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Early C. Ewing, III
Director
Nuclear Safety & Regulatory Affairs
Waterford 3

W3F1-98-0153
A4.05
PR

October 20, 1993

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Reporting of Licensee Event Report

Gentlemen:

Attached is Licensee Event Report (LER) 98-019-00 for Waterford Steam Electric Station Unit 3. This report provides details of the failure of three Containment Isolation Valves to close during testing. This condition is being reported pursuant to 10 CFR 50.73(a)(2)(ii).

Very truly yours,

E.C. Ewing
Director,
Nuclear Safety & Regulatory Affairs

ECE/DAY/rtk
Attachment

cc: E.W. Merschoff (NRC Region IV), C.P. Patel (NRC-NRR),
A.L. Garibaidi, J.T. Wheelock - INPO Records Center,
J. Smith, N.S. Reynolds, NRC Resident Inspectors Office
Administrator - LRPD

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FACILITY NAME (1) **Waterford Steam Electric Station Unit 3** DOCKET NUMBER (2) **05000 382** PAGE (3) **1 OF 07**

TITLE (4) **Failure of Containment Isolation Valves to Close During Testing Due to Solenoid Failures**

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
09	20	98	98	019	00	10	20	98	N/A	05000
									N/A	05000

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)			
5	0	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)
		<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(x)
		<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(iii)	73.71
		<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iv)	OTHER
		<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 368A
		<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME **A.J. Harris, Plant Engineering Manager** TELEPHONE NUMBER (Include Area Code) **504-464-3131**

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
B	LD	SOL	ASCO	YES	B	AB	SOL	ASCO	YES
B	CB	SOL	ASCO	YES	-	-	-	-	-

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO EXPECTED SUBMISSION DATE (15)

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

Three containment isolation (air operated) valves (AOV's) with solenoids were determined to be inoperable due to failure of the respective solenoids on September 20, 1998, during Cold Shutdown In Service Testing (IST). Two of the AOV's with solenoids, Reactor Coolant System [AB] RC-606 (inside containment) and Chemical and Volume Control [CB] CVC-401 (outside containment), are containment isolation valves located on the common Reactor Coolant Pump (RCP) controlled bleedoff (CBO) header to the Volume Control Tank (VCT). The third AOV with a solenoid was Instrument Air [LD] valve IA-909. The solenoids had become stuck open due to the accumulation of silicone gel on the top of the core and sub assembly housing. The time to gel formation is dependent upon ambient and coil temperatures. The gelling combined with infrequent stroking can cause the solenoid to stick. The solenoids were replaced and the valves were retested successfully. An evaluation will be conducted to identify suitable replacements for ASCO 206 series valve solenoids. The event did not impact the health and safety of the public.

**REQUIRED NUMBER OF DIGITS/CHARACTERS
FOR EACH BLOCK**

BLOCK NUMBER	NUMBER OF DIGITS/CHARACTERS	TITLE
1	UP TO 46	FACILITY NAME
2	8 TOTAL 3 IN ADDITION TO 05000	DOCKET NUMBER
3	VARIES	PAGE NUMBER
4	UP TO 76	TITLE
5	6 TOTAL 2 PER BLOCK	EVENT DATE
6	7 TOTAL 2 FOR YEAR 3 FOR SEQUENTIAL NUMBER 2 FOR REVISION NUMBER	LER NUMBER
7	6 TOTAL 2 PER BLOCK	REPORT DATE
8	UP TO 18 -- FACILITY NAME 8 TOTAL -- DOCKET NUMBER 3 IN ADDITION TO 05000	OTHER FACILITIES INVOLVED
9	1	OPERATING MODE
10	3	POWER LEVEL
11	1 CHECK BOX THAT APPLIES	REQUIREMENTS OF 10 CFR
12	UP TO 50 FOR NAME 14 FOR TELEPHONE	LICENSEE CONTACT
13	CAUSE VARIES 2 FOR SYSTEM 4 FOR COMPONENT 4 FOR MANUFACTURER NPRDS VARIES	EACH COMPONENT FAILURE
14	1 CHECK BOX THAT APPLIES	SUPPLEMENTAL REPORT EXPECTED
15	6 TOTAL 2 PER BLOCK	EXPECTED SUBMISSION DATE

