UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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ARLINGTON, TEXAS 76011-4005

October 27, 2004

Joseph E. Venable
Vice President Operations
Waterford 3
Entergy Operations, Inc.
17265 River Road
Killona, Louisiana 70066-0751

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 - NRC SUPPLEMENTAL INSPECTION 05000382/2004008

Dear Mr. Venable:

On September 27, 2004, the NRC completed a supplemental inspection at your Waterford 3 Steam Electric Station. The enclosed report documents the inspection findings, which were discussed with you and other members of your staff, as well as the regulatory performance meeting that was conducted in conjunction with the exit meeting.

The NRC issued a White inspection finding and associated Notice of Violation in a letter to you dated April 12, 2004. The issue was initially discussed in NRC Inspection Report 05000382/2003007, dated February 2, 2004. The finding involved the failure to establish appropriate instructions and to accomplish those instructions for installation of the emergency diesel generator Train A, in May 2003, resulting in a violation of 10 CFR Part 50, Appendix B, Criterion V. A finding of low to moderate safety significance (White) and the associated Notice of Violation were documented in a letter to Entergy Operations, Inc. on April 12, 2004.

The supplemental inspection was conducted to provide assurance that the root and contributing causes of the White inspection finding are understood and to provide assurance that the corrective actions are sufficient to address the root and contributing causes and prevent recurrence of the problem. Detailed observation, assessments, and conclusions of the inspection are presented in the enclosed inspection report.

The NRC concluded that your staff performed thorough evaluations of the emergency diesel generator fuel oil line failure. The root causes of the finding were adequately defined and understood. The corrective actions resulting from the evaluations appropriately addressed the identified causes. This included training on tube bending and development of instructions for installation of new and remaking of compression fittings.

Based on the results of this inspection, two self-revealing findings were evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has determined that violations are associated with these findings. However, because these violations are of very low safety significance and because the issues were entered into Entergy

Operations, Inc. corrective action program, the NRC is treating these findings as noncited violations (NCVs), consistent with Section VI.A of the Enforcement Policy. These NCVs are described in the subject inspection report. If you contest the subject or severity of an 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 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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

Sincerely,

/RA/

William B. Jones, Chief
Project Branch E
Division of Reactor Projects

Docket: 50-382
License: NPF-38

Enclosure:
NRC Inspection Report 050000382/2004008
w/attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket:	50-382
License:	NPF-38
Report:	05000382/2004008
Licensee:	Entergy Operations, Inc.
Facility:	Waterford Steam Electric Station, Unit 3
Location:	Hwy. 18 Killona, Louisiana
Dates:	August 23 through September 27, 2004
Inspector:	V. Gaddy, Senior Project Engineer, Project Branch E
Approved By:	W. B. Jones, Chief, Project Branch E Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000382/2004008; 08/23-9/27/2004; Waterford Steam Electric Station, Unit 3. Supplemental inspection for one White finding in the Mitigating Systems cornerstone.

The report documents a supplemental inspection conducted by a senior project engineer. The inspection identified two Green findings associated with two noncited violations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 0609, "Significance Determination Process." Findings for which the Significance Determination Process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

The NRC performed this supplemental inspection to assess the Entergy Operations, Inc. evaluation associated with the failure to establish appropriate instructions and accomplish those instructions for installation of a fuel oil line for the Train A emergency diesel generator in May 2003. This was a violation of 10 CFR Part 50, Appendix B, Criterion V. This failure resulted in uneven and excessive scoring of the tubing that ultimately led to a complete 360 degree failure of the fuel supply line on September 29, 2003, during a monthly surveillance test, which rendered the Train A emergency diesel generator inoperable.

