

Indian Point 3  
Nuclear Power Plant  
P.O. Box 215  
Buchanan, New York 10511  
914-736-8000



March 16, 1996  
IPN-96-030

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 # 96-004-00  
**Vapor Containment Isolation Valves Were Inoperable and In a  
Condition Prohibited by Technical Specifications Due to Original  
Design Inadequacies**

Dear Sir:

The attached Licensee Event Report (LER) 96-004-00 is hereby submitted as required by 10CFR50.73. This event is of the type defined in 10CFR50.73(a)(2)(i)(B). The Authority has made no new commitments in this LER.

Very truly yours,

A handwritten signature in cursive script, appearing to read 'Robert J. Barrett'.

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

Attachment

cc: See next page

250006

9603250060 960316  
PDR ADOCK 05000286  
S PDR

JE221

cc: Mr. Thomas T. Martin  
Regional Administrator  
Region I  
U. S. Nuclear Regulatory Commission  
475 Allendale Road  
King of Prussia, Pennsylvania 19406-1415

INPO Record Center  
700 Galleria Parkway  
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U.S. Nuclear Regulatory Commission  
Resident Inspectors' Office  
Indian Point 3 Nuclear Power Plant

## 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) Indian Point Unit 3

DOCKET NUMBER (2)  
05000286PAGE (3)  
Page 1 OF 6

TITLE (4) Vapor Containment Isolation Valves Were Inoperable and In a Condition Prohibited by Technical Specifications Due to Original Design Inadequacies

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
02	15	96	96	-- 004 --	00	03	16	96	FACILITY NAME	DOCKET NUMBER
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)	

NAME

M. Dries, System Engineer

TELEPHONE NUMBER (Include Area Code)  
(914) 736-8382

## 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
A	CB	IVS	I207	Y						

## SUPPLEMENTAL REPORT EXPECTED (14)

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

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

On February 15, 1996, with the unit in cold shutdown, a condition prohibited by the Technical Specifications was found. Two air operated vapor containment (VC) isolation diaphragm valves in series were found to be inoperable which violated Technical Specification 3.6.A.1. Engineering determined that the original isolation valve design would close at system pressure when there was a differential pressure or accident design pressure, but not against system pressure with no pressure differential. The cause of this inadequacy in the original design was not determined and was not required for corrective action. The valve operators and air supply solenoid valves were upgraded to ensure performance of the VC isolation function. Maintenance Engineering performed an extent of condition review and determined that no other VC isolation diaphragm valves have a similar condition. This event had no affect on the health and safety of the public.

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TEXT CONTINUATION

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

## DESCRIPTION OF THE EVENT

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

On February 15, 1996, at about 0557 hours, with the plant in the cold shutdown condition (reactor coolant temperature at 180 degrees Fahrenheit, reactor coolant pressure at 380 psig and the pressurizer {PZR} level at 34%), Vapor Containment (VC) {NH} isolation valves {ISV} RC-AOV-519 and RC-AOV-552 did not operate as required during the performance of post work testing. The VC isolation valves are on the 3 inch Primary Water System (PWS) {CB} line to supply spray water to the Pressurizer Relief Tank (PRT) and make-up water to the Reactor Coolant Pumps (RCPs) {P} standpipes. The valves are normally closed during operation but can be opened when required since they automatically close on a Phase A containment isolation signal. The event was documented in Deviation Event Report (DER) 96-0442 and Operations declared the valves inoperable. Both RC-AOV-519 and RC-AOV-552 are 3" air operated diaphragm valves manufactured by the ITT Grinnel Company.

System Engineering assessed the history of these valves with respect to leakage testing performed each refueling and stroke testing performed quarterly. The following was identified:

- Performance records indicate that the historical stroke time was approximately 30 to 35 seconds through the test performed on 6/13/95.
- A stroke test on September 5, 1995, recorded approximately 39 second for closure of RC-AOV-519 which placed the valve in an alert status (alert occurs when the valve stroke time falls within a prechosen time band that is less than the acceptance criteria but greater than usual performance).
- A stroke test on December 26, 1995, recorded approximately 35 seconds for closure of RC-AOV-519.

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- A stroke test on January 25, 1996, recorded approximately 45 seconds for closure of RC-AOV-519. The status of the valve was changed from alert to corrective maintenance and trouble-shooting was initiated.

Maintenance trouble-shooting of RC-AOV-519 identified elastomeric O-rings in the actuator that are used to provide a seal around the stem had become fouled with foreign material. The longer stroke time was attributed to the increased friction on the stem from this condition. The O-rings in RC-AOV-552 were in acceptable condition. Both valves failed post work retesting using standard stroke and leakage tests. Investigating this failure, Maintenance determined that both valves behaved radically different dependent on whether or not the system was pressurized or depressurized (e.g., RC-AOV-519, in the closed position, was observed to close further when the system was depressurized). DER 96-0442 was written to identify the findings.

