



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

February 7, 2020

Mr. John Dent, Jr.
Vice President-Nuclear and CNO
Nebraska Public Power District
Cooper Nuclear Station
72676 648A Avenue
P.O. Box 98
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION – INTEGRATED INSPECTION
REPORT 05000298/2019004

Dear Mr. Dent:

On December 31, 2019, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Cooper Nuclear Station. On January 21, 2020, the NRC inspectors discussed the results of this inspection with Mr. J. Dent, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

Two findings of very low safety significance (Green) are documented in this report. Both of these findings involved violations of NRC requirements. One Severity Level IV violation without an associated finding is also documented in this report. We are treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violations or the significance or severity of the violations documented in this inspection report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement; and the NRC Resident Inspector at Cooper Nuclear Station.

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 U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; and the NRC Resident Inspector at Cooper Nuclear Station.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Jason W. Kozal, Chief
Reactor Projects Branch C
Division of Reactor Projects

Docket No. 05000298
License No. DPR-46

Enclosure:
As stated

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COOPER NUCLEAR STATION – INTEGRATED INSPECTION REPORT 05000298/2019004 – February 7, 2020

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**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Number: 05000298

License Number: DPR-46

Report Number: 05000298/2019004

Enterprise Identifier: I-2019-004-0003

Licensee: Nebraska Public Power District

Facility: Cooper Nuclear Station

Location: Brownville, NE

Inspection Dates: October 1, 2019, to December 31, 2019

Inspectors: M. Hayes, Operations Engineer
A. Patz, Acting Resident Inspector
G. Pick, Acting Resident Inspector
D. Proulx, Senior Project Engineer
M. Stafford, Acting Senior Resident Inspector
P. Vossmar, Senior Resident Inspector

Approved By: Jason W. Kozal, Chief
Reactor Projects Branch C
Division of Reactor Projects

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee’s performance by conducting an integrated inspection at Cooper Nuclear Station, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC’s program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

List of Findings and Violations

Failure to Correct Degraded Reactor Building Flood Seals			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000298/2019004-01 Open/Closed	None (NPP)	71111.12
<p>The inspectors identified a Green finding and associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” for the licensee’s failure to assure that deficient reactor building penetration flood seals were promptly corrected between June 25, 2010, and October 26, 2019. Specifically, the licensee failed to correct three degraded penetration flood seals in the northeast quad of the reactor building, which resulted in groundwater in-leakage on October 3, 2019, that led to an electrical ground on the 125 Vdc system, wetted several reactor core isolation cooling components, and adversely affected portions of the reactor core isolation cooling system. Notably, after the penetrations were discovered leaking in 2010, the licensee closed a planned work order with no action taken, and when discovered again in 2012, the licensee inappropriately determined the degraded penetration seals could be left “use-as-is.”</p>			

Failure to Identify and Correct Degraded Reactor Building Southeast Quad Fan Coil Unit Performance			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000298/2019004-02 Open/Closed	[H.14] - Conservative Bias	71152
<p>The inspectors identified a Green finding and associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” for the licensee’s failure to assure that reactor building southeast quad fan coil unit FC-R-1E degraded performance was promptly identified and corrected after failure of its twin northeast quad fan coil unit FC-R-1F on August 1, 2017. Specifically, during the 2017 extent of condition review, the licensee stated that fan coil unit FC-R-1E had the same design of coil that was found to be deficient in fan coil unit FC-R-1F, noted a declining trend of fan flow, observed that fan performance had been marginal, and concluded that efficacious actions to improve air flow had not been taken; however, the licensee failed to take corrective action to address the deficient condition. As a result, during the next fan coil unit FC-R-1E surveillance test on August 14, 2019, the fan failed to meet its air flow acceptance criteria, which resulted in unplanned inoperability of the supported core spray B system.</p>			

Safety Relief Valve Lift Settings Outside of Technical Specifications Required Setpoints			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Not Applicable	Severity Level IV NCV 05000298/2019004-03 Open/Closed	Not Applicable	71153
A self-revealed, Severity Level IV non-cited violation of Technical Specification 3.4.3, "Safety/Relief Valves and Safety Valves," was identified when the licensee discovered, through as-found test results, that three of the eight safety relief valve assemblies that were removed during the fall 2018 outage failed to lift within the technical specifications lift setpoint requirements.			

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000298/2018-003-01	Safety Valve Failure Results in Loss of Safety Function	71153	Closed
LER	05000298/2019-001-01	Valve Test Failures Result in a Condition Prohibited by Technical Specifications and a Loss of Safety Function	71153	Closed

PLANT STATUS

Cooper Nuclear Station began the inspection period at rated thermal power. On November 15, 2019, the unit was down powered to 70 percent for a control rod sequence exchange. The plant was returned to rated thermal power on November 16, 2019, and remained at or near rated thermal power for the remainder of the inspection period.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors performed plant status activities described in IMC 2515, Appendix D, "Plant Status," and conducted routine reviews using IP 71152, "Problem Identification and Resolution." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.01 - Adverse Weather Protection

Seasonal Extreme Weather Sample (IP Section 03.02) (1 Sample)

- (1) The inspectors evaluated readiness for seasonal extreme weather conditions prior to the onset of seasonal cold temperatures for the following systems:
 - 125 Vdc
 - 250 Vdc
 - Standby gas treatment

Impending Severe Weather Sample (IP Section 03.03) (1 Sample)

- (1) The inspectors evaluated readiness for impending adverse weather conditions for a tornado warning for Nemaha County on October 1, 2019.

