



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

January 31, 2014

EA-13-129

Mr. William R. Gideon
Vice President
Duke Energy Progress, Inc.
H. B. Robinson Steam Electric Plant, Unit 2
3581 West Entrance Rd
Hartsville, SC 29550

**SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 – SUPPLEMENTAL
INSPECTION REPORT 05000261/2013010 AND ASSESSMENT FOLLOW-UP
LETTER**

Dear Mr. Gideon:

On October 2, 2012, your staff failed to perform adequate preventive maintenance on the dedicated shutdown diesel generator (DSDG) cooling system in accordance with vendor recommendations and as required by procedure PLP-018, "Quality Assurance Program for Non-Safety Systems and Equipment used to meet the Station Blackout rule" and Fire Safe Shutdown (SSD) equipment maintenance requirements. This performance deficiency resulted in the DSDG automatically shut down on high engine temperature due to a failure of the radiator drive belts during surveillance testing.

On March 30, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed the onsite inspection at your Robinson Unit 2 facility. Based on the results of this inspection, documented in both NRC Inspection Report 05000261/2013008 and the final significance determination documented in NRC Inspection Report 05000261/2013009, the NRC assigned a White finding Action Matrix input to the Mitigating Systems cornerstone in the second quarter of 2013 based upon the exit meeting date of May 22, 2013. However, after further review, and in consideration that the on-site inspection activity was completed on March 30, 2013, the Action Matrix input has been revised to start in the first quarter of 2013.

In response to this Action Matrix input, the NRC informed you that a supplemental inspection under Inspection Procedure 95001, "Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area," would be required. On October 25, 2013, you informed the NRC that Robinson was ready for this supplemental inspection.

On December 19, 2013, the NRC completed the supplemental inspection and discussed the results of this inspection with Mr. Mike Glover, Director of Site Operations, and other members of your staff. The results of this inspection are documented in the enclosed inspection report.

The NRC performed this supplemental inspection to determine if: 1) the root and contributing causes for the significant issues were understood; 2) the extent of condition and extent of cause for the identified issues were understood; and 3) your completed or planned corrective actions were sufficient to address and prevent repetition of the root and contributing causes. The NRC determined that your staff's evaluation identified the primary root causes of the issue which were lack of a time-based replacement of the Dedicated Shutdown Diesel Generator radiator fan belts and insufficient procedural guidance to assess fan belt and pulley condition and fan belt tension. These root causes also applied to other safety-related or important-to-safety belt-driven equipment at Robinson Unit 2. The corrective actions taken to prevent recurrence were to replace the belts at a frequency recommended by the vendor and add guidance to the preventative maintenance procedures to check the condition of the belts and pulleys.

The NRC has determined that inspection objectives stated above have been met. Therefore in accordance with IMC 0305, "Operating Reactor Assessment Program," this performance issue shall not be considered in the Action Matrix after the end of the fourth quarter of 2013. The NRC inspectors did not identify any findings or violations of more than minor significance. As a result, the NRC has determined the performance at Robinson Unit 2 to be in the Licensee Response Column of the ROP Action Matrix as of January 1, 2014.

On January 23, 2013, the NRC discussed the implementation of your corrective actions with Mr. Mike Glover and other members of your staff.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agency-wide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

George T Hopper, Chief
Projects Branch 4
Division of Reactor Projects

Docket No.: 05000261
License No.: DPR-23

Enclosure: Inspection Report 05000261/2013010
w/Attachment: Supplemental Information

cc distributin via ListServ

The NRC performed this supplemental inspection to determine if: 1) the root and contributing causes for the significant issues were understood; 2) the extent of condition and extent of cause for the identified issues were understood; and 3) your completed or planned corrective actions were sufficient to address and prevent repetition of the root and contributing causes. The NRC determined that your staff's evaluation identified the primary root causes of the issue which were lack of a time-based replacement of the Dedicated Shutdown Diesel Generator radiator fan belts and insufficient procedural guidance to assess fan belt and pulley condition and fan belt tension. These root causes also applied to other safety-related or important-to-safety belt-driven equipment at Robinson Unit 2. The corrective actions taken to prevent recurrence were to replace the belts at a frequency recommended by the vendor and add guidance to the preventative maintenance procedures to check the condition of the belts and pulleys.

The NRC has determined that inspection objectives stated above have been met. Therefore in accordance with IMC 0305, "Operating Reactor Assessment Program," this performance issue shall not be considered in the Action Matrix after the end of the fourth quarter of 2013. The NRC inspectors did not identify any findings or violations of more than minor significance. As a result, the NRC has determined the performance at Robinson Unit 2 to be in the Licensee Response Column of the ROP Action Matrix as of January 1, 2014.

