



**Entergy
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W3F1-97-0024

A4.05

PR

March 3, 1997

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 Number LER-97-002-00 for Waterford Steam Electric Station Unit 3. This Licensee Event Report is submitted in accordance with 10 CFR 50.73(a)(2).

Very truly yours,

T.R. Leonard
General Manager
Plant Operations

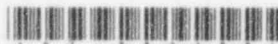
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IE221

cc: L.J. Callan, NRC Region IV
C.P. Patel, NRC-NRR
A.L. Garibaldi
J.T. Wheelock - INPO Records Center
R.B. McGehee
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NRC Resident Inspectors Office
Administrator - LRPD

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|--|--------|---|--------------------------------------|---|-------------------------------|
| NRC FORM 366 (4-95) | | U.S. NUCLEAR REGULATORY COMMISSION | | APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98 <small>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.</small> | |
| LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block) | | | | | |
| FACILITY NAME (1) | | | DOCKET NUMBER (2) | | PAGE (3) |
| WATERFORD STEAM ELECTRIC STATION UNIT 3 | | | 05000 382 | | 1 OF 7 |
| TITLE (4) | | | | | |
| POTENTIAL COMMON MODE FAILURE OF SHUTDOWN COOLING | | | | | |
| EVENT DATE (5) | | LER NUMBER (6) | | REPORT DATE (7) | |
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER |
| 01 | 30 | 97 | 97 | 002 | 00 |
| | | | | MONTH | DAY |
| | | | | 03 | 03 |
| | | | | YEAR | |
| | | | | 97 | |
| | | | | OTHER FACILITIES INVOLVED (8) | |
| | | | | FACILITY NAME | |
| | | | | N/A | |
| | | | | DOCKET NUMBER | |
| | | | | 05000 | |
| | | | | FACILITY NAME | |
| | | | | N/A | |
| | | | | DOCKET NUMBER | |
| | | | | 05000 | |
| OPERATING MODE (9) | | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11) | | | |
| 1 | | 20.2201(b) | | | |
| | | 20.2203(a)(1) | | | |
| | | 20.2203(a)(2)(i) | | | |
| | | 20.2203(a)(2)(ii) | | | |
| | | 20.2203(a)(2)(iii) | | | |
| | | 20.2203(a)(2)(iv) | | | |
| | | 20.2203(a)(3)(i) | | | |
| | | 20.2203(a)(3)(ii) | | | |
| | | 20.2203(a)(4) | | | |
| | | 50.36(c)(1) | | | |
| | | 50.36(c)(2) | | | |
| | | 50.73(a)(2)(i) | | | |
| | | 50.73(a)(2)(ii) | | | |
| | | 50.73(a)(2)(iii) | | | |
| | | 50.73(a)(2)(iv) | | | |
| | | 50.73(a)(2)(v) | | | |
| | | 50.73(a)(2)(vi) | | | |
| | | 50.73(a)(2)(vii) | | | |
| | | 50.73(a)(2)(viii) | | | |
| | | 50.73(a)(2)(ix) | | | |
| | | 73.71 | | | |
| | | OTHER | | | |
| | | Specify in Abstract below or in NRC Form 368A | | | |
| LICENSEE CONTACT FOR THIS LER (12) | | | | | |
| NAME | | | TELEPHONE NUMBER (Include Area Code) | | |
| P.A. GROPP, SUPERVISOR DESIGN ENGR. MECHANICAL | | | (504) 739-6652 | | |
| COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13) | | | | | |
| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | CAUSE |
| | | | | | |
| | | | | | |
| | | | | | |
| SUPPLEMENTAL REPORT EXPECTED (14) | | | | | EXPECTED SUBMISSION DATE (15) |
| YES (If yes, complete EXPECTED SUBMISSION DATE). | | | | | MONTH DAY YEAR |
| X NO | | | | | |
| ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16) | | | | | |
| <p>On December 20, 1996, a 72 hour administrative action statement was entered due to declaring Shutdown Cooling Heat Exchanger B inlet and outlet valves (SI-125B and SI-412B) inoperable. An engineering evaluation determined that nitrogen voiding discovered in Low Pressure Safety Injection (SI) Train B may render those valves unable to open because of pressure locking. The valves were declared operable on December 22, 1996, after bonnet pressure relief devices were installed. On January 27, 1997, as a result of monitoring activities, nitrogen voiding in SI Train A was found. SI-125A and SI-412A were declared inoperable. Although there is no evidence to indicate pressure locking has occurred, on January 30, 1997, Waterford 3 determined that the potential for a common mode failure of SI-125A(B) and SI-412A(B) due to nitrogen in the SI headers may have existed prior to the December 1996 event. Bonnet pressure relief devices were installed on SI-125A and SI-412A on January 30, 1997. This event did not compromise the health and safety of the public.</p> | | | | | |

