



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION I
475 ALLENDALE RD, STE 102
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

May 7, 2024

David P. Rhoades
Senior Vice President
Constellation Energy Generation, LLC
President and Chief Nuclear Officer (CNO)
Constellation Nuclear
4300 Winfield Road
Warrenville, IL 60555

**SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2 –
INTEGRATED INSPECTION REPORT 05000317/2024001 AND
05000318/2024001**

Dear David Rhoades:

On March 31, 2024, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Calvert Cliffs Nuclear Power Plant, Units 1 and 2. On April 22, 2024, the NRC inspectors discussed the results of this inspection with Heath M. Crockett, Director, Organizational Performance and Regulatory, and other members of your staff. The results of this inspection are documented in the enclosed report.

One finding of very low safety significance (Green) is documented in this report. This finding did not involve a violation of NRC requirements.

If you disagree with a finding not associated with a regulatory requirement 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 I; and the NRC Resident Inspector at Calvert Cliffs Nuclear Power Plant, Units 1 and 2.

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,

Brice A. Bickett, Chief
Projects Branch 3
Division of Operating Reactor Safety

Docket Nos. 05000317 and 05000318
License Nos. DPR-53 and DPR-69

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2 –
INTEGRATED INSPECTION REPORT 05000317/2024001 AND
05000318/2024001 DATED MAY 7, 2024

DISTRIBUTION:

BBickett, DORS
RClagg, DORS
SQuiroga, DORS
EDiPaolo, DORS, SRI
ATran, DORS, RI
CFragman, DORS, AA
FGaskins, RI OEDO
RidsNrrPMCalvertCliffs Resource
RidsNrrDorlLpl1 Resource

DOCUMENT NAME: https://usnrc.sharepoint.com/teams/DRPPB3/Shared Documents/ROP_InspectionReports/_CalvertCliffs/2024/CC 2024-001 IR.docx
ADAMS ACCESSION NUMBER: ML24128A001

<input checked="" type="checkbox"/> SUNSI Review		<input checked="" type="checkbox"/> Non-Sensitive <input type="checkbox"/> Sensitive		<input checked="" type="checkbox"/> Publicly Available <input type="checkbox"/> Non-Publicly Available	
OFFICE	RI/DORS	RI/DORS	RI/DORS		
NAME	EDiPaolo	RClagg	BBickett		
DATE	5/6/2024	5/6/2024	5/7/2024		

OFFICIAL RECORD COPY

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

Docket Numbers: 05000317 and 05000318

License Numbers: DPR-53 and DPR-69

Report Numbers: 05000317/2024001 and 05000318/2024001

Enterprise Identifier: I-2024-001-0037

Licensee: Constellation Energy Generation, LLC

Facility: Calvert Cliffs Nuclear Power Plant, Units 1 and 2

Location: Lusby, MD

Inspection Dates: January 01, 2024 to March 31, 2024

Inspectors: G. Dipaolo, Senior Resident Inspector
A. Tran, Resident Inspector
C. Borman, Health Physicist
N. Eckhoff, Health Physicist
N. Floyd, Senior Reactor Inspector
D. Werkheiser, Senior Reactor Analyst

Approved By: Brice A. Bickett, Chief
Projects Branch 3
Division of Operating Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee’s performance by conducting an integrated inspection at Calvert Cliffs Nuclear Power Plant, Units 1 and 2, 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 Adequately Implement Work Instructions Results in Loss of U-4000-22 Service Transformer and Unit 2 Automatic Reactor Trip			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green FIN 05000318/2024001-01 Open/Closed	None (NPP)	71152A
A self-revealed Green finding was identified for Constellation’s failure to adequately implement instructions for the performance of maintenance. Specifically, in 2017, workers installed instrument wiring on the U-4000-22 service transformer voltage regulator with inadequate clearance to a live 13 kilovolt (kV) bus bar contrary to instructions in the work order (WO). This led to the instrument wiring contacting the voltage regulator’s 13kV bus bar, shorting the bus bar to ground, and the de-energization of the U-4000-22 service transformer on November 7, 2023. The loss of U-4000-22 service transformer resulted in a Unit 2 automatic reactor trip and a loss of main feedwater (MFW).			

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000318/2023-003-00	LER 2023-003-00 for Calvert Cliffs Nuclear Power Plant, Unit 2, Manual Actuation of Auxiliary Feedwater System Due to 22 Steam Generator Feedwater Pump Trip	71153	Closed
LER	05000317/2023-001-00	LER 2023-001-00 Calvert Cliffs Nuclear Power Plant, Unit 1, Condition Prohibited by Technical Specifications due to Failure to Sample Diesel Generator Fuel Oil Storage Tank	71153	Closed
LER	05000318/2023-002-00	LER 2023-002-00 for Calvert Cliffs Nuclear Power Plant, Unit 2, Automatic Reactor Trip from Reactor Protection	71153	Closed

		System Actuation due to Loss of Unit Service Transformer		
--	--	--	--	--

PLANT STATUS

Unit 1 began the inspection period at rated thermal power and operated at or near full power until January 25, 2024, when the unit entered an end-of-cycle power coast down. On February 12, 2024, operators shutdown the unit, from 81 percent power, for a planned refueling outage. Operators commenced a unit startup on March 2, 2024, and returned the unit to 100 percent power on March 4, 2024. The unit remained at or near rated thermal power for the remainder of the inspection period.