On January 23, 2013, the NRC discussed the implementation of your corrective actions with Mr. Mike Glover and other members of your staff.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agency-wide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

George T Hopper, Chief
Projects Branch 4
Division of Reactor Projects

Docket No.: 05000261

License No.: DPR-23

Enclosure: Inspection Report 05000261/2013010
w/Attachment: Supplemental Information

cc distributin via ListServ

☒ PUBLICLY AVAILABLE ☐ NON-PUBLICLY AVAILABLE

☐ SENSITIVE ☒ NON-SENSITIVE

ADAMS: ☒ Yes ☐ No

ACCESSION NUMBER:

☒ SUNSI REVIEW COMPLETE ☐ FORM 665 ATTACHED

OFFICE	RII:DRP	RII:DRP	RII:DRP				
SIGNATURE	GTH /RA for/	Via email	GTH /RA/				
NAME	CRapp	SHerrick	GHopper				
DATE	01/31/2014	01/31/2014	01/31/2014				
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY

DOCUMENT NAME:

W. Gideon

3

Letter to William R. Gideon from George Hopper dated January 31, 2014

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 – SUPPLEMENTAL
INSPECTION REPORT 05000261/2013010 AND ASSESSMENT FOLLOW-UP
LETTER

DISTRIBUTION:

C. Evans, RII

L. Douglas, RII

D. Merzke, NRR

OE Mail

RIDSNNRRDIRS

PUBLIC

RidsNrrPMRobinson Resource

ROPassessment Resource

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No: 50-261

License No: DPR-23

Report No: 005000261/2013010

Facility: H. B. Robinson Steam Electric Plant, Unit 2

Location: Hartsville, SC 29550

Dates: December 16, 2013, through December 19, 2013

Inspectors: C. Rapp, Senior Project Engineer
S. Herrick, Project Engineer

Approved by: George T. Hopper, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Enclosure

Report Summary

IR 05000261/2013-010, Duke Progress Energy; 12/16/2013-12/19/2013; H.B. Robinson Steam Electric Plant, Unit 2; Supplemental Inspection

The report covered a one week period of inspection by two Region-based reactor inspectors. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process revision 4." No findings or violations were identified.

Cornerstone: Mitigating Systems

The NRC staff performed this supplemental inspection in accordance with IP 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," to assess the licensee's evaluation of the White inspection finding associated with the failure to perform adequate preventive maintenance on the dedicated shutdown diesel generator (DSDG) cooling system in accordance with vendor recommendations and as required by procedure PLP-018, "Quality Assurance Program for Non-Safety Systems and Equipment used to meet the Station Blackout rule" and Fire Safe Shutdown (SSD) equipment maintenance requirements. The NRC staff previously characterized this issue as having low to moderate safety significance (White), as documented in NRC Inspection Report 05000261/2013009.

During this supplemental inspection, the inspectors determined that the licensee performed an adequate evaluation of the self-revealing White finding for the failure to perform adequate preventive maintenance on the dedicated shutdown diesel generator (DSDG) cooling system in accordance with vendor recommendations, which resulted in the DSDG automatically shutting down on high engine temperature due to a failure of the radiator drive belts during surveillance testing. The licensee concluded that the two root causes for this issue were; the lack of a time-based replacement schedule for the fan belts and insufficient guidance to assess fan belt and pulley conditions.

The inspectors determined that the licensee's problem identification, root cause, extent of condition evaluation and extent of cause evaluation for the White finding were generally adequate. Additionally, the inspector determined that the corrective actions taken and planned appear reasonable and will correct the causes that led to the non-compliance and prevent recurrence. Given the licensee's acceptable performance in addressing the preventive maintenance on the dedicated shutdown diesel generator, the White finding associated with this issue will only be considered in assessing plant performance for a total of four quarters in accordance with the guidance in IMC 0305, "Operating Reactor Assessment Program". Inspectors will review the licensee's implementation of corrective actions during future inspections.

