



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION IV  
1600 EAST LAMAR BOULEVARD  
ARLINGTON, TEXAS 76011-4511

December 23, 2022

Mr. John Dent  
Vice President and Chief Nuclear Officer  
Nebraska Public Power District  
72676 648A Avenue, P.O. Box 98  
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION LICENSE RENEWAL PHASE 4 INSPECTION  
REPORT 05000298/2022011

Dear Mr. John Dent:

On November 18, 2022, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Cooper Nuclear Station. On November 17, 2022, the NRC inspectors discussed the results of this inspection with Mr. Khalil Dia and other members of your staff. The results of this inspection are documented in the enclosed report.

No findings or violations of more than minor significance were identified during this inspection.

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,

A handwritten signature in black ink, appearing to read "Nicholas H. Taylor".

Signed by Taylor, Nicholas  
on 12/23/22

Nicholas H. Taylor, Chief  
Engineering Branch 2  
Division of Operating Reactor Safety

Docket No. 05000298  
License No. DPR-46

Enclosure:  
As stated

cc w/ encl: Distribution via LISTSERV

COOPER NUCLEAR STATION LICENSE RENEWAL PHASE 4 INSPECTION REPORT  
05000298/2022011 DATED DECEMBER 23, 2022.

**DISTRIBUTION:**

SMorris, ORA  
JMonninger, ORA  
RLantz, DORS  
MHay, DORS  
DCylkowski, RC  
MFerdas, RIV/OEDO  
VDricks, ORA  
LWilkins, OCA  
TWengert, NRR  
AMoreno, RIV/OCA  
RAlexander, RSLO  
JJosey, DORS  
WSchaup, DORS  
DNani, DORS  
REaster, DORS  
ASiwy, DORS  
KChambliss, DORS  
AElam, DORS  
R4-DORS-IPAT  
R4Enforcement

DOCUMENT NAME: COOPER NUCLEAR STATION – LICENSE RENEWAL PHASE 4 INSPECTION REPORT  
05000298/2022011

ADAMS ACCESSION NUMBER: **ML22355A134**

SUNSI Review      ADAMS:       Non-Publicly Available       Non-Sensitive      Keyword:  
By:       Yes     No       Publicly Available       Sensitive

OFFICE	DORS/EB2	DORS/EB2	DORS/EB2			
NAME	GPICK	CSMITH	NTAYLOR			
SIGNATURE	GAP	WCS	NHT			
DATE	12/21/2022	12/21/2022	12/23/2022			

**OFFICIAL RECORD COPY**

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

Docket Number: 05000298

License Number: DPR-46

Report Number: 05000298/2022011

Enterprise Identifier: I-2022-011-0004

Licensee: Nebraska Public Power District

Facility: Cooper Nuclear Station

Location: Brownville, NE

Inspection Dates: November 14 to 18, 2022

Inspectors: J. Lee, Reactor Inspector  
G. Pick, Senior Reactor Inspector  
C. Smith, Senior Reactor Inspector

Approved By: Nicholas H. Taylor, Chief  
Engineering Branch 2  
Division of Operating Reactor Safety

Enclosure

## **SUMMARY**

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a license renewal phase 4 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**

No findings or violations of more than minor significance were identified.

### **Additional Tracking Items**

None.

## **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 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.

## **OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL**

### 71003 - Post-Approval Site Inspection for License Renewal

#### Post-Approval Site Inspection for License Renewal (1 Sample)

##### **71003 Phase 4 Inspection Activities**

NRC conducted this Phase 4 Inspection 8 years after the licensee entered the period of extended operation. The inspection confirmed that the licensee continued to meet their commitments, processed any commitment changes in accordance with their commitment management procedure, and evaluated implementation of aging management activities. The period of extended operation included the additional 20 years beyond the original 40-year licensed term. Cooper Nuclear Station began the period of extended operation after midnight on January 11, 2014. The inspectors determined that the licensee had not processed any commitment changes that impacted the programs selected for detailed review.

As part of the license extension, the licensee placed a description of their aging management programs in an updated final safety analysis report (UFSAR) supplement. Cooper Nuclear Station included their aging management program descriptions and commitments in Appendix K, "License Renewal Updated Safety Analysis Report Supplement." The licensee developed program implementing procedures or modified existing program procedures that described implementation of their aging management activities.

