



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

July 19, 2016

Mr. Kelvin Henderson
Site Vice President
Duke Energy Corporation
Catawba Nuclear Station
4800 Concord Road
York, SC 29745-9635

SUBJECT: CATAWBA NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT
05000413/2016002, 05000414/2016002

Dear Mr. Henderson:

On June 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Catawba Nuclear Station Units 1 and 2. On July 14, 2016, the NRC inspectors discussed the results of this inspection with Mr. Tom Simril and other members of your staff. Inspectors documented the results of the inspection in the enclosed inspection report.

NRC inspectors documented two findings of very low safety significance (Green) in this report. These findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCV) consistent with Section 2.3.2.a of the Enforcement Policy. If you contest the violations or the significance of these NCVs, 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 20555-001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspector at Catawba. If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II, and the NRC resident inspector at Catawba.

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 Agencywide 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/

Frank Ehrhardt, Chief
Reactor Projects Branch 1
Division of Reactor Projects

Docket Nos.: 50-413, 50-414
License Nos.: NPF-35, NPF-52

Enclosure:
Integrated Inspection Report 05000413/2016002, 05000414/2016002
w/Attachment: Supplemental Information

cc: w/encl: Distribution via ListServ

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Letter to Kelvin Henderson from Frank Ehrhardt dated July 19, 2016

SUBJECT: CATAWBA NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT
05000413/2016002, 05000414/2016002

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-413, 50-414

License Nos.: NPF-35, NPF-52

Report No.: 05000413/2016002 and 05000414/2016002

Licensee: Duke Energy Carolinas, LLC

Facility: Catawba Nuclear Station, Units 1 and 2

Location: York, SC 29745

Dates: April 1, 2016 through June 30, 2016

Inspectors: A. Hutto, Senior Resident Inspector
C. Scott, Resident Inspector

Approved by: Frank Ehrhardt, Chief
Reactor Projects Branch 1

SUMMARY

IR 05000413/2016-002, 05000414/2016-002; 4/1/2016 – 6/30/2016; Catawba Nuclear Station, Units 1 and 2; Operability Determinations, Problem Identification and Resolution

The report covered a three-month period of inspection by the resident inspectors. There was one NRC identified violation and one self-revealing violation documented in this report. The significance of inspection findings are indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," (SDP) dated April 29, 2015. The cross-cutting aspects are determined using IMC 0310, "Aspects within the Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated February 4, 2015. The NRC's program for overseeing the safe operations of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5.

Cornerstone: Mitigating Systems

- Green: A self-revealing Green NCV of Technical Specifications (TS) 5.4.1.a, "Procedures," was identified for the licensee's failure to adequately implement a procedure for the operation of the Unit 1 residual heat removal (RHR) system. As a result, the breaker for the 1B RHR pump loop suction valve was left open, which resulted in the 1B train of emergency core cooling system (ECCS) being inoperable for greater than its TS allowed outage time. The licensee took immediate corrective actions to close the breaker and restore operability of the 1B train ECCS. The licensee entered this issue into their corrective action program as condition report (CR) 2014866.

The licensee's failure to adequately implement RHR system operating procedure, OP/1A/6200/004, "Shutdown and Alignment for Standby Readiness," prior to plant startup was a performance deficiency (PD). The PD was determined to be more than minor because it was associated with the configuration control attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the performance deficiency resulted in the breaker for the 1B RHR pump loop suction valve being left open and the 1B train of ECCS being inoperable for greater than its TS allowed outage time. The inspectors evaluated the significance of the finding using IMC 0609 Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 1, Section B and determined the finding to be of very low safety significance (Green) because the finding did not represent an actual loss of function of at least a single train for greater than its TS allowed outage time because 1ND37A (redundant decay heat removal (ND) 1B pump suction from reactor coolant (NC) Loop C) was still be able to provide the required permissive signal to open 1ND136B (ND supply to safety injection (NI) pump 1B). The performance deficiency had a cross-cutting aspect of teamwork in the area of human performance because operations did not communicate and coordinate activities associated with the RHR system to ensure nuclear safety is maintained. (H.4) (Section 1R15)

- Green: An NRC identified Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified for the licensee's failure to implement effective corrective actions to prevent repetition of a significant condition adverse to quality regarding connecting rod bearing rotations on the 1A diesel generator (DG). Specifically, the number 6 connecting rod was found rotated approximately 190 degrees following a 24 hour diesel run. The licensee replaced the rotated bearing and implemented modifications on all four Catawba DGs to minimized voiding in the engine driven lube oil pump suction piping. The licensee entered this issue into their corrective action program as CR 2021799.