The NRC concluded that Entergy Operations, Inc. performed thorough evaluations of the emergency diesel generator fuel oil line failure. The root causes of the finding were adequately defined and understood. The corrective actions resulting from the evaluations appropriately addressed the identified causes. The contributing causes for the two noncited violations identified during this inspection are consistent with the finding from the diesel fuel oil line failure, and the corrective actions are consistent with the ongoing corrective actions to improve maintenance work instructions. This included development of work instructions for new and the remaking of existing compression fittings, establishment of maintenance technician qualification requirements for compression fittings, and development of training on tube bending.

Cornerstone: Barrier Integrity

- Green. A self-revealing noncited violation of 10 CFR Part 50, Appendix B, Criterion V, was identified when the valve failed in the open position. The failure resulted from inappropriate work instructions for replacing the actuator diaphragm on the emergency feedwater to Steam Generator 1 backup isolation valve. As a result, the diaphragm was installed incorrectly, resulting in the failure on June 14, 2004.

  The finding was greater than minor because it affected the operability of a containment isolation valve and the availability of the emergency feedwater system, a mitigating

system. The finding was of very low safety significance because a second isolation valve was available and could have performed the isolation function. The valve was promptly repaired and a condition report was initiated. The emergency feedwater system was inoperable for less than the allowed Technical Specification outage time (Section 02.02.d.1).

- Green. A noncited violation of 10 CFR Part 50, Appendix B, Criterion XVI, was identified for the failure to take adequate corrective action to ensure that the torque applied to the flow control valve for Accumulator B of main feedwater isolation Valve No. 1 was sufficient to prevent an O-ring from extruding, resulting in a loss of system hydraulic fluid and rendering the valve inoperable on June 20, 2004. The primary cause of the finding was related to the crosscutting area of problem identification and resolution.

  The finding was greater than minor because it affected the reactor safety barrier cornerstone attribute for maintaining functionality of the containment boundary. The main feedwater isolation valve was repaired within the Technical Specification allowed outage time and a condition report was initiated. This finding was of very low safety significance because it did not result in an actual open pathway affecting the physical integrity of reactor containment and the main feedwater isolation valve was inoperable for less time than the allowed by the Technical Specification outage time (Section 02.02.d.2).

B. Licensee-Identified Violations

None.

REPORT DETAILS

01 INSPECTION SCOPE

This supplemental inspection was performed by the NRC, in accordance with inspection Procedure 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," for failure to establish appropriate instructions and accomplish those instructions for installation of a fuel oil line for the Train A emergency diesel generator (EDG) in May 2003. The finding was a violation of 10 CFR Part 50, Appendix B, Criterion V, and determined to be of low to moderate safety significance (White). The associated Notice of Violation was documented in a letter to Entergy Operations, Inc. (Entergy) on April 12, 2004.

02 EVALUATION OF INSPECTION REQUIREMENTS

02.01 Problem Identification

b. Method of Identification

On September 29, 2003, during the performance of a monthly surveillance run, the Train A EDG experienced a fuel oil line failure. Approximately 3 hours into the surveillance, an operator in the Train A diesel generator room observed the fuel line break and immediately shut down the diesel locally, approximately 15 seconds after the break occurred. The operator reported seeing a solid stream of fuel oil being discharged from the fuel line break located on the left cylinder bank side of the diesel engine. Approximately 70 gallons of fuel oil was discharged from the line break. Entergy reported that all the fuel oil was contained inside the diesel room and the reactor auxiliary Building -35 sump. The failed fuel line was a 3/4-inch stainless steel tube that crossconnects the left and right cylinder banks. The tube failure was a complete 360 degree circumferential break at the compression fitting that connects the line to the left cylinder bank.

c. Duration of Issue and Prior Opportunities for Identification

On January 21, 2003, Entergy initiated a work request to repair a leak on the fuel oil line that had resulted in approximately a 1 drop per minute fuel oil leak from the compression fitting threaded connection where the tube inserts into the fitting. The leak was present only while the engine was running.