Unit 2 began the inspection period at rated thermal power. On February 24, 2024, operators manually tripped the reactor in response to the loss of the 22 steam generator feed pump. Operators commenced a unit startup on February 25, 2024, and returned the unit to 100 percent power on March 3, 2024. On March 4, 2024, operators reduced power to approximately 70 percent for risk management due to electrical system maintenance. The unit returned to 100 percent power on March 7, 2024. The unit 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 activities described in IMC 2515, Appendix D, "Plant Status," observed risk significant activities, and completed on-site portions of IPs. 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

71111.04 - Equipment Alignment

Partial Walkdown Sample (IP Section 03.01) (3 Samples)

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

- (1) Units 1 and 2, 11 and 12 spent fuel pool cooling trains prior to fuel moves, February 15, 2024
- (2) Unit 1, 1A emergency diesel generator (EDG) following surveillance testing, March 26, 2024
- (3) Units 1 and 2, 0C EDG during 2A EDG maintenance window, March 28, 2024

71111.05 - Fire Protection

Fire Area Walkdown and Inspection Sample (IP Section 03.01) (5 Samples)

The inspectors evaluated the implementation of the fire protection program by conducting a walkdown and performing a review to verify program compliance, equipment functionality, material condition, and operational readiness of the following fire areas:

- (1) Unit 1, 1A diesel generator building, fire area DBG1, January 5, 2024
- (2) Unit 1, turbine building, fire area TB, February 13, 2024
- (3) Unit 1, containment, fire area 1CNMT, February 14, 2024
- (4) Unit 2, turbine building, fire area TB, February 26, 2024
- (5) Units 1 and 2, 11-13 and 21-23 charging pump rooms, fire areas 5-10, March 6, 2024

Fire Brigade Drill Performance Sample (IP Section 03.02) (1 Sample)

- (1) The inspectors evaluated onsite fire brigade training and performance during an unannounced fire drill in the Unit 1 turbine building on January 21, 2024.

71111.08P - Inservice Inspection Activities (PWR)

The inspectors verified that the reactor coolant system boundary, reactor vessel internals, risk-significant piping system boundaries, and containment boundary were appropriately monitored for degradation and that repairs and replacements were appropriately fabricated, examined and accepted by reviewing the following activities in Unit 1 during refueling outage CC1R27 from February 12 to February 28, 2024.

PWR Inservice Inspection Activities Sample - Nondestructive Examination and Welding Activities (IP Section 03.01) (1 Sample)

The inspectors verified that the following nondestructive examination (NDE) and welding activities were performed appropriately:

- (1)
 - Manual ultrasonic testing of the main steam system pipe-to-elbow welds, 6-MS-1208-2 and 6-MS-1208-3 (NDE Reports 1R27ISI-UT-005 and 1R27ISI-UT-004)
 - Manual ultrasonic testing of the reactor coolant system pipe-to-elbow welds, 12-PSL-3 and 12-PSL-4, located on the pressurizer surge line (NDE Reports 1R27ISI-UT-006 and 1R27ISI-UT-007)
 - Liquid penetrant testing of the containment spray piping integral attachment weld, 8-CS-1206 H-7 (1R27ISI-PT-001)
 - General visual examinations of the accessible containment surfaces, including the containment liner and moisture barrier, from elevations 10-foot to 144-foot (NDE Reports 1R27CISI-VT-006 thru -016 and 1R27CISI-VT-018 thru -022)
 - Detailed visual examination of the containment pedestal moisture barrier inaccessible areas (NDE Reports 1R27CISI-VT-017 and 1R27CISI-VT-023)
The inspectors reviewed the visual examination record (NDE Report 1R26CISI-VT-008) and associated evaluation (Engineering Change Package (ECP)-22-00077) for relevant indications from the previous outage that the licensee evaluated and accepted for continued service.

PWR Inservice Inspection Activities Sample - Vessel Upper Head Penetration Inspection Activities (IP Section 03.02) (1 Sample)

The inspectors verified that the licensee conducted the following vessel upper head penetration inspections and addressed any identified defects appropriately:

- (1)
 - Visual examination of penetrations 5, 6, and 74 due to indications observed during the previous outage (NDE Report 1R27ISI-VT-125). This was a required follow-up examination conducted in accordance with American Society of Mechanical Engineers Code Case N-729-6.