The licensee's failure to identify a lubricating oil design discrepancy during the root cause investigation for 1A and 1B DG bearing rotations in 2014 was a PD. The PD was more than minor because it was associated with the equipment performance attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that that respond to initiating events to prevent undesirable consequences. Specifically, the rotation of the 1A DG number 6 bearing resulted in approximately 60 hours of unavailability to replace the bearing. The finding was determined to be of very low safety significance, Green, based on the Phase 1 screening criteria found in IMC 609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," as the finding did not represent a loss of a system and/or function, and did not represent an actual loss of function of at least a single train for greater than its TS allowed outage time. This finding had a cross-cutting aspect of evaluation, as described in the problem identification and resolution cross-cutting area because the licensee failed to fully evaluate diesel lube oil system discrepancies that contributed to DG connecting rod bearing rotations during the root cause investigation of previous bearing rotation events in 2014. (P.2) (Section 4OA2.3)

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at or near 100 percent rated thermal power (RTP) for the entire inspection period.

Unit 2 begin the inspection period at 100 percent RTP until June 12, 2016 when power was reduce to approximately 48 percent RTP following a trip of the 2A main feedwater pump. Repairs to the 2A main feedwater pump were completed and the unit was returned to 100 percent RTP on June 14, 2016. Unit 2 remained at or near 100 percent RTP for the rest of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

a. Inspection Scope

.1 Summer Readiness of Offsite and Alternate AC Power System

The inspectors reviewed the licensee's procedures for operation and continued availability of offsite and onsite alternate AC power systems. The inspectors also reviewed the communications protocols between the transmission system operator and the licensee to verify that the appropriate information is exchanged when issues arise that could affect the offsite power system. The inspectors reviewed the material condition of offsite and onsite alternate AC power systems (including switchyard and transformers) by performing a walkdown of the switchyard. Documents reviewed are listed in the attachment.

.2 Seasonal Extreme Weather Conditions

The inspectors conducted a detailed review of the station's adverse weather procedures written for extreme high temperatures. The inspectors verified that weather-related equipment deficiencies identified during the previous year had been placed into the work control process and/or corrected before the onset of seasonal extremes. The inspectors evaluated the licensee's implementation of adverse weather preparation procedures and compensatory measures before the onset of seasonal extreme weather conditions. Documents reviewed are listed in the attachment.

The inspectors evaluated the following risk-significant systems:

- Standby nuclear service water pond
- Unit 1 DG

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)a. Inspection Scope.1 Partial Walkdown

The inspectors verified that critical portions of the selected systems were correctly aligned by performing partial walkdowns. The inspectors selected systems for assessment because they were a redundant or backup system or train, were important for mitigating risk for the current plant conditions, had been recently realigned, or were a single-train system. The inspectors determined the correct system lineup by reviewing plant procedures and drawings. Documents reviewed are listed in the attachment.

The inspectors selected the following three systems or trains to inspect:

- 1B motor driven auxiliary feedwater (CA) pump with the 1A CA pump out of service (OOS) for preventive maintenance (PM)
- 1B DG with the 1B DG OOS for corrective maintenance
- 2A and 2B motor driven CA pumps with the Unit 2 turbine driven CA pump OOS for PM

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05AQ)a. Inspection Scope.1 Quarterly Inspection

The inspectors evaluated the adequacy of selected fire plans by comparing the fire plans to the defined hazards and defense-in-depth features specified in the fire protection program. In evaluating the fire plans, the inspectors assessed the following items:

- control of transient combustibles and ignition sources
- fire detection systems
- fire suppression systems
- manual firefighting equipment and capability
- passive fire protection features
- compensatory measures and fire watches
- issues related to fire protection contained in the licensee's corrective action program

The inspectors toured the following five fire areas to assess material condition and operational status of fire protection equipment. Documents reviewed are listed in the attachment.

- Unit 2, spent fuel pool, fire area 23
- Unit 2, spent fuel pool purge unit, fire area 47
- Unit 0, nuclear service water pump structure, fire areas 29 and 30
- 2B DG room, fire area 28
- auxiliary building general area, 577' level, fire area 18

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

.1 Internal Flooding

The inspectors reviewed related flood analysis documents and walked down the area listed below containing risk-significant structures, systems, and components susceptible to flooding. The inspectors verified that plant design features and plant procedures for flood mitigation were consistent with design requirements and internal flooding analysis assumptions. The inspectors also assessed the condition of flood protection barriers and drain systems. In addition, the inspectors verified the licensee was identifying and properly addressing issues using the corrective action program. Documents reviewed are listed in the attachment.