**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 |

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

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| 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 |
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| 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 |

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

| FACILITY NAME (1) | DOCKET | LER NUMBER (6) | | | PAGE (3) |
|---|--------------|----------------|----------------------|--------------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| WATERFORD STEAM ELECTRIC STATION UNIT 3 | 05000 382 | 97 | -- 002 | -- 00 | 2 OF 7 |
| | | | | | |

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

REPORTABLE OCCURRENCE

This event constitutes a potential failure of both trains of the Shutdown Cooling (SDC) system (EIS Identifier - BP). This event is reportable as a condition that alone could have prevented the fulfillment of the safety function of the SDC system to remove residual heat pursuant to 10CFR50.73(a)(2)(v).

INITIAL CONDITIONS

At the time this condition occurred, Waterford 3 was operating in Mode 1 at approximately 100% power and Emergency Core Cooling System (EIS Identifier - BP, BQ) train A and Containment Spray System (EIS Identifier - BE) train A were out of service. In addition, the plant entered a 72 hour administrative action statement for SDC heat exchanger (EIS Identifier - BP, HX) inlet and outlet valves, SI-125A and SI-412A, to install bonnet pressure relief devices.

EVENT DESCRIPTION

On December 18, 1996, a gas bubble was discovered in the Low Pressure Safety Injection (LPSI) piping at containment penetrations 36 and 37. The bubbles were located at the LPSI train B piping high points between the flow control valves (FCV, EIS Identifier - FCV) and the inside containment isolation check valves.

An initial engineering evaluation determined that LPSI train B piping and supports would not be rendered inoperable due to system pressure and dynamic loading resulting from a transient caused from the nitrogen entrapment. The load capacities for system piping, piping supports, and the penetration anchors would not be exceeded. Design Engineering (DE) walked down the supports inside and outside containment to confirm that there was no damage. Based on this information, DE recommended that LPSI train B be considered operable.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

| FACILITY NAME (1) | DOCKET | LER NUMBER (6) | | | PAGE (3) |
|---|--------------|----------------|-------------------|-----------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| WATERFORD STEAM ELECTRIC STATION UNIT 3 | 05000 382 | 97 | -- 002 | -- 00 | 3 OF 7 |
| | | | | | |

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

ABB Combustion Engineering was contacted to determine the impact of injecting the nitrogen pocket into the Reactor Coolant System (RCS; EIS Identifier - AB) post Loss of Coolant Accident (LOCA). It was determined that nitrogen injection is modeled in the large break LOCA analysis and bounds the as-found nitrogen pocket.

In the same evaluation, DE recommended to enter the appropriate Limiting Condition for Operation (LCO) on valves SI-125B and SI-412B since they may not be able to open remotely for SDC entry due to a pressure locking concern. In February 1996, these valves were identified as being susceptible to pressure locking in Waterford 3's response to Generic Letter 95-07. The operability of both valves was demonstrated using analytical methods assuming Containment Spray Pump shutoff head trapped in the valve bonnet at approximately 300 psig. For this scenario, there is no absolute assurance that the bonnet pressure would not exceed 300 psig when subjected to a pressure surge for only a few seconds.

