

Indian Point 3
Nuclear Power Plant
P.O. Box 215
Buchanan, New York 10511
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**New York Power
Authority**

John H. Garrity
Resident Manager

December 15, 1993
IPN-93-159

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop PI-137
Washington, D.C. 20555

SUBJECT: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
Licensee Event Report # 93-050-00
"The Plant Is Outside Design Basis Because
Air Operated Solenoid Valves Can Fail On
Overpressure Due To Personnel Error"

Dear Sir:

The attached Licensee Event Report (LER) 93-050-00 is hereby submitted in accordance with the requirements of 10CFR50.73. This event is of the type defined in the requirements pursuant to 10CFR50.73(a)(2)(ii)(B). Also attached are the commitments made by the Authority in this LER.

Very Truly Yours,

A handwritten signature in cursive script, appearing to read "John H. Garrity".

John H. Garrity
Resident Manager
Indian Point 3 Nuclear Power Plant

JHG/vjm

cc: See Next Page

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Mr. Thomas T. Martin
Regional Administrator
Region 1
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19406

INPO Records Center
700 Galleria Parkway
Atlanta, Georgia 30339-5957

U.S. NRC Resident Inspector's Office
Indian Point 3

Attachment 1
List of Commitments

Number	Commitment	Due
IPN-93-159-01	An action plan has been drafted to address Generic Letter 91-15. Corrective actions required to address the Generic Letter are scheduled for completion in this plan.	May 31, 1994
IPN-93-159-02	SOV-1276 and SOV-1276A were replaced on December 2, 1993 using solenoid valves with a MOPD greater than or equal to 125 psig (this value exceeds the 120 psig nominal pressure of station service air, the instrument air backup supply). The modification prevents potential over-pressurization with air regulator failure. A similar modification for SOV-1274 and SOV-1275 will be completed.	Startup
IPN-93-159-03	A walkdown of instrument air supplied solenoid valves/regulators in safety related applications was completed to determine the extent of the SOV overpressurization issue. Corrective action is underway for the 109 SOVs identified in the extent of condition. SOVs will be replaced with a SOV having a MOPD of 125 psig or more unless an alternative corrective action (e.g., relief valve addition or safety related air regulators) is selected due to design requirements, parts availability or other problems. Safety related air regulators used to maintain a SOV MOPD will require surveillance and will have setpoints established in accordance with MCM 8. Corrective action will be applied to all SOVs with a MOPD less than 125 psig.	Startup

Number	Commitment	Due
IPN-93-159-04	LER 93-050-00 will be supplemented to identify the SOVs subject to potential overpressurization, identify the SOVs that had a MOPD less than the nominal instrument air pressure of 100 psig, identify the SOVs with an MOPD equivalent to the nominal instrument air system pressure of 100 psig, identify the function of each valve and assess the safety significance. The LER supplement will also discuss the cause of the failure of SOV-110B.	January 14, 1994

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 (MNB 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.

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TITLE (4)
The Plant Is Outside Design Basis Because Air Operated Solenoid Valves Can Fail On Overpressure Due To Personnel Error

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
11	15	93	93	-- 050 --	00	12	15	93	FACILITY NAME	DOCKET NUMBER 05000
									FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)											
POWER LEVEL (10)	000	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
Tim Whittle, Technical Services

TELEPHONE NUMBER (Include Area Code)
(914) 736-8498

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)

✓ YES (If yes, complete EXPECTED SUBMISSION DATE).	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
			1	14	94

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

On November 15, 1993, at approximately 1924 hours, with the reactor in cold shutdown, Operations issued deviation event report 93-734 to identify the potential inoperability of four Service Water System solenoid operated valves affecting emergency diesel generator operation. The condition resulted from solenoid operated valves rated at less than the instrument air pressure supply and a failure mode that could cause unregulated instrument air. Subsequently, 109 additional valves subject to overpressure and one failure of a valve to vent were identified. The condition resulted from original design when valve inoperability due to overpressurization as described in NUREG 1275 was not considered. The cause was personnel error, inadequate knowledge. Corrective action to verify the proper setting of air regulators is complete. Corrective action to prevent overpressurization of solenoid operated valves will be completed by startup. Corrective action to address Generic Letter 91-15 and NUREG 1275 will be completed by May 31, 1994. The LER will be supplemented by January 14, 1994 to complete the identification of valves and the safety significance.

