UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

July 29, 2004

Randall K. Edington, Vice
President-Nuclear and CNO
Nebraska Public Power District
P.O. Box 98
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION - NRC SUPPLEMENTAL INSPECTION REPORT 05000298/2004012

Dear Mr. Edington:

On May 7, 2004, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection at your Cooper Nuclear Station. The enclosed report documents the inspection findings which were discussed during an exit meeting and Regulatory Performance Meeting on July 16, 2004, with members of your staff.

As required by the NRC Reactor Oversight Process Action Matrix, this supplemental inspection was performed in accordance with Inspection Procedure 95001. The purpose of the inspection was to examine the causes for and actions taken related to the performance indicator for unplanned scrams per 7000 critical hours crossing the threshold from Green (very low risk significance) to White (low to moderate risk significance). This supplemental inspection was conducted to provide assurance that the root causes and contributing causes of the events resulting in the White performance indicator are understood, to independently assess the extent of condition, and to provide assurance that the corrective actions for risk significant performance issues are sufficient to address the root causes and contributing causes and to prevent recurrence. The inspection consisted of selected examination of representative records and interviews with personnel.

The NRC concluded that your staff performed thorough evaluations for each of the three scrams and performed a thorough and broad-based self-assessment to identify any performance and process issues that should be addressed as a result of the performance indicator crossing the threshold from Green to White.

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

Kriss M. Kennedy, Chief
Project Branch C
Division of Reactor Projects

Docket: 50-298
License: DPR-46

Enclosure:
NRC Inspection Report 05000298/2004012
w/attachment: Supplemental Information

cc w/enclosure:
Clay C. Warren, Vice President of
Strategic Programs
Nebraska Public Power District
1414 15th Street
Columbus, NE 68601

John R. McPhail, General Counsel
Nebraska Public Power District
P.O. Box 499
Columbus, NE 68602-0499

P. V. Fleming, Licensing Manager
Nebraska Public Power District
P.O. Box 98
Brownville, NE 68321

Michael J. Linder, Director
Nebraska Department of
Environmental Quality
P.O. Box 98922
Lincoln, NE 68509-8922

Chairman
Nemaha County Board of Commissioners
Nemaha County Courthouse
1824 N Street
Auburn, NE 68305

Sue Semerena, Section Administrator
Nebraska Health and Human Services System
Division of Public Health Assurance
Consumer Services Section
301 Centennial Mall, South
P.O. Box 95007
Lincoln, NE 68509-5007

Ronald A. Kucera, Deputy Director
for Public Policy
Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65101

Jerry Uhlmann, Director
State Emergency Management Agency
P.O. Box 116
Jefferson City, MO 65102-0116

Chief, Radiation and Asbestos
Control Section
Kansas Department of Health
and Environment
Bureau of Air and Radiation
1000 SW Jackson, Suite 310
Topeka, KS 66612-1366

Daniel K. McGhee
Bureau of Radiological Health
Iowa Department of Public Health
401 SW 7th Street, Suite D
Des Moines, IA 50309

William J. Fehrman, President
and Chief Executive Officer
Nebraska Public Power District
1414 15th Street
Columbus, NE 68601

Jerry C. Roberts, Director of
Nuclear Safety Assurance
Nebraska Public Power District
P.O. Box 98
Brownville, NE 68321

Chief Technological Services Branch
National Preparedness Division
Department of Homeland Security
Emergency Preparedness & Response Directorate
FEMA Region VII
2323 Grand Boulevard, Suite 900
Kansas City, MO 64108-2670

Electronic distribution by RIV:
Regional Administrator **(BSM1)**
DRP Director **(ATH)**
DRS Director **(DDC)**
Senior Resident Inspector **(SCS)**
Branch Chief, DRP/C **(KMK)**
Senior Project Engineer, DRP/C **(WCW)**
Staff Chief, DRP/TSS **(PHH)**
RITS Coordinator **(KEG)**
Dan Merzke, Pilot Plant Program **(DXM2)**
RidsNrrDipmLipb
DRS STA **(DAP)**
Jennifer Dixon-Herrity, OEDO RIV Coordinator **(JLD)**
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W. A. Maier, RSLO **(WAM)**

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Dockets:	50-298
Licenses:	DPR 46
Report:	05000298/2004012
Licensee:	Nebraska Public Power District
Facility:	Cooper Nuclear Station
Location:	P.O. Box 98 Brownville, Nebraska
Dates:	May 3 through July 16, 2004
Inspector:	L. M. Willoughby, Resident Inspector, Project Branch C Division of Reactor Projects
Approved By:	K. M. Kennedy, Chief, Project Branch C Division of Reactor Projects

SUMMARY OF FINDINGS

IR05000298/2004012; 05/03/04-05/07/04; Cooper Nuclear Station; Supplemental inspection.