71111.04Q - Equipment Alignment

Partial Walkdown Sample (IP Section 03.01) (2 Samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

- (1) Division 1 residual heat removal service water during Division 2 residual heat removal service water planned maintenance on October 21, 2019
- (2) Division 2 residual heat removal service water on November 14, 2019

71111.05Q - Fire Protection

Quarterly Inspection (IP Section 03.01) (4 Samples)

The inspectors evaluated fire protection program implementation in the following selected areas:

- (1) Auxiliary relay room, elevation 903 feet 6 inches, on October 10, 2019
- (2) Control building basement, elevation 859 feet, on October 21, 2019
- (3) Main feedwater pump room, elevation 881 feet, on October 23, 2019
- (4) Reactor protection system motor generator set room, elevation 903 feet 6 inches, on November 26, 2019

71111.11A - Licensed Operator Requalification Program and Licensed Operator Performance

Requalification Examination Results (IP Section 03.03) (1 Sample)

- (1) The inspectors reviewed and evaluated the licensed operator examination failure rates for the requalification annual operating exam administered on December 9, 2019.

71111.11B - Licensed Operator Requalification Program and Licensed Operator Performance

Licensed Operator Requalification Program (IP Section 03.04) (1 Sample)

- (1) Biennial Requalification Written Examinations

The inspectors evaluated the quality of the licensed operator biennial requalification written examination administered on December 9, 2019.

Annual Requalification Operating Tests

The inspectors evaluated the adequacy of the facility licensee's annual requalification operating test.

Administration of an Annual Requalification Operating Test

The inspectors evaluated the effectiveness of the facility licensee in administering requalification operating tests required by 10 CFR 55.59(a)(2), and that the facility licensee is effectively evaluating their licensed operators for mastery of training objectives.

Requalification Examination Security

The inspectors evaluated the ability of the facility licensee to safeguard examination material, such that the examination is not compromised.

Remedial Training and Re-examinations

The inspectors evaluated the effectiveness of remedial training conducted by the licensee and reviewed the adequacy of re-examinations for licensed operators who did not pass a required requalification examination.

Operator License Conditions

The inspectors evaluated the licensee's program for ensuring that licensed operators meet the conditions of their licenses.

Control Room Simulator

The inspectors evaluated the adequacy of the facility licensee's control room simulator in modeling the actual plant and for meeting the requirements contained in 10 CFR 55.46.

Problem Identification and Resolution

The inspectors evaluated the licensee's ability to identify and resolve problems associated with licensed operator performance.

71111.11Q - Licensed Operator Regualification Program and Licensed Operator Performance

Licensed Operator Performance in the Actual Plant/Main Control Room (IP Section 03.01) (1 Sample)

- (1) The inspectors observed and evaluated licensed operator performance in the control room during downpower activities including main steam isolation valve and stop valve testing on November 16, 2019.

Licensed Operator Regualification Training/Examinations (IP Section 03.02) (1 Sample)

- (1) The inspectors observed and evaluated a simulator scenario on October 22, 2019.

71111.12 - Maintenance Effectiveness

Routine Maintenance Effectiveness Inspection (IP Section 02.01) (1 Sample)

The inspectors evaluated the effectiveness of routine maintenance activities associated with the following equipment and/or safety significant functions:

- (1) Reactor core isolation cooling water intrusion on October 21, 2019

71111.13 - Maintenance Risk Assessments and Emergent Work Control

Risk Assessment and Management Sample (IP Section 03.01) (4 Samples)

The inspectors evaluated the risk assessments for the following planned and emergent work activities:

- (1) Reactor core isolation cooling signal conditioner modification on October 8, 2019
- (2) Residual heat removal service water B maintenance on October 22, 2019
- (3) Well water leak in the emergency station service transformer yard on November 8, 2019
- (4) Emergent service water inoperability on December 13, 2019

71111.15 - Operability Determinations and Functionality Assessments

Operability Determination or Functionality Assessment (IP Section 02.02) (6 Samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) Groundwater intrusion into several reactor core isolation cooling starter racks and indications of electrical grounds on the Division 1 125 Vdc system on October 4, 2019
- (2) Inservice test vibration data discrepancy for all large inservice test pumps on October 17, 2019
- (3) Emergency diesel generator 1 digital reference unit setting causes failed surveillance test on November 7, 2019
- (4) Service water booster pump A seal leakage on November 15, 2019
- (5) Service water pump B pump trip on November 22, 2019
- (6) Service water Division 2 discharge blockage on December 13, 2019

71111.18 - Plant Modifications

Temporary Modifications and/or Permanent Modifications (IP Section 03.01 and/or 03.02) (1 Sample)

The inspectors evaluated the following temporary modification:

- (1) Temporary modification to emergency diesel generator 2 and residual heat removal service water subsystem B to support system availability on December 30, 2019

71111.19 - Post-Maintenance Testing

Post-Maintenance Test Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the following post maintenance tests:

- (1) Post-maintenance test following reactor core isolation cooling signal conditioner modification on October 9, 2019
- (2) Residual heat removal service water pump B flow testing and leakage monitoring following maintenance on October 22, 2019
- (3) Emergency diesel generator starting air compressor operability test after battery replacement on October 23, 2019
- (4) High pressure coolant injection level switch test following replacement of the relay for valve HPCI-MO-017, emergency condensate storage tank pump suction valve, on October 29, 2019
- (5) Service water Division 2 post maintenance test following discharge flow blockage on December 13, 2019

71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

Surveillance Tests (other) (IP Section 03.01) (2 Samples)

- (1) Scram discharge volume level calibration and functional test on October 17, 2019
- (2) Reactor equipment cooling 2-year pump inservice test on November 14, 2019

71114.04 - Emergency Action Level and Emergency Plan Changes

Inspection Review (IP Section 02.01-02.03) (1 Sample)

- (1) The inspectors evaluated Cooper Nuclear Station Emergency Plan, Revision 74, on December 11, 2019. The licensee implemented Revision 74 on November 5, 2019, and submitted the revised emergency plan to the NRC on November 14, 2019. This evaluation does not constitute NRC approval.

