



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION I  
2100 RENAISSANCE BOULEVARD, SUITE 100  
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

February 10, 2022

Mr. Daniel G. Stoddard  
Senior Vice President and Chief Nuclear Officer  
Dominion Energy Nuclear Connecticut, Inc.  
Innsbrook Technical Center  
5000 Dominion Blvd.  
Glenn Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNITS 2 AND 3 – INTEGRATED INSPECTION  
REPORT 05000336/2021004 AND 05000423/2021004

Dear Mr. Stoddard:

On December 31, 2021, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Millstone Power Station, Units 2 and 3. On January 27, 2022, the NRC inspectors discussed the results of this inspection with Mr. John Daugherty, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

Three findings of very low safety significance (Green) are documented in this report. All of these findings involved violations of NRC requirements. One Severity Level IV violation without an associated finding is documented in this report. We are treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the Enforcement Policy. We determined that additional follow-up using Inspection Procedure 92702, "Follow-up on Traditional Enforcement Actions Including Violations, Deviations, Confirmatory Action Letters, Confirmatory Orders, and Alternative Dispute Resolution Confirmatory Orders" was not warranted because the violation can be appropriately sampled using baseline inspection resources.

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 I; the Director, Office of Enforcement; and the NRC Resident Inspector at Millstone Power Station, Units 2 and 3.

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 I; and the NRC Resident Inspector at Millstone Power Station, Units 2 and 3.

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,

Matt R. Young, Chief  
Projects Branch 2  
Division of Operating Reactor Safety

Docket Nos. 05000336 and 05000423  
License Nos. DPR-65 and NPF-49

Enclosure:  
As stated

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SUBJECT: MILLSTONE POWER STATION, UNITS 2 AND 3 – INTEGRATED INSPECTION  
REPORT 05000336/2021004 AND 05000423/2021004 DATED FEBRUARY 10,  
2022

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

Docket Numbers: 05000336 and 05000423

License Numbers: DPR-65 and NPF-49

Report Numbers: 05000336/2021004 and 05000423/2021004

Enterprise Identifier: I-2021-004-0029

Licensee: Dominion Energy Nuclear Connecticut, Inc.

Facility: Millstone Power Station, Units 2 and 3

Location: Waterford, CT 06385

Inspection Dates: October 1, 2021, to December 31, 2021

Inspectors: J. Fuller, Senior Resident Inspector  
E. Allen, Resident Inspector  
E. Bousquet, Resident Inspector  
J. Demarshall, Senior Operations Engineer  
L. Dumont, Reactor Inspector  
N. Floyd, Senior Reactor Inspector  
T. Hedigan, Operations Engineer  
P. Ott, Operations Engineer  
D. Werkheiser, Senior Reactor Analyst  
S. Wilson, Senior Health Physicist

Approved By: Matt R. Young, Chief  
Projects Branch 2  
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 Millstone Power Station, Units 2 and 3, 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 Conduct Visual Examinations of Containment Leak Chase Channel Barriers			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Barrier Integrity	Green NCV 05000336/2021004-01 Open/Closed	[H.12] - Avoid Complacency	71111.08P
The NRC inspectors identified a Green finding and associated non-cited violation (NCV) for the licensee's failure to conduct general visual examinations of the containment leak chase channel barriers (i.e., test pipe and caps) as required by 10 CFR 50.55a and American Society of Mechanical Engineers (ASME), Section XI Code, Subsection IWE. Specifically, no visual examinations of the test connections for the leak chase channel barriers were performed until questioned by the NRC inspectors.			

Inaccurate Information Provided to the NRC in License Amendment Request to Extend Integrated Leak Rate Test Intervals			
Cornerstone	Severity	Cross-Cutting Aspect	Report Section
Not Applicable	Severity Level IV NCV 05000336/2021004-02 Open/Closed	Not Applicable	71111.08P
The NRC inspectors identified a Severity Level IV NCV of 10 CFR 50.9, "Completeness and Accuracy of Information," because the licensee provided inaccurate information to the NRC in a license amendment request submitted to the NRC to extend the containment integrated leak rate test intervals. In the request, the licensee incorrectly stated that they had performed general visual examinations of the containment leak chase channels under the Millstone Unit 2 containment inservice inspection program (also referred to as the IWE program), when in fact, the examinations had not been completed, and the program had not been expanded to include these components.			