NRC-Identified and Self-Revealing Findings

None

Enclosure

Report Details

4OA4 Supplemental Inspection

.01 Inspection Scope

This supplemental inspection was performed using Inspection Procedure (IP) 95001, Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area, to assess the licensee's evaluation of a White finding which affected the Mitigating Systems cornerstone in the Reactor Safety strategic performance area. The inspection objectives were to:

- provide assurance that the root causes and contributing causes of risk-significant performance issues were understood
- provide assurance that the extent of condition and extent of cause of risk-significant performance issues were identified
- provide assurance that the licensee's corrective actions for risk-significant performance issues were sufficient to address the root and contributing causes and prevent recurrence

The licensee entered the Regulatory Response Column of the NRC's Action Matrix in the first quarter of 2012 as a result of one inspection finding of low to moderate safety significance (White). The finding was associated with inadequate preventive maintenance on the dedicated shutdown diesel generator (DSDG) cooling system. On October 2, 2012, the DSDG automatically shut down on high engine temperature due to a failure of the radiator drive belts during surveillance testing. The finding was characterized as having White safety significance based on the results of a Phase 3 risk analysis performed by a region-based senior reactor analyst (SRA), as discussed in NRC Inspection Report 05000261/2013008. The failure of the DSDG was attributed to a failed fan belt which drove the cooling system fan. The fan belts were replaced and the DSDG was returned to operable on October 3, 2012.

The licensee informed the NRC on October 25, 2013, that they were ready for the supplemental inspection. In preparation for the inspection, the licensee performed a root cause evaluation (RCE), CR 564838, Revision 3, to identify weaknesses that existed in various organizations which allowed for a risk-significant finding, and to determine the organizational attributes that resulted in the White finding. The licensee also performed a safety culture review as part of the RCE.

The inspectors reviewed the licensee's RCE in addition to other evaluations conducted in support of and as a result of the RCE. The inspectors reviewed corrective actions that were taken or planned to address the identified causes. The inspectors also held discussions with the licensee to ensure that the root and contributing causes and the contribution of safety culture components were understood and corrective actions taken or planned were appropriate to address the causes and preclude repetition.

Enclosure

.02 Evaluation of the Inspection Requirements

02.01 Problem Identification

- a. Determine that the evaluation documented who identified the issue (i.e., licensee-identified, self-revealing, or NRC-identified) and under what conditions the issue was identified.

The fan belt failure occurred during a routine surveillance of the DSDG. The DSDG was loaded as part of the surveillance. A high engine temperature alarm was received after running loaded for several minutes indicating the DSDG cooling system was not functioning. The DSDG tripped on high engine temperature approximately three minutes later. The licensee checked the DSDG cooling system and observed that the radiator fan motor was running, but the fan itself was not turning indicating that either the fan shaft or the fan belts had failed. The licensee characterized this failure as self-revealing because fan belt inspection was not part of the surveillance and failure of the fan belts was readily apparent. The inspectors determined that the licensee's characterization of the violation as self-revealing was appropriate.

- b. Determine that the evaluation documented how long the issue existed and prior opportunities for identification.

The licensee documented the DSDG was inoperable from the last successful surveillance, performed on August 28, 2012, until October 3, 2013, when post-maintenance testing was completed. The fan belts had been replaced only once since the DSDG was installed in the 1980's. The fan belts were found degraded during a routine maintenance inspection in March 2003. All three fan belts were replaced in July 2003, but there was no review to assess if the PM was adequate or if the fan belts needed to be replaced on a set frequency. The licensee identified this as a missed opportunity to review preventative maintenance requirements. The inspectors determined the evaluation properly documented how long the issue existed and the prior opportunities for identification.

- c. Determine that the evaluation documented the plant-specific risk consequences, as applicable, and compliance concerns associated with the issue.

The RCE documented that the DSDG was unavailable as the emergency power source during station blackout and certain safe shutdown fire situations. The DSDG provided backup power for the reactor coolant pump seal cooling system and the reactor coolant makeup system. The inspectors determined the evaluation adequately documented the plant-specific risk and compliance concerns.

- d. Findings

No findings were identified

Enclosure

02.02 Root Cause, Extent of Condition, and Extent of Cause Evaluation

- a. Determine that the problem was evaluated using a systematic methodology to identify the root and contributing causes.

The licensee used several systematic evaluation methods to identify root and contributing causes. The methods used included:

- Events and Causal Factors Analysis
- Procedure Review Analysis
- Human Performance Analysis
- Barrier Analysis
- Organization and Programmatic Analysis
- Support/Refute Analysis

The inspectors determined the problem was evaluated using systematic methodologies.

- b. Determine that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.

The RCE was commensurate with the significance of the problem. The licensee used multidisciplinary team approach which involved the system engineer, maintenance, operations, and licensing. The RCE sponsor was the Director of Site Operations. The analysis methodologies were applied systematically to determine the root causes and contributing causes and develop appropriate corrective actions to prevent recurrence. The licensee evaluated both extent of condition and extent of cause to identify process or systematic problems. The inspectors determined that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.