Cornerstone: Initiating Events

The U.S. Nuclear Regulatory Commission performed this supplemental inspection to assess the licensee's evaluations associated with three unplanned reactor trips during calender year 2003. The cumulative effect of these trips was that the Performance Indicator for unplanned scrams per 7000 critical hours crossed the threshold from Green (very low risk significance) to White (low to moderate risk significance) for the fourth quarter of calendar year 2003. The licensee performed individual root cause evaluations for the three reactor trips. In addition to the individual trip evaluations, the licensee performed a root cause evaluation to identify any performance and process issues that led to the White performance indicator. During this supplemental inspection, performed in accordance with Inspection Procedure 95001, the inspector determined that the licensee performed a comprehensive and thorough evaluation in which specific problems were identified, an adequate root cause evaluation was performed, and corrective actions were taken, or planned, to prevent recurrence.

REPORT DETAILS

01 INSPECTION SCOPE

The U.S. Nuclear Regulatory Commission (NRC) performed this supplemental inspection to assess the licensee's evaluation associated with a performance indicator (PI) that crossed the threshold from Green to White. The PI was for unplanned scrams per 7000 critical hours and is related to the initiating event cornerstone in the reactor safety strategic performance area. The PI was White for the fourth quarter of 2003.

Cooper Nuclear Station experienced three unplanned reactor trips in 2003. The cumulative effect of these trips caused the PI to cross the threshold from Green to White. The inspector reviewed the licensee's actions associated with these three events and conducted interviews of licensee personnel.

The licensee performed a root cause evaluation to identify performance and process issues that led to the White PI. The scope of the licensee's examination was significantly broader than the scope of this supplemental inspection. The inspector reviewed this self-assessment.

02 EVALUATION OF INSPECTION REQUIREMENTS

02.01 Problem Identification

a. Method of identification

The PI crossed the threshold from Green to White during the fourth quarter of 2003 as a result of an unplanned scram on November 28, 2003. Prior plant scrams had occurred on May 26 and October 28, 2003. A brief description and the cause, corrective actions, and safety significance of each scram from the associated licensee event report (LER) and notifications are given below. For each trip the event was self-revealing and there were no indications of the impending failure prior to the event.

On December 12, 2003, the licensee initiated Notification 4349308 to perform a self-assessment evaluation in response to the negative trend in plant performance indicated in part by the unplanned reactor scrams and the resulting White PI. The root causes and corrective actions developed in this notification are discussed in Sections 02.02 and 02.03, respectively.

.1 May 26, 2003: Manual Reactor Scram due to Main Turbine High Vibration (LER 05000298/2003004-00).

Description. On May 26, 2003, at 100 percent power, a main turbine blade failure caused a step change in turbine vibration indication from less than 4 mils to 10.2 mils. Plant operators commenced a reactor shutdown, but vibration continued to slowly increase. Operators then manually scrammed the reactor from 89 percent power.

Cause. The licensee determined that the most probable cause for the low pressure turbine blade failure was high cyclic fatigue. Nebraska Public Power District planned to perform further analysis to determine the root cause for the blade failures.

Corrective Action. The licensee replaced the installed low pressure turbine rotors with spare rotors. The licensee plans on installing new low pressure rotors in the next refueling outage.

Safety Significance. The licensee determined that the safety significance of this event was very low based on the fact that there were no challenges to the fuel, reactor coolant pressure, primary containment, or secondary containment boundaries. The plant was not placed in an unanalyzed condition, and there was no effect on design requirements for safety functions or functions important to safety.

.2 October 28, 2003: Manual Reactor Scram Initiated Due to Transmission Line Structure Fire (LER 05000298/2003006-00).

Description. On October 28, 2003, a fired occurred on a wooden transmission structure located between the main generator output and the 345 kV switchyard. Due to the imminent loss of the main generator output line to the switchyard, a rapid downpower was initiated, station loads were transferred to the startup transformer, and a manual scram was performed.

Cause. The licensee identified two root causes for the event: the failure to properly ground insulator strings on 345 kV wooden cross arms and the failure to take appropriate actions following a similar fire in 1997 on the Booneville 345 kV wooden structure located adjacent to the tower that had the fire in October 2003.

Corrective Action. The licensee removed the wooden structure and repaired the transmission lines. The licensee also implemented actions to verify that 161 kV wooden towers were properly grounded and properly ground the Booneville 345 kV tower.

