NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), 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.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Indian Point 3	05000286	1 OF 4

TITLE (4)

Plant Outside of Design Basis Involving Single Failure Criteria for the Auxiliary Feedwater System, Due to Error in Original Design

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
12	12	1997	1997	-- 031	-- 01	07	31	1998	N/A	05000
									FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
20.2203(a)(1)	20.2203(a)(3)(i)	✓ 50.73(a)(2)(ii)	50.73(a)(2)(x)
20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Fred Weinert, Design Electrical Engineer	(914)788-2088

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

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 December 12, 1997, with the plant operating at 100% power, Engineering determined that the plant might have been outside of its design basis during past operation. A design configuration was discovered in which, for a specific and limited set of plant conditions, the Auxiliary Feedwater (AFW) System would not meet single failure criteria. The design configuration is that certain AFW System controls associated with two motor-driven pumps are powered from the same instrument bus. The specific condition required is a safety injection signal or loss of offsite power at the same time that Instrument Bus 33 is connected to its backup power supply. The result is the tripping of both motor-driven pump motors due to flow runout, so that a single failure of the remaining turbine-driven pump would prevent the AFW system from performing its design function.

The cause of the event could not be definitively determined because the design configuration was present at initial plant startup. A probable cause is that design personnel did not recognize that certain controls for the motor-driven pumps were required to prevent flow runout and thereby protect the pump motor from tripping on excess current. Corrective actions were taken to modify the design configuration. The event did not affect the health and safety of the public because the actual length of time when plant conditions were subject to the single failure was minimal.

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

Energy Industry Identification System Codes are shown within brackets, { }.

DESCRIPTION OF EVENT

On December 12, 1997, with the plant operating at 100% power, Engineering determined that the plant might have been outside of its design basis during past operation.

The Auxiliary Feedwater (AFW) System {B} consists of one turbine-driven and two motor-driven pumps {P}. Discharge throttle valves {FCV} that are remote-operated by control room operators are used to control flow from the motor-driven pumps. The valve position circuit also includes a cutback controller that provides a pump runout protection feature. If 120Vac control power is lost to the valve control circuits, the valve will fail open and runout flow conditions would trip the pump motor within approximately five to ten minutes. Power to the valve control circuits for both motor-driven pumps has been supplied from the same instrument bus (IB 33) since original plant construction. The safety-grade instrument bus {EF} is a battery-backed uninterruptible power supply. However, an interruptible backup power source for the instrument bus is available in the event that the inverter is out of service for preventive or corrective maintenance activities. The IP3 Technical Specifications allow only one of the four instrument buses to be powered from its respective back up source at a time.

The original plant design for the instrument bus backup power source used a lighting bus transformer that was automatically stripped from its 480Vac supply in response to a safety injection or an undervoltage (i.e., loss of offsite power) signal. The back up power source for the instrument buses has changed over time, but the potential single failure condition still existed either for an undervoltage signal only or for both safety injection and undervoltage. Therefore, if IB 33 was connected to its backup power source during a safety injection or loss of offsite power event, both motor-driven pumps could be lost due to the runout condition previously described. Under these conditions, the AFW system would not meet single failure criteria because a single failure of the remaining turbine-driven pump could prevent the AFW system from performing its design function.

CAUSE OF EVENT

The event was caused by an error or oversight during the original design process. The exact cause can not be determined because of the length of time since it occurred. However, some evidence indicates that there was a lack of understanding that the loss of power to the valve control circuits could result in the pump motors tripping because of flow runout. During original design, the consequence of excess flow on mass energy addition to containment during main steam line break was evaluated and found acceptable. However, the consequence of excess flow on the operability of the pumps did not appear to be evaluated.

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CORRECTIVE ACTIONS

The concern regarding both runout protection circuits being on the same instrument bus was identified by the Authority on September 25, 1997, as documented in DER 97-2377. Corrective action was taken to develop a temporary modification to reconfigure the affected pump control circuits on separate instrument buses. The physical change was completed in October 1997. Power for control circuits to Auxiliary Boiler Feed Pump (ABFP) 31 were left on Instrument Bus 33 and power for the circuits to ABFP 33 were moved to Instrument Bus 32. The Authority will implement an appropriate permanent modification during the next refueling outage, RO10. When the condition described in DER 97-2377 was identified, the persons conducting the evaluation concluded that AFW system single failure concerns were addressed by the Technical Specification condition that allows only one instrument bus to be on a backup power supply. Therefore the reporting of this condition was delayed and DER 97-2827 was written on December 12, 1997 to document this single failure consideration. A Shift Order was issued December 12 to provide written instructions to plant operators to require that 31 or 33 ABFP be declared inoperable whenever the associated instrument bus is connected to the backup power supply. Plant operating procedures (SOP-FW-4 and SOP-EL-2) were revised in February 1998 to incorporate the instructions from the shift order. An extent-of-condition review for other control circuits powered from vital instrument buses concluded that the deficiency described in this LER is an isolated case.

