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NewYorkPower Authority

Robert J. Barrett
Plant Manager

October 11, 1996
IPN-96-110

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

SUBJECT: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
License No. DPR-64
Licensee Event Report # 96-013-01
"Plant Outside Design Basis Due To Inadequate Service Water to the Control Room Air Conditioning System Caused by Crud Limiting the Stroke of Service Water System Valves"

Dear Sir:

The attached Licensee Event Report (LER) 96-013-01 revision is hereby submitted as required by 10 CFR 50.73. This event is of the type defined in 10 CFR 50.73 (a)(2)(ii)(B). The purpose of this revision is to correct and supplement information previously provided as a result of disassembly and inspection of valve components.

There are no new commitments made by the Authority in this LER.

Very truly yours,

Robert J. Barrett
Plant Manager
Indian Point 3 Nuclear Power Plant

Attachment

cc: See next page

cc: Hubert J. Miller
Regional Administrator
Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19406-1415

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700 Galleria Parkway
Atlanta, Georgia 30339-5957

U.S. Nuclear Regulatory Commission
Resident Inspectors' Office
Indian Point 3 Nuclear Power Plant

NRC FORM 366 (5-92)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)		ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.
FACILITY NAME (1)		DOCKET NUMBER (2)
TITLE (4)	Plant Outside Design Basis Due to Inadequate Service Water to the Control Room Air Conditioning System Caused by Crud Limiting the Stroke of Service Water System Valves	

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
08	01	96	96	-- 013 --	01	10	11	96	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	99		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
			20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER
			20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
			20.405(a)(1)(iv)	✓	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
J. Gullick, Design Engineering Manager	(914)736-8846

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	KG	PCV	W255	Yes					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On August 1, 1996, at approximately 1345 hours, with the plant at 99 percent power, System Engineering determined that the Service Water System pressure control valves to the Control Room Air Conditioning System had a shortened valve stroke and service water supply did not meet the design flow stated in the FSAR. Subsequent investigation determined that a single pressure control valve at full stroke would provide sufficient flow for the control room air conditioners to meet their design requirements. The short stroke on PCV-1297 placed the plant outside the design basis during past operation because service water flow would not be sufficient to maintain required control room temperature during all plant conditions. The short stroke was caused by crud blocking the valve plug from fully opening. On September 12, 1996, subsequent disassembly and inspection of PCV-1296 discovered crud that maintenance judged would have prevented full stroke. The limited stroke would have prevented sufficient flow to meet design requirements. Corrective action includes removal of valve internals, removal of valves, continuing service water system monitoring through the Generic Letter 89-13 program, evaluating the source of the crud to assess adequacy of corrective action and evaluating the plant change to 95 degrees F service water for similar concerns. The affect on public health and safety was not significant.

DESCRIPTION OF EVENT

Note: The Energy Industry Identification System Codes are identified within the brackets { }

On August 1, 1996, at approximately 1345 hours, with the plant at 99 percent power (reactor coolant temperature at approximately 567 degrees F, reactor coolant pressure at approximately 2235 psig respectively, and pressurizer level was at 46 percent) System Engineering (SE) initiated Deviation Event Report (DER) to report Service Water System (SWS) {KG} pressure control valves {PCV} SWN-PCV-1296 and SWN-PCV-1297 had a shortened valve stroke and service water supply to the Control Room Air Conditioners (CRAC) {VI} did not meet the design flow stated in the FSAR. The plant was subsequently determined to be in a condition that was outside the design basis during past operation with PCV-1297 because limited valve travel would not have allowed sufficient service water flow to maintain required control room temperature during all plant conditions. An operability determination by Engineering concluded that the installed condition of companion valve PCV-1296 was not an operability concern and that PCV-1296 was capable of performing its safety function. (Subsequent investigation discovered crud in valve PCV-1296; see page 4 of 7)

The CRAC supplies cooled air for maintaining control room environmental temperatures below 78 degrees F (the initial temperature for station blackout analysis) during normal operation (with assistance from the non-safety related supplemental coolers) and maintaining functional capacity (i.e., limiting the maximum temperature for proper operation of control room electronic components with loss of a single air conditioning unit). A service water line is routed from each service water header through a PCV (PCV-1296 and PCV-1297 are 2 inch pressure control valves, Type 70-28-1D, manufactured by the W-K-M Valve Division {W255} of ACF Industries) to a CRAC unit (Westinghouse model UF 180W {W120} 15 ton, 6000 CFM units).