On March 19, 2003, Entergy initiated a work order to replace 2 compression fittings and the left/right cross connect fuel oil tubing. The work instructions stated "Replace tubing item 15 (tube) and fittings items 12 (fitting) and 14 (fitting) on drawing KSV-50-7." On May 15, 2003, the fuel oil header left/right bank crossconnect tubing and the associated fittings were removed. Mechanical maintenance personnel obtained a piece of replacement tubing and bent it into a configuration that replicated the original shape. No drawings were used to bend the tubing and the maintenance personnel had not been provided training on tube bending. The replacement tubing was installed at this time.

On May 16, 2003, the system engineer questioned the foreign material exclusion

controls that were in place during the tube replacement. Maintenance personnel indicated that cleanliness had been assured by blowing compressed air through the new tube prior to installation. To address any potential internal cleanliness concerns, the tubing was removed and cleaned with an approved solvent. The tubing was then reinstalled and a successful postmaintenance test was performed. The problem with the alignment of the fuel oil tubing and the overcompression of the swagelock nut occurred during the installation activities. There were no other opportunities to identify the latent condition until the catastrophic failure that occurred on September 29, 2003.

d. Risk consequences and compliance issues

In the root cause analysis for this event, dated October 16, 2003, Entergy documented their risk assessment using the Waterford 3 PSA model. Entergy determined that the event was of very low safety significance and did not affect the health and safety of the public.

The risk significance of this event was discussed during the Regulatory Conference held on March 8, 2004. During this conference, Entergy concluded that the risk associated with this event was of very low safety significance (Green) and provided information to support it's risk significance. The NRC considered the information developed during the inspection, the information presented at the conference, as well as other supplemental information provided by Entergy. After evaluating all the information, the NRC concluded that the inspection finding should be classified as having low to moderate risk significance (White). The NRC issued a White Inspection finding and associated Notice of Violation in a letter to you dated April 12, 2004.

02.02 Root Cause and Extent of Condition Evaluation

a. Evaluation of method used to identify root causes and contributing causes

Entergy used the failure modes and effect technique during the root cause analysis. The failure modes and effect analysis was a systematic analysis of the failure that was performed by identifying and evaluating each failure scenario. This technique identified credible failure mechanisms and helped explain why the failure occurred. The inspector verified that the root cause analysis was conducted in accordance with Procedure LI-118, "Root Cause Analysis Process." The inspector concluded that Entergy utilized appropriate techniques to identify the root cause and other contributing causes to this failure.

b. Level of detail of the root cause analysis

The inspector concluded that the level of detail of the root cause was adequate. The root cause of this event was determined to be "maintenance performed incorrectly." The analysis concluded that the failure mode was induced during the replacement tubing

installation. The tube bends and fit-ups were not precise and this caused an uneven swage when the fitting was installed. The induced stress resulted in a crack that propagated due to vibration until it eventually failed.

The failed piece of tubing was analyzed. The analysis determined that fatigue failure was the cause of the failure. Although the tubing was in a vibration environment, the vibration only acted in the propagation of the crack. The crack developed due to a stress riser that was created during installation of the tubing.

c. Consideration of prior occurrences of the problem and knowledge of prior operating experience

Entergy determined that there were two prior occurrences with instances of failed tubing. Both instances involved the Train A chiller. The first instance occurred in 1999. The cause of this failure was determined to be a combination of repeated over-tightening of the fitting (which caused a reduction in the wall thickness of the tube) and vibration. The second instance occurred in 2000. This failure was due to a fit-up problem that inappropriately used the swagelock nut to provide the mechanical alignment of the tubing. This required tightening the nut beyond the vendor's recommendation.

Additional training was provided as corrective action to both these events. Training following the 1999 event emphasized the proper tightening of swagelock fittings to ensure leak tightness and to prevent over-tightening. Training following the 2000 event was provided to assure proper alignment prior to making the connection, not using the mechanical advantage of the threaded connection to overcome misalignment.