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FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)	
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		98	019	00		

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

REPORTABLE OCCURRENCE

Operations was performing valve testing in accordance with procedure OP-903-033, "Cold Shutdown IST Valve Tests" on September 20, 1998, with the plant in cold shutdown. Valves IA-909 (Instrument Air [LD] Header Outside Containment Flow Control Valve), [CB] CVC-401 (RCP Bleed Off Outside Containment Isolation Valve), and [AB] RC-606 (RCP Control Bleedoff Inside Containment Isolation Valve) failed to close to the safety position while performing cold shutdown testing. The concurrent failures of containment isolation valves CVC-401 and RC-606 to close is being reported pursuant to 10 CFR 50.73(a)(2)(ii), "Any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or that resulted in the nuclear power plant being in an unanalyzed condition that significantly compromised plant safety. "

A four hour notification was made on September 20, 1998 at approximately 0600 to the NRC documenting the condition pursuant to 10 CFR 50.72(b)(2)(i), "Any event, found while the reactor is shut down, that, had it been found while the reactor was in operation, would have resulted in the nuclear power plant, including its principal safety barriers, being seriously degraded or being in an unanalyzed condition that significantly compromises plant safety. "

INITIAL CONDITIONS

The unit was in Mode 5, Cold Shutdown. There were no structures, systems, or components that were inoperable at the time of the occurrence that contributed to the event.

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EVENT DESCRIPTION

The following valve failures were observed on September 20, 1998 during performance of OP-903-033, "Cold shutdown IST Valve Tests."

At 0045, Operations noted that Air Operated Valve (AOV) IA-909 failed to close during testing. An operator was dispatched to inspect the valve and no abnormalities were noted. The valve solenoid was described as being hot to the touch. Approximately 10 minutes after the first stroke attempt, a second attempt was made to stroke the valve from the control room. The operator stationed at the valve heard no indication of solenoid de-activation and observed no valve movement.

At 0228 hours, Operations attempted to stroke AOV CVC-401 and found that the valve did not stroke in the closed direction. An operator was dispatched to inspect the valve and no abnormalities were noted. The valve solenoid was described as being hot to the touch. A second attempt was made to stroke the valve from the control room while the operator remained stationed at the valve. Sounds (click indicating solenoid deactivation) were not heard, nor was valve movement observed. The operator lightly tapped the valve solenoid and immediately a click was heard, air vented from the solenoid exhaust port, and the valve stroked smoothly to the closed position. The operator in the field confirmed with the control room that the valve closed.

At 0315 hours, Operations attempted to close AOV RC-606 and found that the valve failed to stroke in the closed direction. Since RC-606 is located inside containment and CVC-401, located outside of containment, was known to be closed, no operator was dispatched to inspect RC-606. A second attempt was made to stroke the RC-606 from the control room. This attempt was unsuccessful and the valve remained in the open

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position. RC-606 (inside containment) and CVC-401 (outside containment) are containment isolation valves located on the common RCP controlled bleedoff (CBO) header to the Volume Control Tank (VCT).

CAUSAL FACTORS

A Root Cause Investigation Team was formed and determined, based on inspection of the solenoid valve internals, that the most probable cause of failure of the air operated containment isolation valves was the sticking of the solenoids in the normally energized position caused by accumulation of silicone gel on the top of the core and sub assembly housing. The solenoids were stuck in the normally energized position (valve open) due to the accumulation of silicone gel on the top of the core and sub assembly housing. The time to gel formation is dependent upon ambient and coil temperature (function of wattage and being continuously energized). The gelling combined with infrequent stroking can cause the solenoid to stick in the energized position with the valve open. The solenoids for valves IA-909, CVC-401 and RC-606 are continuously energized ASCO Series 206 (high wattage coils) and are stroked when the plant is in Mode 5, Cold Shutdown.