On December 20, 1996, SI-125B and SI-412B were declared inoperable and a 72 hour administrative action statement was entered due to the concern over SDC heat exchanger B availability. Pressure relief devices were installed, and the two valves were declared operable on December 22, 1996.

On January 27, 1997, SI-125A and SI-412A were declared inoperable due to the discovery of nitrogen voiding in LPSI Train A. These valves were being scheduled to have bonnet pressure relief devices installed at the time the nitrogen was discovered. This void was discovered by ultrasonic testing which is being performed every 72 hours due to the initial nitrogen discovery. As with the B Train, LPSI Train A would not be rendered inoperable due to a possible pressure transient if LPSI Pump B was started, but the SDC heat exchanger isolation valves could be pressure locked. Again, a 72-hour administrative action statement was entered and pressure relief devices were installed on SI-125A and SI-412A. The valves were declared operable and the action statement exited on January 30, 1996.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

| FACILITY NAME (1) | DOCKET | LER NUMBER (6) | | | PAGE (3) |
|---|--------------|----------------|----------------------|--------------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| WATERFORD STEAM ELECTRIC STATION UNIT 3 | 05000 382 | 97 | 002 | 00 | 4 OF 7 |
| | | | | | |

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

Although there is no evidence to indicate pressure locking has occurred, on January 30, 1997, Waterford 3 determined that the potential for a common mode failure of SI-125A(B) and SI-412A(B) due to nitrogen in the LPSI headers may have existed in the past. Engineering analysis has not been able to conclude absolutely that pressure locking would not have occurred with the nitrogen bubble present. This event is reportable in accordance with 10CFR50.73(a)(2)(v) as a potential common mode failure that could prevent both trains of SDC from removing residual heat.

CAUSAL FACTORS

The source of this nitrogen was determined to be leakage from the nitrogen laden water contained in the Safety Injection Tanks (SIT). The SITs contain a nitrogen blanket pressurized at approximately 600 psig. The solubility of nitrogen in water is greater at higher pressures. If leakage occurs into a lower pressure system, the nitrogen will come out of solution forming a bubble in the local high points in the system.

The formation of the nitrogen bubble between LPSI train A FCVs and the inside containment isolation check valves was coincident with the stroking of FCVs, SI-138A and SI-139A. These valves are routinely stroked in accordance with Engineered Safety Features Actuation System (ESFAS; EIS Identifier - JE) subgroup relay testing (OP-903-094). The stroking of the FCV's caused the piping between the FCV and the inside containment check valve to depressurize and enable the nitrogen to come out of solution.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

| FACILITY NAME (1) | DOCKET | LER NUMBER (6) | | | PAGE (3) |
|---|--------|----------------|----------------------|--------------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| WATERFORD STEAM ELECTRIC STATION UNIT 3 | 05000 | | | | 5 OF 7 |
| | 382 | 97 | 002 | 00 | |

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

CORRECTIVE MEASURES

- System Engineering has initiated a monitoring program to periodically verify and trend that the arc length of the gas pocket does not exceed the following sizes (The arc length will also be verified after valve stroke or pump surveillances):

| | | |
|----------------|--------------|-------------|
| Penetration 36 | 2SI8-113RL1A | 11.8 inches |
| Penetration 37 | 2SI8-122RL1B | 10.4 inches |
| Penetration 38 | 2SI8-130RL2A | 8 inches |
| Penetration 39 | 2SI8-138RL2B | 8 inches |

These arc lengths for penetrations 36 and 37 are based on a gas pocket up to 10% larger than the as-found condition. Sensitivity studies demonstrate that increasing the air pocket size up to 10% larger than the as-found had a negligible effect on the pressure surge and segment forces. The arc length approved for penetrations 38 and 39 were based on piping geometry similarities with penetrations 36 and 37, but conservatively limited to approximately one-half of the gas pocket size found at penetration 36.