##### **2.1.1 Aboveground Steel Tanks Program**

This program manages the loss of material from external surfaces of outdoor, aboveground carbon steel tanks. This is accomplished by periodic visual inspection of external surfaces and taking thickness measurement of locations that are inaccessible for external visual inspection. The inspectors determined that the licensee included the following tanks in the program:

- Fire Protection Tank A
- Fire Protection Tank B
- Condensate Storage Tank A.

The inspectors verified that the licensee completed the required visual and thickness measurements of the aboveground steel tanks during the first 10 years of the period of extended operation.

The inspectors did not identify any issues with the licensee's implementation of the aboveground steel tanks aging management program.

### 2.1.3 Buried Piping and Tanks Inspection Program

This program conducts periodic and opportunistic inspections of the exterior of buried piping and tanks. The inspectors determined that the licensee included the following systems in their buried piping program: diesel generator fuel oil, standby gas treatment, high pressure coolant injection, service water, condensate makeup, and plant drains. For high pressure coolant injection, the licensee completed ultrasonic evaluation of the piping prior to entering the period of extended operation and during the last refueling outage (October 2022).

During this inspection the inspectors verified that the licensee reapplied external coatings after inspecting the exterior of the excavated buried piping. The licensee inspected a minimum of eight feet of exposed piping and utilized guided wave nondestructive examination to account for a minimum of two percent of linear piping. The inspectors verified that the licensee completed the required visual and ultrasonic inspections of the high risk buried piping during the first 10 years of the period of extended operation.

The inspectors reviewed the maintenance of the cathodic protection system. The licensee tested their cathodic protection system annually in accordance with NACE standards RP0285-2002, "Corrosion Control of Underground Storage Tank Systems by Cathodic Protection," and SP0169-2007, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems." The inspectors confirmed that the licensee maintained an average system availability above 90 percent and initiated condition reports to document faults with the system.

The inspectors did not identify any issues with the licensee's implementation of the buried pipe and tanks inspection aging management program.

### 2.1.9 BWR Vessel Internals Program

This program implements the recommendations of the staff-approved Boiling Water Reactor Vessel and Internals Program (BWRVIP). The effects of aging were managed through inspection, flaw evaluation, repair, and monitoring and control of reactor coolant water chemistry.

During this inspection, the inspectors verified that previous deviations, DD-43 and DD-70, to BWRVIP had been corrected. Deviation disposition DD-43, variance from BWRVIP-25 Guidance for Inspection of Core Plate Bolts was resolved by incorporating BWRVIP-25, Revision 1-A into the program. The deviation disposition, DD-70, for missed BWRVIP-41, Rev 3 jet pump and BWRVIP-18, Rev 1-A core spray inspections was archived as the deviation was resolved. The inspectors verified that the recommendations of EPRI BWR Water Chemistry Guidelines, BWRVIP-190 Rev

1 were incorporated into site procedures.

The inspectors did not identify any issues with the licensee's implementation of the BWR vessel internals program.

#### 2.1.10 Containment Inservice Inspection Program

This program manages loss of material and cracking for the primary containment Class MC pressure retaining components and their integral attachments including the associated bolted connections.

During this inspection, the inspectors focused on licensee inspections and evaluations of the wetted portion of the steel containment shell. The licensee revised their commitments (refer to Inspection Report 05000298/2017008 (ADAMS ML17326A215)) from recoating their torus after entering the period of extended operation to increased monitoring of the torus to identify degrading conditions. Specifically, divers clean and inspect 100 percent of the wetted portion of the torus every 4 years. The inspectors determined that the licensee coated any newly identified pits and verified the condition of other identified pits during each inspection. The last inspection occurred in October 2020.

Further, the licensee transferred the outline of their test pads to the exterior of the torus for bays 3, 5, 6, and 9 to allow them to ultrasonically examine for loss of material every two years. The inspectors confirmed that the licensee performed appropriate calculations to determine the number of years until the wetted portion of the torus would need to be recoated. The inspectors determined that the calculations demonstrated that the torus would not need a recoat until well after the next 4-year torus inspection.

The inspectors did not identify any issues with the licensee's implementation of containment Inservice inspection program.

#### 2.1.12 Diesel Fuel Monitoring Program

This program ensures that adequate diesel fuel quality is maintained to prevent loss of material in fuel systems. Exposure to fuel oil contaminants such as water and microbiological organisms is minimized by periodic sampling and analysis, draining and cleaning of tanks, and verifying the quality of new fuel oil before its introduction into the storage tanks.