Safety Significance. The licensee determined that the safety significance of this event was very low based on the fact that it did not have an impact on the risk analysis assumptions, specifically, on the assumed frequency of occurrence of this type of event. In addition, all equipment responded as expected during the event. The conditional core damage probability for this event was calculated to be 7.19E-7. Since this is less than 1E-06, the event was not risk significant.

.3 November 28, 2003: Automatic Reactor Scram Following Reactor Feed System Control Malfunction (LER 05000298/2003007-00)

Description. On November 28, 2003, the Reactor Feed Pump Turbine B controller transferred from automatic control to manual control and lowered the pump speed to approximately 3100 revolutions per minute. This resulted in a low reactor vessel water level, which caused the reactor to automatically scram.

Cause. The licensee was unable to determine the specific cause of the controller failure. Their initial investigation indicated this event may have been caused by a spurious signal entering the reactor feed pump turbine controller. The licensee also found that the operator control stations associated with the reactor feed pump controllers were not properly grounded, which could cause undesirable operation of the operator control station associated with the reactor feed pump controller by allowing a spurious signal to interact with the controller. Another possible cause was radio frequency interference or a signal burst on the analog input signal to the reactor feed pump speed control system.

Corrective Action. The licensee installed ground wires between the operator control station cases and the cabinet control ground bus, and installed devices to suppress radio frequency interference on the reactor feed control input signals. The licensee also added an alarm in the control room to alert operators when reactor feed pump control shifted from automatic to manual. The long-term corrective action was to modify the control circuitry to attenuate frequencies greater than one kilohertz in order to prevent spurious signals in the reactor feed pump turbine controller, dampen noise on the master controller, and filter noise.

Safety Significance. The licensee determined that the safety significance of this event was very low. The conditional core damage probability for this event was calculated to be 7.19E-07. Since this is less than 1E-06, the event was not risk significant.

b. Duration of issue and prior opportunities for identification

The PI returned to the Green band in the first quarter of 2004. In their evaluation, the licensee identified that several opportunities existed for prior identification of performance issues.

The root cause evaluation considered unplanned scrams and unplanned power changes greater than 10 percent that occurred within the last 3 years. Since January 1, 2001, there were 16 unplanned power reductions and 5 reactor scrams. Their evaluation indicated that the trend has been increasing since the first quarter of 2001 and that at each opportunity the issue could have been identified.

c. Risk consequences and compliance issues

As discussed in Section 02.01, the licensee performed a quantitative or qualitative probabilistic risk assessment for each of the three plant scrams and determined that the events were of very low risk significance.

One compliance issue associated with the above trips was addressed in a previous NRC inspection report. A Green self-revealing finding for failure to evaluate and take corrective actions for a fire on the Booneville 345 kV transmission line relating to the trip on October 28, 2003, was discussed in NRC Inspection Report 05000298/2003007. The inspector identified no additional findings of significance during this inspection.

02.02 Root Cause and Extent of Condition Evaluation

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

The inspector reviewed the licensee's root cause evaluation for the White PI and noted that the licensee staff used various methods to identify the root and contributing causes. The inspector determined that the licensee's process was adequate to provide accurate causes and to evaluate the extent of condition for the white PI.

b. Level of detail of the root cause evaluation

The licensee's root cause evaluation for the White PI was thorough and identified one root cause and six contributing causes. The causes covered the areas of human performance; procedural adequacy; corrective action effectiveness; and equipment design, monitoring, and maintenance. The root cause and associated contributing causes are as follows:

Root Cause: Failure or lack of organizational sensitivity to power generation equipment. Power generation equipment included nonsafety-related equipment or equipment with no associated Technical Specifications that could affect power generation.

Contributing Cause 1: Lack of work instruction detail for power generation equipment contributes to human errors that affect power generation.

Contributing Cause 2: Inadequate original design and design control for power generation equipment.

Contributing Cause 3: Inadequate preventive maintenance plans for power generation equipment contribute to unplanned equipment failures.

Contributing Cause 4: Weakness in error prevention behavior contributes to unplanned power changes.

Contributing Cause 5: Lack of programmatic controls to ensure predictive monitoring plans are used to manage interim risk related to unplanned power changes after anomalies, precursors, or significant deficiencies are recognized.

Contributing Cause 6: Lack of formal programmatic controls requiring reconciliation of vendor manual recommendations.

Based upon a review of the root cause evaluation, notifications associated with the scrams, and discussions with plant personnel, the inspector determined that the evaluation to establish the root and contributing causes was adequate and accurate.