- c. Determine that the root cause evaluation included a consideration of prior occurrences of the problem and knowledge of prior operating experience (OE).

The RCE included a review of prior occurrences of the same or similar problems and knowledge of prior OE. The licensee reviewed both internal and external OE including industry and NRC generic communications to identify prior fan belt failures. The licensee broadened this review to also include previous instances of diesel engine overheating, preventative maintenance program deficiencies, and vendor recommendations. The licensee identified six internal OE items and 13 external OE items that were evaluated to determine if the causes or contributors were similar to the DSDG failure. The licensee concluded that none of the internal OE items were similar to the DSDG failure. The inspectors noted that one OE item was similar to the DSDG failure. A fan belt failure at the Brunswick Nuclear Plant (BNP) resulted in reduced cooling of the spent fuel pool. This event was documented in BNP CR 454887, but was not distributed as OE to Robinson for review. This OE item was evaluated and determined not to be relevant to this event because the cause for the fan belt failure was attributed to replacing a single fan belt. The procedure for fan belt replacement required that fan belts were replaced as a complete set. However, this conclusion was not

Enclosure

documented in the RCE. The inspectors determined that the root cause evaluation included appropriate consideration for prior occurrences of the problem and knowledge of prior OE.

- d. Determine that the root cause evaluation addressed the extent of condition and the extent of cause of the problem.

Extent of Condition: The licensee's RCE included an extent of condition review. The extent of condition applies to all site critical and important components with belt driven support systems based on risk impact. The licensee used a three-step process to develop a list of components that might be affected by the extent of condition:

- The individual equipment tags for belt driven equipment were identified by all system engineers based on their knowledge of their respective systems.
- Condition reports involving belts for the last ten years were retrieved from the licensee's Passport system to validate that the system engineer reviews included appropriate belt driven equipment.
- A report of all belts in the parts list was provided by Robinson's Materials and Contract Services. Each belt part was linked back to the equipment tag and respective plant system. These additional equipment tags were included in the extent of condition.

This broad search on all belts used at Robinson ensured that the extent of condition was well covered. The corrective actions included replacing the fan belts and establishing a PM frequency to inspect and change the fan belts for all the components on the extent of condition list.

The inspectors reviewed the RCE and the list of components included in the extent of condition. The inspectors also performed a walkdown in the Auxiliary Building and the Turbine Building to verify that all the site critical and important components were captured in the extent of condition analysis. The inspectors determined that the licensee adequately addressed the extent of condition of the issue.

Extent of Cause: The licensee determined that appropriate corrective actions were established for deficiencies identified consistent with the root causes identified in the RCE. However, future plant equipment with belts needs to be addressed in the extent of cause. The concern was two fold in that other PMs may not contain an appropriate time-based replacement criteria based on risk aspects of that system/component or industry guidelines, and other PMs may have inadequate instructions to detect deteriorating conditions prior to failure. The corrective actions included: developing and implementing PM basis documents for belt driven equipment; generating PM requests as required and track to completion. The inspectors determined that the licensee's RCE properly addressed the extent of cause.

Enclosure

- e. Determine that the root cause, extent of condition, and extent of cause evaluations appropriately considered the safety culture components as described in IMC 0305.

The licensee performed a safety culture assessment which used the safety culture components in NRC Inspection Manual Chapters (IMCs) 0310 and 0305 and RIS 2006-13. The assessment reviewed the various safety culture components and aspects to determine if a weakness in any safety culture component was a root cause or significant contributing cause. The licensee did identify weaknesses in the area of Human Performance related to decision making, resources, and work practices. However, these weaknesses had already been identified as either root or contributing causes. The licensee did identify an aggregate weakness in Problem Identification and Resolution – Corrective Action Program. However, the licensee did not consider this to be causal to the DSDG failure and additional corrective actions were not developed. The inspectors determine that the evaluation appropriately considered the safety culture components described in IMC 0305.

- f. Findings

No findings were identified

02.03 Corrective Actions

- a. Determine that appropriate corrective actions are specified for each root and contributing cause or that the licensee has an adequate evaluation for why no corrective actions are necessary.

