



March 17, 2006

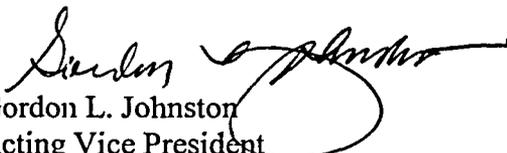
L-2006-079
10 CFR § 50.73

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

Re: St. Lucie Unit 2
Docket No. 50-389
Reportable Event: 2006-001-00
Date of Event: January 20, 2006
Manual Reactor Trip Due to Condenser Tube Leak

The attached Licensee Event Report 2006-001 is being submitted pursuant to the requirements of 10 CFR § 50.73 to provide notification of the subject event.

Very truly yours,


Gordon L. Johnston
Acting Vice President
St. Lucie Nuclear Plant

GLJ/dlc

Attachment

IE22

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@nrc.gov, and to the Desk Office, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

| | | |
|---|-------------------------------------|-------------------------------|
| 1. FACILITY NAME St. Lucie Unit 2 | 2. DOCKET NUMBER 05000389 | 3. PAGE Page 1 of 4 |
|---|-------------------------------------|-------------------------------|

4. TITLE
Manual Reactor Trip Due to Condenser Tube Leak

| 5. EVENT DATE | | | 6. LER NUMBER | | | 7. REPORT DATE | | | 8. OTHER FACILITIES INVOLVED | |
|---------------|-----|------|---------------|-------------------|-----------------|----------------|-----|------|------------------------------|---------------|
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAME | DOCKET NUMBER |
| 01 | 20 | 2006 | 2006 | - 001 | - 00 | 03 | 17 | 06 | | |
| | | | | | | | | | FACILITY NAME | DOCKET NUMBER |

| | | | | | | | | | | |
|--|--|---|--|---|--|--|--|--|--|--|
| 9. OPERATING MODE 1 | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) | | | | | | | | | |
| | <input type="checkbox"/> 20.2201(b) | <input type="checkbox"/> 20.2203(a)(3)(i) | <input type="checkbox"/> 50.73(a)(2)(i)(C) | <input type="checkbox"/> 50.73(a)(2)(vii) | | | | | | |
| 10. POWER LEVEL 100 | <input type="checkbox"/> 20.2201(d) | <input type="checkbox"/> 20.2203(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(viii)(A) | | | | | | |
| | <input type="checkbox"/> 20.2203(a)(1) | <input type="checkbox"/> 20.2203(a)(4) | <input type="checkbox"/> 50.73(a)(2)(ii)(B) | <input type="checkbox"/> 50.73(a)(2)(viii)(B) | | | | | | |
| | <input type="checkbox"/> 20.2203(a)(2)(i) | <input type="checkbox"/> 50.36(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(iii) | <input type="checkbox"/> 50.73(a)(2)(ix)(A) | | | | | | |
| | <input type="checkbox"/> 20.2203(a)(2)(ii) | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x) | | | | | | |
| | <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2) | <input type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 73.71(a)(4) | | | | | | |
| | <input type="checkbox"/> 20.2203(a)(2)(iv) | <input type="checkbox"/> 50.46(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(v)(B) | <input type="checkbox"/> 73.71(a)(5) | | | | | | |
| <input type="checkbox"/> 20.2203(a)(2)(v) | <input type="checkbox"/> 50.73(a)(2)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(C) | <input type="checkbox"/> OTHER | | | | | | | |
| <input type="checkbox"/> 20.2203(a)(2)(vi) | <input type="checkbox"/> 50.73(a)(2)(i)(B) | <input type="checkbox"/> 50.73(a)(2)(v)(D) | Specify in Abstract below or in NRC Form 366A | | | | | | | |

12. LICENSEE CONTACT FOR THIS LER

| | |
|--|--|
| NAME Donald L. Cecchetti - Licensing Engineer | TELEPHONE NUMBER (include Area Code) (772) 467 - 7155 |
|--|--|

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX |
|-------|--------|-----------|--------------|--------------------|-------|--------|-----------|--------------|--------------------|
| - | SD | COND | W120 | YES | - | - | - | - | - |

| | | | | | | | | | |
|---|---|----|--|-------------------------------------|--|--|-------|-----|------|
| 14. SUPPLEMENTAL REPORT EXPECTED | | | | 15. EXPECTED SUBMISSION DATE | | | MONTH | DAY | YEAR |
| YES (If yes, complete EXPECTED SUBMISSION DATE). | X | NO | | | | | | | |

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

On January 20, 2006, with St. Lucie Unit 2 in Mode 1 at 100 percent power, a Main Condenser high conductivity/sodium annunciator was received in the control room. Chemistry confirmed that the high sodium level was due to seawater intrusion from the 2B2 Main Condenser waterbox. In accordance with the "Secondary Chemistry - Off Normal Procedure," 2-0610030, a rapid down power was initiated. The Shift Manager, based on Chemistry input and procedure direction, continued the down power and removed the unit from service rather than remain critical at a low power level. All systems worked as designed and the reactor was manually tripped at approximately 25 percent power in accordance with plant operating procedures without incident. All control rods fully inserted and the Steam Generator (SG) Safety Relief Valves did not actuate. Feedwater to the SG was supplied by the Main Feedwater (MFW) pumps during the shutdown and later transferred to the Auxiliary Feedwater (AFW) pumps. All safe shutdown equipment operated as designed with no equipment failures or impact to the health and safety of the public.