- Unit 1 and 2 543' and 522' auxiliary building flood features

.2 Underground Cables

The inspectors reviewed related flood analysis documents and inspected the areas listed below containing cables whose failure could adversely impact risk-significant equipment. The inspector directly observed the condition of cables and cable support structures and, as applicable, verified that dewatering devices and drainage systems were functioning properly. In addition, the inspectors verified the licensee was identifying and properly addressing issues using the corrective action program. Documents reviewed are listed in the attachment.

- Cable man hole CMH-7A

b. Findings

No findings were identified.

1R07 Heat Sink Performance (71111.07)a. Inspection ScopeAnnual Review

The inspectors verified the readiness and availability of the 1A DG jacket water (KD) heat exchanger to perform its design function by reviewing results of PT/1/A/4400/006 E, "KD Heat Exchanger 1A Heat Capacity Test," verifying critical operating parameters through direct observation, and verifying correct categorization and receipt of maintenance under the Maintenance Rule. Additionally, the inspectors verified that the licensee had entered any significant heat exchanger performance problems into the corrective action program and that the licensee's corrective actions were appropriate. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11)a. Inspection Scope.1 Resident Inspector Quarterly Review of Licensed Operator Requalification

On June 16, 2016, the inspectors observed a simulator scenario conducted for training of an operating crew which included failure of steam generator 1A level control valve, 1B reactor coolant pump leak, reactor trip and loss of offsite power to both units.

The inspectors assessed the following:

- licensed operator performance
- the ability of the licensee to administer the scenario and evaluate the operators
- the quality of the post-scenario critique
- simulator performance

Documents reviewed are listed in the attachment.

.2 Resident Inspector Quarterly Review of Licensed Operator Performance in the Actual Plant/Main Control Room

The inspectors observed licensed operator performance in the main control room on June 13, 2016 during boration of the reactor coolant system for temperature control, and starting the 1A main feed pump at approximately 50 percent power.

The inspectors assessed the following:

- use of plant procedures
- control board manipulations

- communications between crew members
- use and interpretation of instruments, indications, and alarms
- use of human error prevention techniques
- documentation of activities
- management and supervision

Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors assessed the licensee's treatment of the three issues listed below to verify the licensee appropriately addressed equipment problems within the scope of the maintenance rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"). The inspectors reviewed procedures and records to evaluate the licensee's identification, assessment, and characterization of the problems as well as their corrective actions for returning the equipment to a satisfactory condition. The inspectors also interviewed plant personnel to assess the licensee's treatment of performance deficiencies and extent of condition. Documents reviewed are listed in the attachment.

- CR 2018073, 1B nuclear service water (RN) pump strainer erratic operation
- CR 2021799, 1A DG con rod bearing #6 found rotated
- Licensee's 10 CFR 50.65(a)(3) Periodic Evaluation

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

a. Inspection Scope

The inspectors reviewed the five maintenance activities listed below to verify that the licensee assessed and managed plant risk as required by 10 CFR 50.65(a)(4) and licensee procedures. The inspectors assessed the adequacy of the licensee's risk assessments and implementation of risk management actions. The inspectors also verified that the licensee was identifying and resolving problems with assessing and managing maintenance-related risk using the corrective action program. Additionally, for maintenance resulting from unforeseen situations, the inspectors assessed the effectiveness of the licensee's planning and control of emergent work activities. Documents reviewed are listed in the attachment.

- Unit 2, Yellow risk condition for the 2B ND train OOS for planned maintenance
- Unit 1, Yellow risk condition for the 1A motor train auxiliary feedwater pump train

- OOS for planned maintenance
- Unit 1, Yellow risk condition for the 1A DG OOS for connecting rod bearing inspections
- Unit 2, Yellow risk condition for the 2A DG OOS for PMs
- Unit 1, Critical activity plan for vital battery 1EBB replacement

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15)

a. Inspection Scope

.1 Operability and Functionality Review

The inspectors selected the four operability determinations or functionality evaluations listed below for review based on the risk-significance of the associated components and systems. The inspectors reviewed the technical adequacy of the determinations to ensure that technical specification operability was properly justified and the components or systems remained capable of performing their design functions. To verify whether components or systems were operable, the inspectors compared the operability and design criteria in the appropriate sections of the technical specification and updated final safety analysis report to the licensee's evaluations. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with operability evaluations. Documents reviewed are listed in the attachment.