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

The licensee's evaluation considered prior occurrences of performance issues associated with the root and contributing causes. The licensee also reviewed industry operating experience and concluded that the scope of the root cause evaluation and planned corrective actions were adequate to address the performance issues associated with the White PI.

The inspector found that the licensee appropriately considered operational and industry experience in their root cause evaluation.

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

The licensee's evaluation considered the potential for common cause and the extent of condition associated with the performance issues.

The inspector found that the licensee adequately considered and evaluated potential common causes and extent of condition of the performance issues associated with the White PI.

02.03 Corrective Actions

a. Appropriateness of corrective actions

The licensee identified 10 corrective actions or enhancements to address the root cause and contributing causes. The licensee also noted that The Strategic Improvement Plan (TIP) did not address the full breadth of programmatic problems associated with power generation equipment.

The licensee's corrective actions listed below were initiated to address the root cause and contributing causes identified in Section 02.02.b.

.1 Identify components whose single failure could cause unplanned power changes greater than or equal to 10 percent and classify these components as Critical Class 1 (Crit 1) production components. Perform this activity in concert with the Equipment Reliability Improvement Project. Identify these Crit 1 components in the component database so that the component classification is retrievable. (Identified as a corrective action in TIP Action Plan 5.3.1.1, Action 1C)

This action was associated with the root cause and contributing causes 1, 4, and 5.

.2 Review and reconcile external/internal operating experience and vendor manual recommendations associated with Crit 1 components. Revise preventive

maintenance plans accordingly. Provide a process that ensures future vendor manual changes will meet the same standard. (Identified as a corrective action in TIP Action Plan 5.3.1.1, Action 4B)

This action was associated with contributing causes 3 and 6.

.3 Establish programmatic controls for the preventive maintenance program and the design control process that requires reconciliation, via technical basis, with the vendor manual when vendor recommendations are not implemented.

This action was associated with contributing causes 3 and 6.

.4 Establish programmatic controls in the work control process to meet the following: (1) identify emergent or planned work on Crit 1 components in the schedule and on the work packages prior to conduct of work and (2) revise the prejob brief process to require discussion of critical steps and the consequences of inadequate performance for Crit 1 components.

This action was associated with the root cause and contributing causes 1 and 4.

.5 Conduct a self-assessment of a representative sample of Crit 1 components, using industry peers, to determine if adequate procedural guidance is available to support maintenance activities.

This action was not associated with a specific cause.

.6 Develop a framework for robust interim action strategies that can be used to manage the possibility of recurrence of significant events during root cause investigation and implementation of long-term corrective actions. The framework should facilitate the development of effective monitoring and predictive capability if failures occur that could result in scrams, unplanned power changes, or other significant conditions. The strategy will address: (1) the need for interim management and predictive monitoring based on both probability and consequence (i.e., risk) and (2) strategies that will include necessary administrative controls to ensure interim action remains in place until no longer necessary. Based upon the results, create actions to Work Control, Performance Analysis, Performance Improvement, and Outage Management departments to revise appropriate procedures to incorporate this strategy into their processes.

This action was associated with contributing cause 5.

.7 Obtain independent expertise to assess and identify areas for improvement in the work planning process for Crit 1 production components. At a minimum, perform the following: (1) map out the work planning process, and (2) develop standardized templates for maintenance and preventive maintenance for Crit 1 production components.

This action was associated with the root cause and contributing causes 1 and 4.

.8 Revise the procedural guidance to improve the focus of the Corrective Actions Review Group (CRG) and provide more emphasis on safety significance, immediate and interim actions, and extent of condition related to Crit 1 components for significant or degraded conditions. Have CRG members read and sign revised CRG guidance.

This action was associated with contributing cause 5.

.9 Implement the following Corrective Action Effectiveness Review Plan: (1) review the results of the action to classify Crit 1 equipment, ensuring the action is completed as intended; (2) by July 1, 2004, status the action to re-baseline preventive maintenance tasks to ensure the reviews are properly reconciling vendor manual recommendations, interview the project owner, and review a sample of Crit 1 component preventive maintenance tasks that have been re-base-lined against the vendor manual to assess the adequacy of reconciliation; (3) status all corrective actions associated with this root cause on July 1, 2004; and (4) perform closeout review of the remaining corrective actions on their due date and status the PIs for SCRAMs and unplanned power change.

The purpose of this action was to monitor the success of the action plan generated from the root cause associated with the White PI.