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

MS06: Emergency AC Power Systems (IP Section 02.05) (1 Sample)

- (1) October 1, 2018 - September 30, 2019

MS07: High Pressure Injection Systems (IP Section 02.06) (1 Sample)

- (1) October 1, 2018 - September 30, 2019

MS08: Heat Removal Systems (IP Section 02.07) (1 Sample)

- (1) October 1, 2018 - September 30, 2019

MS09: Residual Heat Removal Systems (IP Section 02.08) (1 Sample)

- (1) October 1, 2018 - September 30, 2019

MS10: Cooling Water Support Systems (IP Section 02.09) (1 Sample)

- (1) October 1, 2018 - September 30, 2019

71152 - Problem Identification and Resolution

Annual Follow-up of Selected Issues (IP Section 02.03) (1 Sample)

The inspectors reviewed the licensee's implementation of its corrective action program related to the following issues:

- (1) Southeast quad fan coil unit failure during surveillance testing on November 4, 2019

71153 – Follow-up of Events and Notices of Enforcement Discretion

Event Report (IP Section 03.02) (2 Samples)

The inspectors evaluated the following licensee event reports (LERs):

- (1) LER 05000298/2018-003-01, Safety Valve Failure Results in Loss of Safety Function (ADAMS Accession No. ML19128A034). The inspectors determined that it was not reasonable to foresee or correct the cause discussed in the LER; therefore, no performance deficiency was identified. The inspectors also concluded that no violation of NRC requirements occurred.
- (2) LER 05000298/2019-001-01, Valve Test Failures Result in a Condition Prohibited by Technical Specifications and a Loss of Safety Function (ADAMS Accession No. ML19241A241). The circumstances surrounding this LER and an associated non-cited violation are documented in the Inspection Results section of this report.

INSPECTION RESULTS

Failure to Correct Degraded Reactor Building Flood Seals			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000298/2019004-01 Open/Closed	None (NPP)	71111.12
<p>The inspectors identified a Green finding and associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” for the licensee’s failure to assure that deficient reactor building penetration flood seals were promptly corrected between June 25, 2010, and October 26, 2019. Specifically, the licensee failed to correct three degraded penetration flood seals in the northeast quad of the reactor building, which resulted in groundwater in-leakage on October 3, 2019, that led to an electrical ground on the 125 Vdc system, wetted several reactor core isolation cooling components, and adversely affected portions of the reactor core isolation cooling system. Notably, after the penetrations were discovered leaking in 2010, the licensee closed a planned work order with no action taken, and when discovered again in 2012, the licensee inappropriately determined the degraded penetration seals could be left “use-as-is.”</p> <p><u>Description:</u> On September 20, 2019, the licensee entered their Emergency Procedure 5.1FLOOD, “Flood,” Revision 28, to address rising floodwaters on the Missouri River. On October 3, 2019, the licensee received control room alarms indicating that there was an electrical ground on the Division 1 125 Vdc battery charger A and 125 Vdc 1A bus. During investigation of the ground alarm, the licensee discovered groundwater in-leakage coming from three exterior wall penetrations in the northeast quad of the reactor building. The northeast quad houses the reactor core isolation cooling (RCIC) system and core spray (CS) A. The water was discovered dripping into two 250 Vdc starter rack panels for the RCIC vacuum priming pump and the RCIC gland seal condenser pump. Water was also dripping on the RCIC turbine steam admission valve operator, an essential component. Subsequent walkdowns by plant personnel identified water and continued leakage into a third terminal box, box TB203. Box TB203 houses multiple RCIC essential cables, including the cabling leading to the RCIC governor panel. Upon discovery of the in-leakage, the licensee diverted water from dripping on these locations, at which point the 125 Vdc 1A ground alarm cleared. The alarm for the ground on the 125 Vdc A charger remained locked in. Initially, the licensee</p>			

isolated power to the RCIC gland seal condensate pump and vacuum priming pump starter racks, but the ground on the Division 1 125 Vdc system remained. After initiating DC ground scouting activities, the licensee discovered that the ground was located on a limit switch associated with RCIC air operated steam line drip leg valve RCIC-AOV-AO35. This valve's cabling ran through box TB203. The licensee replaced the limit switch, dried the wetted electrical components, and resealed the leaking wall penetrations.

Following the event, the inspectors noted that the licensee had closed the issue from the corrective action program to the work management process. The inspectors reviewed previous instances – condition reports (CRs) and work orders (WOs) – where leakage from these penetrations was identified. The inspectors reviewed Condition Report CR-CNS-2010-04628, which identified active leakage from these penetrations, located at approximately the 895 feet elevation on the north wall of the northeast quad, above the fan coil unit. The inspectors noted that WO 4783927 directed workers to repair the in-leakage; however, there were no actual hours worked charged to the activity. In addition, confirmation notes for the task stated, “in-leakage is required for urethane grout to activate. Final confirmation, if required, will contact planner for revision.” The inspectors also reviewed Condition Report CR-CNS-2012-06131, and three related CRs that documented leakage from these penetrations. The inspectors noted that the corrective action associated with the penetrations included an evaluation stating that the degraded penetration seals could be left “use-as-is.”