Failure to Document and Evaluate Pressurizer Power Operated Relief Valve Test Failure in Accordance with Surveillance Test Program			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000336/2021004-03 Open/Closed	[H.11] - Challenge the Unknown	71111.15
The inspectors identified a Green finding and associated NCV of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," when power operated relief valve (PORV) 2-RC-402 failed to meet surveillance test requirements, and the unsatisfactory test results were not documented and adequately evaluated to assure that test requirements were satisfied in accordance with			

WC 9, "Station Surveillance Program," Revision 7, and Surveillance Procedure (SP) 2610M, "PORV Hot Functional Test," Revision 6.

Failure to Identify a Failed Auxiliary Feedwater Turbine Supply Check Valve that Resulted in an Unanalyzed Condition

Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000336/2021004-04 Open/Closed	[P.2] - Evaluation	71111.15

A self-revealed Green finding and associated NCV of 10 CFR Part 50, Appendix B, Criteria XVI, "Corrective Action," was identified on October 23, 2021, when the licensee did not promptly identify and correct a failure of the auxiliary feedwater turbine supply check valve from the #2 steam generator (2-MS-4B), a condition adverse quality.

#### **Additional Tracking Items**

None.

## PLANT STATUS

Unit 2 began the inspection period at 99 percent rated thermal power (RTP) as it coasted down to a planned refueling outage. On October 7, 2021, Unit 2 shut down for the outage and returned to RTP on November 10, 2021. Unit 2 operated the remainder of the inspection period at or near RTP.

Unit 3 operated at or near RTP for the entire 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," conducted routine reviews using IP 71152, "Problem Identification and Resolution," 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

### 71111.01 - Adverse Weather Protection

#### Seasonal Extreme Weather (IP Section 03.01) (2 Samples)

- (1) The inspectors evaluated readiness for seasonal extreme weather conditions prior to the onset of seasonal cold temperatures for the Unit 2 reserve and normal station service transformer's deluge system on October 6, 2021, and the auxiliary steam supply to the Unit 2 auxiliary building on November 17, 2021.
- (2) The inspectors evaluated readiness for seasonal extreme weather conditions prior to the onset of seasonal cold temperatures for the Unit 3 refueling water storage tank and condensate storage tank systems on December 6, 2021.

### 71111.04 - Equipment Alignment

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

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

- (1) Unit 2 main steam supply (outside containment) to the turbine driven auxiliary feedwater (TDAFW) pump on October 28, 2021

- (2) Unit 2 #1 steam generator level and pressure instrument lines and transmitters inside containment on October 30, 2021
- (3) Unit 3 auxiliary feedwater system ('A' Train - outside containment) on December 6 and December 22, 2021

#### Complete Walkdown (IP Section 03.02) (1 Sample)

- (1) The inspectors evaluated system configurations during a complete walkdown of the Unit 2 safety injection system (inside and outside containment) on November 4, 2021.

#### 71111.05 - Fire Protection

##### Fire Area Walkdown and Inspection (IP Section 03.01) (3 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 2 auxiliary building, ventilation equipment room (fire area A-33), on October 28, 2021
- (2) Unit 2 containment building (fire area C-1 on all elevations) during the Unit 2 refueling outage (October 2021)
- (3) Unit 3 auxiliary building enclosure, auxiliary boiler (fire area ABR-1), on November 8, 2021

#### 71111.06 - Flood Protection Measures

##### Inspection Activities - Internal Flooding (IP Section 03.01) (1 Sample)

The inspectors evaluated internal flooding mitigation protections in the:

- (1) Unit 2 east and west cable vaults on the 45'-0" elevation which is connected to the cable vaults on the 25'-6" elevation on December 3 and December 15, 2021.