The licensee periodically samples the diesel fuel oil day tanks and the diesel fire pump fuel oil storage tank. Additionally, the licensee performs visual inspections – including ultrasonic measurements of the tank bottoms – for the diesel fuel oil day tanks, the diesel fuel oil storage tanks, and the diesel fire pump fuel oil storage tank. Finally, the licensee tests new fuel oil during receipt, and ensures it meets the required specifications before loading into the associated storage tanks.

During this inspection, the inspectors walked down the accessible fuel oil storage tanks, reviewed the procedures, completed work orders, fuel oil chemistry results, and reviewed the ultrasonic measurements associated with the diesel fuel oil storage tanks and diesel fire pump fuel oil storage tanks.

The inspectors did not identify any issues with the licensee's implementation of the diesel fuel monitoring program.

#### 2.1.18 Flow-Accelerated Corrosion Program

This program predicts, detects, and monitors flow-accelerated corrosion in plant piping and other pressure retaining components. The program is based on EPRI recommendations in NSAC-202L for an effective flow-accelerated corrosion program.

During this inspection, the inspectors reviewed the licensee's use of CHECWORKS and FACManager to track, model, perform analysis, and trend systems susceptible to flow accelerated corrosion.

The inspectors did not identify any issues with the licensee's implementation of the flow-accelerated corrosion program.

#### 2.1.22 Metal-Enclosed Bus Inspection Program

This program inspects the following:

- non-segregated bus between the emergency station service transformer and 4.16 kV switchgear buses (1F and 1G).
- non-segregated bus between the start-up station service transformer X-winding and 4.16 kV switchgear buses (1A and 1B).

Inspections include the bus and bus connections, the bus enclosure assemblies, and the bus insulation and insulators.

In 2017, the licensee experienced a phase-to-phase fault of the non-segregated bus on the secondary side of the emergency station service transformer (ESST), resulting in the loss of function of the ESST. The fault in the ESST resulted from corona present between the non-segregated bus bar supports and the bus bar, which degraded the insulation and led to tracking and a fault. The corona damage was attributed to the lack of grommets between the bus bar supports and bus bars themselves. For more information on the bus duct failure, see NRC inspection report 05000298/2017011 (ADAMS No. ML17223A459) and NRC inspection report 05000298/2017012 (ADAMS No ML17354A634.)

Further, in NRC inspection report 05000298/2017004 (ADAMS No. ML18043A363), the NRC identified a failure to implement their license renewal commitments for the metal-enclosed bus inspection program when maintenance personnel did not take corrective action to repair unacceptable visual indications of surface anomalies indicative of insulation degradation on the startup station service transformer X-winding bus. During this current inspection, the inspectors found the corrective actions have been completed, including replacement of the bus bars, installation of grommets, and addition of space heaters in non-electrically loaded sections of the bus. The corrective actions listed above will minimize the corona formation associated with bus and bus support pieces.

The inspectors did not identify any issues with the licensee's implementation of the

metal-enclosed bus duct inspection program.

#### 2.1.25 Non-EQ (Environmentally Qualified) Inaccessible Medium Voltage Cable Program

This program ensures that the intended functions of non-EQ inaccessible power cables exposed to "significant moisture" will be maintained consistent with the current licensing basis. The program included two elements:

- Periodic Cable Testing - To increase the chances of detecting significant cable insulation degradation prior to any impending cable failure (allowing for timely cable replacement); and
- Periodic Manhole Inspections/De-watering - To ensure the cables' operating environment within this program is maintained (low moisture/non-wet conditions) to provide the highest possible level of circuit reliability during the power cable operating life.

The inspectors reviewed the procedures and work orders for cable testing and found the licensee performed cable testing on a frequency of 10 years. Further, the inspectors found that the licensee has automatic sump pumps that de-water the manholes, except for Manhole #6A. The licensee installed a level alarm in Manhole #6A, which initiates an alarm in the control room, which procedurally requires operations personnel to generate a CR and to de-water the manhole.

During this inspection, the inspectors interviewed the licensee staff, reviewed the modification package, reviewed water in-leakage and de-water trends, and found that the alarm setpoint for Manhole #6A is sufficiently conservative to allow enough time between when the alarm is triggered and when the manhole is de-watered to prevent water from reaching the bottom of the cables. This prevents long-term submergence of the cables.