- Unit 1, 1B ND suction valve breaker found off, CR 2014866
- Unit 1, 1A DG con rod bearing #6 found rotated, CR 2021799
- Unit 2, 2B charging (NV) pump bearing oil leak, CR 2027683
- Unit 1 and 2, Rotork 10 CFR Part 21 evaluation, CR 2028905

b. Findings

Introduction: A self-revealing Green NCV of TS 5.4.1, "Procedures," was identified for the licensee's failure to adequately implement a procedure for the operation of the Unit 1 RHR system. Specifically, the breaker for the 1B RHR pump loop suction valve was left open which resulted in the 1B train of ECCS being inoperable for greater than its TS allowed outage time. The licensee took immediate corrective actions to close the breaker and restore operability of the 1B train ECCS.

Description: On March 28, 2016, during the 1B train ECCS cold leg recirculation interlock test, operators discovered that breaker 1EMXD-F02A for the 1B RHR pump loop suction valve (1ND-36B) was open. This breaker is required to be closed in Mode 1-3 to allow remote operation of 1ND-36B and satisfy the interlocks for cold leg recirculation. A permissive signal from either 1ND-36B or 1ND-37A (redundant ND 1B Pump suction from NC Loop C) is needed to satisfy the interlocks to open the ND supply

valve to the 1B NI pump for cold leg recirculation operation. With this breaker open, 1ND36B could not provide a permissive signal to open valve 1ND136B, ND supply valve to the 1B NI pump, for cold leg recirculation, rendering the 1B train of ECCS inoperable. However, 1B ECCS cold leg recirculation remained available because 1ND37A was still able to provide the required permissive signal to open 1ND136B.

The last time the breaker was operated was December 12, 2015 during refueling outage 1EOC22. The licensee determined that the breaker was left open while concurrently performing pressure boundary leakage testing on the loop suction valves for the 1B ND pump per PT/1/A/4200/001 and aligning the RHR system for standby readiness per OP/1/A/6200/004. Both procedures operate the ND loop suction valves and breakers. Ineffective coordination of the pressure boundary leakage test procedure and the RHR operating procedure for standby readiness contributed to breaker 1ND-36B being left open. The operating procedure for placing the system in standby readiness should have been the last procedure performed on the RHR system before plant startup.

Analysis: The licensee's failure to adequately implement RHR system operating procedure OP/1A/6200/004, "Shutdown and Alignment for Standby Readiness," prior to plant startup was a PD. The PD was determined to be more than minor because it was associated with the configuration control attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the performance deficiency resulted in the breaker for the 1B RHR pump loop suction valve being left open and the 1B train of ECCS being inoperable for greater than its TS allowed outage time. The inspectors evaluated the significance of the finding using IMC 0609 Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 1, Section B and determined the finding to be of very low safety significance (Green). Specifically, the finding did not represent an actual loss of function of at least a single train for greater than its TS allowed outage time because 1ND37A (redundant ND 1B pump suction from NC Loop C) was able to provide the required permissive signal to open 1ND136B (ND supply to NI pump 1B). The performance deficiency had a cross-cutting aspect of teamwork in the area of human performance because operations did not communicate and coordinate activities associated with the RHR system to ensure nuclear safety is maintained. (H.4).

Enforcement: TS 5.4.1.a, "Procedures," requires, in part, that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide (RG) 1.33, Revision 2, Appendix A, dated February 1978. RG 1.33 Appendix A, Section 3, "Procedures for Startup, Operation, and Shutdown of Safety-Related PWR Systems," requires procedures for operation of the emergency core cooling system. Procedure OP/1A/6200/004, "Operation of Residual Heat Removal System," is the plant procedure for startup, operation, and shutdown of the RHR system.