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

DESCRIPTION OF EVENT

On November 15, 1993, at approximately 1924 hours, with the reactor in cold shutdown (reactor power level at 8 cps, reactor coolant temperature at 106 degrees F, reactor coolant pressure at atmospheric and pressurizer level at 28 %), Operations issued deviation event report (DER) 93-734 to identify the potential inoperability of four Service Water System (SWS) (BI) solenoid operated valves (SOV) (FSV) (i.e., SOV-1276, SOV-1276A, SOV-1274 and SOV-1275).

The four SOVs are normally energized, located in an instrument air system (LD) line and, upon receipt of the appropriate signal, deenergize to control the air supply to an air operated valve (AOV) (V). Their functions are as follows:

- SOV-1276 and SOV-1276A are located in the instrument air line between the valve positioner and diaphragm of parallel butterfly valves used as flow control valves (FCV) (i.e., FCV-1176 and FCV-1176A, respectively). They are normally energized. When deenergized, the SOVs change position to interrupt the air supply and vent the FCVs so that they go to a full open position and allow service water to supply the emergency diesel generators (EDG) (EK).
- SOV-1274 and SOV-1275 are located in the instrument air line supply to FCV-1176 and FCV-1176A, respectively. They are normally energized to maintain air to the diaphragms to keep the FCVs in the closed position. When deenergized, the SOVs switch the air supply to a flow indicating controller that will position the FCVs to maintain the proper flow of service water to the EDGs. Operation of either FCV-1176 or FCV-1176A will maintain flow to all EDGs.

The instrument air supply to the SOVs is pressure controlled using non safety related air pressure regulators. During an NRC Service Water Operational Inspection a discrepancy between the regulator pressure gauge and the maximum operating pressure differential (MOPD) rating on SOV-1276 and SOV-1276A was identified by an NRC inspector. Technical Services evaluated this discrepancy.

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On November 15, 1993, Instrumentation and Control verified the pressure supplied to the four SOVs. DER 93-734 documents the results. The results were as follows:

- SOV-1276 was 41.7 psig and SOV-1276A was 46 psig. The MOPD allowable by design for the two solenoids is 35 psig. The air regulators were reset to less than 35 psig.
- SOV-1274 and SOV-1275, with a design allowable MOPD of 75 psig, were not over-pressurized. However, a failure of an air regulator could expose the SOVs to nominal instrument air header pressure (100 psig) and overpressurize them.

The historical circumstances leading to the overpressurization and the potential for overpressurization were evaluated by Technical Services. The original system design assumption considered loss of instrument air and the SOVs and operated valves were designed to fail in the safe position. No consideration was given to overpressurization of the SOVs as a failure mechanism. Non safety related instrument air regulators were installed in 1988 based on an evaluation that identified no safety function. The evaluation accepted the original design premise, the valves were fail safe on loss of instrument air, and did not consider overpressure as a failure mechanism. The overpressurization arises because no program was in place to verify the setpoints of the pressure regulators (no safety function was identified). This was attributed to personnel error.

Generic Letter (GL) 91-15 and its attached NUREG 1275 identify the failure mechanisms that can occur when a SOV is overpressurized. When a solenoid is normally deenergized, overpressure can create a pressure differential between the inlet and exhaust ports that will lift the core assembly slightly to cause leakage. When a solenoid is normally energized, the excess pressure can retard or prevent the core from dropping which is required for the exhaust port to open and the control port to close. Information Notice (IN) 88-24 originally identified the potential for overpressurization to create operational problems. IN 88-24 was addressed as industry feedback at IP3. The action taken addressed only those SOVs at IP3 which had the same model number as the valves identified in the IN. The potential for overpressurization due to air regulator failure was not addressed.

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The Authority did not evaluate GL 91-15 when received. The Nuclear Licensing department did not request an adequate review of GL 91-15 because the GL did not require a response to the NRC. There were no procedural requirements to request such a review.