The inspectors did not identify any issues with the licensee's implementation of the non-EQ inaccessible medium voltage cable program.

#### 2.1.26 Non-EQ Instrumentation Circuits Test Review Program

This program assures the intended functions of sensitive, high-voltage, low-signal cables exposed to adverse localized equipment environments caused by heat, radiation, and moisture can be maintained consistent with the current licensing basis through the period of extended operation. Note that electrical equipment categorized under 10 CFR 50.49 "Environmental qualification of electric equipment important to safety for nuclear power plants (EQ)" is excluded.

The inspectors determined the following components were within the scope of this program:

- Main Steam Line Radiation Monitors
- Reactor Building Ventilation Exhaust Radiation Monitor
- Neutron Monitoring System Intermediate Range Monitors (IRMs)
- Neutron Monitoring System Local Power Range Monitors (LPRMs/APRMs)

Most sensitive instrumentation circuit cables and connections were included in the instrumentation loop calibration at the normal calibration frequency, which provides sufficient indication of the need for corrective actions based on acceptance criteria related to instrumentation loop performance.

The inspectors determined that the instrumentation circuits test review is performed in accordance with CNS procedure 3.47.26, "Non-EQ Sensitive Instrument Circuit Test Review Program"; and performed at a frequency of 10 years. Further, when cables were disconnected during calibration testing, the licensee used insulation resistance tests or time domain reflectometry methods to detect deterioration. This review is also performed at a frequency of at least once every 10 years.

The inspectors did not identify any issues with the licensee's implementation of the non-EQ instrumentation circuits test review program.

#### 2.1.34 Selective Leaching Program

This program monitored selective leaching of gray cast iron components to ensure the capability of the components to perform their design function through the period of extended operation. The licensee had determined that gray cast iron valves in their fire water system experienced selective leaching.

The inspectors confirmed the licensee had developed a preventive maintenance task to select two valves every 5 years for destructive testing to evaluate the effects of selective leaching. The inspectors verified that the first set of destructive tests confirmed that selective leaching of the valves did not challenge their integrity. The licensee had removed two additional valves during their last outage (October 2022) but did not have any results at the time of this inspection.

The inspectors did not identify any issues with the licensee's implementation of the selective leaching program, for the gray cast iron valves in their fire protection system.

#### 2.1.35 Service Water Integrity Program

This program implements the recommendations of Generic Letter 89-13, "Service Water," related to open cycle cooling water systems. Because the baseline heat sink inspection (Inspection Procedure 71111.07T, "Heat Sink Inspection") reviews the flow testing, periodic cleaning, and heat transfer capability testing of heat exchangers cooled by service water, the inspectors did not review these aspects of program implementation. The inspectors evaluated the thickness mapping of service water lines. The inspectors noted that the licensee did not perform any thickness mapping of the underground portions of the service water piping since they were coated and inaccessible.

The licensee performed their thickness mapping of the above-ground portions as part of their microbiologically influenced corrosion program. The licensee implemented the program following the guidance in procedure 3-EN-DC-340, "Microbiologically Influenced Corrosion (MIC) Monitoring Program," Revision 5, and procedure 3.10, "Flow Accelerated Corrosion (FAC) and Microbiologically Influenced Corrosion (MIC)

Program Implementation,” Revision 17. The inspectors confirmed that the licensee evaluated numerous susceptible locations as determined by their FAC manager program. The licensee used appropriate susceptibility criteria when selecting locations to monitor. The inspectors verified that the licensee appropriately initiated condition reports as required by their program.

The inspectors did not identify any issues with the licensee’s implementation of the service water integrity program.

## **INSPECTION RESULTS**

No findings were identified.

## **EXIT MEETINGS AND DEBRIEFS**

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

- On November 17, 2022, the inspectors presented the license renewal phase 4 inspection results to Mr. Khalil Dia and other members of the licensee staff.

## DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71003	Calculations	NEDC 94-214	Evaluation of Torus Shell Corrosion and the Impact to Structural Integrity of the Torus	8, 9, 10, & 11
71003	Drawings	453014626	Diesel Oil Storage Tanks No. 11 & 12	02/03/2016
71003	Drawings	453245953	Cathodic Protection Test Locations	4
71003	Drawings	454002849	Cooper Nuclear Station Composite Yard Piping Arrangement	05/24/2022
71003	Drawings	454003596	Cooper Nuclear Station Flow Diagram Diesel Oil Transfer System	
71003	Drawings	454003705	Yard Circulating and Service Water Piping - Plan & Sections	2/19/2015
71003	Drawings	454003706	Turbine & Control Buildings Composite Piping Below Mat Plans & Sections	1
71003	Drawings	454004629	Containment Vessels Cooper Nuclear Station	15
71003	Drawings	454010846	SW-2 Service Water Yard Piping Isometric	4
71003	Drawings	454238830	Torus Suppression Chamber Plan Views and Penetration Details	2
71003	Drawings	460024319	Cooper Nuclear Station Torus Diving and Inspection General Arrangement	2/24/2021
71003	Engineering Evaluations	50361	JN-2211 BEM™ Condition Assessment of Division 2 SW 24"	1
71003	Engineering Evaluations	CNS-RPT-13-LRIMR08	Selective Leaching Program - Readiness Report	0
71003	Engineering Evaluations	ER-2022-12	Non-EQ Instrumentation Circuits Test Review Program Report	0
71003	Engineering Evaluations	SIR-04-158	API 570 Inspection Report – Diesel Fuel Oil Tank “B”	04/18/2005
71003	Engineering Evaluations	SIR-04-159	API 570 Inspection Report – Diesel Fuel Oil Tank “A”	04/18/2005
71003	Miscellaneous		Underground Piping and Tank Asset Management Plan	2
71003	Miscellaneous		Test Patch Images for Torus Bays 3, 5, 6, & 9	
71003	Miscellaneous		NPPD - Cooper Nuclear Plant, Brownville, NE 2022 Annual Cathodic Protection Survey	0
71003	Miscellaneous		Cooper Nuclear 2021 Annual Cathodic Protection Survey	0
71003	Miscellaneous		Strategic Water Chemistry Plan	11

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71003	Miscellaneous		Open Cooling Water Strategic Plan	3
71003	Miscellaneous	NSAC-202L	Recommendations for an Effective Flow-Accelerated Corrosion Program	4
71003	Miscellaneous	PBD-BPT	Buried Piping and Tanks Program Basis Document	0
71003	Miscellaneous	PBD-MIC	Microbiologically Influenced Corrosion Program Basis Document	2
71003	NDE Reports	NUC2014106	Refueling Outage RE28 Reactor Torus Desludging, IWE Examination, Coating Inspection and Coating Repair	0
71003	NDE Reports	NUC2016114	Refueling Outage RE29 Reactor Torus Desludging, IWE/IWF Examination, Coating Inspection and Coating Repair	1
71003	Procedures	2.3_S-1	Alarm Procedure - Yard Manhole 6/6A High Level	09/27/2018
71003	Procedures	3-EN-DC-340	Microbiologically Influenced Corrosion (MIC) Monitoring Program	5
71003	Procedures	3-EN-DC-343	Underground Piping and Tanks Inspection and Monitoring Program	12
71003	Procedures	3.10	Flow Accelerated Corrosion (FAC) and Microbiologically Influenced Corrosion (MIC) Program Implementation	17
71003	Procedures	3.13.1	Underground Piping and Tank Inspection Program Implementation	6
71003	Procedures	3.13.1.1	Underground Piping and Tanks Visual Inspection	1
71003	Procedures	3.28.6	Containment Inservice Inspection Program Implementation	3
71003	Procedures	3.47	License Renewal Implementation Program	3
71003	Procedures	3.47.25	Non-EQ Inaccessible Power Cables Program	5
71003	Procedures	3.47.34	Selective Leaching Program	1
71003	Procedures	3.48	Service Water Program Implementation	2
71003	Procedures	6.DG.604	Diesel Fuel Oil Storage Tank, Bunker A & B, Quality Test Surveillance Procedure	02/27/19
71003	Procedures	7.2.53.14	Emergency Diesel Generator Fuel Rack Examination and Adjustment	02/20/2019
71003	Procedures	7.3.41	Examination, Repair, And Testing Of SSST Non-Segregated Buses And Associated Equipment	10/06/2021
71003	Procedures	7.3.41.2	Examination, Repair, And Testing Of ESST Non-Segregated Buses And Associated Equipment	02/23/2022
71003	Self-Assessments	LO-2021-0210	License Renewal Focus Self-Assessment 2022	08/29/2022

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71003	Work Orders		4975008, 5173309, 5211541, 5283289, 5368792, 5406656	