Contrary to the above, on December 12, 2015, the licensee failed to adequately implement procedures for operation of the RHR system as required by Section 3 of RG 1.33. Specifically the licensee failed to align the RHR system for standby readiness prior to plant startup. This resulted in the breaker for the 1B RHR pump loop suction valve being left open during plant startup and the 1B train of ECCS being inoperable for greater than its TS allowed outage time. As a corrective action, the licensee closed the

breaker and restored operability of the 1B train of ECCS. Because this violation was of very low safety significance and was entered into the licensee's corrective action program as CR 2014866, this violation is being treated as a NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV05000413/2016002-01, "Failure to Adequately Implement RHR Operating Procedure"

1R18 Plant Modifications (71111.18)

a. Inspection Scope

The inspectors verified that the plant modification listed below did not affect the safety functions of important safety systems. The inspectors confirmed the modification did not degrade the design bases, licensing bases, and performance capability of risk significant structures, systems and components. The inspectors also verified modifications performed during plant configurations involving increased risk did not place the plant in an unsafe condition. Additionally, the inspectors evaluated whether system operability and availability, configuration control, post-installation test activities, and changes to documents, such as drawings, procedures, and operator training materials, complied with licensee standards and NRC requirements. In addition, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with modifications. Documents reviewed are listed in the attachment.

- EC 403946, "LD Tubing from Main Lube Oil Header to Lube Oil Pump Suction"

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors either observed post-maintenance testing or reviewed the test results for the maintenance activities listed below to verify the work performed was completed correctly and the test activities were adequate to verify system operability and functional capability.

- operability performance test of 1A CA pump following PMs, April 14, 2016
- loaded surveillance test of the 1A DG following connecting rod bearing replacement, April, 21, 2016
- functional operation of the 2B CA pump following PMs, May 4, 2016
- operability performance test of the Unit 2 turbine driven CA pump following PMs, June 2, 2016
- operability performance test of the Unit 2 centrifugal charging pump 2B following bearing replacement

The inspectors evaluated these activities for the following:

- acceptance criteria were clear and demonstrated operational readiness

- effects of testing on the plant were adequately addressed
- test instrumentation was appropriate
- tests were performed in accordance with approved procedures
- equipment was returned to its operational status following testing
- test documentation was properly evaluated

Additionally, the inspectors reviewed a sample of corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with post-maintenance testing. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors reviewed the five surveillance tests listed below and either observed the test or reviewed test results to verify testing adequately demonstrated equipment operability and met technical specification and current licensing basis. The inspectors evaluated the test activities to assess for preconditioning of equipment, procedure adherence, and equipment alignment following completion of the surveillance. Additionally, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with surveillance testing. Documents reviewed are listed in the attachment.

Routine Surveillance Tests

- PT/1/A/4350/002 A, "Diesel Generator 1A Operability Test," (24 hour run)
- PT/2/A/4350/002 A, "Diesel Generator 2A Operability Test," (24 hour run)
- PT/2/A/4450/005 A, "Hydrogen Skimmer Fan/Containment Air Return Fan 2A Performance Test"
- PT/0/A/4150/003 A, "NSSS Thermal Outputs," (Unit 1)

In-Service Tests (IST)

- PT/1/A/4200/004 C, "Containment Spray Pump 1B Performance Test"

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation (71114.06)

a. Inspection Scope

The inspectors observed the emergency preparedness drill conducted on May 26, 2016. The inspectors observed licensee activities in the simulator and/or technical support center to evaluate implementation of the emergency plan, including event classification, notification, and protective action recommendations. The inspectors evaluated the licensee's performance against criteria established in the licensee's procedures. Additionally, the inspectors attended the post-exercise critique to assess the licensee's effectiveness in identifying emergency preparedness weaknesses and verified the identified weaknesses were entered in the corrective action program. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

a. Inspection Scope

The inspectors reviewed a sample of the performance indicator (PI) data, submitted by the licensee, for the Unit 1 and Unit 2 PIs listed below. The inspectors reviewed plant records compiled between April 2015 and March 2016 to verify the accuracy and completeness of the data reported for the station. The inspectors verified that the PI data complied with guidance contained in Nuclear Energy Institute 99-02, "Regulatory Assessment Performance Indicator Guideline," and licensee procedures. The inspectors verified the accuracy of reported data that were used to calculate the value of each PI. In addition, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with PI data. Documents reviewed are listed in the attachment.

Cornerstone: Mitigating Systems

- high pressure injection system
- emergency AC power system
- heat removal system

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Routine Review

The inspectors screened items entered into the licensee's corrective action program to identify repetitive equipment failures or specific human performance issues for follow-up. The inspectors reviewed problem identification program reports, attended screening meetings, or accessed the licensee's computerized corrective action database.