There is a cross connect with a manual valve between the lines. The PCV controller is controlled by downstream service water pressure and the valve is actuated by air from the Instrument Air System {LD}. Normal operation is to supply service water to both CRAC units from the essential header through one PCV (flow through the other PCV from the non-essential header is prevented by manual valves) and the cross connect valve.

A temporary modification was initiated on July 31, 1996 to remove the internals of PCV-1297 (crud under the plug limited valve stroke to 11/16 inch rather than the full open position of 1-1/4 inch). During development and review of the temporary modification, the flow coefficient of the PCVs, whether open to the limited position of 11/16 inch or full open to 1-1/4 inch, was determined to be less than assumed in the SWS hydraulic evaluation. DER 96-1776 was written on August 1, 1996, to document this finding. An operability determination concluded that a single PCV open 1-1/4 inch would provide service water flow of 54 and 55 gpm to the CRAC units at the same time. Both of these values exceeded the 52.5 gpm through a single CRAC unit that a calculation shows is sufficient to maintain functional capability. The service water flow with a PCV open 11/16 inch would be about 17 gpm to each CRAC unit (or 34 gpm to a single unit) which is not sufficient for a single CRAC unit to maintain functional capability.

DER 96-1267, issued May 18, 1996, first documented that PCV-1297 would not open more than 11/16 inch. Using this as a starting point, Licensing assessed the use of the service water headers since May 18, 1996 and determined the plant operated with SWS flow to the CRAC units through PCV-1297 from June 4 to June 30, 1996.

DER 96-1267, written when a CRAC compressor tripped due to insufficient SWS flow, represented a prior opportunity to identify this event. The DER investigation identified the cause of the inadequate service water flow as a sensing line clogged with dirt (this had occurred previously and prevented an adequate control signal from reaching the valve positioner) and also noted the valve only stroked to 11/16 inch when the valve controller was capable of stroking the valve to 1-1/4 inches. The event was not identified at that time because the vendor submitted incorrect stroke information, based on original specification information data (which was consistent with the Design Basis Documentfor service water), that led Maintenance to conclude that the original design was to limit the stroke to 11/16 inch.

On September 12, 1996, Maintenance examined PCV-1296 following removal of internals of the valve and discovered crud between the backseat of the valve plug and the valve"s bonnet extension. No measurement was made of the valve"s stroke prior to disassembly of the valve because disassembly was performed as a corrective action not an investigation (a determination had been made that the valve would fully stroke). The crud was removed, and a DER recorded the condition and initiated an investigation and evaluation of the crud. Maintenance judged that the crud would have prevented the valve from fully opening and estimated that the valve would have stroked approximately one (1) inch of its full stroke of 1 1/4 inches. Engineering assessed the as-found condition by having an independent engineering consultant perform a hydraulic evaluation using a valve flow coefficient equivalent to the estimated reduced stroke of one (1) inch.

The independent engineering evaluation determined that valve PCV-1296 with a one (1) inch stroke resulted in a Service Water flow of 37 gpm per CRAC unit, which is less than the 52.5 gpm through a single CRAC unit that a calculation showed was sufficient to maintain functional capability. Engineering concluded, that under design basis conditions, the flow to the CRAC units (2) would not be sufficient to prevent the CRAC unit compressors (2 each) from tripping on high inlet pressure even though the CRAC units were functioning under the existing plant conditions.

CAUSE OF EVENT

The cause of reduction of service water flow below the minimum required flow was due to limitation of the stroke travel on PCV-1297 and PCV-1296. The valve stroke was limited because of crud between the valve plug and body which prevented the valve plug from fully opening.

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Contributing causes were an ineffective evaluation of the 11/16 inch valve stroke for PCV-1297 in May 1996 and inadequate design review when raising the design temperature of the SWS to 95 degrees F (a requirement of 70 gpm per CRAC unit was considered acceptable based on a 1989 test of SWS flow rather than a hydraulic calculation).

CORRECTIVE ACTIONS

The following corrective actions have been or will be performed to address the causes of this event:

- The extent of condition has been addressed by the evaluations performed for Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," which evaluated the potential for low flow blockage for safety related portions of the system. The evaluations identified the potential for flow blockage in this section of piping and a modification to remove the PCVs was planned for the next refueling. The program for Generic Letter 89-13 monitors the SWS the service water system for flow blockage and corrective action is taken as required.