ANALYSIS OF EVENT

This event is being submitted in accordance with 10 CFR 50.73 (a)(2)(ii)(B) for a plant condition that was outside the design basis of the plant. The condition involves a design deficiency which, under a specific and limited set of plant conditions, would result in the single failure criterion for the auxiliary feedwater system being not satisfied. A review of Licensee Event Reports over the past two years identified the following similar event for inadequate designs with respect to the single failure criterion:

> LER 97-003; "Discovery of a Design Deficiency in the DC Power System Which Could Result in the Loss of the Battery Chargers Causing the Plant to be Outside of Design Basis," dated April 14, 1997. This event was caused by an error in original plant design when the battery chargers were inappropriately classified as non-seismic/non-category I.

The corrective actions identified for LER 97-003 would not have prevented the event described in this LER because the condition existed at initial plant startup.

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SAFETY SIGNIFICANCE

The condition described in this LER did not involve a significant effect on the health and safety of the public because of the specific and limited conditions required for the single failure condition to occur. A probability analysis was performed to further quantify safety significance. The initial Indian Point 3 Individual Plant Examination (IPE) model was modified to represent the failure of both motor-driven ABFPs upon loss of Instrument Bus 33. The change in core damage frequency (CDF) in comparison to the IPE base case was calculated to be 9.95E-05 per year. This result can be combined with an actual or assumed out-of-service time for static inverter 33 to determine the conditional core damage probability (CCDP).

Out-of-service time for the inverter can result from failures requiring corrective maintenance and from planned actions to support preventive maintenance. A review of NPRDS data was conducted for the time period 1980 through 1997 and only 3 instances were identified involving corrective maintenance on the inverter during periods when the plant was in a condition requiring the AFW system to be operable. The out-of-service times for these corrective maintenance periods ranged from less than 1 day to about 2.5 days. Preventive maintenance on the inverters is governed by three procedures. A maintenance procedure (ELC-009-INV) is performed periodically and as needed to replace the filters in the inverter cabinet. However, this activity is performed with the inverter energized and does not require IB 33 to be connected to the backup power supply. Routine preventive maintenance of the inverter is performed at a 2-year frequency (IC-SI-29) which requires the inverter to be deenergized. Although the procedure allows the work to be performed with the plant at power, this routine preventive maintenance is typically performed during plant outages. A third routine maintenance activity is a calibration (IC-PC-I-E-33INV) of inverter components on a 2-year frequency. This task also may be performed with the plant at power, and experience shows that this activity is completed within one shift. A review of maintenance work request records from 1992 through 1997 shows that the 2-year preventive maintenance activities have been done during plant outages. Therefore, considering the past history of corrective and preventive maintenance, it is reasonable and conservative to assume a three day out-of-service time for purposes of the probabilistic safety assessment. Combining the CDF value described above with a period of three days yields a CCDP value of 8.2E-07. This value is categorized as 'not risk significant' using the guidance of EPRI TR-105396, PSA Applications Guide.

This evaluation is further supported by a review of plant records that verified the availability of the turbine driven auxiliary feedwater pump (ABFP 32) during the three time periods mentioned above.

Also, LER 97-019-00 (NYPA letter IPN-97-131, dated September 25, 1997) reported a condition in which the full flow acceptance criterion for the turbine driven auxiliary feedwater pump (ABFP 32) was inadequate. The flowrate value used to determine pump operability did not account for an assumed time delay for manual operator actions associated with the operation of ABFP 32. Test results showed that actual available flowrate supported accident analysis assumptions. Therefore, sufficient auxiliary feedwater would have been available from ABFP 32 in the event of a flow runout condition in ABFP 31 and 33.

In addition, Emergency Operating Procedures are in place at Indian Point 3 which provide a response to the loss of secondary heat sink. In the unlikely event that normal main feedwater and auxiliary feedwater are not available to remove decay heat using the steam generators, heat removal can be accomplished by direct feed and bleed of the Reactor Coolant System.