#### 71111.08P - Inservice Inspection Activities (PWR)

##### PWR Inservice Inspection Activities (IP Section 03.01) (1 Sample)

- (1) The inspectors verified that the reactor coolant system boundary, steam generator tubes, 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 from October 12 to November 5, 2021:

##### 03.01.a - Nondestructive Examination (NDE) and Welding Activities

- Manual phased array ultrasonic testing of the charging nozzle to safe end dissimilar metal weld overlay, BCH-C-1001 (NDE Report M2-VE-21-001)
- Manual ultrasonic testing of the loop 2B hot leg shutdown cooling line (NDE Report M2-UT-21-007) – examination performed in accordance with Materials Reliability Program-146 guidelines



- Visual examinations of the containment floor leak chase channels test ports and associated moisture barrier (WO53203321685) – included relevant indications accepted for continued service
- Welding activities associated with the replacement of the turbine driven auxiliary feedwater pump discharge check valve, MS22-FW-7, under engineering change EC-MP2-19-01031 (WO53102946462) – included manual phased array ultrasonic testing of two pipe-to-valve welds, W-1 and W-2 (NDE Reports BOP-VE-21-001/-002)

#### 03.01.b - Pressurized-Water Reactor Vessel Upper Head Penetration Examination Activities

- Bare metal visual examination of penetrations 15, 20, 45, 62, 63, 64, and 73

#### 03.01.c – Pressurized-Water Reactor Boric Acid Corrosion Control Activities

- Boric acid evaluation for 2-RC-002, pressurizer surge line sample control valve (CR1182189)
- Boric acid evaluation for 2-SI-021B, 'B' low-pressure safety injection pump casing vent (CR1182217)
- Boric acid evaluation for 2-SI-068, 'A' low-pressure safety injection pump discharge drain (CR1182264)

#### 71111.11A - Licensed Operator Requalification Program and Licensed Operator Performance

##### Requalification Examination Results (IP Section 03.03) (2 Samples)

- (1) The inspectors reviewed and evaluated the licensed operator examination failure rates for the Unit 3 requalification annual operating exam administered August to October 2021.
- (2) The inspectors reviewed and evaluated the Unit 2 licensed operator annual requalification results for the annual operating exam which was completed on December 15, 2021.

#### 71111.11B - Licensed Operator Requalification Program and Licensed Operator Performance

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

- (1) 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. The observation was completed on December 7 and December 8, 2021, for Unit 2. This observation completed a partial inspection that was initially documented in the Millstone Power Station, Units 2 and 3 – Integrated Inspection Report 05000336/2020004 and 05000423/2020004 (ADAMS Accession No. ML21032A099).

## 71111.11Q - Licensed Operator Regualification 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 Unit 2 control room during the shutdown, cooldown, and draining of the reactor coolant system associated with the Unit 2 planned refueling outage from October 7 to October 11, 2021.
- (2) The inspectors observed and evaluated licensed operator performance in the Unit 3 control room during the 'B' train solid state protection system operational testing and reactivity manipulations on December 15, 2021.

### Licensed Operator Regualification Training/Examinations (IP Section 03.02) (2 Samples)

- (1) The inspectors observed and evaluated the Unit 3 simulator exercise involving loss of condensate, reactor trip, and loss of auxiliary feedwater on November 16, 2021.
- (2) The inspectors observed and evaluated the Unit 2 simulator exercise involving loss of reactor plant component cooling water, reactor trip, steam generator tube rupture, and loss of high-pressure safety injection pump on November 18, 2021.

## 71111.12 - Maintenance Effectiveness

### Maintenance Effectiveness (IP Section 03.01) (1 Sample)

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

- (1) Unit 3 control building heating and ventilation chiller (3HVK\*CHL1B) on December 17, 2021 (CR1185090 and CA8816943)

## 71111.13 - Maintenance Risk Assessments and Emergent Work Control

### Risk Assessment and Management (IP Section 03.01) (5 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 2 elevated shutdown risk during reactor coolant system decreased inventory on October 11 and October 12, 2021
- (2) Unit 3 high risk during north bus outage concurrent with line 371 outage on October 16, 2021
- (3) Unit 2 total decay heat removal outage during replacement of the shutdown cooling suction relief valve (2-SI-468) and the low-pressure safety injection header '2A' vent valve (2-SI-805) on October 20, 2021 (WO53203227192 and WO53103068932)
- (4) Unit 2 medium risk plan for elevated risk during north bus outage on October 22, 2021
- (5) Unit 2 elevated risk during the TDAFW pump outage and circulating water bay 'D' outage on November 16, 2021

