UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

April 11, 2000

Charles M. Dugger, Vice President
Operations - Waterford 3
Entergy Operations, Inc.
17265 River Road
Killona, Louisiana 70066-0751

SUBJECT: NRC INSPECTION REPORT NO. 50-382/00-02

Dear Mr. Dugger:

This refers to the inspection conducted on February 13 through April 1, 2000, at the Waterford Steam Electric Station, Unit 3, facility. The enclosed report presents the results of this inspection.

Based on the results of this inspection, the NRC has determined that one Severity Level IV violation of NRC requirements occurred. The violation is being treated as a noncited violation (NCV), consistent with Section VII.B.1.a of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or severity level of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Waterford Steam Electric Station, Unit 3, facility.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, if requested, will be placed in the NRC Public Document Room (PDR).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

***/RA/***

P. H. Harrell
Project Branch D
Division of Reactor Projects

Docket No.: 50-382
License No.: NPF-38

Enclosure:
NRC Inspection Report No.
50-382/00-02

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**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

| | |
|---|---|
| Docket No.: | 50-382 |
| License No.: | NPF-38 |
| Report No.: | 50-382/00-02 |
| Licensee: | Entergy Operations, Inc. |
| Facility: | Waterford Steam Electric Station, Unit 3 |
| Location: | Hwy. 18<br>Killona, Louisiana |
| Dates: | February 13 through April 1, 2000 |
| Inspectors: | T. R. Farnholtz, Senior Resident Inspector<br>J. M. Keeton, Resident Inspector |
| Approved By: | P. H. Harrell, Chief, Project Branch D |

ATTACHMENT: Supplemental Information

# EXECUTIVE SUMMARY

Waterford Steam Electric Station, Unit 3
NRC Inspection Report 50-382/00-02

This routine, announced inspection included aspects of operations, maintenance, engineering, and plant support activities. The report covers a 7-week period of resident inspection.

## Operations

- During a forced outage to repair a cracked weld on the charging pump header, operators took conservative actions when confronted by abnormal circumstances. Operators performed in a professional manner (Section O1.1).

- Failure to perform inservice testing of valves at the required time interval was a violation of Technical Specification 4.7.12.1. This Severity Level IV violation is being treated as a noncited violation consistent with Appendix C of the NRC Enforcement Policy. The corrective actions have been completed per the licensee event report recommendations (Section O8.2).

## Maintenance

- Replacement of a master control board in a safety-related static uninterruptible power supply was performed in a professional and timely manner (Section M1.1).

## Engineering

- The licensee identified a condition where the feedwater isolation valves would close faster than was previously assumed and cause greater forces and loads on the valves, piping, and supports. A confirmation of operability (W4.101) was performed to determine the continued operability of these components. The evaluation concluded that these components were operable. The evaluation with the associated calculation was adequate (Section E2.1).

## Plant Support

- The emergency planning staff identified several problems during the performance of an emergency preparedness drill. The identified problems were appropriately critiqued (Section P4.1).

## Report Details

Summary of Plant Status

At the beginning of this inspection period, the plant was operating at 100 percent power. On March 6, 2000, the reactor was shut down to repair a leak on the charging pump suction header. The header was repaired and a reactor startup was performed on March 8. On March 9, reactor power was raised to 100 percent. Reactor power remained at essentially 100 percent power until the end of this inspection period.

## I. Operations

### O1 Conduct of Operations (71707)

O1.1 Technical Specification (TS) 3.0.3 Entry to Repair Charging Header Leak

a. Inspection Scope (93702, 71707)

The inspectors observed operators during the decision-making process, the plant shutdown, and plant restart. TS, procedures, and operator logs were reviewed, as appropriate.

b. Observations and Findings

On March 6, 2000, operators identified a cracked weld on the pump suction header of the chemical and volume control system. TS 3.1.2.4 requires at least two charging pumps to be operable in Modes 1, 2, 3, and 4. Because the leak was determined to make all three trains of charging inoperable, TS 3.0.3 was invoked at 11:45 a.m. A plant shutdown was commenced at 12:22 p.m., and the main generator was removed from the grid at 2:18 p.m. The reactor was shut down and a plant cooldown was commenced.

TS 3.0.3 allows the plant to be placed in cold shutdown within 37 hours of entry into the action statement. Repairs to the chemical and volume control system charging header were immediately undertaken. Repairs were completed and TS 3.0.3 was exited at 1:27 p.m. on March 7, while still in hot shutdown. A plant heatup to restart the reactor was commenced.

