UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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March 26, 2004

EA-03-077

Paul D. Hinnenkamp
Vice President - Operations
Entergy Operations, Inc.
River Bend Station
5485 US Highway 61N
St. Francisville, LA 70775

SUBJECT: RIVER BEND - NRC SUPPLEMENTAL INSPECTION REPORT 05000458/2004011

Dear Mr. Hinnenkamp:

On February 27, 2004, the NRC completed a supplemental inspection at your River Bend 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 December 29, 2003. The issue was initially discussed in NRC Inspection Report 05000458/2002-07, dated February 7, 2003. This finding involved the failure to properly lock open condensate prefilter vessel bypass flow control Valve CNM-FCV200. As a result, when the reactor automatically scrammed, the valve closed and feedwater flow was lost to the reactor. The operators were able to provide makeup water to the reactor using the reactor core isolation cooling system. Failure to properly lock open condensate prefilter vessel bypass flow control Valve CNM-FCV200 was a violation of Technical Specification 5.4.1.a.

This 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 problems. Detailed observations, assessments, and conclusions of the inspection are presented in the enclosed inspection report.

The inspection concluded that the root causes of the finding were adequately defined and understood, and the corrective actions resulting from the evaluations appropriately addressed the identified causes.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, 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/

David N. Graves, Chief
Project Branch B
Division of Reactor Projects

Docket: 50-458
License: NPF-47

Enclosure:
NRC Inspection Report
05000458/2004011

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket:	50-458
License:	NPF-47
Report:	05000458/2004011
Licensee:	Entergy Operations, Inc.
Facility:	River Bend Station
Location:	5485 U.S. Highway 61 St. Francisville, Louisiana
Dates:	February 23-27, 2004
Inspector:	R. A. Kopriva, Senior Project Engineer, Project Branch B
Approved By:	David N. Graves, Chief, Project Branch B Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000458/2004011; 02/23-27/2004; Entergy Operations, Inc; River Bend Station. Supplemental Inspection for one White finding in the Mitigating Systems cornerstone.

The inspection was conducted by a senior project engineer. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

Inspector Identified Findings

Cornerstone: Mitigating Systems

The NRC performed a supplemental inspection to assess the licensee's evaluation associated with the failure to properly lock open Condensate Prefilter Vessel Bypass Flow Control Valve CNM-FCV200. Failing to lock open Valve CNM-FCV200 as required by procedures was a violation of Technical Specification 5.4.1.a.

This supplemental inspection, performed in accordance with Inspection Procedure 95001, concluded that the licensee performed a comprehensive evaluation of the White finding.

Extent of condition and extent of cause were reviewed during the inspection. The licensee's review was thorough and complete. The corrective actions taken to address the issues identified with the event and to prevent recurrence were satisfactory and have been completed.

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 properly lock open Condensate Prefilter Vessel Bypass Flow Control Valve CNM-FCV200. Not locking open Valve CNM-FCV200 as required when the condensate system is operating was a violation of Technical Specification 5.4.1.a. 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 December 29, 2003.

02 EVALUATION OF INSPECTION REQUIREMENTS

02.01 Problem Identification

a. Determination of who identified the issue and under what conditions

On September 18, 2002, with the plant at full power, a turbine control system malfunction caused a turbine trip and subsequent reactor scram. When reactor water level began to decrease following the scram, feedwater flow increased. Before water level had been restored, the high pressure feedwater pumps tripped on loss of suction pressure to all three feedwater pumps. The operators manually started reactor core isolation cooling to control reactor water level. The licensee's investigation identified that the root cause for the loss of all feedwater was that the sudden increase in feedwater flow caused Condensate Prefilter Vessel Bypass Flow Control Valve CNM-FCV200 to close unexpectedly, isolating the condensate system from the feedwater system. This in turn caused the low suction pressure for the feedwater pumps. The licensee's investigation of Valve CNM-FCV200 following the transient found that the handwheel of the valve was locked in an open position, but the handwheel was disengaged from the valve actuator, allowing the valve to close on the rapid increase in condensate flow.

b. Determination of how long the issue existed and prior opportunities for identification

Condensate Prefilter Vessel Bypass Flow Control Valve CNM-FCV200 was installed during a planned outage between May 12-16, 2002. The valve had been installed, opened, locked with a chain in the "disengaged" position, and remained opened until September 18, 2002, at 8:25 p.m. CDT. At that time, a reactor scram causing a reactor water level transient and increase in feedwater flow caused Valve CNM-FCV200 to go closed. A walkdown of the system, approximately three and a half (3.5) hours after the reactor scram, identified the valve as closed, with the handwheel locked and the valve disengaged from the actuator.