## 71111.15 - Operability Determinations and Functionality Assessments

### Operability Determination or Functionality Assessment (IP Section 03.01) (4 Samples)

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

- (1) Unit 2 reactor coolant system cooldown transient during transition from concurrent, reactor coolant pump and shutdown cooling system, operation to shut down cooling only on October 8, 2021 (CR1182203)
- (2) Unit 2 failure of the steam supply check valve (2-MS-4B) from the #2 steam generator to the TDAFW pump and foreign material evaluation for steam supply piping to the auxiliary feedwater turbine on October 30, 2021 (CR1183570 and ETE-MP-2021-1119)
- (3) Unit 3 service water system return line from control building chilled water system operability determination due to pinhole leak (CR1182882) and subsequent housekeeping patch and increased monitoring (OD CA8601969) on November 10, 2021
- (4) Unit 2 operability determination and associated compensatory actions associated with isolation of the #2 steam generator main steam header low point steam trap (M2ST-158) and the auxiliary feedwater turbine drip leg steam trap (M2ST-159) on December 1, 2021 (CR1186264)

## 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 or permanent modifications:

- (1) Auxiliary feedwater turbine supply check valve from #2 steam generator (2-MS-4B) valve disc retention permanent modification (MP2-21-01174)

## 71111.19 - Post-Maintenance Testing

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

The inspectors evaluated the following post-maintenance test activities to verify system operability and functionality:

- (1) Unit 2 low-pressure safety injection header to loop 1A injection motor operated valve (2-SI-615) after motor replacement on October 7, 2021 (WO53203292042)
- (2) Unit 2 2-RB-211E 'C' reactor building component cooling water pump suction valve actuator overhaul and diagnostic testing on October 27, 2021 (WO53M20303873)
- (3) Unit 2 auxiliary feedwater turbine regulating valve (FW-43A) after positioner calibration on October 30, 2021 (WO53203269599)
- (4) Unit 2 TDAFW discharge check valve (2-FW-7) after valve was replaced with a new design on October 30, 2021 (WO53102946462 and design change MP2-19-01031)
- (5) Unit 2 auxiliary feedwater turbine supply check valve from the #2 steam generator (2-MS-4B) after repair to the valve disc to arm connection on November 20, 2021 (WO532033332562)

#### 71111.20 - Refueling and Other Outage Activities

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

- (1) The inspectors evaluated Unit 2 refueling outage 2R27 activities from October 7, 2021, to November 8, 2021.

#### 71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

##### Surveillance Tests (other) (IP Section 03.01) (6 Samples)

- (1) Unit 2 main steam safety valve simmer testing on October 5, 2021 (WO53203270344)
- (2) Unit 2 PORV 2-RC-402 hot functional testing surveillance test on October 7, 2021 (SP 2610M)
- (3) Unit 2 as-found testing of steam generator to the TDAFW pump steam supply motor operated valves 2-MS-201 and 2-MS-202 on October 15, 2021 (WO53203230402 and WO53102574083)
- (4) Unit 2 control room in-leakage verification surveillance test on October 29, 2021 (WO53203232050)
- (5) Unit 2 emergency core cooling system sump internal inspection on October 29, 2021 (WO53203269314)
- (6) Unit 3 'B' solid state protection system operational test on December 15, 2021 (WO53203313424)

##### Inservice Testing (IP Section 03.01) (1 Sample)

- (1) Unit 2 emergency core cooling system containment sump outlet valve (CS-16.1A) leak test on October 10, 2021 (WO53203269823)

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

- (1) Unit 2 containment isolation valve 2-EB-89 leak rate surveillance test (WO53203310556) on October 28, 2021

## **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 and 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 reviewed the following:

##### Radiation Work Permits

- 2210208
- 2210407
- 3210093

##### Electronic Alarming Dosimeter Alarms

- Unit 3 - reviewed one high radiation area dose rate alarm occurrence in containment during planned maintenance outage.

##### Labeling of Containers

- Units 2 and 3 - observed container labeling and condition in a temporary radioactive material storage area.
- Unit 2 - observed temporary storage containers labeling and condition in containment.

#### 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) Unit 2 - observed licensee surveys of potentially contaminated material leaving the radiologically controlled area.
- (2) Unit 2 - observed workers exiting the radiologically controlled area during a refueling outage.

#### 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) Unit 2 - observed radiological job coverage of new seal installation on the temporary reactor vessel cover. The work was performed under radiation work permit number 2210330.
- (2) Unit 2 - observed control rod drive mechanism coil stack maintenance activities.
- (3) Unit 2 - observed refueling operations on the spent fuel floor and in containment.
- (4) Unit 2 - observed maintenance on seal injection check valve 215 in containment.