The inspectors also discovered that NRC Information Notice (IN) 94-27, “Facility Operating Concerns Resulting from Local Area Flooding,” discussed key equipment concerns that occurred during the 1993 flood at Cooper Nuclear Station. The IN stated, “water leaking into the RCIC pump room was impinging on RCIC electrical components. Subsequently, an annunciator lit up indicating a ground in the RCIC 250 Vdc circuitry. This ground was apparently caused by water that had entered into some of the RCIC circuitry.” At the time of the 1993 flood, the licensee took action to reseal the penetrations following identification of this in-leakage. However, since the penetrations were again identified as leaking in 2010 and 2012 and no action was taken to correct the condition, the inspectors determined that the licensee had failed to promptly correct the adverse condition.

Corrective Actions: The licensee removed portions of the RCIC system from service until the ground could be identified, repaired the ground, dried the wetted components, and resealed the degraded flood seals.

Corrective Action References: Condition Reports CR-CNS-2019-05168 and CR-CNS-2019-05169

Performance Assessment:

Performance Deficiency: The licensee's failure to assure that deficient reactor building penetration flood seals were promptly corrected is a performance deficiency.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the protection against external factors 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. Specifically, the performance deficiency created an electrical ground on the 125 Vdc system, wetted several RCIC essential and nonessential components, and resulted in portions of the RCIC system being removed from service.

Significance: The inspectors assessed the significance of the finding using Appendix A, “The Significance Determination Process (SDP) for Findings At-Power.” The inspectors determined this finding was of very low safety significance (Green) because it: was not a design deficiency; did not represent a loss of system and/or function; did not represent an actual loss of function of at least a single train for longer than its technical specification allowed outage time; and did not result in the loss of a high safety-significant nontechnical specification train.

Cross-Cutting Aspect: Not Present Performance. No cross-cutting aspect was assigned to this finding because the inspectors determined the finding did not reflect present licensee performance.

Enforcement:

Violation: Title 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” requires, in part, measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly corrected.

Contrary to the above, between June 25, 2010, and October 26, 2019, the licensee failed to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances were promptly corrected. Specifically, the licensee failed to correct three deficient penetration flood seals in the northeast quad of the reactor building, which resulted in groundwater in-leakage on October 3, 2019, that led to an electrical ground on the 125 Vdc system, wetted several essential RCIC components, and adversely affected portions of the RCIC system. After the penetrations were discovered leaking in 2010, the licensee closed a planned work order with no action taken, and when discovered again in 2012, the licensee inappropriately determined the degraded penetration seals could be left “use-as-is.”

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

Failure to Identify and Correct Degraded Reactor Building Southeast Quad Fan Coil Unit Performance			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000298/2019004-02 Open/Closed	[H.14] - Conservative Bias	71152
The inspectors identified a Green finding and associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” for the licensee’s failure to assure that reactor building southeast quad fan coil unit FC-R-1E degraded performance was promptly identified and corrected after failure of its twin northeast quad fan coil unit FC-R-1F on August 1, 2017. Specifically, during the 2017 extent of condition review, the licensee stated that fan coil unit FC-R-1E had the same design of coil that was found to be deficient in fan coil unit FC-R-1F, noted a declining trend of fan flow, observed that fan performance had been marginal, and concluded that efficacious actions to improve air flow had not been taken; however, the licensee failed to take corrective action to address the deficient condition. As a			

result, during the next fan coil unit FC-R-1E surveillance test on August 14, 2019, the fan failed to meet its air flow acceptance criteria, which resulted in unplanned inoperability of the supported core spray B system.

Description: On August 1, 2017, reactor building northeast quad fan coil unit FC-R-1F failed its surveillance test due to not meeting fan flow acceptance criteria. The deficient design of the Aerofin coil in fan coil unit FC-R-1F is the subject of Non-Cited Violation 2017003-01 documented in Integrated Inspection Report 05000298/2017003 (ADAMS Accession No. ML17318A186). At the time of the failure of fan coil unit FC-R-1F, as part of an independent extent of condition review, the inspectors reviewed the trend of air flow performance for the twin southeast quad fan coil unit FC-R-1E. The inspectors noted that fan coil unit FC-R-1E had the same design of Aerofin coil. During their review, the inspectors found that from 1991 until the most recent test in August 2016, fan coil unit FC-R-1E had exhibited a clear declining air flow performance trend. Specifically, from 1991 to 2001, fan coil unit performance degraded from 8302 scfm to 7578 scfm. In 2001, the coil was replaced, but performance did not improve with the new Aerofin design of coil. It declined even further, immediately experiencing a drop from 7578 scfm prior to coil replacement, down to 7428 scfm during post-maintenance testing (PMT) of the new coil. Between 2001 and August 2016, fan flow continued to decline, dropping to 7231 scfm during the 2016 test – a value that gave little margin to the minimum surveillance test acceptance criterion of 6975 scfm. The inspectors noted that this was even less margin than its sister unit had prior to failure – fan coil unit FC-R-1F had exhibited a flow rate of 7360 scfm during the test performed 1.5 years prior to its failure.