On March 8 at 12:57 a.m., reactor criticality was achieved and power was increased to 18 percent. Problems were encountered while starting up the main turbine. One of the low-pressure turbine intercept valves, RS-211B, failed to open when the main turbine was latched. Repairs to the valve delayed the plant startup about 3 hours. Additional problems were identified with Governor Valve 1 (MS-153) after solving the intercept valve problem. Repair to the governor valve required replacement of the hydraulic solenoid (MOOG) valve. The main generator was paralleled to the grid at 2:12 p.m. and power escalation was commenced. On March 9, 100 percent power was achieved.

The inspectors observed good three-way communication techniques being practiced. Problem identification and resolution were found to be conservative and approached

with appropriate deliberation. Control room access was appropriately controlled. Good self-checking and peer-checking techniques were observed.

c. Conclusions

During a forced outage to repair a cracked weld on the charging pump header, operators took conservative actions when confronted by abnormal circumstances. Operators performed in a professional manner.

**O8 Miscellaneous Operations Issues (92901)**

O8.1 (Closed) Licensee Event Report (LER) 50-382/98-011: TS 3.0.3 Entry/Component Cooling Water (CCW) Makeup Check Valve Failing Inservice Test (IST)

On June 3, 1998, while performing testing on CCW Makeup Pump B, Check Valve CMU-2131B failed the IST. Because of the valve alignments required to perform the test, failure of Valve CMU-2131B rendered both trains of CCW makeup inoperable. The operators took the appropriate action and entered TS 3.0.3. The systems were realigned and TS 3.0.3 was exited 13 minutes later.

The corrective actions for this event included repair of the failed check valve and installation of a minor modification that makes it unnecessary to align the valves, making the alternate train inoperable when performing the IST on the check valves. All corrective actions have been completed.

O8.2 (Closed) LER 50-382/98-013: Missed IST Valve Surveillances

On July 1, 1998, during a surveillance procedure review, the licensee identified four valves in the CCW system for which ISTs required by TS 3.7.12 had not been performed. Upon identification of the missed surveillances, TS 3.0.3 was entered and TS 4.0.5 for the affected valves was performed satisfactorily.

The cause of the missed surveillances was found to be inadvertent omission from the procedure. The procedures were revised to include these valves.

Failure to perform the surveillances at the required time interval was a violation of TS 4.7.12.1. This Severity Level IV violation is being treated as a noncited violation consistent with Appendix C of the NRC Enforcement Policy. The corrective actions have been completed per LER recommendations (50-382/0002-01).

O8.3 (Closed) Violation (VIO) 50-382/9809-01: Failure to enter appropriate emergency diesel generator (EDG) TS action statement/missile barrier door

The inspectors verified that this violation has been entered into the licensee's corrective action program as CR-98-710.

O8.4 (Closed) VIO 50-382/9814-01: Failure to start the emergency diesel generators as required by procedure.

The inspectors verified that the licensee's corrective actions for this violation have been completed, as stated in the licensee's response letter dated November 19, 1998.

## II. Maintenance

### M1 Conduct of Maintenance (61726, 62707)

The inspectors observed all or portions of the following maintenance and surveillance activities as specified by the referenced maintenance action items and surveillance procedures:

- 408652 Overhauled 4kv Switchgear 4A Feeder Breaker Reinstallation
- 412471 SUPS SB Card Replacement and Post Maintenance Test
- OP-903-024 RCS Water Inventory Balance

In general, the observed work activities were conducted in an acceptable and effective manner. The technicians were knowledgeable and conducted the work as required by the applicable procedures. Appropriate support personnel, including health physics, quality control, and supervisory personnel, were at the work site when required.

M1.1 Replacement of Master Control Board in Safety-Related Static Uninterruptible Power Supply (SUPS) SB

a. Inspection Scope (62707)

The inspectors observed the prejob briefing, maintenance activity, and postmaintenance testing. The maintenance package was reviewed for completeness.

b. Observations and Findings

As reported in NRC Inspection Report 50-382/99-026, SUPS SB had been experiencing spurious transfers to the alternate power source. The spurious transfers had become more frequent and prompted the licensee to make repairs to the suspect control board. The vendor had identified a transistor on the control board, which was suspected to be out of tolerance enough to cause the spurious switching.

On February 28, 2000, the inspectors observed the prejob briefing, preparations for the control board change out, additional troubleshooting of SUPS SB control panel, change out of the master control board, postmaintenance testing, and return of SUPS SB to service. All activities were performed in a professional manner with appropriate supervisory oversight. Documentation was found to be complete and appropriate.

TS 3.8.3.1 limiting conditions for operation were appropriately entered. The maintenance activity was completed and TS action exited in a timely manner.

c. Conclusions

Replacement of a master control board in a safety-related SUPS was performed in a professional and timely manner.