PWR Inservice Inspection Activities Sample - Boric Acid Corrosion Control Inspection Activities (IP Section 03.03) (1 Sample)

The inspectors verified the licensee is managing the boric acid corrosion control program through a review of the following evaluations:

- (1)
 - Boric Acid Evaluation for 11A reactor coolant pump (RCP), corrosion identified at 11A RCP bay (AR 4749634)
 - Boric Acid Evaluation for 1PZVPRC11, possible minor boric acid residue on pressurizer manway bolting (AR 4749595)
 - Boric Acid Evaluation for 1-SI-618-CV, dry / inactive bolted flange leak on 11A safety injection tank check valve leakage control valve (AR 4749644)

71111.11Q - Licensed Operator Requalification Program and Licensed Operator Performance

Licensed Operator Performance in the Actual Plant/Main Control Room (IP Section 03.01) (2 Samples)

- (1) The inspectors observed and evaluated licensed operator performance in the main control room during shutdown of Unit 1 for the refueling outage on February 12, 2024.
- (2) The inspectors observed and evaluated licensed operator performance in the main control room during Unit 2 startup from a forced outage on February 25-27, 2024.

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

- (1) The inspectors observed and evaluated licensed operator training in the simulator involving shutdown and startup activities on January 23, 2024.

71111.12 - Maintenance Effectiveness

Maintenance Effectiveness (IP Section 03.01) (2 Samples)

The inspectors evaluated the effectiveness of maintenance to ensure the following structures, systems, and components (SSCs) remain capable of performing their intended function:

- (1) Units 1 and 2, AR 4700327, transition to maximum reactor coolant loop cold leg temperature required, January 23, 2024

- (2) Unit 1, AR 4749050, replacement of high-pressure safety injection flow transmitters due to obsolete Rosemount instrument transmitters, March 28, 2024

71111.13 - Maintenance Risk Assessments and Emergent Work Control

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

The inspectors evaluated the accuracy and completeness of risk assessments for the following planned and emergent work activities to ensure configuration changes and appropriate work controls were addressed:

- (1) Unit 1, elevated risk condition due to 12A service water heat exchanger maintenance, January 10, 2024
- (2) Unit 1, risk-informed completion time implementation due to containment isolation valve, 1-SI-148, being inoperable, January 17, 2024
- (3) Unit 1, risk-informed completion time implementation of containment isolation valve, 1-SI-148, following probabilistic risk assessment model enhancements, January 25, 2024
- (4) Unit 1, elevated risk condition due to reduced inventory conditions, February 26, 2024

71111.15 - Operability Determinations and Functionality Assessments

Operability Determination or Functionality Assessment (IP Section 03.01) (6 Samples)

The inspectors evaluated the licensee's justifications and actions associated with the following operability determinations and functionality assessments:

- (1) Unit 2, AR 4717188, 22B service water heat exchanger flushing control valve stuck in intermediate, February 1, 2024
- (2) Units 1 and 2, Operations Standing Order 23-13, offsite power bus operability in alternate alignment, February 6, 2024
- (3) Unit 1, AR 4735570, out-of-date calibration data packages utilized to calibrate high-pressure safety injection flow transmitters 1FT311 and 1FT321, February 8, 2024
- (4) Unit 2, Operability Evaluation 24-001, Revision 0, associated with AR 4749050, auxiliary feedwater (AFW) actuation system level transmitters calibrated with incorrect master calibration data, February 23, 2024
- (5) Unit 1, AR 4749836, 1-SI-118, 11A safety injection header check valve found open, March 20, 2024
- (6) Unit 1, AR 4754589, 1-SI-148, 12B safety injection header check valve packing leak, March 22, 2024

71111.18 - Plant Modifications

Temporary Modifications and/or Permanent Modifications (IP Section 03.01 and/or 03.02) (2 Samples)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Unit 1, 1-TCC-23-0044, "Jumper Out Reactor Protection System Channel 'A' T-hot 1TT122HA," installed on December 21, 2023, January 4, 2024

- (2) Unit 1, ECP-23-000416, "Balance of Plant 4kV Fast Bus Transfer Modification," March 7, 2024

71111.20 - Refueling and Other Outage Activities

Refueling/Other Outage Sample (IP Section 03.01) (1 Sample)

- (1) The inspectors evaluated Unit 1 refueling outage activities from February 12, 2024 to March 3, 2024.

