, Questions on 50.59 Safety Evaluation for BUSFPCS Modification and Ability of System to Maintain Functionality Above 200°F SFP Temperature, 5/17/01.
21. DER-01-02173, Was Interruption of SFP Cooling a Reportable Event, 5/17/01.
22. DER-01-02174, Testing Performed to Verify That the Assumptions Used For Makeup to the SFP Can be Accomplished At a Rate Consistent With the Analysis, 5/17/01.
23. DER-01-02517, NRC Green Finding - BUSFPCS Risk Assessment, 6/6/01.
24. DER-01-02518, BUSFPCS Green NCV of TS, 6/6/01.
25. DER-01-02796, Potential Unreviewed Safety Question Regarding NSE 98-03-019 SFPC, 11/15/00.

Modifications, Calculations, and Drawings.

1. Modification Package, Mod 98-3-019-SFPC, Rev. 0, Backup Spent Fuel Pool Cooling System, 2/19/99.
2. Calculation IP3-CALC-FHS-03418, R11 Spent Fuel Pit Heat Load Due to Core Offload, Rev. 0, 4/10/01.
3. Calculation 2123-012-015-001, Rev. 1, Backup Spent Fuel Pool Cooling Pump Sizing, 2/1/00.
4. Temporary Modification 01-00384-01, Water Treatment Contractor Raw Water Inlet Alternate Source Temporary Modification Installation, dated 3/12/01.
5. Temporary Modification 99-02974-05, Water Treatment Contractor system water supply, dated 10/12/99.
6. Indian Point 3 Nuclear Power Plant Primary Water Makeup Pump Curves, dated 10/18/72.
7. Indian Point 3 Nuclear Power Plant Drawing 9321-F-27243, Rev. 40, Flow Diagram, Primary Make-up Water System Nuclear Steam Supply Plant.
8. Indian Point 3 Nuclear Power Plant Drawing 9321-F-20269, Rev. 4, Flow Diagram, Contractor Water Treatment System.

Safety Evaluations

1. Nuclear Safety Evaluation NSE 99-3-062-SPEC, Rev. 0, Relaxation of Core Offload Time Requirements, 6/29/99.
2. Nuclear Safety Evaluation NSE 98-3-019-SFPC, Rev. 5, Backup Spent Fuel Pool Cooling System, 11/15/00.
3. Safety Evaluation (10 CFR 50.59) EVL-01-3-028-RCS, Rev. 0, Basis for Core Offload Time Requirements.

4. Nuclear Safety and Environmental Impact Screen for ARP-013, Alarm Response Procedure, Rev. 27, 9/21/99.

Procedures and Plans

1. ARP-013, Alarm Response Procedure, Rev. 27, TIC-651, Spent Fuel Pit High Temp., 9/21/99.
2. ARP-013, Alarm Response Procedure, Rev. 28, TIC-651, Spent Fuel Pit High Temp., 3/19/01
3. ONOP-SFP-1, Rev. 11, Loss-of-Spent Fuel Pit Cooling, 9/27/99.
4. POP-4.3, Rev.4, Operation Without Fuel in the Reactor, 3/19/01.
5. SOP-SFP-001, Rev. 15, Spent Fuel Pit Cooling and Purification System Operation, 2/28/01.
6. SOP-SFP-003, Rev. 3, Operation of the Backup Spent Fuel Pool Cooling System, 5/3/01.
7. DID-R10-009, Defense-in-Depth Continency Plan for Core Cooling When the Normal Spent Fuel Pit Cooling System is Removed from Service For Maintenance, Rev. 3, 9/17/99.
8. DID-R11-008, Defense-in-Depth Continency Plan C8-Core Cooling, When the Normal Spent Fuel Pit Cooling System is Removed from Service, Rev. 1, 5/04/01.