Following review of the trend, the inspectors reviewed the licensee's extent of condition evaluation, which was part of the apparent cause evaluation (Revision 0) performed for the 2017 fan coil unit FC-R-1F failure. The inspectors noted that the extent of condition review recognized that the southeast fan coil unit FC-R-1E was vulnerable to the same design concerns as its twin since both had the same Aerofin coil. The extent of condition review stated that engineering had documented a declining air flow rate trend for fan coil unit FC-R-1E. It also stated that the fan coil unit had marginal air flow rate. It further stated that a preventive maintenance activity that drove periodic replacement of the coil had been discontinued. Finally, the extent of condition review concluded that "efficacious actions to improve the air flow rate on the SE quad fan coil unit is not apparent." The inspectors determined that fan coil unit FC-R-1E had exhibited deficient performance and was vulnerable to the same deficiency as the failed fan coil unit FC-R-1F. The inspectors noted that although the extent of condition review identified this vulnerability, there was no corrective action initiated to address the concern. Procedure 0-CNS-LI-118, "Cause Evaluation Process," Revision 0, defines "extent of condition" as the extent to which the condition is present in other plant processes, equipment, or human performance activities. It further states, "corrective actions must be taken to address vulnerabilities identified from an extent-of-condition review." The inspectors raised the concern about the lack of a corrective action for fan coil unit FC-R-1E to licensee management. As a result, in December 2017, Corrective Action 2017-04701-CA-013 was generated stating, "based on cause determination of the [northeast] quad fan coil unit, determine if additional actions are necessary for the [southeast] quad as extent of condition."

On August 14, 2019, the licensee performed surveillance testing of southeast quad fan coil unit FC-R-1E. This was the first surveillance test performed since August 17, 2016. During testing, the fan coil unit failed to meet surveillance test air flow acceptance criteria, with as found fan coil unit flow at 6956 scfm, compared to the procedural acceptance criterion of greater than or equal to 6975 scfm. The licensee initiated an operability evaluation for the

supported core spray (CS) B system and initiated action to clean the fan. A licensee design calculation stated that the fan coil unit could potentially be functional with flow as low as 6767 scfm, and the licensee intended to incorporate this information into their operability evaluation. However, following the fan cleaning, the southeast quad fan coil unit PMT air flow was measured at 6458 scfm. With these flow rates, the licensee determined that they could not justify operability, and as a result, CS B was declared inoperable. The licensee then created and implemented a work order to perform a full cooling coil cleaning and ventilation duct inspection and cleaning. Following the full cleaning, resultant air flow was 7111 scfm, which was above the limit of 6975 scfm, and the licensee declared the fan coil unit functional and CS B operable. The inspectors reviewed the original corrective action that had been generated to address the deficient fan coil unit FC-R-1E performance in 2017 and found that it had been closed to an evaluation and conclusion that “no corrective actions are required for FC-R-1E.” The inspectors determined that the licensee had failed to promptly correct a condition adverse to quality prior to failure of the fan coil unit and unplanned entry into a limiting condition for operation for CS B.

Corrective Actions: The licensee performed cleaning of the fan coil, fan blades, and duct work to restore fan coil unit FC-R-1E air flow rates above minimum surveillance criteria and increased coil cleaning preventive maintenance to a 3-year frequency.

Corrective Action References: Condition Report CR-CNS-2019-04317

Performance Assessment:

Performance Deficiency: The licensee’s failure to assure that deficient reactor building southeast quad fan coil unit performance was promptly identified and corrected is a performance deficiency.

Screening: The inspectors determined the performance deficiency 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 respond to initiating events to prevent undesirable consequences. Specifically, the performance deficiency resulted in unplanned inoperability of the supported CS B system.

Significance: The inspectors assessed the significance of the finding using Appendix A, “The Significance Determination Process (SDP) for Findings At-Power.” The inspectors determined this finding was of very low safety significance (Green) because it: was not a design deficiency; did not represent a loss of system and/or function; did not represent an actual loss of function of at least a single train for longer than its technical specification allowed outage time; and did not result in the loss of a high safety-significant nontechnical specification train.

Cross-Cutting Aspect: H.14 - Conservative Bias: Individuals use decision making-practices that emphasize prudent choices over those that are simply allowable. A proposed action is determined to be safe in order to proceed, rather than unsafe in order to stop. Specifically, after NRC inspectors challenged the lack of corrective action for fan coil unit FC-R-1E at the time of the August 2017 failure of fan coil unit FC-R-1F, the licensee generated a corrective action to address the deficient condition; however, this corrective action was closed to an inappropriate justification of why no action was necessary.

Enforcement:

Violation: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected.

Contrary to the above, between August 1, 2017, and August 14, 2019, the licensee failed to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances were promptly identified and corrected. Specifically, the licensee failed to assure that reactor building southeast quad fan coil unit FC-R-1E degraded performance was promptly identified and corrected after failure of its twin northeast quad fan coil unit FC-R-1F on August 1, 2017. In particular, during the 2017 extent of condition review, the licensee stated that fan coil unit FC-R-1E had the same design of coil that was found to be deficient in fan coil unit FC-R-1F, noted a declining trend of fan flow, observed that fan performance had been marginal, and concluded that efficacious actions to improve air flow had not been taken; however, the licensee failed to take corrective action to address the deficient condition. As a result, during the next fan coil unit FC-R-1E surveillance test on August 14, 2019, the fan failed to meet its air flow acceptance criteria, which resulted in unplanned inoperability of the supported CS B system.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