71111.24 - Testing and Maintenance of Equipment Important to Risk

The inspectors evaluated the following testing and maintenance activities to verify system operability and/or functionality:

Post-Maintenance Testing (PMT) (IP Section 03.01) (6 Samples)

- (1) Unit 1, WO C93960996, 1-SI-148, post-maintenance testing following repairs after failure of valve seat leakage surveillance testing, January 17, 2024
- (2) Unit 2, WO C93917720, 22 emergency core cooling system cooler basket strainer post-maintenance testing following replacement of drain valve assembly, January 30, 2024
- (3) Unit 2, WO C93919004, 22 AFW pump post-maintenance testing following local speed governor inspection, February 7, 2024
- (4) Unit 1, WO C93828735, 11 control room post-loss of coolant incident exhaust filter post-maintenance testing following repairs due to failed acceptance criteria, February 29, 2024
- (5) Unit 1, WO C120085113, 12B safety injection header check valve, 1-SI-148, post-maintenance testing following repairs due to binding, March 1, 2024
- (6) Unit 1, WO C93848662, primary reactor coolant loop resistance temperature detectors post-maintenance testing following re-crimping spliced connections, March 12, 2024

Surveillance Testing (IP Section 03.01) (4 Samples)

- (1) Units 1 and 2, STP-F-77-0, "Staggered Test of Diesel Fire Pump," Revision 01007, January 9, 2024
- (2) Unit 2, STP-O-8B-2, "Test of 2B EDG and 4kV Bus 24 Undervoltage," Revision 36, January 10, 2024
- (3) Units 1 and 2, STP-F-492-0, "Halon System Cylinder Checks," Revision 13, January 17, 2024
- (4) Unit 1, STP-O-4A-1, "'A' Train Integrated Engineered Safety Features Test," Revision 03500, March 14, 2024

Inservice Testing (IST) (IP Section 03.01) (2 Samples)

- (1) Unit 1, STP-O-073H-1, "Auxiliary Feedwater Pump Large Flow Test," Revision 01400, February 14, 2024
- (2) Unit 1, STP-O-073M-1, "Containment Spray Flow Test," Revision 0803, February 21, 2024

Containment Isolation Valve (CIV) Testing (IP Section 03.01) (1 Sample)

- (1) Unit 1, STP-O-108D2A-1, "Containment Penetration 2A Local Leak Rate Tests," Revision 00100, February 21, 2024

RADIATION SAFETY

71124.01 - Radiological Hazard Assessment and Exposure Controls

Radiological Hazard Assessment (IP Section 03.01) (1 Sample)

- (1) The inspectors evaluated how the licensee identifies the magnitude and extent of radiation levels, the concentrations and quantities of radioactive materials, and how the licensee assesses radiological hazards.

Instructions to Workers (IP Section 03.02) (1 Sample)

- (1) The inspectors evaluated how the licensee instructs workers on plant-related radiological hazards and the radiation protection requirements intended to protect workers from those hazards.

Contamination and Radioactive Material Control (IP Section 03.03) (2 Samples)

The inspectors observed/evaluated the following licensee processes for monitoring and controlling contamination and radioactive material:

- (1) Surveys of potentially contaminated material leaving the radiologically controlled area
- (2) Workers exiting the radiologically controlled area at Unit 1

Radiological Hazards Control and Work Coverage (IP Section 03.04) (4 Samples)

The inspectors evaluated the licensee's control of radiological hazards for the following radiological work:

- (1) Observed removal of the transfer canal blind flange in the reactor cavity
- (2) Observed transportation of the reactor vessel head from operating position to the reactor head stand
- (3) Observed reactor cavity walkdown and fill
- (4) Reviewed RCP seal assembly as low as reasonably achievable plan - 24R-011

High Radiation Area and Very High Radiation Area Controls (IP Section 03.05) (3 Samples)

The inspectors evaluated licensee controls of the following high radiation areas and very high radiation areas:

- (1) Unit 1, degasifier filter room
- (2) Unit 1, number 12 RCP bay
- (3) Unit 1, containment access to under reactor vessel

Radiation Worker Performance and Radiation Protection Technician Proficiency (IP Section 03.06) (1 Sample)

- (1) The inspectors evaluated radiation worker and radiation protection technician performance as it pertains to radiation protection requirements.

OTHER ACTIVITIES – BASELINE

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:

BI01: Reactor Coolant System (RCS) Specific Activity Sample (IP Section 02.10) (2 Samples)

- (1) Unit 1, January 1, 2023 through December 31, 2023
- (2) Unit 2, January 1, 2023 through December 31, 2023

BI02: RCS Leak Rate Sample (IP Section 02.11) (2 Samples)

- (1) Unit 1, January 1, 2023 through December 31, 2023
- (2) Unit 2, January 1, 2023 through December 31, 2023

71152A - Annual Follow-up Problem Identification and Resolution

Annual Follow-up of Selected Issues (Section 03.03) (1 Sample)

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

- (1) Unit 2, automatic reactor trip on November 7, 2023, due to loss of U-4000-22 service transformer (AR 4716036), March 28, 2024

71153 - Follow-Up of Events and Notices of Enforcement Discretion

Event Report (IP Section 03.02) (3 Samples)