The root cause of the September 29, 2003, tubing failure was attributed to the tube bends and fit-ups not being precise, causing an uneven swage when the fittings were installed. Additionally, at least one failure analysis laboratory stated that over-tightening of the connection was a contributing cause of the failure. Based on this, it appears that the corrective actions taken following the 1999 and 2000 chiller tubing failures, if effective, should have prevented the over-tightening and fit-up issues associated with this event.

Entergy reviewed operating experience from several events throughout the industry. One specific issue that occurred at Davis-Besse in 1988 was identified as being similar to this event. While performing a surveillance on a diesel generator, a 5/8-inch steel tube ruptured at the swagelock fitting. Davis-Besse personnel determined that the tubing was scored at the location of the rupture, causing it to break due to normal vibration. This condition was created when installing a design change on both diesel generators. Prior to the September 29, 2003, tubing failure, Entergy had not taken any specific action in response to this event.

d. Consideration of potential common causes and extent of condition of the problem

Common Cause Potential

Entergy determined that the failure mechanism for the September 29, 2003, tubing failure was introduced during the tubing replacement in May 2003. The tube bends and fit-ups were not precise and this caused an uneven swage when the fitting was installed. The induced stress resulted in a crack that propagated due to vibration.

Entergy performed an evaluation and determined that there was no common cause potential with EDG Train B because the mechanism that contributed to the EDG Train A failure did not exist. The crossconnect tubing installed on EDG Train B was from the original installation performed by the vendor and had been in service since initial installation. In addition, no other Cooper-Bessemer KSV-16 EDGs in the nuclear industry had reported similar incidences.

Extent of Cause

Entergy determined that the contributors to the identified failure mechanisms were:

- Fit-up
- Vibration
- Excessive tube scoring
- Complicated configuration (tube bends)
- Side loading
- Large bore tubing $\geq$ ½ inch
- Field fabrication and installation of original factory installed tubing

All the contributing causes appeared to have played a role in the failure observed. Entergy determined that removing any one of the above factors could have eliminated or mitigated the severity of the failure.

Entergy considered the relationship between run time to the identified failure mode (high cycle fatigue). Most installed plant equipment was eliminated based on run time. The failure of the tubing of EDG Train A occurred within 29 hours of run time. Therefore, plant systems and components with significant run times to support plant operations were excluded from this evaluation and focus was placed on safety-related equipment normally in a standby mode with low run times.

The following systems of concern were identified:

- Emergency feedwater
- EDGs
- Essential chiller water
- Containment spray

- High pressure safety injection
- Low pressure safety injection

The above systems were visually inspected and did not reveal any similar configurations with installed large bore tubing (½ inch or greater) that had been recently replaced. In addition, Entergy did not identify any of the other contributors during the visual inspections.

Extent of Condition

As documented in the final significance determination letter dated April 12, 2004, the NRC issued a 10 CFR Part 50, Appendix B, Criterion V, violation for inadequate work instructions related to this event. The work instructions simply stated, "Replace tubing item 15 and fittings items 12 and 14 showing on drawing KSV50-7. Apply approved sealant to threads. Maintain FME IAW UNT-07-059." No direction was provided to mechanical maintenance personnel on how to bend the tubing. Although Entergy considered the tube bends to be a complicated configuration, no direction or caution was provided for bending the tube. The licensee considered this activity to be within the skill of the craft; however, Entergy had not provided training to mechanical maintenance personnel on tube bending techniques.

In addition to the root causes specified in Section 02.02.d of this report, Entergy identified the need for improvements to the quality of work instructions. To address this issue, Entergy implemented the following improvement initiatives:

- Performed an internal work package quality assessment. This report contained areas for improvement in work package detail and feedback and planner training.

- Benchmarked the work package quality at another nuclear facility based on industry recommendations. Actions were initiated to improve work package quality and work order format.

- An additional work package quality assessment is scheduled for February 2005 to evaluate work quality.