The licensee identified numerous prior opportunities for correcting improperly locked open Valve CNM-FCV200. The root cause evaluation noted several causal factors as those contributing to the event and, if properly addressed, would have delineated the correct actions necessary to lock open Valve CNM-FCV200. The root cause

contributors to the improper locking of Valve CNM-FCV 200 are found in Section 02.02 (b).

c. Determination of the plant-specific risk consequences and compliance concerns associated with the issue

In Condition Report CR-RBS-2002-01372 the licensee satisfactorily identified all of the issues that were directly and indirectly involved with the reactor scram. Each issue was researched and inspected. The interrelationships between systems, components, and structures were evaluated, incorporating all of the available plant data. The safety significance of the automatic reactor trip was reviewed. All shutdown systems operated per design. Operator response was timely and proper. None of the three primary fission product boundaries were challenged. There was no impact on nuclear safety.

During a Regulatory Conference held on June 23, 2003, the licensee stated that their risk evaluation of the condition concluded that the event was of very low safety significance (Green). The licensee agreed that the failure to properly lock Valve CNM-FCV200 was a performance deficiency and a violation of their Technical Specifications. Taking into account both internal and external consequences of the event, the licensee's evaluation concluded that the overall risk was very low because: (1) the safety systems in the plant were functional, including the control rod drive system, which would have provided a high pressure injection source after the first 6 hours; (2) Valve CNM-FCV200 would have failed only during a plant scram and not during a controlled manual shutdown as evidenced by the July 2002 plant shutdown; and (3) the fire risk from a fire area is nonexistent for evaluation of the event when there is no plant scram caused by a fire in that area. On July 9, 2003, the licensee submitted additional information for review to further substantiate their finding of very low safety significance. The additional information was reviewed by the staff's Senior Reactor Analyst. During the NRC review of the risk significance, the analyst qualitatively assessed the significance of the external events contributing to the risk finding. Additionally, quantitative methods used by the NRC indicated that external factors could increase the risk significance of the subject finding by at least a factor of two over risk caused by internal initiators alone. The NRC concluded that the licensee provided an insufficient basis for determining that the increase in risk associated with fires was insignificant. Accordingly, the NRC concluded that the finding was appropriately characterized as White, an issue of low to moderate safety significance. The NRC evaluation is described in the final significance determination letter to Entergy Operations, Inc., dated December 29, 2003.

02.02 Root Cause and Extent of Condition Evaluation

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

The licensee utilized Barrier and Change Analysis techniques, Event and Causal Factor Analysis, TapRoot evaluation, field walkdowns, document reviews, and personnel interviews. These methodologies are generally accepted as standard methods and were adequately utilized for this finding. The inspector concluded that the licensee

effectively utilized accepted root cause determination methods and adequately identified the root and contributing causes for this finding.

b. Level of detail of the root cause evaluation

The level of detail of the root cause evaluation was satisfactory. The licensee was thorough in their analysis of each system and subsystem that was, or had, the potential to be affected by the event. The root cause evaluation focused on the issues prior to the closure of Valve CNM-FCV200 and the resulting loss of feedwater due to the valve closure. Piping systems, instrumentation, pressures, and levels were all included in the evaluation.

The licensee's root cause investigation identified two major causes for the unexpected closure of Valve CNM-FCV200.

1. The risk and consequences associated with the change to the Condensate Full Flow Prefilter modification were not adequately reviewed or assessed. Numerous opportunities were missed that could have identified and resolved the lack of understanding and need for training on the operation of Valve CNM-FCV200, including during modification meetings, installation of the modification, and discussions between Operations and Engineering,

2. Work practices and procedures were not followed.

The following items were identified as root cause contributors:

- There was only one other Valtec valve in the plant with a manual operator, which is significantly different and smaller than Valve CNM-FCV200. The Engineering Request did not call out this difference and, as a result, the operations and training members did not recognize a difference in the plant operator/valve interface. The preparing engineer focused on the "engineering" aspects of the modification and relied on other members of the modification team to identify the differences in operational aspects of the valve.

- Training personnel did not request/require proper instructions/documents necessary to determine that valve operation would be different, took credit for previous training experience, and assumed the specific component was similar to generic valve operations. Training management had not been reinforcing the intrusive behaviors that would have been necessary to make the proper determination based on the limited information contained in the Engineering Request.