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

- (1) LER 05000317/2023-001-00, "Condition Prohibited by Technical Specifications due to Failure to Sample Diesel Generator Fuel Oil Storage Tank" (ADAMS Accession No. ML23331A300). The circumstances surrounding this LER are documented in Calvert Cliffs Nuclear Power Plant, Unit 1 – Special Inspection Report 05000317/2023050 (ADAMS Accession No. ML23272A027) Inspection Results section, NCV 05000317/2023050-03. This LER is closed.
- (2) LER 05000318/2023-002-00, "Automatic Reactor Trip from Reactor Trip from Reactor Protection System Actuation due to Loss of Unit Service Transformer" (ADAMS Accession No. ML24008A240). A Green self-revealing finding was identified during the review of the LER and is documented under the Inspection Results section of this report, FIN 05000318/2024001-01. This LER is closed.
- (3) LER 05000318/2023-003-00, "Manual Actuation of Auxiliary Feedwater System Due to 22 Steam Generator Feedwater Pump Trip (ADAMS Accession No. ML24008A243). The inspectors determined that the cause of the condition described in the LER was not reasonably within the licensee's ability to foresee and correct, and

therefore, was not reasonably preventable. No performance deficiency, nor violation of NRC requirements was identified. This LER is closed.

Personnel Performance (IP Section 03.03) (2 Samples)

- (1) The inspectors evaluated AR 4752936, Unit 2, manual reactor trip due to the loss of the 22 steam generator feed pump and licensee’s performance on February 24, 2024.
- (2) The inspectors evaluated AR 4753953, Units 1 and 2, loss of 13kV bus 11 resulting in the automatic start and loading of the 1A and 2A EDGs on February 28, 2024.

INSPECTION RESULTS

Failure to Adequately Implement Work Instructions Results in Loss of U-4000-22 Service Transformer and Unit 2 Automatic Reactor Trip			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green FIN 05000318/2024001-01 Open/Closed	None (NPP)	71152A
<p>A self-revealed Green finding was identified for Constellation’s failure to adequately implement instructions for the performance of maintenance. Specifically, in 2017, workers installed instrument wiring on the U-4000-22 service transformer voltage regulator with inadequate clearance to a live 13 kilovolt (kV) bus bar contrary to instructions in the work order (WO). This led to the instrument wiring contacting the voltage regulator’s 13kV bus bar, shorting the bus bar to ground, and the de-energization of the U-4000-22 service transformer on November 7, 2023. The loss of U-4000-22 service transformer resulted in a Unit 2 automatic reactor trip and a loss of main feedwater (MFW).</p> <p><u>Description:</u> On November 7, 2023, the U-4000-22 service transformer de-energized due to ‘A’ phase differential overcurrent causing a loss of power to the 22, 23, and 24 4kV buses. This caused the loss of both control element drive mechanism motor-generator sets, resulting in undervoltage on the reactor trip bus and a Unit 2 automatic reactor trip. The loss of non-safety-related 22 and 23 4kV buses resulted in a loss of MFW. The 2B EDG automatically started to restore power to 24 4kV safety-related bus. Operators manually started the 21 AFW pump and removed decay heat using the turbine bypass valves.</p> <p>Inspection of the U-4000-22 service transformer voltage regulator revealed that the secondary instrument wiring for the ‘A’ phase current transformer associated with open phase detection circuitry, in contact with the ‘A’ phase 13kV bus bar. This caused the 13kV ‘A’ phase to short to ground and resulted in the U-4000-22 service transformer protective relaying tripping the associated 13kV supply breaker and 4kV low-side breakers to buses 22, 23, and 24 isolating the fault. Constellation entered this issue into their corrective action program and completed a corrective action program evaluation as documented in AR 4716036.</p> <p>The open phase detection current transformer and associated circuitry for the U-4000-22 service transformer was installed in 2017 by modification ECP-15-000572, “Open Phase Detection” and WO C93393660. WO C93393660, task 100, contained instructions to install the current transformer per ECP-15-000572-001-CN-010, “Implement Open Phase Condition Detection Scheme.” Note 8, on ECP-15-000572-001-CN-010, stated “clearance of 7.5 inches</p>			

minimum is required from 13kV live parts (e.g., adapter plate) to conductive material.” The inspectors reviewed AR 4716036 and noted that Constellation concluded that because the current transformer wiring was 8-gauge stranded insulated switchboard wire, rated for 600V, workers should have considered the instrument wiring as uninsulated in the vicinity of the 13kV live bus bars, and the clearance of 7.5 inches should have been maintained.

The inspectors reviewed MA-AA-716-011, “Work Execution and Close Out,” Revision 23, the revision in effect when WO 93393660 was performed, and noted, Step 4.8.1.1.B required lead craft or craft designated by the first line supervisor to “perform work activities and equipment checks in accordance with approved procedures or work instructions.” Contrary to WO C93393660, the clearance between the ‘A’ phase current transformer instrument wiring and the 13kV bus bar was significantly less than 7.5 inches. Constellation concluded that this was the result of inadequate work practices by supplemental workforce personnel who installed the instrument wiring. The current transformer instrument wiring was routed such that inducted heat allowed it to sag over time and came into contact with the 13kV bus bar.