**M8 Miscellaneous Maintenance Issues (92902)**

M8.1 (Closed) LER 50-382/98-014: Manual Reactor Trip with Subsequent Emergency Feedwater Actuation System Initiation

On July 16, 1998, the reactor had been manually tripped because of rapidly lowering steam generator levels. Turbine Feedwater Pump A speed had decreased because of a malfunction in the flow control logic. Appropriate corrective actions were taken as described in this LER.

M8.2 (Closed) LER 50-382/98-015: Potential Common-Mode Failure of Control Room Envelope Isolation Valves

This issue had been addressed in detail in NRC Inspection Report 50-382/98-14. Noncited Violation 50-382/9814-02 was issued.

## III. Engineering

**E2 Engineering Support of Facilities and Equipment**

E2.1 Confirmation of Operability of the Feedwater Isolation Valves (FWIV)

a. Inspection Scope (37551)

The inspectors reviewed the licensee's confirmation of operability (W4.101) concerning the FWIVs. A change in the closure time calculation methodology and the latest inservice testing data revealed that the valves may close faster than the 1.5-second design basis minimum analyzed limit.

b. Observations and Findings

On March 21, 2000, the licensee identified a condition concerning the FWIV. These valves serve to prevent the continued flow of mass and energy into containment and/or a ruptured steam generator after a main steam or feedwater line break accident. In addition, these valves, along with the piping and supports downstream of the valves to containment, function to maintain containment integrity postaccident. The identified condition involved the closure time of these valves that may have been faster than the

design basis minimum analyzed limit. The analyzed limit of 1.5 seconds was in place to address concerns of water hammer and the resulting damage to piping and supports.

These valves are equipped with two hydraulic accumulators on each valve, which are pressurized with nitrogen. Both accumulators are used to close the valve on an automatic close signal. However, to prevent damage to the valve, the stroke time testing is performed using only one of the accumulators. On April 29, 1994, the vendor supplied the licensee with test data from a load cell set up to replicate the as-installed valve. This test data was used to determine the close stroke time for the valve under actual plant conditions. The surveillance test acceptance criteria (using one accumulator) was 1.75 to 2.75 seconds. This was thought to bound the required stroke time limits (using both accumulators) of 1.5 to 5 seconds. The condition identified on March 21, 2000, indicated that the valve would close faster than the 1.5-second lower limit.

The licensee determined the vendor-supplied test data was not adequate to ensure the close stroke time would be within the analyzed limit. A new methodology was developed to mathematically calculate the close stroke time. This method was included in the licensee's confirmation of operability (W4.101) for the FWIVs. The new method used incremental stem movement in the close direction and calculated the nitrogen pressure at each increment. Incremental stroke times were calculated with certain assumptions made. The total valve stroke time was determined by adding all the incremental stroke times.

Using as-found accumulator pressure data, the licensee determined that the close stroke time for FWIV A was 1.12 seconds and for FWIV B was 1.14 seconds. The accumulator pressures were subsequently lowered and resulted in close stroke times of 1.23 seconds for Valve A and 1.29 seconds for Valve B. Analysis of the valves, piping, and supports concluded that these components would be able to withstand the increased loads produced by the fast valve closure.

The inspectors reviewed the W4.101 to determine its adequacy. The inspectors noted that the two engineers who prepared the document and performed the calculations were also the independent reviewers. The licensee stated that they essentially reviewed each others work and therefore met the intent of an independent review. The inspectors questioned the adequacy of this approach since a document of this complexity containing a large number of assumptions and numerical data is subject to subtle errors. A true independent review would be more appropriate.

The approach used and the assumptions seemed reasonable. The data was presented in a logical manner. However, the method resulted in an estimation rather than a precise stoke time value since it was based on several assumptions and the number of increments for stem movement was chosen to be 31. This seemed a good number for a 15.5-inch stroke. A larger number of increments would have resulted in a more precise answer, but would also result in a more complex calculation. The reason the inspectors noted these characteristics in this calculation was that the as-found analysis for FWIV B fast valve closure would result in a load increase of 52.9 percent. However, the pipe

support analysis for fast valve closure for this train was performed using a 53 percent increase in load. Any relatively small error or overlooked aspect of this situation could result in being outside the analyzed condition. The 52.9 percent increase in load represented a significant decrease in margin for the associated valve, pipes, and supports. A similar significant increase in fast valve closure loads was noted for Train A.

In addition, the inspectors questioned why the data provided by the vendor in 1994 was not effectively validated. The inadequacy of this information was not determined until 2000, a period of approximately 6 years.