- The internals of valve PCV-1297 were removed to increase flow and the air supply to the valve controller was isolated.

- The internals of valve PCV-1296 were removed to increase flow and the air supply to the valve controller was isolated.

- Valves PCV-1296 and PCV-1297 will be removed from the system The modification will initiate changes to the FSAR and the DBD to reflect the correct flow and system/component operation related to PCV-1296 and 1297 as part of the modification process. The modification will be complete by the end of refueling outage 9.

- System Engineering is further evaluating the source of the crud to further assess the cause and the adequacy of corrective action which is based on a buildup of crud rather than traveling crud. A preliminary determination on the source and the need for a revised corrective action will be made by December 3, 1996. This evaluation is scheduled for completion 60 days after the end of refueling outage 9.

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

- Design Engineering is evaluating the change in plant design to the 95 degrees SWS temperature to identify whether changes to flow requirements have been adequately addressed in design. This evaluation will be complete by December 9, 1996.

- Maintenance evaluated the determination in DER 96-1267 that PCV-1297 was acceptable with a 11/16 inch stroke and concluded there is no need to change maintenance work practices.

ANALYSIS OF EVENT

The event is reportable under 10 CFR 50.73 (a) (2) (ii) (B). The licensee shall report any operation or condition that resulted in the plant being in a condition that was outside the design basis of the plant. As a result of debris that shortened that the stroke travel on PCV-1297 and PCV-1296, the maximum attainable flow rate to the CRAC units was less than required to maintain control room temperatures within the value required to maintain equipment qualification. This condition was determined to exist from May 18, 1996 because the source of the crud has not been identified and earlier indications of shortened valve stroke were not identified for either valve. Operationally, the SWS to the CRAC units was through PCV-1296 except from June 4, 1996 to June 30, 1996. On August 23, 1996, SWS flow to the CRAC units was established through PCV-1297, whose internals had been removed, and this alignment was maintained until after the internals were removed from PCV-1296.

A review of Licensee Event Reports (LERs) for the past two years for similar events identified the following LERs that reported the CR Heating Ventilation and Air Conditioning system outside design basis: LER 94-005, 94-009, 94-012.

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

SAFETY SIGNIFICANCE

This event did not have a significant effect on the health and safety of the public. At the time the condition was discovered there was no accident or event. Furthermore, it is unlikely that the plant would have operated with service water provided to the CRAC through PCV-1297 if the plant design conditions were approached. With this service water alignment, the CRAC compressors tripped in May and June when river water temperatures were significantly less than 95 degrees F. If an accident had occurred with a loss of offsite power, a single CRAC failure and design basis conditions, a service water flow of 52.5 gpm to a single CRAC would limit the rise in control room to 107 degrees F over 48 hours. With PCV-1297 open 11/16 inch, flow would be about 65 percent of the required flow (there would be approximately 17 gpm to the two CRAC units or 31 gpm to a single unit) and with PCV-1296 open one inch, total flow would exceed the required flow (there would be approximately 37 gpm to each CRAC unit or 54.4 gpm to a single CRAC unit). Although service water flow through PCV-1297 is insufficient to remove enough heat to keep the control room temperature within equipment design limits, the service water flow of 65 percent would remove a substantial percentage of the heat and allow time for Operations to identify rising temperature, diagnose the problem and take corrective action by opening the isolation valves to PCV-1296. It is more likely that one or more of the CRAC compressors would have tripped due to insufficient SWS flow. Operations has seen this type of problem in the recent past (e.g., May and June of 1996) and based on our judgement could readily take corrective action by opening the isolation valves to PCV-1296. If the isolation valves to PCV-1296 were opened or if Service Water were being provided through this valve, the CRAC units would perform their function under many conditions. As design basis conditions were approached, operator action would be required to diagnose the reason for the CRAC unit compressor"s tripping and manually restart only one compressor. With rising temperature in the control room and the CRAC not operating, it is also possible for some of the supplemental cooling units to be manually loaded onto the emergency diesel generators (the supplemental units are powered from MCC 39 which can be manually aligned to the safety buses). Either of these corrective actions would have mitigated the consequences.