.2 Semi-Annual Trend Review

a. Inspection Scope

The inspectors reviewed issues entered in the licensee's corrective action program and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors focused their review on repetitive equipment issues and human performance trends, but also considered the results of inspector daily problem identification program report screenings, licensee trending efforts, and licensee human performance results. The review nominally considered the six month period of January 2016 through June 2016, although some examples extended beyond those dates when the scope of the trend warranted. The inspectors compared their results with the licensee's analysis of trends. Additionally, the inspectors reviewed the adequacy of corrective actions associated with a sample of the issues identified in the licensee's trend reports. The inspectors also reviewed corrective action documents that were processed by the licensee to identify potential adverse trends in the condition of structures, systems, and/or components as evidenced by acceptance of long-standing non-conforming or degraded conditions. Documents reviewed are listed in the attachment.

b. Findings and Observations

No findings were identified.

.3 Annual Followup of Selected Issues

a. Inspection Scope

The inspectors conducted a detailed review of problem identification program report CR 2021799, "1A DG connecting rod bearing #6 found rotated."

The inspectors evaluated the following attributes of the licensee's actions:

- complete and accurate identification of the problem in a timely manner
- evaluation and disposition of operability and reportability issues
- consideration of extent of condition, generic implications, common cause, and previous occurrences
- classification and prioritization of the problem
- identification of root and contributing causes of the problem
- identification of any additional condition reports
- completion of corrective actions in a timely manner

Documents reviewed are listed in the attachment.

b. Findings and Observations

Introduction: An NRC identified Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified for the licensee's failure to implement effective corrective actions to prevent repetition of a significant condition adverse to quality regarding the connecting rod bearing rotations on the 1A DG. Specifically, the number 6 connecting rod was found rotated approximately 190 degrees following a 24 hour diesel run.

Description: On April 19, 2016, the licensee discovered that the 1A DG number 6 connecting rod bearing had rotated approximately 190 degrees during a routine inspection following a 24 hour diesel surveillance. The licensee immediately replaced the number 6 bearing resulting in approximately 60 hours of unavailability.

The 1A number 6 bearing had previously rotated in 2014 along with additional bearings on the 1A and 1B diesel generator which prompted the licensee to perform a root cause investigation. The licensee concluded that the cause of the bearing rotations were a result of a combination of factors each contributing to a loss of margin to the bearing's resistance to rotate during normal operation. The most significant of these factors were lower yield strength and elastic limits in replacement bearings, low standby lube oil temperatures in the stagnant portion of the lube oil system, and an oversized bore in the 1A number 6 connecting rod.

The investigation of the most recent rotation revealed that voiding was occurring in the suction piping of the engine driven lube oil pump and that this void contributed to a slower than expected time for the lube oil to achieve operating pressure during starting and thus allowing the crank pin to "grab" the bearing and rotate it. The licensee found that the vendor drawing for the Enterprise diesels showed an oil line from the standby lube oil pump to the suction of the engine driven pump designed to keep the suction pipe full of oil; however, the Catawba Enterprise diesels were missing this feature. This discrepancy was not identified during the 2014 root cause investigation even though the configuration of the Catawba diesel generator lube oil system was a primary focus item, and was within the licensee's ability to identify and correct at that time. As a result, reduced bearing lubrication during the initial moments of the 1A diesel start contributed to the continued rotation of the number 6 connecting rod bearing. The licensee has subsequently implemented an engineering change to install the lube oil keep fill line on all four Catawba DGs, consistent with the Enterprise diesel engine design.

Analysis: The licensee's failure to identify a lubricating oil design discrepancy during the root cause investigation for 1A and 1B DG bearing rotations in 2014 was a PD. The PD was more than minor because it was associated with the equipment performance attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that that respond to initiating events to prevent undesirable consequences. Specifically, the rotation of the 1A DG number 6 bearing resulted in approximately 60 hours of unavailability to replace the bearing. The finding was determined to be of very low safety significance, Green, based on the Phase 1 screening criteria found in IMC 609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," issued June 19, 2012, as the finding did not

represent a loss of a system and/or function, and did not represent an actual loss of function of at least a single train for greater than its TS allowed outage time. This finding had a cross-cutting aspect of evaluation, as described in the problem identification and resolution cross-cutting area because the licensee failed to fully evaluate diesel lube oil system discrepancies that contributed to DG connecting rod bearing rotations during the root cause investigation of previous bearing rotation events in 2014. (P.2)