Corrective Actions: Constellation completed repairs to the U-4000-22 service transformer voltage regulator. Extent-of-condition inspections of the service transformer voltage regulator current transformer instrument wiring that was installed for the open phase detection modifications in 2016 and 2017 (i.e., service transformers U-4000-11, U-4000-12, and U-4000-21) were also completed. Although not in contact with any adjacent components, the voltage regulator current transformer instrument wiring associated with U-4000-21 was also found with inadequate clearance and the condition was corrected.

Corrective Action References: AR 4716036

Performance Assessment:

Performance Deficiency: The inspectors determined that the failure to adequately implement work instructions for the performance of maintenance, as required by MA-AA-716-011, was a performance deficiency that was within Constellation’s ability to foresee and correct and should have been prevented. Specifically, in 2017, workers installed instrument wiring associated with an open phase detection modification current transformer with inadequate clearance to a live 13 kV bus bar contrary to instructions in WO C93393660. This led to the instrument wiring contacting the ‘A’ phase U-4000-22 service transformer voltage regulator 13 kV bus bar, shorting the bus bar to ground, and the de-energization of U-4000-22 service transformer on November 7, 2023. The loss of U-4000-22 service transformer resulted in a Unit 2 automatic reactor trip and a loss of MFW.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Human Performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure to provide sufficient clearance between the current transformer instrument wiring caused the loss of the U-4000-22 service transformer and resulted in a Unit 2 automatic reactor scram on November 7, 2023. The inspectors reviewed IMC 0612, Appendix E, and determined that this issue was sufficiently similar to Example 4.b. because the failure to follow procedure resulted in a reactor trip.

Significance: The inspectors assessed the significance of the finding using IMC 0609 Appendix A, “The Significance Determination Process (SDP) for Findings At-Power.” Using Exhibit 1, Section B, the finding required a detailed risk evaluation because the finding

caused a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition (e.g., loss of feedwater).

The performance deficiency caused the loss of service transformer U-4000-22, de-energizing 4kV buses 22, 23, and 24. Bus 24 was immediately re-powered by the auto-start of the 2B EDG. Non-safety buses 22 and 23 resulted in the loss of MFW due to the loss of power to the condensate and condensate booster pumps. These three buses (22, 23, 24) were subsequently re-powered from the main control room via the alternate feeder power supply transformer U-4000-12. Condensate and MFW were considered available after the alternate power alignment. This initiating event was evaluated as a transient/reactor trip (TRANS).

The regional senior reactor analyst (SRA) used the Systems Analysis Programs for Hands-On Evaluation (SAPHIRE), Revision 8.2.9, and the Standardized Plant Analysis Risk (SPAR) model for Calvert Cliffs, Unit 2, Model Version 8.84, to conduct initiating event analysis. This included consideration of the effect on SSCs that were impacted by the performance deficiency.

In accordance with IMC 0308, "Technical Basis for Significance Determination Process," and Risk Assessment of Operational Events Handbook guidance, the SDP evaluates the risk increase/significance of the performance deficiency that causes an initiating event by using the incremental conditional core damage probability (ICCDP) estimate:

ICCDP = Conditional core damage probability (CCDP) – Baseline core damage probability (CDP)

The following influential assumptions were used:

- TRANS best represented the initiating event.
- Bus 22, 23, 24 were readily recoverable. Surrogate probabilities were used to reflect the transfer to alternate power alignments governed by station procedures.
- The loss of MFW is considered recoverable.
- Nominal test and maintenance values; key equipment alignments were set (i.e., running vs. standby) as existed before the event.
- Diverse and flexible mitigation equipment credit was not assumed due the short timing of the event and minimal effect on the risk outcome.

The SRA noted Constellation had a previous evaluation, CA-SDP-004, Revision 0, which consisted of a risk calculation for a Unit 2 reactor trip that occurred November 2021. This evaluation noted that condensate storage tank 12 is used as a suction source for AFW for both Units 1 and 2 and contains an inventory of at least 300,000 gallons of water. Therefore, when AFW is only needed for one unit, as in this event, condensate storage tank 12 will not deplete in the 24-hour mission time. The SRA developed a post-processing rule to delete core damage cutsets which contained the initiating event coincident with basic event, AFW-XHE-XM-SUCTLT, for this SDP.

The SRA also noted in CA-SDP-004 that Constellation credited improved once-thru core cooling operator action reliability (i.e., feed and bleed) with longer AFW operating times. The longer the AFW operates, the more likely operations will be able to successfully align once-thru core cooling due to increased available time to complete the action. Constellation used a human error probability of 3E-2 in their CA-SDP-004 analysis. This was applied when MFW and AFW is lost immediately at the time of the initiating event. Constellation decreased this

failure rate to 2.85E-3 when MFW is lost but AFW operates for one hour, reflecting the longer time potentially available to complete this mitigating action. The SRA wrote a post-processing rule for cutsets with common cause failure of AFW pumps to run, which adjusted the SPAR model value of 2E-2 to 2.85E-3 for the failure of operators to feed and bleed. This was incorporated to account for the longer time available to perform the action.