Safety Relief Valve Lift Settings Outside of Technical Specifications Required Setpoints			
Cornerstone	Severity	Cross-Cutting Aspect	Report Section
Not Applicable	Severity Level IV NCV 05000298/2019004-03 Open/Closed	Not Applicable	71153
A self-revealed, Severity Level IV non-cited violation of Technical Specification 3.4.3, "Safety/Relief Valves and Safety Valves," was identified when the licensee discovered, through as-found test results, that three of the eight safety relief valve assemblies that were removed during the fall 2018 outage failed to lift within the technical specifications lift setpoint requirements.			
<u>Description:</u> Licensee Event Report 05000298/2019-001-01, "Valve Test Failures Result in a Condition Prohibited by Technical Specifications and a Loss of Safety Function," (ADAMS Accession No. ML19241A241), was associated with three of the eight safety relief valves (SRVs) as-found setpoints being outside of the +/- 3 percent setpoint band required for their operability. This was discovered between March 4 and March 6, 2019, following as-found testing on all eight SRV assemblies that were removed during the refueling outage. The licensee determined that the three SRV pilot valves stuck due to corrosion bonding. The licensee determined that these three SRVs were inoperable for an indeterminate period of time from November 6, 2016, when the unit entered Mode 2 (beginning of operating cycle) to September 30, 2018, when the unit entered Mode 4 (beginning of refueling outage). The inspectors reviewed the licensee event report and determined that the report adequately documented the summary of the event including the cause and potential safety consequences. The inspectors also reviewed other documents that indicate that this type of failure is a known industry issue associated with this type of valve.			

Corrective Actions: The licensee replaced all eight of the SRV pilot valves with refurbished valves during the fall 2018 refueling outage. The currently installed valves were certified, tested, and as-left values were verified to be within +/- 1 percent of their setpoints. The licensee is tracking industry initiatives to address the known corrosion bonding phenomenon and is working on a technical specification amendment to address this issue.

Corrective Action References: Condition Reports CR-CNS-2019-01248, CR-CNS-2019-01277, and CR-CNS-2019-01300

Performance Assessment: The NRC determined this violation was not reasonably foreseeable and preventable by the licensee, and therefore, is not a performance deficiency. The inspectors determined that because the licensee received the refurbished valves after being inspected, certified, and tested to within +/- 1 percent of their setpoint values, the issue could not be reasonably foreseeable and preventable. Inspectors concluded that no performance deficiency exists. The licensee is aware of the industry issues of corrosion bonding with these valves. These issues are documented and actions are being taken through their corrective action program to address the issues.

Enforcement:

Severity: Traditional Enforcement is being used because there was no performance deficiency using the Interim Guidance for Dispositioning Severity Level IV Violations with No Associated Performance Deficiency (ADAMS Accession No. ML18158A220). This violation is characterized as a Severity Level IV non-cited violation based on its similarity to a Severity Level IV, Example 6.1.d.1, in the Enforcement Policy.

Violation: Cooper Nuclear Station Technical Specification 3.4.3, "Safety/Relief Valves (SRVs) and Safety Valves (SVs)," Condition A, requires that with one or more required SRVs or SVs inoperable, that the unit be in Mode 3 in 12 hours and Mode 4 in 36 hours. Contrary to the above, three required SRVs were inoperable from November 6, 2016, to September 30, 2018, and the unit did not enter Mode 3 and Mode 4 in 12 hours and 36 hours respectively.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On September 26, 2019, the inspectors presented the biennial requalification inspection results to Mr. J. Sullivan, General Manager Plant Operations, and other members of the licensee staff.
- On December 12, 2019, the inspectors presented the biennial requalification inspection results to Mr. J. Florence, Superintendent, Simulator and Training Support, and other members of the licensee staff.
- On December 12, 2019, the inspectors presented the Emergency Plan, Revision 74, inspection results to Mr. L. Mocnik, Manager, Emergency Preparedness, and other members of the licensee staff.
- On January 21, 2020, the inspectors presented the integrated inspection results to Mr. J. Dent, Site Vice President, and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.01	Corrective Action Documents	CR-CNS-	2019-00553, 2019-05337, 2019-05567, 2019-05578, 2019-05583	
71111.01	Miscellaneous	NPP1-PR-01	Station Blackout Coping Assessment for the Cooper Nuclear Station Final Report	2
71111.01	Procedures	0-BARRIER	Barrier Control Process	29
71111.01	Procedures	0-BARRIER-CONTROL	Control Building	7
71111.01	Procedures	0-PROTECT-EQP	Protected Equipment Program	50
71111.01	Procedures	2.2.38.2	Portable Heating System	17
71111.01	Procedures	5.10FLEX.24	Control Building Temporary Heating FLEX Operations	1
71111.01	Procedures	5.1FLOOD	Flood	28
71111.01	Procedures	5.1WEATHER	Operation During Weather Watches and Warnings	21
71111.01	Procedures	5.3SBO	Station Blackout	46
71111.01	Work Orders	WO	5285714	
71111.04Q	Drawings	2006, Sheet 4	Flow Diagram - Control Building Service Water System	61
71111.04Q	Procedures	2.2A.RHRSW.DIV1	RHR Service Water Booster Pump System Component Checklist (Div 1)	10
71111.04Q	Procedures	2.2B.RHRSW.DIV1	RHR Service Water Booster Pump System Instrument Valve Checklist (Div 1)	0
		2.2B.RHRSW.DIV2	RHR Service Water Booster Pump System Instrument Valve Checklist (Div 2)	0
71111.05Q	Corrective Action Documents	CR-CNS-	2019-06117, 2019-06523	
71111.05Q	Drawings	2016, Sheet 1	Flow Diagram – Fire Protection Turbine Generator Building	72
71111.05Q	Fire Plans	CNS-FP-224	Control Building Basement Floor, Elevation 882'-6"	5
71111.05Q	Fire Plans	CNS-FP-225	Control Building Auxiliary Relay Room Elevation 903'-6"	8
		CNS-FP-226	Control Building – RPS Room 1B	8
		CNS-FP-227	Control Building Corridor, Batt/Swgr Rms 1A, RPS Rm 1A	8
71111.05Q	Fire Plans	CNS-FP-243	Turbine Building Reactor Feed Pump Area, Elevation 882'-6"	6
71111.05Q	Fire Plans	CNS-FP-306	Appendix A Barrier Drawing – Cable Spreading Room	7
71111.05Q	Procedures	0-BARRIER-MAPS	Barrier Maps	10