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

Description of the Event

On January 20, 2006, with St. Lucie Unit 2 in Mode 1 at 100 percent power, annunciator G-20, "Condensate Conductivity/Sodium High" was received in the control room. Chemistry confirmed that the high sodium level was due to seawater intrusion from the 2B2 Main Condenser waterbox. In accordance with OP 2-0610030, "Secondary Chemistry - Off Normal Procedure," a 10MWe/minute down power to less than 5 percent power was initiated at 0742 in accordance with off-normal 2-ONP-22.01, "Rapid Down Power". The 2B2 Circulating Water pump (EIIS:SG) was secured, and the 2B2 Main Condenser waterbox (EIIS:SG) was isolated. The Shift Manager, based on Chemistry input and procedure direction, continued the down power and removed the unit from service. At 0853, a brief for tripping the unit was performed and at 0856, the unit was tripped. All systems worked as designed. All control rods fully inserted and the Steam Generator (SG) Safety Relief Valves did not actuate. Feedwater to the SG was supplied by the Main Feedwater (MFW) pumps during the shutdown and later transferred to the Auxiliary Feedwater (AFW) pumps. All safe shutdown equipment operated as designed with no equipment failure.

The main condenser (EIIS:SG) is classified as non-seismic, non-safety-related equipment. The design basis for the condenser is condensation and de-aerating main steam flow exiting the low-pressure turbines. Therefore, the identified failure of the condenser tube had no impact on the health and safety of the public and did not prevent the plant from achieving a safe shutdown of the facility.

Cause of the Event

The cause of the rapid chloride and sodium level increase was a seawater leak in the 2B2 Main Condenser waterbox as a result of a condenser tube exhibiting a longitudinal crack in the tube seam weld. This type of crack is typically the result of a manufacturing defect in the welded seam of the tube. The rapid shutdown was required because secondary chemistry parameters reached Action Level 3 as defined in the Operations procedure OP-2-0610030, "Secondary Chemistry - Off Normal". Section 5.3.5., for Action Level 3 requires a plant shutdown to at least Mode 2, as quickly as safe operations permit, regardless of the duration of the excursion into the Action Level 3.

Analysis of the Event

The seawater contamination event led to the decision to trip the reactor and therefore, is reportable under 10 CFR 50.73(a)(2)(iv)(A) as "any event or condition that resulted...in a manual reactor scram or reactor trip."

Review of the operating history and Eddy Current Test (ECT) data for St. Lucie Unit 1 and Unit 2 did not identify any actual failures in the past due to manufacturing weld defects. Comparison of historical ECT results of Unit 1 condenser tubes to the results found on the Unit 2 failed tube revealed an estimated twenty tubes with similar indications. None of these indications on Unit 1 were found in the manufacturing weld of the tubes. All Unit 1 indications were random and were preventively plugged at the time of discovery.

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Unit 1 and Unit 2 Main Condensers are of the same design and material, and between the Unit 1 and 2 Main Condensers, there have been more than 50 years operating experience without a previous failure of this type. Considering the total number of condenser tubes in each unit is approximately 48,000, and the percentage of historical tube failures due to a similar cause, the probability of a near term failure would be extremely low.

Further analysis of ECT data of the surrounding tubes revealed an indicated tube wall thickness greater than nominal tube wall thickness at a point in the surrounding tubes near the failure. The increased thickness suggests an increase in the outside diameter of adjacent tubes. One potential cause is the failed tube was leaking for sometime and had leaked on adjacent tubes, resulting in rust/crusting of nearby tubes, thereby increasing their outside diameter and tube wall thickness. As a conservative measure the adjacent tubes were plugged.

Considering the low number of past indications or actual tube failures similar to this event, there is a low probability of a similar event prior to the 100 percent planned ECT of the Unit 2 Main Condenser to be performed in the upcoming spring outage in 2006. Unit 1 completed 100 percent ECT in December, 2005, and tubes were preventively plugged in accordance with FPL Engineering requirements.

Analysis of Safety Significance

The Main Condenser consists of two fifty-percent capacity divided waterboxes with single pass surface condensers. Each waterbox is connected to two separate Circulating Water inlet and outlet lines. Cooling is provided by four Circulating Water pumps. The condenser tubes are titanium, and the condenser tube sheets are aluminum bronze to provide corrosion resistance to the seawater environment. The St. Lucie's Updated Final Safety Analysis (UFSAR), Section 10.4.1, states the Main Condenser serves no safety function and is classified as a non-seismic piece of equipment. The Main Condenser's design basis is to condense 100 percent of the full load main steam flow leaving the low-pressure turbines and to de-aerate the condensate before leaving the condenser hotwell. Given the condenser has no safety function, no safety analyses were affected. In that the unit achieved a safe shutdown condition without any plant or equipment issues, this trip had no impact on the health and safety of the public.

Corrective Actions

The proposed corrective actions and supporting actions listed below are entered into the site Corrective Action Program. Any changes to the proposed actions will be managed under the commitment management change program.

1. Condenser Waterbox 2B2 tube R76 T24 and the surrounding six tubes were plugged. (Complete)
2. Additional Eddy Current Testing was performed on a sample of surrounding tubes and no additional defects were noted. (Complete)
3. 100 percent planned ECT of the Unit 2 Main Condenser will be performed in the upcoming spring outage, scheduled to begin 4/24/06.

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Corrective Actions (cont)

4. The failed tube in the 2B2 waterbox will be removed during second quarter refueling outage, scheduled to begin 4/24/06, and a failure analysis conducted.

Similar Events

This is the first Unit 1 or Unit 2 failure attributed to this failure mechanism. Previous Main Condenser ECT sampling has revealed unexpected inside wall diameter indications of tubes in non-impact zones. Some of the indications were more than 90 percent through wall. All tubes identified were preventively plugged.

Failed Component

Main Condenser Tube