The vendor, contacted to help evaluate this situation, provided information which explained that sizing a diaphragm valve/actuator must consider whether it closes with a 100% differential pressure across the valve (i.e. valve closed with little or no downstream pressure), a 0% differential pressure (i.e. valve closed with a constant line pressure upstream and downstream) or for both conditions. The vendor determined that RC-AOV-519 and RC-AOV-552 (the valves are designed to positively seal with a differential pressure) would close against a differential pressure of 150 psi (the PWS design pressure) but would not close with a line pressure greater than about 120 psig when there is no differential pressure. The original specification for these valves was for a maximum differential pressure of 200 psi, with no reference to a minimum pressure differential or constant line pressure requirement. The valve design has not been modified since the original plant design and construction.

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The condition identified by the vendor can exist when closing isolation valve RC-AOV-560, downstream and in series with RC-AOV-519 and 552, in a sequence that maintains a line pressure greater than 120 psi. There would then be no differential pressure during stroke testing. Stroke testing in these conditions creates another problem when the limit switches are adjusted after the valves are shut but do not fully close. The valves are assumed to be fully closed during the adjustment so subsequent failures to close would be masked and could allow a control room indication that the valves are fully closed when they are not. There is no direct external indication on the valves to show if they are fully closed.

Tests were performed to assess the vendor information. The valves were closed at near ambient pressure and then the limit switches were adjusted. The valves were then tested and they passed (zero leakage at simulated accident pressure and stroked fully closed in less than 20 seconds with no pressure in the line). When the stroke testing was repeated at Primary Water system pressure (approximately 150 psi), both valves failed to fully close and the dual position indication in the control room showed the valves did not fully close. Corrective action was taken by replacing the actuators with the next larger size, as recommended by the vendor, and replacing the air supply solenoid valves. The valves were then demonstrated to be operable by a retest.

Maintenance identified air operated diaphragm VC isolation valves that could be subject to the same problem, based on valve design and application, and determined, by subsequent review, that none would be subject to the event.

## CAUSE OF THE EVENT

The design and specification of the valves during initial design and construction was not adequate to assure the valves met their design requirement for containment isolation. The cause of the design deficiency was not established. The cause was probably engineering

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error or a lack of knowledge when the previously purchased valve was selected for use. Corrective action did not require the cause to be established.

**CORRECTIVE ACTIONS**

Modification DC 96-3-040 RCS has replaced the operators and air supply solenoid valves for both RC-AOV-519 and 552 so that the valves meet design requirements.

An extent of condition review identified no other air operated diaphragm valves utilized as containment isolation valves that had a similar design problem.

**ANALYSIS OF THE EVENT**

This event is reportable under 10 CFR 50.73(a)(2)(i)(B). The licensee shall report any condition prohibited by the plant's Technical Specifications. Containment integrity is defined in Technical Specification section 1.10 as all automatic containment isolation valves being "operable". The definition in Technical Specification section 1.5 for operable is that the component is capable of performing it's intended function in the intended manner. Since containment isolation valves RC-AOV-519 and 552 were not designed to function under the conditions that could exist in the Primary Water System line, by definition, there has been a condition prohibited by Technical Specification during past operation. This condition could have existed at any time while the plant was above cold shutdown since original operation.

A review of Licensee Event Reports (LERs) for the past three years for similar events has identified original design deficiencies reported in LERs 94-005 and -006 and LERs 93-026, -030, -035, -036, -043, -044, -045 and -047.

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## SAFETY SIGNIFICANCE

This event identifies a loss of containment isolation valve function under certain conditions. This event had no significant affect on the public health and safety.

Containment isolation valves RC-AOV-519 and RC-AOV-552 would not have fully closed if they had received an isolation signal when the line was in service or the valves had been closed while the system was at pressure but not in operation. In either case, a water seal greater than 50 psig, which is greater than peak VC accident pressure, would have been maintained between the valves to prevent containment leakage. This water seal would have been provided by the fluid in the line when the valves were closed. If the line depressurized due to damage inside or outside containment or gradual bleed-off, the isolation valves would have fully closed when the pressure of the water seal was greater than accident pressure since the valves are spring closed air operated valves and testing has demonstrated the ability of the valves to fully close with 50 psig in the line. The Isolation Valve Seal Water System (IVSWS) would assure a water seal between the isolation valves of about 50 psi.