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.05Q	Procedures	0.7.1	Control of Combustibles	40
71111.05Q	Procedures	6.FP.302	Automatic Deluge and Pre-action Systems Testing	28
71111.05Q	Procedures	6.FP.606	Fire Barrier/Penetration Seal Visual Examination	25
71111.05Q	Procedures	6.FP.608	License Required Firefighting Equipment Examination	28
71111.11B	Miscellaneous		Licensed Operator Reactivation Packages	
71111.11B	Miscellaneous		Annual and Biennial Exam Results	
71111.11B	Miscellaneous		Week 4 2019 RO Biennial Requalification Exam	
71111.11B	Miscellaneous		Remediation Test Overlap Tool	
71111.11B	Miscellaneous	Cycle 31 Core Reload Test (Simulator)	Reactor Core Performance Test	04/30/2019
71111.11B	Miscellaneous	Simulator Discrepancies	Simulator Discrepancies	08/08/2019
71111.11B	Miscellaneous	Transient Test ANSI 3.5 Required	Reactor SCRAM	Cycle 31
71111.11B	Miscellaneous	Transient Test ANSI 3.5 Required	Loss of Feedwater	Cycle 31
71111.11B	Procedures	0-EN-TQ-202	Simulator Configuration Control	9C2
71111.11B	Procedures	0-EN-TQ-210	Conduct of Simulator Training	9C3
71111.11B	Procedures	0-EN-TQ-217	Examination Security	6C1
71111.11B	Procedures	OTP813	Annual Operating Requalification Examination Development and Administration	13
71111.11B	Procedures	TPP 201	CNS Licensed Personnel Requalification Program	73
71111.11Q	Corrective Action Documents	CR-CNS-	2019-05945, 2019-05947, 2019-06523	
71111.11Q	Miscellaneous		Simulator Performance Mode #8 Expected Actions/Excellence Criteria	0
71111.11Q	Miscellaneous	SKL051-51-381	Performance Mode #8 Simulator Exercise Guide	0
71111.11Q	Procedures	2.0.3	Conduct of Operations	103
71111.11Q	Procedures	6.MS.201	Main Steam Isolation Valve Operability Test	24
71111.11Q	Procedures	6.RPS.302	Main Turbine Stop Valve Closure and Steam Valve Functional Test	59
71111.12	Corrective Action	CR-CNS-	2010-04628, 2012-06131, 2012-06474, 2012-06476, 2012-	

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Documents		06477, 2019-05168, 2019-05169, 2019-05174, 2019-05187, 2019-05221, 2019-05232,	
71111.12	Drawings	3059, Sheet 6	EE-PNL-AA3 125VDC Load & Fuse Schedule	17
71111.12	Drawings	CNS-BLDG-133	Penetration Drawing North Wall 881'9" Reactor Building	3
71111.12	Engineering Evaluations	EE 13-040	External Flooding Protection Features	0
71111.12	Miscellaneous		CNS In-service Testing Basis Document	12
71111.12	Miscellaneous	Information Notice 94-27	Facility Operating Concerns Resulting from Local Area Flooding	0
71111.12	Work Orders	WO	4783927, 5318928, 5318943	
71111.13	Corrective Action Documents	CR-CNS-	2019-05289, 2019-05293, 2019-05762, 2019-06302, 2019-06318	
71111.13	Miscellaneous		Protected Equipment List RCIC Week 1940	10/08/2019
71111.13	Miscellaneous		Protected Equipment List RHRSW B Pump	10/21/2019
71111.13	Miscellaneous		Protected Equipment List Service Water B Unplanned Inoperability	12/09/2019
71111.13	Miscellaneous	11672289	Notification	
71111.13	Miscellaneous	BCP-2019-0286	Barrier Control Permit	
71111.13	Procedures	0-BARRIER	Barrier Control Process	29
71111.13	Procedures	0-CNS-52	Control of Switchyard and Transformer Yard Activities at CNS	33
71111.13	Procedures	0-CNS-WM-104A	On-line Fire Risk Management Actions	5
71111.13	Procedures	0-PROTECT-EQP	Protected Equipment Program	46
71111.13	Work Orders	WO	5215734, 5288861, 5304020, 5315842, 5322336, 5329082, 5329777	
71111.15	Corrective Action Documents	CR-CNS-	2010-03689, 2010-05776, 2019-02462, 2019-04286, 2019-05168, 2019-05169, 2019-05174, 2019-05187, 2019-05221, 2019-05232, 2019-05403, 2019-05416, 2019-05421, 2019-05436, 2019-05689, 2019-05702, 2019-05705, 2019-05720, 2019-05801, 2019-05817, 2019-05830, 2019-05831, 2019-05851, 2019-05967, 2019-06019, 2019-06302, 2019-06339, 2019-06353, 2019-06388, 2019-06403, 2019-06518	
71111.15	Drawings	2006, Sheet 1	Flow Diagram Circulating, Screen Wash & Service Water Systems	90
71111.15	Drawings	2006, Sheet 2	Flow Diagram Circulating, Screen Wash & Service Water	49