Enforcement: 10 CFR 50 Appendix B, Section XVI, "Corrective Action," required that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. Contrary to the above, the licensee failed to implement effective corrective actions to preclude repetition of a significant condition adverse to quality regarding the 1A DG number 6 connecting rod bearing rotations on April 19, 2016. The licensee replaced the rotated bearing and implemented modifications on all four Catawba DGs to minimized voiding in the engine driven lube oil pump suction piping. Because the inadequate corrective action measures were of very low safety significance and have been entered into the licensee's corrective action program (CR 2021799), this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. (NCV 05000413/2016002-02: "Failure to Implement Effective Corrective Actions to Prevent Diesel Generator Connecting Rod Bearing Rotations")

4OA3 Follow-up of Events and Notices of Enforcement Discretion

.1 (Closed) Licensee Event Report (LER) 05000413/2016-001-00, Mispositioned Breaker for Residual Heat Removal Loop Suction Results in Inoperable Train of Emergency Core Cooling

a. Inspection Scope

On March 28, 2016, while performing the 1B train ECCS cold leg recirculation interlock test, operators discovered that breaker 1EMXD-F02A for the 1B RHR pump loop suction valve (1ND-36B) was incorrectly positioned open. With this breaker open, 1ND36B could not provide a permissive signal to open valve 1ND136B, ND supply valve to the 1B NI pump, for cold leg recirculation, rendering the 1B train of ECCS inoperable. The licensee's investigation determined that the breaker was inadvertently left open on December 12, 2015 when operators were concurrently performing two separate procedures on the 1B train of RHR system. Ineffective coordination of the RHR pressure boundary leakage test and alignment of the RHR system for standby readiness caused the breaker misposition. The breaker misposition resulted in a condition prohibited by TS 3.5.2, "ECCS-Operating" and 3.8.1, "AC Sources-Operating." This was also reported as a condition that could have prevented the fulfillment of a safety function for Unit 1 ECCS while the 1A DG was inoperable for greater than 4 hours while the breaker was mispositioned. The licensee closed the breaker to restore operability of the 1B train of ECCS and entered this issue into their corrective action program as CR 2014866. The inspectors reviewed the corrective actions and determined that they were adequate. The enforcement aspects of this LER are discussed in Section 1R15. This LER is closed.

b. Findings

No findings were identified.

4OA5 Other Activities

Operation of an Independent Spent Fuel Storage Installation (60855.1)

a. Inspection Scope

The inspectors performed a walkdown of the onsite independent spent fuel storage installation (ISFSI) and monitored the activities associated with the dry fuel storage campaign completed on May 17, 2016 (cask 79). The inspectors observed the loading activities to verify that the licensee recorded and maintained the location of each fuel assembly placed in the ISFSI. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On July 14, 2016, the resident inspectors presented the inspection results to Mr. Tom Simril and other members of the licensee's staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

S. Andrews, Regulatory Affairs Engineer
T. Arlow, Emergency Planning Manager
M. Carwile, Chemistry Manager
C. Fletcher, Regulatory Affairs Manager
B. Foster, Operations Manager
K. Henderson, Site Vice-President
T. Jenkins, Maintenance Manager
L. Keller, General Manager Nuclear Engineering
B. Leonard, Training Manager
K. Phillips, Work Management Manager
T. Simril, Plant Manager
J. Smith, Radiation Protection Manager
J. Schell, Corporate Nuclear Engineering
S. West, Director, Nuclear Plant Security

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000413/2016002-01	NCV	Failure to Adequately Implement RHR Operating Procedure [Section 1R15]
05000413/2016002-02	NCV	Failure to Implement Effective Corrective Actions to Prevent Diesel Generator Connecting Rod Bearing Rotations [Section 4OA2]

Closed

05000413/2016-001-00	LER	Mispositioned Breaker for Residual Heat Removal Loop Suction Results in Inoperable Train of Emergency Core Cooling [Section 4OA3]
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LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

OP/0/B/6700/015, "Weather Related Activities"
PT/0/B/4700/039, "Hot Weather Protection"
AP/1(2)/A/5500/037, "Generator Voltage and Electric Grid Disturbances"
CNC-1381.06-00-0062, "Degraded Grid Voltage Alarm Setpoints for Real Time Contingency Analysis Initiation"
Duke Energy Nuclear Switchyard Interface Agreement
Duke Energy response to GL 2006-02 dated March 30, 2006
Catawba Action Register for Hot Weather Protection

Section 1R04: Equipment Alignment

OP/1/A/6250/002, "Auxiliary Feedwater System"
OP/1/A/6350/002, "Diesel Generator Operation"
CN-2592-01.00, "Flow Diagram of Auxiliary Feedwater System" (Unit 2)