The two items above were revised to reflect both the base case and the condition case for this this evaluation. In addition, the condition case was assessed with the following SPAR model adjustments:

- The initiating event (TRANS) was set to 1.0, other initiating events were set to zero.
- U-4000-22 service transformer fails to operate (ACP-TFM-FC-U400022) was set to 1.0 (versus TRUE) as common cause was not applicable to the other transformer (U-4000-12). U-4000-12 was wired in an acceptable manner by contractors. This is based on inspector review of transformer U-4000-12 open phase detection wiring WOs and post-event licensee photographs of its wiring placement. This primarily impacts bus 24 for this SDP.
- Condensate and condensate booster pump fail-to-run basic events were set to 0.1, as a surrogate to the loss of bus 22, 23 (which would result in a loss of MFW) and its availability after bus power was restored (via U-4000-12). This was used since condensate affects low-pressure feedwater and supports steam generator cooling functions but is not modeled directly dependent on U-4000-22 power due to the SPAR model power supply granularity. A sensitivity was performed by using a general MFW recovery factor (0.1) for cutsets that resulted in loss of steam generator cooling events (TRANS * SGC). Results were insensitive.
- Operator actions to maintain feedwater to steam generators (MFW-XHE-XO-ERROR) was set to 0.1, as a surrogate to represent higher risk of losing MFW.
- Diverse scram system was credited by applying a licensee failure probability (1.1E-2) coincident with core damage cutsets containing a basic event RPS-RTB-FC-FTO, reactor trip breakers failing to open, based on system design and operator response procedures.

The calculated CCDP for a conditional transient with the above adjustments was 1.3E-6/year. The baseline CDP for transient is calculated at 5.8E-7/year. The ICCDP is calculated to be (1.3E-6 – 5.8E-7)/year, which results in a risk increase of 7.2E-7/year. The dominant sequence is a transient with failure of reactor protection system (anticipated transient without scram), various single failure of emergency/safety relief valves to re-close upon lifting, and failure of high-pressure injection.

The performance deficiency did cause a transient (reactor trip), however an external event that could cause a transient cannot cause the performance deficiency to be revealed. Therefore, the risk can be assessed looking only at internal events and risk contribution due to fire, flood, tornado, or seismic events need not be considered.

A large early release frequency (LERF) assessment was made using SAPHIRE and IMC 0609, Appendix H, "Containment Integrity Significance Determination Process," dated March 23, 2020. The SAPHIRE calculated increase in LERF was <1E-7 based on zero-factor multipliers for dominant sequences. Also, since Calvert Cliff, Unit 2, is a Combustion Engineering designed pressurized-water reactor, a separate consequential steam generator tube rupture (C-SGTR) screening was performed in accordance with IMC 0609, Appendix H, Section 5, aided by NUREG-2195, "Consequential SGTR Analysis for Westinghouse and

Combustion Engineering Plants,” Appendix L, dated July 2017. Since all dominant sequence LERF factors were zero, this assessment screened out having very low safety significance.

The licensee also performed an analysis of the performance deficiency using the Calvert Cliff, Unit 2, Full-Power Internal Events application-specific model based on the model of record and discussed results with the SRAs. The licensee’s calculated ICCDP was 6E-7 with similar dominant sequences identified by the SRA’s evaluation.

In summary, the increase in risk associated with the performance deficiency using the ICCDP estimate is 7.2E-7/year and represents a finding of very low safety significance (Green). ICCDP or delta core damage frequency are the risk metrics for the SDP to evaluate the significance of inspection findings, and their numerical values are consistent with the risk-informed scale and basis detailed in IMC 0308.

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: Inspectors did not identify a violation of regulatory requirements associated with this finding.

Observation: Unit 2 Automatic Reactor Trip on November 7, 2023, Due to Loss of U-4000-22 Service Transformer (AR 4716036)	71152A
---	--------

The inspectors reviewed Corrective Action Program Evaluation 4716036 and the corrective actions associated with the automatic reactor trip of Unit 2 due to the loss of service transformer U-4000-22 on November 7, 2023. The inspectors performed an in-depth review of Constellation’s evaluation and corrective actions for the event as described in LER 05000318/2023-002-00 (ADAMS Accession No. ML24008A240).

The corrective action program evaluation used different techniques to determine the causes of the event as required by PI-AA-125-1006, “Investigation Techniques Manual.” The cause of the U-4000-22 fault was determined to be inadequate work practices during the installation of the current transformers which resulted in the ‘A’ phase of the 13kV voltage regulator being shorted to ground. Other identified causes included improper screening of the installation work order and preventive maintenance performed on the transformer did not identify inadequately installed instrument wiring. Proper screening of the work order would have identified it as an operational critical component in the work process and would have resulted in increased Constellation oversight of work performed by supplemental workforce. Corrective actions to address the causes were completed or planned and appeared to be timely.