Design and Licensing Bases Documents

1. Indian Point 3 Nuclear Power Plant Final Safety Analysis Report (FSAR) Update, Section 1.3.6, Fuel and Radioactivity Control (Criteria 60 to 64).
2. Indian Point 3 Nuclear Power Plant Final Safety Analysis Report (FSAR) Update, Section 9.3, Auxiliary Coolant System.
3. Indian Point 3 Nuclear Power Plant Final Safety Analysis Report (FSAR) Update, Section 9.5, Fuel Handling System.
4. Indian Point 3 Nuclear Power Plant Final Safety Analysis Report (FSAR) Update, Section 16.4.5, Thermal Stresses in Walls of Spent Fuel Pit.
5. Indian Point 3 System Description 4.3, Spent Fuel Pit Cooling System, Rev. 2, 11/1/99.
6. Indian Point 3 Nuclear Power Plant Design Basis Document for the Backup Spent Fuel Pool cooling System (BSFPCS), IP3-DBD-308, Rev.2, 1/3/01.
7. Indian Point 3 Nuclear Power Plant Technical Specifications
8. Amendment No. 13 to Facility Operating License No. DPR-64 for the Indian Point Nuclear Generating Station, Unit No. 3, 3/22/78.
9. Amendment No. 90 to Facility Operating License No. DPR-64 for the Indian Point Nuclear Generating Station, Unit No. 3, 10/12/89.
10. Amendment No. 98 to Facility Operating License No. DPR-64 for the Indian Point Nuclear Generating Station, Unit No. 3, 5/7/90.
11. Amendment No. 173 to Facility Operating License No. DPR-64 for the Indian Point Nuclear Generating Station, Unit No. 3, 4/15/97.

12. Amendment No. 205 to Facility Operating License No. DPR-64 for the Indian Point Nuclear Generating Station, Unit No. 3, 2/27/01.

13. NRC Memorandum, James M. Taylor, Executive Director for Operations, to Chairman Jackson, Commissioner Rodgers, and Commissioner Dicus, "Resolution of Spent Fuel Storage Pool Action Plan Issues," 7/26/96.

14. NRC Letter, George F. Wunder to William J. Cahill, Jr., Chief Nuclear Officer, New York Power Authority; dated 10/9/96; "Resolution of Spent Fuel Storage Pool Safety Issues: Issuance of Final Staff Report and Notification of Staff Plans to Perform Plant Specific, Safety Enhancement Backfit Analyses, Indian Point Nuclear Generating Unit No. 3 (TAC No. M95848)."

15. New York Power Authority Letter, William J. Cahill, Jr., Chief Nuclear Officer, to U.S. Nuclear Regulatory Commission; dated 11/22/96; "Response to Spent Fuel Pool Safety Issues."

16. NRC Memorandum, L. Joseph Callan, Executive Director for Operations, to Chairman Jackson, Commissioner Diaz, Commissioner Dicus, and Commissioner McGaffigan; dated 9/30/97; "Followup Activities on the Spent Fuel Pool Action Plan."

<u>Miscellaneous Indian Point 3 Documents</u>

1. Memorandum IP-LIC-01-030, J. Comiotes to P. Kokolakis, Assessment of the Reportability of Interruption of BUSFPCS, dated 5/18/01.

2. Memorandum IP3-WCC-01-009, R. Robenstein to R. Cavalieri, R-11 Risk Assessment Report (Based on refueling schedule as of 4/23/01).

3. Memorandum, J. Circle to B. Rokes, CDP for Loss of BUSF Pool Cooling, 5/11/01.

4. Operations/System Engineering Communication Form Memorandum, L. Lee to P. Rubin, Maintaining SFP Cooling for R11 offload window w/ only BUSFPC in service, 5/5/01.

5. IP3 Control Room Operating Log, 5/3/01 through 5/9/01.

6. Memorandum, J. Circle to J. DeRoy, Loss-of-Spent Fuel Pool Backup Cooling (Risk Analysis), 5/10/01.

7. Memorandum, J. Circle to E. Firth, IP3 SFP PRA, 6/5/01.

8. Instructor Lesson Plan, Simulator Plant Operating Procedures Course, LIC-SMP-31, RCP Malfunctions and Spent Fuel Pool Cooling Problems, Rev. 3, 2/18/00.

9. Instructor Lesson Plan, Plant Modifications Course, NQR-MOD-03, Backup Spent Fuel Pool Cooling System, Rev. 0, 3/10/99.

10. OD-36, Attachment 3, Special Log Tracking Sheet, Operator Rounds and Daily Surveillance Tests, Rev. 19, Monitor SFP Temperature While on Only B/U SFP Cooling With High SFP Temp., 3/19/01.