The NRC concluded that Entergy Operations, Inc. performed thorough evaluations of the EDG fuel oil line failure. The root causes of the finding were adequately defined and understood, and the corrective actions resulting from the evaluations appropriately addressed the identified causes. As part of the extent of condition review the inspector reviewed several corrective action documents and other work instructions to determine if they were adequate to accomplish the indicated task. This extent of condition review identified two other instances of inadequate work instructions.

1. Valve EFW-229A (Emergency Feedwater to Steam Generator 1 (SG1) Backup Isolation Valve)

a. Inspection Scope

During the inspection, the inspector performed an extent of condition review to determine if the work instruction developed to support maintenance on the emergency feedwater to SG1 backup isolation valve was adequate.

b. Findings

Introduction. A Green noncited violation of 10 CFR Part 50, Criterion V, for inadequate work instructions associated with the actuator diaphragm of Valve EFW-229A (Emergency Feedwater to SG1 Backup Isolation Valve). The finding was self-identified following the failure of the actuator diaphragm because of improper installation.

Description. On June 14, 2004, while performing a walkdown of the main control boards, an operator noted that Valve EFW-229A indicated in the open position. The operator's attempts to close the valve was unsuccessful. The safety function of this valve is to close on a main steam isolation signal. Since the valve could not perform this safety function, it was declared inoperable.

Entergy performed troubleshooting on the valve and determined that the actuator diaphragm had a tear in it. The diaphragm was found with the backing material facing the pressurized air side instead of having been installed with the backing side away from the pressurized air. This resulted in the backing material separating from the rubber liner, causing the rubber to tear.

The inspector reviewed the work instructions (Work Authorization 01167455, dated March 1999) that installed the diaphragm. The work instructions for the diaphragm replacement specified disassemble and reassemble of the actuator in accordance with the Technical Manual. The inspector then reviewed the Technical Manual Masoneilan Sigma F Actuator Instruction ER2000E, for the assembly and disassembly instructions. Section 7.3 of this manual addressed diaphragm replacement. The inspector noted that the technical manual provided no direction to maintenance personnel on how to properly install the replacement diaphragm.

The inspector then reviewed associated Work Order 46296. This was the work order that was used in June 2004 to replace the damaged diaphragm. The work instructions in this work order also did not provide direction for properly installing the diaphragm. Finally, the inspector reviewed the master task document for replacing the diaphragm for all emergency feedwater to steam generator backup isolation valves. The inspector noted that the work instructions contained in the master task document did not contain instructions for the proper orientation of the diaphragm during installation.

Analysis. The deficiency associated with this finding was the failure to assure the work instructions for replacing the actuator diaphragm for Valve EFW-229A were adequate. The work instructions did not provide adequate direction to maintenance personnel on the proper orientation of the diaphragm. This was determined to be a contributing cause to the improper installation of the diaphragm on Valve EFW-229A and the valve failure. The finding was greater than minor because it affected the operability of a containment isolation valve and the availability of the emergency feedwater system, a mitigating system. The finding was of very low safety significance because a second isolation valve was available and could have performed the isolation function. The valve was promptly repaired and a condition report was initiated. The emergency feedwater system was inoperable for less than the allowed Technical Specification outage time.

Enforcement. 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstance and shall be accomplished in accordance with these instructions, procedures, and drawings. The work instructions specified in Work Order 46296 were not adequate to replace the actuator diaphragm on Valve EFW-229A in that orientation of the diaphragm was not specified. The diaphragm was incorrectly installed, causing the valve to fail. Because this finding is of very low safety significance and was entered into the Entergy corrective action program as Condition Reports CR-WF3-2004-01805 and CR-WF3-2004-01834, this violation is being treated as a noncited violation consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000382/2004008-01, Inadequate Maintenance Instructions Affecting the Emergency Feedwater System.