- Operations is to maintain Refueling Water Storage Pool level at or above 93% to maintain the assumptions in the engineering analysis.
- An administrative 72 hour LCO was entered on each train of SDC when the nitrogen pockets were discovered due to the plant being in an operational mode where SDC is not required.
- Bonnet pressure relief devices were installed on SI-125A(B) and SI-412A(B).
- In light of this event, Waterford 3 will perform a review of our response to GL 95-07 to ensure that our conclusions and calculations remain valid.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

| FACILITY NAME (1) | DOCKET | LER NUMBER (6) | | | PAGE (3) |
|---|--------------|----------------|----------------------|--------------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| WATERFORD STEAM ELECTRIC STATION UNIT 3 | 05000 382 | 97 | 002 | 00 | 6 OF 7 |
| | | | | | |

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

- Vent lines will be installed at the high points between the inside and outside CIVs at Penetrations 36, 37, 38, and 39. This work is scheduled to be completed during Refueling Outage 8 which is scheduled to begin on April 11, 1997.

SAFETY SIGNIFICANCE

The SDC system is designed such that no single failure of an active component during residual heat removal results in a loss of core cooling capability or prevents the initiation of SDC, either during normal plant cooldown or following an accident.

Valves SI-125A(B) and SI-412A(B) are used to direct SDC flow to the SDC heat exchangers during normal plant shutdowns and refueling operations. Prior to the initiation of SDC, these valves are in the locked closed position.

TS 3.4.1.5, applicable in operational mode 5 with the RCS loops not filled, requires two SDC loops to be operable and at least one SDC loop in operation.

TS 3.9.8.1, applicable in operational mode 6 when the water level above the top of the reactor pressure vessel flange is greater than or equal to 23 feet, requires at least one SDC train to be operable and in operation.

TS 3.9.8.2, applicable in operational mode 6 when the water level above the top of the reactor pressure vessel flange is less than 23 feet, requires two independent SDC trains to be operable and at least one SDC train shall be in operation.

FSAR section 6.3.3.4, "Post-LOCA Long-Term Cooling," states that for large break LOCA's, simultaneous hot and cold leg injection will maintain core cooling and boric acid flushing. FSAR Figure 6.3-13, "Overlap of Acceptable Long Term Cooling Procedures in Terms of Cold Leg Break Size," shows that hot and cold leg injection will maintain core cooling for break sizes from 10 ft² down to 0.011 ft².

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TEXT CONTINUATION

| FACILITY NAME (1) | DOCKET | LER NUMBER (6) | | | PAGE (3) |
|---|--------------|----------------|----------------------|--------------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| WATERFORD STEAM ELECTRIC STATION UNIT 3 | 05000 332 | 97 | -- 002 | -- 00 | 7 OF 7 |
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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

From the time that the nitrogen was initially discovered in LPSI train B until the bonnet pressure relief devices were installed on the four valves in question, Waterford 3 was in operational mode 1 where SDC is not required to be operable. Ultrasonic testing was initiated on both LPSI Trains upon the initial discovery of nitrogen in the B Train. LPSI Train A was operable from the time nitrogen was discovered in the B Train until the bonnet pressure relief devices were installed on SI-125B and SI-412B. Therefore, the potential that both trains of SDC would have been rendered inoperable due to pressure locking of the valves was greatly reduced.

There is no evidence to indicate that pressure locking of SI-125A(B) or SI-412A(B) has occurred in the past. If any of the valves in question had become pressure locked, manual operation of the valve handwheel would have been able to free the valve. Although conclusive evidence is not available, based on Engineering judgment, Waterford 3 believes that this pressure locking phenomenon would not have occurred on these valves. Therefore, this potential failure is being conservatively reported. This event did not compromise the health and safety of the public.

SIMILAR EVENTS

None