- The component engineer failed to identify different operational aspects of the valve. When the component engineer conducted the Engineering

Request review, he focused solely on the programmatic aspects of the valve and believed Operations had the responsibility to figure out how the valve operated.

- The reactor operator limited his assurance of the mechanical capability of the engaging mechanism by asking the vendor if the engaging mechanism would hold. The engineer took no additional action to ensure the mechanism would be engaged following installation.

- During interviews with operations personnel, it was identified that they did not know how to operate the valve. Operations had requested that a person with knowledge on valve operation be available at installation to assist with any problems. The engineer did not specifically remember the request for assistance.

- The operations modifications team member had known for some time that Valve CNM-FCV200 was different from others installed in the plant. After the valve arrived on site, an operator went out to look at the valve and determined that it was different and that he would need to learn the operation of the valve so he could disseminate the information. This was not captured in the process, nor was it passed on to operations management.

- The procedure writer discovered that the valve was different after the valve arrived on site. He intended to learn how the valve worked and to incorporate the information into the System Operating Procedure. However, the valve was installed ahead of schedule and the opportunity was missed.

- The licensee did not recognize that there was no technical manual for Valve CNM-FCV200 available at the time the valve was installed.

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

The licensee did not have any prior occurrences identical to this event. Due to the unique configuration of the newly installed modification, there was no prior operating history associated with the Full Flow Condensate Prefilter System.

The licensee reviewed operating experiences from several different events throughout the industry. Events at other facilities that contained attributes similar to the closing of Valve CNM-FCV200 were identified and reviewed. Events were identified through Licensee Event Reports, Significant Event Reports, Operating and Maintenance Reports, Information Notices, and Bulletins.

The licensee's review of "Analysis of Significant Events" from the Institute of Nuclear Plant Operation identified four similar causes leading to loss of feedwater events. These causes as they applied to River Bend Station were:

- Lack of appreciation of risks - River Bend personnel did not consider the impact on the plant if Valve CNM-FCV200 failed closed. Since the valve's air supply was disconnected and the valve appeared locked in an open position, the valve was considered an open pipe. Personnel did not consider that it was still a valve that had the capability of inadvertently closing and interrupting flow to the reactor vessel

- Erroneous assumptions - Personnel assumed that chaining and locking the valves handwheel would prevent it from closing.

- Inadequate (ambiguous) procedure guidance - Procedure ADM-0076, "Verification Program," was vague and the procedure intent for positioning valves and independently verifying valve position was subject to interpretation.

- Operator knowledge or training - operations personnel had not received training on the operation of Valve CNM-FCV200.

The issues that were applicable to River Bend Station have been reviewed and incorporated into the licensee's procedures and training.

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

Extent of Condition is defined as the extent to which the actual condition exists with other plant processes, equipment, or human performance.

The licensee conducted a systematic review of other valves within the plant had similar operational considerations. Valve CNM-FCV200 was unique, and the operators were unfamiliar with it's operation. Also, the licensee reviewed several human performance aspects of all the systems, and their interrelationships, and no actual conditions identical to the Valve closure of Valve CNM-FCV200 were identified.

Extent of Cause is defined as the extent to which the root causes of an identified problem have impacted other plant processes, equipment, or human performance.

The inspector reviewed Condition Report CR-RBS-2002-01372 for the event and computer programs for work and modification control, interviewed supervisors and workers, and reviewed the human performance analysis performed. The licensee's root cause and causal effects analysis included potential impacts on other plant equipment and/or processes. The lack of procedural guidance for valve operation and lack of training/operator knowledge of Valve CNM-FCV200 were reviewed for applicability to

other equipment or plant processes. These root causes and potential common causes have been identified with less significant events at the plant throughout it's operating history. The licensee has satisfactorily addressed these issues within their corrective action process.

02.03 Corrective Actions

a. Appropriateness of corrective actions

The inspector reviewed the licensee's immediate and long-term corrective actions. The corrective actions identified included multiple systems, departments, and disciplines throughout the site. Immediate corrective actions included:

- Engaging the handwheel on Valve CNM-FCV200 and locking handwheel and engaging mechanism in the engaged position.

- Operations staff provided coaching and reinforcement of Procedure ADM-0076 with respect to valve lineups, personnel authorized to reposition valves, and the verification of valve positions.

- Human Performance interviews with the Operations personnel associated with valve tagging were completed.

- Maintenance Rule Functional Failure determinations were completed.

- The licensee completed their evaluation of the elevated pressure and temperature on affected systems prior to returning the systems to service.