2. Main Feedwater Isolation Valve 1 Accumulator B

a. Inspection Scope

The inspector performed an extent of condition review to determine if the work instructions developed to support maintenance on main feedwater isolation Valve 1 Accumulator B were adequate.

b. Findings

Introduction. The inspectors identified a Green noncited violation of 10 CFR Part 50, Criterion V, for inadequate corrective action associated with main feedwater isolation Valve Accumulator B. The finding was self-identified following the failure of the valve because of improper torquing during a maintenance activity.

Description. On June 20, 2004, main feedwater isolation Valve 1 was declared inoperable due to low accumulator pressure. This main feedwater isolation valve is required to close within 5.0 seconds upon receipt of a main steam isolation signal. Nonlicensed operators inspected the valve and found hydraulic fluid on the floor

surrounding the valve. Entergy determined that there was a leak at the O-ring connection (extruded O-ring) associated with the G1 (flow control valve) valve on Accumulator B.

A similar failure had occurred in January 2004 and was documented in NRC Inspection Report 05000382/2004002. Entergy documented this failure in Condition Report CR-WF3-2004-0016 and had determined that the O-ring failed due to excessive flange mating surface clearance due to uneven mating surfaces and a low applied torque. Entergy determined that, in order to prevent the O-ring from extruding, the clearance between the valve body and its mating surface should be less than 5 mils and this was ensured by adequately torquing the flow control valve. Following corrective maintenance on January 8, 2004, Entergy determined that the required torque applied to the valve should be at least 250 ft-lbs. Subsequent to this determination, Entergy retorqued the valve, but the actual torque value was not recorded in the work instructions and could not be conclusively determined.

The work instructions used to perform the January 2004 corrective maintenance did not specify a specific torque value. The inspector reviewed the valve reassembly instructions contained in the manual that provides guidance for performing maintenance on the valve. Step 3-D.2.b.(2) of the Electrical Power Research Institute manual entitled, “Main Feedwater Isolation Valve Maintenance,” stated that the hex nut adjacent to the manifold shall be torqued to a specified value and that site applicable instructions shall be consulted for the required torque value. Entergy had not developed a torquing requirement to prevent O-ring extrusion. The inspector identified the failure to ensure the flow control valve was properly torqued, following the valve failure in January 2004, as having a crosscutting aspect associated with problem identification and resolution.

Analysis. The performance deficiency associated with this finding was that Entergy failed to take adequate corrective action following the January 2004 main feedwater isolation Valve Accumulator B failure to ensure that the torque applied to the flow control valve was sufficient to prevent the O-ring from extruding. This failure resulted in the valve’s failure from a loss of hydraulic fluid. This finding was greater than minor because it affected the reactor safety barrier integrity cornerstone for providing reasonable assurance that the physical design barriers protect the public from radionuclide releases caused by accidents or event. The finding was greater than minor because it affected the reactor safety barrier cornerstone attribute for maintaining functionality of the containment boundary. The main feedwater isolation valve was repaired within the Technical Specification allowed outage time and a condition report was initiated.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Actions,” requires in part, that measures be established to assure that conditions adverse to quality be promptly identified and corrected. The maintenance instruction used to perform corrective maintenance on flow control valve main feedwater isolation Valve 1 Accumulator B in January 2004 did not specify a torque value. Following the corrective

maintenance, Entergy determined the required torque value; however, Entergy failed to take measures to ensure the appropriate torque had been applied to the valve. Subsequently, the valve failed in an identical manner in June 2004 as it had failed in January 2004. This finding is of very low safety significance and has been entered into Entergy's corrective action program as Condition Report CR-WF3-2004-1880. Because the finding has been entered into the corrective action program and it is of very low safety significance, the finding is being treated as a noncited violation consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000382/200408-02, Inadequate Corrective Action Affecting Main Feedwater Isolation Valve.

02.03 Corrective Actions

a. Appropriateness of corrective actions

Entergy determined that the root cause for the EDG Train A fuel oil line failure was "Maintenance Performed Incorrectly." The root cause stated that the failure was induced during the replacement of the fuel oil line in May 2003. The tube bends and fit-up were not precise and this caused an uneven swage when the fitting was installed. The induced stress resulted in a crack that propagated due to vibration until it eventually failed.