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
			Systems	
71111.15	Drawings	2006, Sheet 3	Flow Diagram Circulating, Screen Wash & Service Water Systems	58
71111.15	Drawings	2006, Sheet 4	Flow Diagram Control Building Service Water System	61
71111.15	Drawings	2036, Sheet 1	Flow Diagram Reactor Building Service Water System	A6
71111.15	Drawings	2077	Flow Diagram – Diesel Gen. Bldg. Service Water, Starting Air, Fuel Oil, Sump System & Roof Drains	79
71111.15	Drawings	2120	Yard Circ & Service Water Piping Plan & Sections	21
71111.15	Drawings	3059, Sheet 6	EE-PNL-AA3 125VDC Load & Fuse Schedule	17
71111.15	Drawings	71756-D	28KXL – 1 Stage Bowl Assembly	1
71111.15	Drawings	G5-262-743, Sheet 1	Emergency Diesel Generator #1 Electrical Schematic	27
71111.15	Drawings	G5-262-743, Sheet 1A	Emergency Diesel Generator #1 Electrical Schematic	12
71111.15	Drawings	G5-262-743, Sheet 6A	Emergency Diesel Generator #1 Electrical Schematic	N07
71111.15	Miscellaneous	VM-1746	Woodward Composite Manual	7
71111.15	Work Orders	WO	5207490, 5318928, 5318943, 5329004, 5329085	
71111.18	Corrective Action Documents	CR-CNS-	2019-06322, 2019-06327, 2019-06470	
71111.18	Drawings	2077	Flow Diagram – Diesel Gen. Bldg. Service Water, Starting Air, Fuel Oil, Sump System & Roof Drains	79
71111.18	Miscellaneous	TCC 5328958	Diesel Generator Cooling Water Alternate Discharge Flow Path	0, 1
71111.18	Miscellaneous	TCC 5329190	RHR HX Alternate Discharge Flow Path	0
71111.18	Work Orders	WO	5328958, 5329005	
71111.19	Corrective Action Documents	CR-CNS-	2019-05528, 2019-05540, 2019-06543	
71111.19	Drawings	2044	High Pressure Coolant Injection and Reactor Feed Systems	77
71111.19	Procedures	6.2DG.105	Diesel Generator Starting Air Compressor Operability (IST) (Div 2)	25
71111.19	Procedures	6.2SW.101	Service Water Surveillance Operation (Div 2) (IST)	55
71111.19	Procedures	6.2SWBP.101	RHR Service Water Booster Pump Flow Test and Valve Operability Test (Div 2)	30

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.19	Procedures	6.HPCI.302	HPCI Suppression Chamber and ECST Water Level Channel Calibration	16
71111.19	Procedures	6.RCIC.102	RCIC IST and 92 Day Test	38
71111.19	Work Orders	WO	5209258, 5209753, 5210074, 5215734, 5315842, 5321520, 5321622	
71111.22	Miscellaneous		Vendor Manual VM-0217, 5800 Series Split Casing Pumps	6
71111.22	Miscellaneous		CNS Inservice Testing Program Basis Document	12.1
71111.22	Miscellaneous		CNS Fifth Interval Inservice Testing Program for Pumps and Valves	4
71111.22	Procedures	6.2REC.101	REC Surveillance Operation (IST)(DIV2)	19
71111.22	Procedures	6.2RPS.308	North SDV (Scram Discharge Volume) High Water Level Switches and Transmitters Examination and Channel Calibration (Div 2)	21
71111.22	Procedures	6.2RPS.310	South SDV High Water Level Switches and Transmitters Examination and Channel Calibration (Div 2)	19, 20
71111.22	Procedures	7.2.18	Reactor Building Closed Cooling Water Pump Maintenance	21
71151	Corrective Action Documents	CR-CNS-	2018-07872, 2019-05383	
71151	Miscellaneous		MSPI Derivation Reports	10/01/2018 - 09/30/2019
71151	Miscellaneous		CNS Station Logs	10/01/2018 - 09/30/2019
71151	Miscellaneous	NEI 99-02	Regulatory Assessment Performance Indicator Guideline	7
71151	Procedures	0-EN-LI-114	Performance Indicator Process	15C1
71151	Procedures	3-EN-DC-151	PSA Maintenance and Update	3C5
71152	Corrective Action Documents	CR-CNS-	2017-04701, 2019-04317, 2019-04336	
71152	Procedures	6.2HV.601	Air Flow Test of Fan Coil Unit FC-R-1E (Div 2)	7
71152	Work Orders	WO	5312924	
71153	Corrective Action Documents	CR-CNS-	2018-06301, 2018-08411, 2019-01248, 2019-01277, 2019-01300, 2019-02072	
71153	Drawings	7567F-010	Model 7567F 6x10 Relief Valve	N02
71153	Procedures	2.2.1	Nuclear Pressure Relief System	39
71153	Procedures	6.ADS.302	ADS Accumulator Functional Test	10