Section 1R05: Fire Protection

AD-EG-ALL-1520, "Transient Combustible Control"
Fire Brigade Response Strategies for Safety Related Areas
PT/0/A/4400/001P, "Inspection of Portable Fire Extinguishers"
Fire Strategy Fire Area 13, "Auxiliary Building 577 level, Unit 1 Electrical Penetration Room"
Fire Strategy Fire Area 47, "Unit 2 Spent Fuel Pool Purge Unit, "
Fire Strategy Fire Area 23, "Unit 2 Spent Fuel Pool"
Fire Strategy Fire Area 30, "RN Pump Structure"
CN-1209-10.17, "Fire Protection Equipment, Nuclear Service Water Pump Structure"

Section 1R06: Flood Protection Measures

UFSAR Section 3.6.1, "Postulated Piping Failures in Fluid Systems Inside and Outside Containment"
CNS-1465.00-00-0020, "Design Basis Specification for Flooding from Internal Sources"
CNS-1565.WL-00-0001, "Design Basis Specification for the Liquid Waste (WL) System"
Drawing CN-1938-06, "Electrical Equipment Layout Outdoor Area"

Section 1R11: Licensed Operator Requalification

CPE-08, "Crew Performance Evaluation," 2/16/16

Section 1R12: Maintenance Effectiveness

1998431, Maintenance Rule A(3) Self-Assessment, 3/17/2016

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Clearance PRT-1-16-1A-CA PMP PM-0079
AD-WC-ALL-0200, "On-line Work Management"
Weekly Risk Profile, UNIT 1, A Train Channel III, 16W15
Weekly Risk Profile, Unit 2, A Train Channel I, 16W16
Protection Plan for 2A DG OOS, Yellow risk, AH 1EBB critical plan

Section 1R15: Operability Evaluations

OP/1/A/6200/004, "Residual Heat Removal System"
PT/T/A/4200/001, "Reactor Coolant System Pressure Boundary Valve Leak Rate Test"

Pioneer Motor Bearing Engineering Report, "Preliminary Assessment of Bearing Operation After Rotation of an Enterprise Engine," 27 April 2016
 Ricardo Report RD16/128801.2, "Connecting Rod Bearing Analysis," June 1, 2016

Section 1R18: Plant Modifications

EC 403946, "LD Tubing from Main Lube Oil Header to Lube Oil Pump Suction"

Section 1R19: Post-Maintenance Testing

OP/1/A/6250/002, "Auxiliary Feedwater System"
 PT/2/A/4250/003, "Turbine Driven Auxiliary Feedwater Pump #2 Performance Test"
 PT/2/A/4200/007, "Centrifugal Charging Pump 2B Test"
 PT/2/A/4206/006, "Leak Determination for the NV System"

Section 1R22: Surveillance Testing

PT/1/A/4350/002 A, "Diesel Generator 1A Operability Test," (24 hour run)
 PT/2/A/4350/002 A, "Diesel Generator 2A Operability Test," (24 hour run)
 PT/2/A/4450/005 A, "Hydrogen Skimmer Fan/Containment Air Return Fan 2A Performance Test"
 PT/0/A/4150/003 A, "NSSS Thermal Outputs," (Unit 1)
 PT/1/A/4200/004 C, "Containment Spray Pump 1B Performance Test"

Section 1EP6: Drill Evaluation

CNS Drill Control Package and Scenario Manual, May 26, 2016
 RP/0/A/5000/001, "Classification of Emergency"
 Nuclear Power Plant Emergency Notification Forms, ERO Drill messages 1-5, 5/26/16

Section 4OA1: Performance Indicator Verification

NSD 225, "NRC Performance Indicators"
 NEI 99-02, "Regulatory Assessment Performance Indicator Guideline"
 Catawba Master File CN: 854.02-1, "MSPI Emergency AC Power"
 Catawba Master File CN: 854.02-4, "MSPI Safety Injection"
 Catawba Master File CN: 854.02-3, "MSPI Heat Removal"

Section 4OA2: Problem Identification and Resolution

CR 2021799, 1A DG con rod bearing #6 found rotated
 Root Cause Analysis, PIP C-14-2352, 1A and 1B emergency diesel connecting rod bearing rotations
 PIP C-06-7946, During DG 1A break-in run, diesel tripped on high vibration

Section 4OA5: Other Activities

MP/1/A/7650/281, "Unit 1 Loading Spent Fuel into MAGNASTOR Cask"
 MP/1/A/7650/281 A, "Unit 1 MAGNASTOR Contingencies"