#### 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 2 - reactor head stand locked high radiation area controls
- (2) Unit 2 - liquid radioactive waste and storage area
- (3) Unit 3 - waste disposal building

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:

OR01: Occupational Exposure Control Effectiveness (IP Section 02.15) (1 Sample)

- (1) October 1, 2020, through September 30, 2021

PR01: Radiological Effluent Technical Specifications (TS)/Offsite Dose Calculation Manual  
Radiological Effluent Occurrences (RETS/ODCM) Radiological Effluent Occurrences  
(IP Section 02.16) (1 Sample)

- (1) October 1, 2020, through September 30, 2021

71152 - Problem Identification and Resolution (PI&R)

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) Unit 2 feedwater heater temperature instrumentation providing inaccurate readings

**INSPECTION RESULTS**

Failure to Conduct Visual Examinations of Containment Leak Chase Channel Barriers			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Barrier Integrity	Green NCV 05000336/2021004-01 Open/Closed	[H.12] - Avoid Complacency	71111.08P
The NRC inspectors identified a Green finding and associated NCV for the licensee's failure to conduct general visual examinations of the containment leak chase channel barriers (i.e., test pipe and caps) as required by 10 CFR 50.55a and ASME, Section XI Code, Subsection IWE. Specifically, no visual examinations of the test connections for the leak chase channel barriers were performed until questioned by the NRC inspectors.			
<u>Description:</u> During the week of October 11, 2021, the inspectors completed walkdowns of the accessible components and surfaces inside the containment structure, as part of the NRC			

inservice inspection for the Millstone Unit 2 refueling outage. The inspectors observed the material conditions of components and specifically focused on the containment liner and leak chase channel system.

As background, the design function of the containment liner is to serve as the primary leakage barrier against radionuclides for the containment structure. The leak chase channel system consists of steel channel sections that are welded over the containment steel liner plate seam welds which were then embedded in the concrete floor slab (i.e., basemat) during construction. The network of channels is separated into zones and have a ¼-inch steel test pipe connected to the channel that extends up through the concrete floor. The test pipes have a threaded steel cap and are located at small, recessed cutouts in the concrete such that the pipe/cap sit just below the containment floor elevation. This system allowed for pressure testing of the containment liner seam welds for leak-tightness during original plant construction. Since these test connection pipes and caps are at the concrete-to-metal interface of the containment floor and are prone to being wetted, they are susceptible to experiencing corrosion. If such degradation were to occur, this could allow moisture intrusion into the leak chase channels and corrosion degradation of the inaccessible areas of the containment liner within the channels.

In May 2014, the NRC issued Information Notice 2014-07, "Degradation of Leak-Chase Channel Systems for Floor Welds of Metal Containment Shell and Concrete Containment Metallic Liner," which discussed instances where licensees that did not conduct the required inservice inspections. The Information Notice also summarized the NRC's basis for including the leak chase components within the scope of Subsection IWE in Section XI of the ASME Code, and how licensees could fulfill the requirements. The guidance states that 100 percent of the accessible components of the leak chase system should be inspected during each inspection period. This general visual examination includes moisture barrier materials intended to prevent intrusion of moisture against inaccessible areas of the pressure retaining metal containment shell or liner at concrete-to-metal interfaces and at metal-to-metal interfaces which are not seal welded. In May 2020, the NRC added a condition in 10 CFR 50.55a, "Codes and Standards", under 50.55a(b)(2)(ix)(K). The new condition requires general visual examination of containment leak chase channel barriers over a 10-year inspection interval in accordance with the completeness percentage in Table IWE-2411-1 of the 2017 Edition of ASME Section XI (i.e., 100 percent).

During walk downs inside containment, the inspectors identified several containment leak chase channel barriers (test pipes and caps) located at the containment floor that were degraded, including surface corrosion/exfoliation and one location where the test pipe and cap were missing. The licensee captured the inspectors' observations in condition report CR1182891 and performed the required visual examinations of the entire population of containment leak chase channel test locations. Out of a total of 53 locations, 11 locations had degradation that would allow intrusion of moisture into and against the inaccessible surfaces of the metal containment liner within the leak chase channel system. The licensee performed best effort VT-1 visual examinations at these 11 locations using a borescope probe through the test pipe opening and down into the channel and did not identify evidence of significant containment liner or weld material loss. The licensee also performed local pressure tests at each of the 11 locations up to a pressure of 56 psig, conducted a corrosion analysis of the remaining liner thickness, and documented the conclusion in an engineering evaluation. The inspectors reviewed the results of the examinations, including the engineering evaluation and completed corrective actions, and determined that the licensee demonstrated the containment liner was able to perform its design function.