Technical Services performed a walkdown of SOVs as part of the evaluation of this event and identified SOVs, in addition to the first four identified, that were or could be overpressurized. These are as follows:

- Eleven SOVs were found in an overpressurized condition. Six of these had an air regulator pressure setpoint higher than the SOV MOPD. These valves are SOV-956F (functions to operate the reactor coolant system (RCS) (AB) hot leg 1 and 2 sample containment isolation valve), SOV-956G (functions to operate the accumulator (ACC) sample containment isolation valve), SOV-956H (functions to operate the accumulator sample containment isolation valve), SOV-110B (functions to isolate the chemical volume and control system (CVCS) (CB) blender outlet), SOV-1321 (functions to operate the auxiliary feedwater (AFW) (BA) pump 31 recirculation valve) and SOV-1323 (functions to operate the AFW pump 33 recirculation valve). Five SOVs had failed regulators resulting in air pressure higher than the SOV MOPD. These valves were SOV-1680 (functions to operate the spent resin storage tank vent stop valve), SOV-213A (functions to operate the CVCS excess letdown line isolation valve), SOV-1728 (functions to operate the containment sump pump discharge containment isolation valve), SOV-1036B (functions to operate the large gas decay tank sample isolation valve) and SOV-523 (functions to operate the pressurizer (PZR) relief tank drain).
- There were 98 SOVs identified as subject to overpressurization if air regulators were to fail and expose them to the instrument air system operating range of 95 to 110 psig. There were 59 SOVs with a MOPD less than the nominal instrument air pressure of 100 psig and 39 SOVs with a MOPD equivalent to the nominal instrument air system pressure of 100 psig. There were no SOVs identified between 101 and 110 psig. A supplement to this LER will identify these valves.
- One overpressurized valve, SOV-110B, did not vent. An evaluation is being performed to determine the cause of failure. This information will be reported in a supplement to this LER.

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The results of the corrective action walkdowns were identified in DER 93-766, DER 93-782 and DER 93-794.

CAUSE OF THE EVENT

The cause of this event was personnel error, inadequate knowledge. The system was designed so that the air operated valves fail safe when the instrument air supply is lost. The failure mode of the SOVs due to overpressure from air regulator failure or high setpoint and the effect on the AOVs was not recognized.

The failure to adequately address IN 88-24 was personnel error, a failure to recognize the proper extent of condition. The scope of the IN was established without fully considering the implications of the IN. It was treated as a manufacturing type defect and the scope was restricted to valves identical to those in the IN.

The failure to adequately address GL 91-15 was personnel error, a mindset on processing Generic Letters. Work practice was inadequate since there was no procedural requirement for an objective assessment of significance when Generic Letters did not require a response.

CORRECTIVE ACTIONS

The following corrective actions have been or will be performed in order to address the deficiencies identified during the investigation of this event:

- An action plan has been drafted to address Generic Letter 91-15. Corrective actions required to address the Generic Letter are scheduled for completion in this plan. The action plan is scheduled for completion by May 31, 1994.
- SOV-1276 and SOV-1276A were replaced on December 2, 1993 using solenoid valves with a MOPD greater than or equal to 125 psig (this value exceeds the 120 psig nominal pressure of station service air, the instrument air backup supply). The modification prevents potential overpressurization with air regulator failure. A similar modification for SOV-1274 and SOV-1275 will be completed by plant startup.

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- A walkdown of instrument air supplied solenoid valves/regulators in safety related applications was completed to determine the extent of the SOV overpressurization issue. Corrective action is underway for the 109 SOVs identified in the extent of condition. SOVs will be replaced with a SOV having a MOPD of 125 psig or more unless an alternative corrective action (e.g., relief valve addition or safety related air regulators) is selected due to design requirements, parts availability or other problems. Safety related air regulators used to maintain a SOV MOPD will require surveillance and will have setpoints established in accordance with MCM 8. Corrective action will be applied to all SOVs with a MOPD less than 125 psig. The corrective action will be completed prior to startup.
- LER 93-050-00 will be supplemented to identify the SOVs subject to potential overpressurization, identify the SOVs that had a MOPD less than the nominal instrument air pressure of 100 psig, identify the SOVs with an MOPD equivalent to the nominal instrument air system pressure of 100 psig, identify the function of each valve and assess the safety significance. The LER supplement will also discuss the cause of the failure of SOV-110B. The LER supplement is scheduled for January 14, 1994.

ANALYSIS OF THE EVENT

This event is reportable under 10 CFR 50.73(a)(2)(ii)(B). The licensee shall report any condition that resulted in the plant being outside the design basis. The design of the system did not prevent the SOVs from being subjected to pressures greater than their rated MOPD. Pressure greater than the rated MOPD can prevent an SOV from performing its design function.

Similar events have been reported in Licensee Event Reports. A failure to properly consider the effects of a loss of instrument air was reported in LERs 93-045 and 93-045. Reports identifying inadequacies in original design are in LERs 93-048, 93-047, 93-045, 93-044, 93-035, 93-030, 93-026, 93-007, 92-008 and 92-006.