The licensee identified two root causes: 1) lack of a time-based replacement schedule for the fan belts; and 2) insufficient guidance to assess fan belt and pulley conditions. The corrective actions to prevent recurrence (CAPRs) were to: 1) establish a routine PM task to replace the fan belts every two years; and 2) add a requirement to CM-608, Alignment and Adjustment of Belt Driven Equipment, to use belt and sheave gauges to check for wear and a tensionometer to check fan belt tension. Checking for belt wear was implemented by adding a note to procedure CM-608, Revision 16. However, after discussions with the fan belt vendor, it was determined using a belt gauge was not appropriate for determining wear and in CM-608, Revision 20, the note was deleted and guidance to perform a detailed visual inspection of the fan belts was added. The inspectors observed that the note in revision 16 was not identified as implementing a CAPR and was removed without review for impact on the CAPR, nor was the CAPR updated to reflect the change to CM-608. Procedure PRO-NGGC-0201, NGG Procedure Writers Guide, Revision 28, required that procedure sections or steps that implemented CAPRs be cross-referenced to the CAPR. The licensee issued CM-608, Revision 24, that annotated the sections or steps that implemented the CAPR and initiated CR 651925 to document this action was missed.

The licensee also identified three contributing causes: 1) the fan belt guard did not allow for fan belt inspection; 2) decision making for nonsafety-related SSC's that are important to safety was not adequate; and 3) maintenance practices did not reflect vendor

Enclosure

recommendations for belt and pulley condition and belt tension. The licensee developed appropriate and clearly defined corrective actions for each contributing cause.

The extent of condition reviewed the preventative maintenance practices for belt-driven equipment that was necessary to support systems that were critical or important to safety. Generally, the corrective actions were to replace the drive belts and to establish a time-based replacement frequency for each component, based either on vendor information or maintenance history. The inspectors did not identify any new or different problems created as a result of the proposed corrective actions.

The inspectors determined that appropriate corrective actions were specified for each root and contributing cause.

- b. Determine that corrective actions have been prioritized with consideration of risk significance and regulatory compliance.

Only one corrective action (CORR-26, Document current motor, fan, and radiator fan belt performance over a six-month period) remained open. All data had been taken and the licensee was in the process of documenting the results. All other corrective actions had been timely completed and achieved compliance with regulatory requirements. The inspectors determined that corrective actions have been prioritized with consideration of risk significance and regulatory compliance.

- c. Determine that a schedule has been established for implementing and completing the corrective actions.

A schedule was established for implementing and completing the corrective actions. Each corrective action was appropriately assigned and tracked to ensure timely completion. The inspectors determine that a schedule has been established for implementing and completing the corrective actions.

- d. Determine that quantitative or qualitative measures of success have been developed for determining the effectiveness of the corrective actions to prevent recurrence.

The licensee had established both interim and final effectiveness reviews for the two CAPRs and an interim effectiveness review for developing and implementing a PM basis document for belt-driven equipment (CORR-10). The interim effectiveness reviews due dates were November 28, 2013, and September 31, 2014. The criteria for the interim reviews were to ensure fan belt replacement was scheduled on a biennial basis, review fan belt performance, and review results from maintenance observations.

The final effectiveness review criteria were similar. Also, the due date for the final review was September 20, 2015; one year from the last interim effectiveness review. This provided ample time between the interim effectiveness review and the final review to assess long-term CAPR effectiveness.

Enclosure

The inspectors determined that quantitative or qualitative measures of success have been developed for determining the effectiveness of the corrective actions to prevent recurrence.

- e. Determine that the corrective actions planned or taken adequately address a Notice of Violation (NOV) that was the basis for the supplemental inspection, if applicable.

The inspectors determined that the corrective actions to revise the preventative maintenance procedure and periodic replacement of the fan belts were adequate to address the NOV that directly corresponds with the DSDG failure.

- f. Findings

No findings were identified

4OA6 Exit Meeting

On December 19, 2013, the inspectors presented the inspection results to Mr. Mike Glover, Director of Site Operations, and other members of your staff who acknowledged the results. No proprietary information was identified.

On January 23, 2014, a Regulatory Performance Meeting was held by telephone conference with Mr. Mike Glover, and other members of your staff. Licensee staff discussed implementation of corrective actions. NRC staff reviewed the Oversight Process timeline for closing the inspection finding.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee:

S. Connelly, Regulatory Affairs
R. Gideon, Site Vice President – Robinson
P. Gillespie, Senior Vice President
R. Glover, Director of Site Operations
W. Peavyhouse, Director Nuclear Engineering

NRC:

G. Hopper, Chief, Projects Branch 4, Division of Reactor Projects, Region II

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

05000261/201308-01	VIO	Failure to Perform Adequate Preventative Maintenance on the DSDG In accordance with Vendor Guidelines
--------------------	-----	---

Discussed

None

List of Documents Reviewed

CR/RCE 564838 rev 3
CM-608, rev 16 and rev 24
RNP-PMB-BLT-001, rev 0