CORRECTIVE MEASURES

Immediate Action:

The failed solenoids which operate valves CVC-401, RC-606 and IA-909 were replaced with like replacements which had no accumulated in-service time.

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Engineering performed an evaluation to determine the mean time required for the silicone, in the Dow Corning Lubricant contained in the ASCO Series 206 solenoids, to gel. It was determined that the gel time is longer than the time to the next refuel outage 9.

Engineering identified ASCO 206 series valves FW-166 A (and B), and FW-173 A (and B) as being high wattage, continuously energized, and safety related.

Corrective Actions to Prevent Recurrence:

Engineering will evaluate suitable replacements for ASCO 206 series valves installed on RC-606, IA-909, CVC-401, (Feed water) FW-166 A (and B), FW-173 A (and B). Consideration will be given to the results of an independent failure analysis of the CVC-401 solenoid.

Engineering will initiate Condition Identification's (CI's) to have the Solenoids for RC-606, IA-909, CVC-401, FW-166A&B, and FW-173A&B replaced with the identified suitable replacement in Refuel 9.

Engineering will evaluate the replacement of other ASCO 206 series solenoids which are safety related, normally energized and quarterly stroked.

Engineering will inspect, and evaluate the solenoids from one quarterly stroked valve, one cold shutdown valve, and one feedwater-regulating valve for the presence of silicone gel in critical areas. All three solenoids will be an ASCO model series 206.

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SAFETY SIGNIFICANCE

IA-909, Instrument Air Header Outside Containment Flow Control Valve

In the event that IA-909 would fail to close when required in response to a Containment Isolation Actuation Signal (CIAS), a check valve (CVC-910) inside containment would close to isolate the penetration. Credit is taken for this check valve as a containment isolation valve. Check valve CVC-910, which is tested in accordance with the local leak rate testing program, was last tested during Refueling Outage 8 with satisfactory results. In addition, the Emergency Operating Procedure requires the Operator upon a CIAS actuation, to verify closure of IA-909. If IA-909 did not close as required, operator action to close the valve would be credited for valve closure locally. IA-909 is provided with a handwheel to allow an operator to manually close this valve and isolate instrument air. Valve closure could also be accomplished by mechanically agitating the solenoid, which would likely cause the solenoid to perform its function of venting air off the valve actuator, allowing spring closure. An alternative course of action would be to isolate instrument air to the solenoid and vent air off the valve actuator, allowing spring closure. There is reasonable assurance that the safety impact caused by failure of IA-909 would be minimized due to the CVC-910 check valve and the procedurally required operator action to verify IA-909 closed.

RC-506, RCP Control Bleedoff Inside Containment Isolation Valve and
CVC-401, RCP Bleed Off Valve (Outside Containment)

RC-606 (inside containment) and CVC-401 (outside containment) are containment isolation valves located on the common Reactor Coolant Pump (RCP) controlled bleedoff (CBO) header to the Volume Control Tank (VCT). The Emergency Operating

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Procedure requires that an Operator upon a CIAS actuation verify closure of RC-606 and CVC-401. Concurrent failures of the RC-606 and CVC-401 valves to close during an accident (small break LOCA) would allow contaminated RCS coolant to enter the VCT. RCP bleedoff flow during normal operating conditions is about 1.5 gallons per minute per RCP. Potential degradation of the RCP seal could result in higher bleedoff flow. Excess flow check valves, RC-409A (B) and RC-509A (B), would limit CBO flow to the VCT to a maximum of 15 gallons per minute per RCP. This flow would fill and pressurize the VCT. The VCT relief valve, CVC-182, would open and discharge to the holdup tanks, which are capable of accommodating the expected flow. Operator action, within two hours, would be taken to isolate the common CBO header to the VCT via manual operation of either CVC-401 or the downstream manual valve CVC-403. This would provide isolation of the penetration. There would be no uncontrolled release of radioactive fluid to the environment, and the health and safety of the public would not be impacted.

SIMILAR EVENTS

There have been no similar LER's at Waterford 3 in the past two years.