The inspectors identified documentation discrepancies and one corrective action in the corrective action program evaluation that was not appropriately entered into the corrective action database and was inappropriately closed without completing the intended action. Constellation entered discrepancies into the corrective action program as AR 4759533. Other than FIN 05000318/2024001-01, the inspectors did not identify any findings or violations of more than minor significance.

EXIT MEETINGS AND DEBRIEFS

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

- On April 22, 2024, the inspectors presented the integrated inspection results to Heath M. Crockett, Director, Organizational Performance and Regulatory, and other members of the licensee staff.
- On February 21, 2024, the inspectors presented the radiological hazard assessment and exposure controls inspection results to Peter Moodie, Plant Manager, and other members of the licensee staff.
- On March 1, 2024, the inspectors presented the Unit 1 inservice inspection results to Patrick Navin, 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 Resulting from Inspection	AR 04751966	NRC ID: 11 FOST Heat Trace Panels Indicating "Open"	02/21/2024
71111.05	Fire Plans	FFSM-166	NFPA 805 Fire Area: DGB1	001
71111.08P	Corrective Action Documents	AR 04706077		
	Corrective Action Documents Resulting from Inspection	AR 04754313		
	Drawings	61744	Containment Liner Floor Plan and Details	15
		61756SH0002	Containment Interior Plan at Elevation 10'-0"	1
	Engineering Evaluations	ECP-22-000087	Technical Evaluation for CC1R26 Reactor Vessel Head Penetrations 5 and 6	0
		ECP-24-000071	Technical Evaluation for 11A RCP Degraded Cover-to-Case Studs	0
	Miscellaneous	ER-CA-330-1001	CCNPP Inservice Inspection Program Plan for the Fifth Ten-Year Interval	6
ER-CA-330-1004		CCNPP Risk-Informed Inservice Inspection Program Report	1	
71111.12	Corrective Action Documents	AR 04698781	Trend IR for Recent Sporadic T-Cold Indications	11/17/2023
	Engineering Changes	ECP-22-000132	Equivalent Change for 1FT311, 1FT321, and 1FT331 with Rosemount 3154N Series	0
		ECP-22-000158	Replace Unit 2 Steam Generator Pressure and Level Transmitters with Rosemount 3154N Series	0
71111.13	Corrective Action Documents Resulting from Inspection	AR 04738609	Trend in Equipment Protection Behaviors	01/24/2024
		AR 04748991	Protected Equipment Barrier Benchmark required	01/09/2024
71111.15	Engineering Changes	ECP-24-000032	Past Operability Review for As-Left Out-of-Tolerance From 1FT311 an 1FT321 Calibration Checks	0

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Miscellaneous	NRC Safety Evaluation and Environmental Impact Appraisal	License Amendments No. 19 and No. 5 to Facility Operating Licenses No. DPR-53 and DPR-69	01/14/1977
		Regulatory Guide 1.32	Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants	2
	Procedures	OI-49	Operability Verification	01900
		STP-O-90-2	AC Sources and Onsite Power Distribution Systems 7 Day Operability Verification	28
	Work Orders	C93894805	STP-O-65J-1	02/12/2024
71111.18	Corrective Action Documents	AR 4723681		
	Miscellaneous	Updated Final Safety Analysis Report, Section 7.2.3.7	Thermal Margin/Low-Pressure Trip	49
	Procedures	CC-AA-112	Temporary Configuration Change	32
		OP-AA-108-101	Control of Equipment and System Status	18
		TA-220	Temporary Removal of Degraded Reactor Protection System Instrumentation Input	00300
71111.20	Corrective Action Documents Resulting from Inspection	AR 04749704	NRC Identified Transient Combustible Issue	02/13/2023
		AR 04751475	NRC Identified Fire Door Not Properly Latched in Aux Bldg	02/19/2024
	Miscellaneous	CC1R27	Calvert Cliffs Shutdown Safety Plan	
	Procedures	FH-305	Core Alterations	34
		FH-311	Fuel Assembly Visual Inspection	9
		OP-5	Plant Shutdown from Hot Standby to Cold Shutdown	06600
71111.24	Procedures	OI-20	Fire Protection System	04100
		STP-F-492-0	Halon System Cylinder Checks	13
		STP-F-696-0	Fore Pump Flow Test	01200
	Work Orders	C93953123	STP-O-8B-2, Test of 2B DG and 4kv Bus 24 UV	36
71151	Corrective Action Documents	AR 043730627	NRC ID: IRIS Indicator Data Forms Lack SFAM Approval	1/17/2024

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Resulting from Inspection			
	Miscellaneous	BI01 & BI02 Data Sheets		