Based on interviews with the licensee and a review of the Millstone containment inservice inspection program, the inspectors determined that the licensee had not previously examined the containment leak chase channel barriers located in the containment floor. The licensee concluded that one cause of the issue was the plant configuration did not match the design configuration on the as-built drawing from 1976. Specifically, the drawing stated, "fill with grout after tests are complete." The inspectors determined that the licensee's failure to visually examine the containment leak chase channel barriers in accordance with 10 CFR 50.55a and ASME Section XI Code, Subsection IWE, was a performance deficiency.

Corrective Actions: The licensee performed the required examinations on the entire population of containment leak chase channel barriers and completed repairs to restore the moisture barrier function for the degraded locations.

Corrective Action References: CR1182891, CR1183133, and CR1183461

Performance Assessment:

Performance Deficiency: Failure to conduct general visual examinations of the containment leak chase channel barriers as required by 10 CFR 50.55a and ASME Section XI.

Screening: The inspectors determined the performance deficiency was more than minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, intrusion of moisture into the inaccessible areas could occur and result in unmitigated corrosion degradation of the metal containment liner and associated liner welds.

Significance: The inspectors assessed the significance of the finding using Appendix A, "The Significance Determination Process for Findings At-Power." The inspectors determined the finding was Green because it did not result in an actual open pathway in the physical integrity of the reactor containment.

Cross-Cutting Aspect: H.12 - Avoid Complacency: Individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Individuals implement appropriate error reduction tools. Specifically, the licensee did not demonstrate a questioning attitude for the possibility of a latent issue associated with the design configuration of the leak chase channel system when observing conditions during plant walkdowns each refueling outage and did not confirm nor recognize the actual plant configuration.

Enforcement:

Violation: 10 CFR 50.55a, "Codes and Standards," as modified by NRC Final Rulemaking published in the Federal Register dated August 8, 1996, states, in part, that the examination of metallic liners in concrete containments shall satisfy the requirements of ASME Code, Section XI, Subsection IWE of the 1992 Edition with the 1992 Addenda through the latest edition, and addenda incorporated by reference in paragraph 10 CFR 50.55a(b)(2).

10 CFR 50.55a (b)(2)(ix)(K) "Metal Containment Examinations: Eleventh provision" states in part that a general visual examination of containment leak chase channel moisture barriers must be performed once each interval, in accordance with the completion percentages in Table IWE-2411-1 of the 2017 Edition [of the ASME Section XI Code].



Table IWE-2411-1, "Inspection Program," of the 2017 Edition requires at a minimum, completing examinations of 100 percent of moisture barriers on a 10-year interval.

Contrary to the above, on September 9, 2008, and September 9, 2018, the licensee failed to examine the metallic liner in its concrete containment to satisfy the requirements of the ASME Code. Specifically, the licensee did not perform general visual examinations of 100 percent of the containment leak chase channel moisture barriers during the first containment inservice inspection interval of September 9, 1998, to September 9, 2008, or the second inspection interval of September 10, 2008, to September 9, 2018. In November 2021, following identification of the violation by the NRC, the licensee completed visual examinations of the required leak chase channel barriers in accordance with Subsection IWE and planned a corrective action to add these components into the containment inservice inspection program for future examinations.

Enforcement Action: This violation is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy.