11. SOP-SFP-003, Attachment 6, Rev. 2, Backup SFP Cooling System Logs, 4/26/01 through 5/8/01.

ATTACHMENT 3

LOSS-OF-SPENT FUEL POOL COOLING CHRONOLOGY

	Date/ Time	Event
1.	8/99	Back Up Spent Fuel Pool Cooling System (BUSFPCS) installed. Modification package 98-3-019 SFPC, Rev. 0, 2/19/99. Safety evaluation NSE 98-3-019.
2.	9/99	BUSFPCS used during Refueling Outage 10 (R10)
3.	9/21/99	BUSFPCS only system cooling spent fuel pool (SFP) with full core off-load and SFP temperature increasing at rate that would exceed alarm setpoint of 135°F which was contrary to Safety Evaluation NSE 98-3-019, associated with the modification that installed the BUSFPCS which stated that the temperature alarm setpoint would not have to be reset until end of plant life. DER 99-1983 written to address concern. NSE 98-3-019 was revised (Rev. 5, 11/15/00) to address higher SFP temperatures associated with full core off-loads.
4.	9/23/99	Lost BUSFPCS due to loss of makeup water to the BUSFPCS cooling tower. DER 99-2017 written to address the issue. Long term corrective action was to install a Contractor Water Treatment (CWT) System modification.
5.	11/99	Installed a Contractor Water Treatment System modification to improve reliability of makeup water supply to the BUSFPCS.
6.	11/99	Placed BUSFPCS in service to enable a non-outage repair of component cooling valve AC-803.
7.	6/00	IP3 FSAR Update amended to allow reduction in the 267 hour time limit for any core offload provided that it can be shown that the heat load in the spent Fuel Pit will not exceed 35.00 x 10^6 BTU/hr and that the Spent Fuel Pit bulk temperature will not exceed 200°F at any time.
8.	3/01	Modified the CWT system water supply source to come from Indian Point 3 versus Indian Point 2. Temporary modification 01-00384-01. Supplemented CWT system with a portable water treatment system due to flow conditions that were too low for the main CWT system.
9.	4/26/01 0:00 a.m.	BUSFPCS placed in service in parallel with normal SFP cooling system for R11. SFP temperature 81°F.
10.	4/27/01 9:57 p.m.	IP3 taken off line to commence R11 refueling outage.
11.	4/30/01 0:00 a.m.	BUSFPCS and normal SFP cooling system in service. SFP temperature 78°F.
12.	5/3/01 0:00 a.m.	BUSFPCS and normal SFP cooling system in service. SFP temperature 78°F.

13.	5/4/01 7:48 a.m.	Commenced fuel transfer from reactor vessel to SFP.
14.	5/5/01 0:00 a.m.	BUSFPCS and normal SFP cooling system in service. SFP temperature 86°F.
15.	5/5/01 4:00 p.m.	BUSFPCS and normal SFP cooling system in service. SFP temperature 98°F.
16.	5/6/01 3:00 a.m.	Completed core off-load to SFP.
17.	5/6/01 4:00 a.m.	BUSFPCS and normal SFP cooling system in service. SFP temperature 104°F.
18.	5/6/01 9:13 p.m.	Removed normal SFP cooling system from service and placed SFP cooling on the BUSFPCS.
19.	5/7/01 0:00 a.m.	BUSFPCS in service. SFP temperature 120°F.
20.	5/7/01 4:45 a.m.	SFP temperature was increasing and reached the alarm point of 135°F. This was expected based on the timing of the full core off-load. Temperature was expected to stabilize at about 145°F - 150°F. Operators initiated a special log of the SFP temperature in accordance with Alarm Response Procedure ARP-013. Readings of SFP temperature were recorded every two hours until the normal SFP cooling system was returned to service.
21.	5/8/01 0:00 a.m.	SFP temperature at 151°F and stable.
22.	5/8/01 2:00 a.m.	CWT system operator verified that the supplemental CWT system was in operation supplying water to the BUSFPCS.
23.	5/8/01 2:00 a.m.	SFP temperature at 151°F and stable.
24.	5/8/01 2:10 a.m. estimate	Lost power to the CWT trailer causing loss of makeup water to BUSFPCS cooling tower.
25.	5/8/01 2:30 a.m. estimate	Lost BUSFPCS when primary pump tripped on low differential pressure with respect to the secondary pump pressure at the heat exchanger. This is approximately 47 hours since full core offload and about 244 hours since shutdown of the reactor.
26.	5/8/01 2:35 a.m.	Nuclear plant operator (NPO) on rounds found the pressure gauge at the BUSFPCS cooling tower makeup water supply inlet was reading zero and that there was no water level shown in the level sight glass for the cooling tower basin. The NPO contacted the Central Control Room (CCW).