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SAFETY SIGNIFICANCE

The event associated with the four valves first identified did not significantly affect the public health and safety. The safety significance associated with the valves identified as subject to overpressurization when determining the extent of condition is under evaluation and conclusions will be presented in a supplement.

Initial Event

There were no actual safety consequences associated with the four valves in the initial event. The two overpressurized SOVs did not fail and no air regulators failed. The SWS was able to cool the EDG. The potential safety consequences were assessed by evaluating the consequences of the overpressurization that did occur as well as the safety significance of the potential failure air pressure regulators resulting in full instrument air to the valves. (they are not designed for the seismic event). The first is the consequential failure of the air pressure regulators following a seismic event. The second is the assumed failure of the air pressure regulators following a design basis event (DBA). The safety significance under plant design conditions is as follows:

- Testing demonstrated that the existing overpressurization of SOV-1176 and SOV 1176A had no safety significance. The function of SOV-1276, SOV-1276A, as well as, SOV-1274 and SOV-1275 has been checked during weekly, monthly and quarterly EDG performance tests. These tests include de-energizing SOV-1276 and SOV-1276A to allow the butterfly valves to open fully, verifying valve stroke time, and verifying the ability to achieve full service water flow to the EDGs.
- The potential failure of the air regulators has no significant safety effect for an earthquake or design basis accident (DBA).

An earthquake could result in the consequential failure of the air pressure regulators since they are not designed to function under this condition. There would be no effects from the consequential failure unless offsite power were also lost. Given

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this low probability event, there is still reasonable assurance that safe shutdown could be achieved using the 10 CFR 50, Appendix R diesel generator. As discussed in LER 93-027, the diesel generator is expected to survive an earthquake because of the low intensity of the IP3 earthquake (i.e., 0.15g horizontal and 0.1 g vertical) and the inherent capabilities identified through a review of historical data during the resolution of Unresolved Safety Issue A-46.

The occurrence of a DBA and the concurrent or subsequent loss of offsite power is a design event. The design event assumes failure of non safety components when evaluating this event. However, the air pressure regulators are not lost as a consequence of the DBA. Since frequent testing, discussed above, shows that the air pressure regulators have been functional (i.e., they maintain the air pressure at a level that will allow the SOVs to perform their intended function), it is not expected that all of the valves will fail. Operation of one of the valves in each pair would allow full cooling of the EDG.

Extent of Condition

The extent of condition was considered for both the potential overpressurization and for inadequate assessment of regulatory feedback. The results were as follows:

- ORG reviewed the current process for evaluating IN and concluded that it is adequate. The information in IN 88-24 was not adequately addressed by the process due to personnel focus on the potential for a manufacturing issue. This was not a process error requiring procedural change.
- Generic Letters issued between January 1, 1988 and December 31, 1992 that did not require a licensee response were screened to determine whether any required a major programmatic review similar to GL 91-15. There were no Generic Letters of this type and, as a result, no further screening is planned. Several GLs were redistributed to provide assurance that specific information was disseminated. This did not affect the conclusions. A licensing guideline was issued December 4, 1992 requiring all GLs, including those that did not require a written response, to be formally screened.

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- To evaluate the extent of condition, the Technical Services Department identified safety related SOVs that use air as a medium, inspected the SOVs to identify nameplate data and supply pressure and adjusted the air supply regulator, where necessary. The extent of condition was as follows: there are 11 valves whose air regulators are supplying air at a pressure greater than the MOPD; one of the 11 valves failed to vent; there are 59 valves subject to overpressurization if air regulators fail since their MOPD is less than the nominal instrument air pressure (100 psig); and, there are 39 valves subject to overpressurization if air regulators fail and the instrument air pressure above the nominal value since their MOPD is 100 psig. The maximum expected instrument air pressure is 120 psig when the service air system is acting as a backup. This is not a normal operating mode and was not considered in the extent of condition. Corrective action accounts for this mode of operation.

Safety significance is currently being assessed for the overpressurized valves and those capable of overpressurization due to air regulator failure. The LER will be supplemented with a listing identifying the valve, valve function and safety significance. The supplement will be issued by January 14, 1994.

There is no safety significance for the one valve that failed to vent, SOV-110B. The SOV operates valve CH-110B at the discharge to the boric acid blender and is opened to establish the boration path during normal operation. CH-110B failed open so normal boration was still available. If the valve failed closed, there were other boration paths. CH-110B has no safety function and could have failed open or closed with no effect on safety during postulated plant accidents.