Other corrective actions completed were:

- Operator Training provided information on lessons learned and operating experience on the event to all Operations personnel. The training addressed the specifics regarding the failure to follow through on identified problems and reinforce expectations for new valve positioning.

- Design Engineering revised the modification process (NMM-DC115) for 10 CFR 50.59 evaluations to clearly specify the need for distinct evaluations for each phase of modification implementation.

- The Human Performance Coordinator has developed a site-wide standard on error prevention tools to include specific details on expectations for "Questioning Attitude."

- The Engineering Request Database Operations Impact screening questions have been revised to consider differences between new equipment/components and existing plant equipment.

- The Engineering Request Database Training Impact screening questions have been revised to consider the need for training in operational aspects of man/machine interfaces.

- The Temporary Alteration Process has been evaluated to ensure sufficient guidance exists for operational training needs for added equipment.

The inspector concluded that these actions adequately addressed the root causes identified.

b. Prioritization of corrective actions

The inspector concluded that the corrective actions were properly prioritized. Actions of an immediate nature were given the highest priority and accomplished on an acceptable schedule. Actions to resolve program, training, and procedure weaknesses were established. A completion date and a responsible manager were assigned for each corrective action, and these were tracked through the corrective action system.

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

The inspector determined that the licensee had completed all corrective actions for Condition Reports CR-RBS-2002-01371 and -01372. The inspector reviewed a sample of 14 corrective actions and concluded that they had been implemented successfully.

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

The licensee performed a Quality Assurance Surveillance (QS-2004-RBS-002) of the Significant Event Response Team evaluation and report, and the root cause and corrective actions identified in response to the Notice of Violation. The initial effectiveness review for CR-RBS-2002-1372 (Condensate Prefilter Valve CNM-FCV200 event) concluded that the corrective actions to prevent reoccurrence contained vulnerabilities which were addressed in CR-RBS-2003-3070.

An effectiveness review of CR-RBS-2003-3070 revealed that the CR did not reference CR-RBS-2002-1372 or the initial effectiveness review performed under River Bend Station Learning Organization Document (RLO) 2003-003, Corrective Action 3. The Corrective Action and Assessment group generated a new action item RLO-2004-003, Corrective Action 9, to address the effectiveness review of CR-RBS-2003-3070 and the configuration control aspects of CR-RBS-2002-1372 (Condensate Prefilter valve CNM-FCV200 event). The licensee generated CR-RBS-2004-00485 to document the additional corrective actions identified in Quality Assurance Surveillance QS-2004-RBS-002.

While the Quality Assurance surveillance noted that the corrective actions had not been completely effective in preventing component mispositionings, the licensee is continuing to address the issue and additional effectiveness reviews will be conducted in accordance with Procedure LI-118, “Root Cause Analysis Process.”

02.04 Management Meetings

Exit Meeting Summary

The inspectors presented the inspection results to Mr. R. King, Director, Nuclear Safety Assurance, and other members of licensee management at the conclusion of the inspection on February 27, 2004. The licensee acknowledged the information presented.

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

Upon completion of the exit meeting, a Regulatory Performance Meeting was conducted 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

PARTIAL LIST OF PERSONS CONTACTED

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R. Heath, Supervisor - Chemistry
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NRC

D. Graves, Chief, Project Branch B
P. Alter, Senior Resident Inspector
R. Kopriva, Senior Project Engineer
M. Miller, Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

05000458/200306-03	VIO	Failure to properly lock open condensate prefilter vessel bypass flow control Valve CNM-FCV200.

LIST OF DOCUMENTS REVIEWED

RIVER BEND STATION CONDITION REPORTS (CRs)

Number	Topic
CR-RBS-2002 - 01372	CNM-FCV200, Full flow condensate bypass valve, in the closed position.

CR-RBS-2002 - 01371	Main Turbine Valve closure and subsequent Reactor Scram
CR-RBS-2204 - 00485	Effectiveness Review of CR-RBS-2002-01372

SELF-ASSESSMENTS

Number	Topic
CR-RBS-2004-00485	Effectiveness review of the corrective actions taken to address CR-RBS-2002-01372

MISCELLANEOUS

Document	Description	Revision
SOP-0007	Condensate System Operation 104	25
MAI 356793	CNM-FCV-200	NA
EDA-AA-115	Engineering Request - Response Development	05
OSP-0014	Administrative Control of Equipment and/or Devices	14
ADM-0022	Conduct of Operations	30A
ADM-0076	Verification Program	03
HU-100	Human Performance Tools Implementation Guide	
EN 39200	Event Notification 09/18/2002	