The W4.101 concluded that the Trains A and B FWIVs remained operable. Based on a review of the evaluation and discussions with licensee personnel, the inspectors concluded that the analysis was adequate.

c. Conclusions

The licensee identified a condition where the FWIVs would close faster than was previously assumed and cause greater forces and loads on the valves, piping, and supports. A confirmation of operability (W4.101) was performed to determine the continued operability of these components. The evaluation concluded that these components were operable. The evaluation with the associated calculation was adequate.

**E8 Miscellaneous Engineering Issues (92903)**

E8.1 (Closed) Inspection Followup Item (IFI) 50-382/9802-01: Resolution of Potter Brumfield Motor-Driven Relay Failures

This IFI was issued as a result of repeated failures of Potter Brumfield relays. A Part 21 report was issued to address these issues. The licensee identified eight safety-related relays of concern and performed or has scheduled the actions recommended in the Part 21 report. This IFI is closed.

## IV. Plant Support

**P4 Staff Knowledge and Performance in Emergency Preparedness**

P4.1 Emergency Preparedness Site Exercise

a. Inspection Scope (71750, 92904)

On February 23, 2000, the licensee conducted a site-wide exercise. The inspectors observed portions of the exercise in the control room simulator, Technical Support Center, and Emergency Operations Facility.

b. Observations and Findings

The scenario had been designed to exercise each of the facility functions. The scenario involved communications problems and resolutions, security accountability issues, radiological controls, medical emergencies, and augmentation.

The inspectors reviewed the critique notes from each of the facilities and found that the licensee had identified problems that paralleled the inspectors' observations. These observations included communications among the facilities that were incomplete or confusing. The emergency preparedness staff identified these and other problems during the exercise critique.

c. Conclusions

The emergency planning staff identified several problems during the performance of an emergency preparedness drill. The identified problems were appropriately critiqued.

**F8 Miscellaneous Fire Protection Issues (92904)**

F8.1 (Closed) Violation (VIO) 50-382/9809-02: Failure to Control Impairment of Fire Door 150

The inspectors verified the corrective actions described in the licensee's response letter dated August 24, 1998, to be reasonable and complete. The inspectors concluded that this violation had been appropriately addressed.

## V. Management Meetings

**X1 Exit Meeting Summary**

The inspectors presented the inspection results to members of licensee management on April 5, 2000. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

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A. J. Wrape, Director, Engineering

INSPECTION PROCEDURES USED

| | |
|---|---|
| 37551 | Onsite Engineering |
| 61726 | Surveillance Observations |
| 62707 | Maintenance Observations |
| 71707 | Plant Operations |
| 71750 | Plant Support Activities |
| 92700 | Onsite LER Review |
| 92902 | Followup-Maintenance |
| 92903 | Followup-Engineering |
| 92904 | Followup-Plant Support |
| 93702 | Prompt Onsite Response to Events |

## ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

| | | |
|---|---|---|
| 50-382/0002-01 | NCV | Missed IST Valve Surveillances (Section O8.2) |

Closed

| | | |
|---|---|---|
| 50-382/98-011 | LER | TS 3.0.3 Entry/CCW Makeup Check Valve Failing IST (Section O8.1) |
| 50-382/98-013 | LER | Missed IST Valve Surveillances (Section O8.2) |
| 50-382/0002-01 | NCV | Missed IST Valve Surveillances (Section O8.2) |
| 50-382/9809-01 | VIO | Failure to enter appropriate EDG TS action statement/Missile Barrier Door (Section O8.3) |
| 50-382/9814-01 | VIO | Failure to start EDGs as required by procedure (Section O8.4) |
| 50-382/98-014 | LER | Manual Reactor Trip with Subsequent Emergency Feedwater Actuation System Actuation (Section M8.1) |
| 50-382/98-015 | LER | Potential Common Mode Failure of Control Room Envelope Isolation Valves (Section M8.2) |
| 50-382/9802-01 | IFI | Resolution of Potter Brumfield Motor Driven Relay Failures (Section E8.1) |
| 50-382/9809-02 | VIO | Failure to Control Impairment of Fire Door 150 (Section F8.1) |

Discussed

None

## LIST OF ACRONYMS USED

| | |
|---|---|
| CCW | component cooling water |
| CFR | Code of Federal Regulations |
| EDG | emergency diesel generator |
| FWIV | feedwater isolation valve |
| IFI | inspection followup item |
| IST | inservice test |
| LER | licensee event report |
| NRC | Nuclear Regulatory Commission |
| PDR | Public Document Room |
| SUPS | static uninterruptible power system |
| TS | Technical Specification |
| VIO | violation |
| W4.101 | a confirmation of operability |