27.	5/8/01 2:37 a.m.	The fuel storage building Senior Reactor Operator (SRO) reported to the CCW that the primary BUSFPCS pump had tripped. (The trip was a design feature of the system which trips the primary BUSFPCS pump on low discharge pressure from the secondary BUSFPCS pump. The secondary BUSFPCS pump had lost discharge pressure due to the loss of suction caused by the loss of makeup water to the cooling tower basin.)
28.	5/8/01 2:38 a.m.	NPO dispatched to the CWT trailer.
29.	5/8/01 2:39 a.m.	NPO entered the fuel storage building and confirmed that the primary BUSFPCS pump had tripped. Notified CCW.
30.	5/8/01 2:40 a.m.	SFP temperature 155°F.
31.	5/8/01 2:42 a.m.	Power restored to the CWT trailer thereby restoring makeup water to the BUSFPCS cooling tower. A GFI plug had interrupted and was reset.
32.	5/8/01 2:50 a.m.	BUSFPCS was restored.
33.	5/8/01 3:00 a.m.	BUSFPCS in service. SFP temperature 155°F and stable.
34.	5/8/01 3:10 a.m.	BUSFPCS in service. SFP temperature 154.5°F.
35.	5/8/01 4:00 a.m.	BUSFPCS in service. SFP temperature 155°F.
36.	5/8/01 6:00 a.m.	BUSFPCS in service. SFP temperature 155°F.
37.	5/8/01 4:00 p.m.	BUSFPCS in service. SFP temperature 154°F.
38.	5/8/01 5:12 p.m.	Normal SFP cooling system restored and operated in parallel with the BUSFPCS.
39.	5/8/01 8:00 p.m.	BUSFPCS and normal SFP cooling system in service. SFP temperature 118°F.

ATTACHMENT 4

SPECIAL INSPECTION CHARTER

May 11, 2001

MEMORANDUM TO: Larry Doerflein, Team Manager, Branch Chief, DRS
Gregory V. Cranston, Team Leader, Special Inspection

FROM: Wayne D. Lanning, Director Division of Reactor Safety

SUBJECT: SPECIAL INSPECTION CHARTER - INDIAN POINT NUCLEAR POWER STATION, UNIT 3

A special inspection has been established to inspect and assess the plant's response to a loss of fuel pool cooling that occurred at Indian Point 3 Nuclear Power Station on May 8, 2001. The special inspection team will include:

Manager: Larry Doerflein, Branch Chief, DRS
Leader: Gregory V. Cranston, Reactor Inspector, DRS
Members: Steven R. Jones, Senior Resident Inspector, DRP
James M. Trapp, Senior Reactor Analyst, DRS (In-office support)

This special inspection is in response to a loss of backup spent fuel pool cooling, with the normal spent fuel pool cooling system removed from service and a full core recently off loaded into the spent fuel pool. The basis for the special inspection is to assess the licensee’s root cause evaluation and corrective actions and independently evaluate the risk significance of the loss-of-spent fuel pool cooling. The special inspection will also determine if there are any generic implications associated with the event.

The special inspection was initiated in accordance with NRC Management Directive 8.3 (draft), NRC Incident Investigation Program. The inspection will be performed in accordance with the guidance of Inspection Procedure 93812, Special Inspection. The report will be issued within 45 days following the exit for the inspection. If you have questions regarding the objectives of the attached charter, please contact William Ruland at (610) 337-5376.

Special Inspection Charter
Indian Point Nuclear Power Station, Unit 3
Loss-of-Spent Fuel Pool Cooling

The team should understand the scope and direction of the licensee's investigations and assessment of the events, and their initial responses. Through sampling and independent verification, the team may use facts and information collected by the licensee's investigation team. The pace and nature of team activities should be gauged to assure, where practicable, that they do not unduly impact the licensee's efforts.

The team leader shall develop an inspection plan, that outlines the areas of responsibility for the team members to ensure the identification and documentation of the relevant facts to support the objective below.

The objective of the inspection is to determine the facts surrounding the loss-of-spent fuel pool cooling that occurred at Indian Point Nuclear Power Station, Unit 3, on May 8, 2001, when the normal spent fuel pool cooling was not available and backup spent fuel pool cooling was temporarily lost. Specifically, the team should:

1. Develop a time line for the event.
2. Assess the adequacy of the licensee's investigation and root cause evaluation of the loss of backup spent fuel pool cooling.
3. Assess the adequacy of the licensee's corrective actions and extent of condition review for the loss of backup spent fuel pool cooling.
4. Assess the adequacy of the licensee's technical and operational basis for the design and operation of the backup spent fuel pool cooling system. This should include assessment of steps taken by the licensee to protect and monitor this system.
5. Independently evaluate the risk significance of the loss-of-spent fuel pool cooling and confirm the adequacy of the licensee's risk evaluation through consultation with regional and headquarters Senior Reactor Analysts.
6. Assess the adequacy of the licensee's determination that the loss-of-spent fuel pool cooling event was not reportable.
7. Assess if shutdown risk assessment and control activities were appropriate and consistent with their commitments.
8. Determine the root cause(s) of the event.
9. Document the inspection findings and conclusions in an inspection report within 45 days of the exit meeting for the inspection.