.10 Implement the following interim action: (1) provide a communication to the CRG and Work Item Screening Group on the lessons learned from this common cause analysis [root cause analysis associated with the White PI]; (2) emphasize the need to increase focus on problems associated with Crit 1 components; (3) emphasize the need to improve predictive monitoring for precursors or anomalies associated with Crit 1 components; and (4) emphasize the need to have good interim actions with administrative controls to help prevent recurrence until long-term actions are in place. Discuss the accumulation of risk brought on by multiple events with respect to the adequacy of interim actions. Document attendance and information presented.

The licensee did not associate this action with any specific cause.

The inspector noted that there were no corrective actions associated with contributing cause 2. The licensee explained that there were two attributes associated with this contributing cause, design control and original design. For design control the issue was primarily related to the failure to reconcile or formally assess vendor requirements. The licensee stated that this issue was being addressed by corrective action 3. For the original design issue the licensee did not assign a corrective action to identify original design deficiencies in the Crit 1 components since only four data points out of the

80 points identified in the root causes reviewed involved original design deficiencies. Licensee management determined this did not warrant a project to validate the original design of all Crit 1 components.

Based upon a review of the root cause evaluation, discussions with plant personnel, and review of some of the completed corrective actions, the inspector determined that the corrective actions were appropriate.

b. Prioritization of corrective actions

The inspector reviewed the prioritization of corrective actions and determined that the licensee properly prioritized these actions. All except two of the corrective actions have due dates before July of 2004. The latest date assigned for a corrective action is February 2005 and deals with the review and reconciling of external and internal operating experience along with vendor manual recommendations associated with Crit 1 production components. The revision of preventive maintenance plans and the development of a process that ensures future vendor manual changes were evaluated and also included in this corrective action.

c. Establishment of schedule for implementing and completing corrective actions

The inspector found that the licensee established appropriate schedules for implementing and completing corrective actions. Actions completed to date were completed as scheduled. The licensee appropriately considered risk in the scheduling of corrective actions.

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

The licensee will utilize corrective action 9 to measure the effectiveness of their corrective actions. The inspector considered the measures to determine the effectiveness of corrective actions to be adequate.

03 MANAGEMENT MEETINGS

Exit Meeting Summary

The results of the supplemental inspection were presented to S. Minahan and other members of licensee management and staff on July 16, 2004. The inspector confirmed that proprietary information was not provided or examined during the inspection.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

J. Sumpter, Senior Staff Engineer, Licensing
E. McCuthen, Licensing Supervisor
J. Roberts, Director, Nuclear Safety Assurance
G. Kline, Director Engineering
C. Markert, Assistant Maintenance Manager
J. Christensen, Co-Director, Nuclear Safety Assurance
T. Hottovy, Equipment Reliability Manager
T. Chard, Radiation Protection Manager
J. DeBartolo, Ombudsman
R. Estrada, CAP Manager
J. Waid, Training Manager
K. Dahlberg, General Manager Nuclear Support
M. Boyce, Corrective Action & Assessment Manager
R. Fili, System Engineering Manager
G. Smith, Project Manager
K. Knight, PS&O Manager
M. Allen, QA Programs Supervisor
S. Minahan, Operations General Manager
K. Chambliss, Operations Manager

NRC Personnel

S. Schwind, Senior Resident Inspector
S. Cochrum, Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF DOCUMENTS REVIEWED

Notifications:

10313025	10312997	10312486	10308089
10308496	10310052	1031356	10312693
10093280	10166047	10167074	10313256

Root Causes:

SCR 2003-1169	SCR 2003-1957	SCR 2003-1844	SCR 2003-1930
RCR 2003-1861	RCR 2002-2435	SCR 2001-0567	SCR 2002-0880
SCR 2003-1432	SCR 2002-2162	SCR 2001-0849	SCR 2001-0733
SCR 2003-1169	RCR 2002-0799	SCR 2002-0815	RCR 2003-1736
SCR 2003-1169	SCR 2003-1689	SCR 2003-0954	

Miscellaneous

Interface Operating Agreement Between Nebraska Public Power District Energy Delivery Business Unit and Nebraska Public Power District Nuclear Power Group Business Unit, Revision 1, June 5, 2003

Cooper Nuclear Station Equipment Reliability Improvement Project, FEG and CCD Project Procedure, March 22, 2004

LIST OF ACRONYMS

CRG	Corrective Actions Review Group
Crit 1	Critical Class 1
LER	licensee event report
NRC	U.S. Nuclear Regulatory Commission
PI	Performance indicator
SCR	Significant Condition Report
TIP	Strategic Improvement Plan