The inspector determined that Entergy had taken adequate corrective actions to address the fit-up of the fuel oil line. Entergy also replaced the 5/8-inch steel tube with a flexible hose on both EDGs. Continuing training has been provided on an as needed basis to all mechanical maintenance personnel performing tube bending. Entergy identified several corrective actions to prevent recurrence that were developed from the root cause and contributing cause (Root Cause MT1D; Contributing Cause DC1F). The corrective actions included: establishing work standards for compressions fittings and development of installation instructions for new and the remaking of existing fittings. Training was also established on basic tube bending techniques.

b. Prioritization of Corrective Action

The inspector determined that the corrective actions were properly prioritized. All immediate and short-term corrective actions had been completed. The remaining actions were appropriately prioritized based on the significance of the remaining activities.

c. Establishment of schedule for implementing and completing the corrective actions

The inspector determined that Entergy had completed all the actions identified in the root cause analysis, with the exception of the effectiveness review. In addition to the root causes specified in Section 02.02.d of this report, Entergy identified the need for improvements to the quality of work instructions. An additional work package quality assessment is scheduled for February 2005 to evaluate work quality. An effectiveness

review of the corrective actions is scheduled to be completed in May 2005.

d. Establishment of quantitative or qualitative measures of success for determining the effectiveness of the corrective actions to prevent recurrence

An additional work package quality assessment is scheduled for February 2005 to evaluate work quality. An effectiveness review of the corrective actions is scheduled to be completed in May 2005.

4OA2 Identification and Resolution of Problems

.1 Cross-References to Problem Identification and Resolution Findings Documented Elsewhere

Section 02.02.d.2 of the report describes a finding associated with the main feedwater isolation Valve 1 Accumulator B failure. The first finding involved a failure to correct a condition adverse to quality. Specifically, Entergy failed to take adequate corrective action following the January 2004 main feedwater isolation Valve 1 Accumulator B failure to ensure that the torque applied to the flow control valve was sufficient to prevent the O-ring from extruding. The findings were indicative of a potential deficiency in the licensee's corrective action program.

4OA6 Meetings

Exit Meeting Summary and Regulatory Performance Meeting

The inspector conducted an inspection debrief with Mr. J. Venable, Vice President Operations, and other members of his staff at the conclusion of the inspection on August 27, 2004. Entergy acknowledged the information presented.

On September 27, 2004, the inspectors conducted a combined exit and Regulatory Performance Meeting as prescribed in NRC Manual Chapter 0305 to discuss the event, root causes, and corrective actions. The significance of the finding was reviewed and the performance issues, underlying causes, and corrective actions were discussed and understood.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

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P. Caropino, Maintenance Coordinator
R. Dodds, Manager, Licensing
J. Holman, Manager, Nuclear Engineering
J. Laque, Manager, Maintenance
L. LeBlanc, Maintenance
B. Lietzke, Supervisor, Operations Training
T. Mitchell, Director, Engineering
B. Murillo, Licensing
K. Peters, Director, Nuclear Safety Assurance
D. Rieder, Quality Assurance
J. Venable, Vice President

NRC

M. Hay, Senior Resident Inspector
G. Larkin, Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Open and Closed

05000382/2004008-01	NCV	Inadequate Maintenance Instructions Affecting the Emergency Feedwater System (Section 02.02.d.1)
05000382/2004008-02	NCV	Inadequate Corrective Action Affecting Main Feedwater Isolation Valve (Section 02.02.d.2)

Closed

05000382/2003007-05	VIO	Failure to establish appropriate instructions and implement those instructions

LIST OF DOCUMENTS REVIEWED

Condition Reports

CR-WF3-2003-02759
CR-WF3-2004-01880
CR-WF3-2000-00221
CR-WF3-2004-00016
CR-WF3-2004-00016
CR-WF3-2004-01805
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