Inaccurate Information Provided to the NRC in License Amendment Request to Extend Integrated Leak Rate Test Intervals			
Cornerstone	Severity	Cross-Cutting Aspect	Report Section
Not Applicable	Severity Level IV NCV 05000336/2021004-02 Open/Closed	Not Applicable	71111.08P
The NRC inspectors identified a Severity Level IV NCV of 10 CFR 50.9, "Completeness and Accuracy of Information," because the licensee provided inaccurate information to the NRC in a license amendment request submitted to the NRC to extend the containment integrated leak rate test intervals. In the request, the licensee incorrectly stated that they had performed general visual examinations of the containment leak chase channels under the Millstone Unit 2 containment inservice inspection program (also referred to as the IWE program), when in fact, the examinations had not been completed, and the program had not been expanded to include these components.			
<p><u>Description:</u> By letter dated October 4, 2017, the licensee submitted a license amendment request to the NRC to revise the Millstone containment integrated leak rate test intervals. On September 25, 2018, the NRC issued Amendment No. 335 to Renewed Facility Operating License No. DPR-65 for Millstone Power Station Unit 2, approving the extension of test intervals associated with Technical Specification 6.19, "Containment Leakage Rate Test Program," from 10 years to 15 years for Type A primary containment leak rate tests and from 60 months to 75 months for Type C local leak rate tests. While reviewing this amendment and the licensee's associated request, the inspectors identified a discrepancy in the licensee's statements addressing their impact assessment of NRC Information Notice 2014-07. Specifically, the licensee stated the following in their license amendment request:</p> <p><i>"Previously, the Millstone IWE Program had inspected the accessible leak chase channels and plugs or caps during the general visual examination as a liner boundary. In response to NRC Information Notice 2014-07, "Degradation of Leak Chase Channel System for Floor Welds of Metal Containment Shell and Containment Metallic Liner," the examination was expanded to include the inspection as an E-A Containment Surfaces, Item No. E130 - Moisture Barriers. This examination identified no deficiencies. At this time there are no primary containment surface areas that require augmented examinations."</i></p>			

As described in NCV 05000336/2021004-01 documented in this report, the inspectors identified that the licensee did not perform the general visual examinations of all the accessible leak chase channel barriers (i.e., plugs or caps), as intended. The inspectors reviewed Millstone's response to NRC Information Notice 2014-07 and noted that the same inaccurate information was carried over as an input into the license amendment request. Following the inspectors' identification of the issue, the licensee performed visual examinations of 100 percent of the containment leak chase channel barriers located in the containment floor. Eleven locations had deficiencies with degradation that would allow intrusion of moisture into and in contact with the inaccessible surfaces of the metal containment liner within the leak chase channel system and required augmented examinations to disposition those deficiencies. The inspectors determined the statement provided in the license amendment request was inaccurate and constituted a violation of 10 CFR 50.9, "Completeness and Accuracy of Information."

Corrective Actions: The licensee generated CR1184140 to address this discrepancy.

Corrective Action References: CR1184140

Performance Assessment: None

Enforcement: The Reactor Oversight Process's significance determination process does not specifically consider the regulatory process impact in its assessment of licensee performance. Therefore, it is necessary to address this violation which impedes the NRC's ability to regulate using traditional enforcement to adequately deter non-compliance.

Severity: The inspectors determined this is a Severity Level IV violation in accordance with Section 6.9 of the NRC Enforcement Policy. In particular, the inspectors considered that, had the information been complete and accurate at the time, it likely would have resulted in the need for further clarification of the licensee's actions to address NRC Information Notice 2014-07 but would not have caused the NRC to change the decision to issue the license amendment or resulted in substantial further inquiry.

Violation: 10 CFR 50.9, "Completeness and Accuracy of Information," states, in part, that information provided to the Commission by a licensee shall be complete and accurate in all material respects.

Contrary to the above, on October 4, 2017, the licensee failed to ensure that information provided to the NRC was complete and accurate in all material respects associated with a license amendment request to extend the containment integrated leak rate test intervals required by Technical Specification 6.19, "Containment Leakage Rate Testing Program." Specifically, the licensee stated "...the Millstone IWE Program had inspected the accessible leak chase channels and plugs or caps during the general visual examination as a liner boundary... the examination was expanded to include the inspection as an E-A Containment Surfaces, Item No. E130 – Moisture Barriers. This examination identified no deficiencies." However, the licensee had not revised the Millstone containment inservice inspection program (IWE program) and did not perform the general visual examinations of all the accessible leak chase channel barriers (i.e., plugs or caps). This information was material to the NRC because it was considered as part of the basis for approving a license amendment request to extend containment integrated leak rate test intervals.

Enforcement Action: This violation is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy.

Failure to Document and Evaluate Pressurizer Power Operated Relief Valve Test Failure in Accordance with Surveillance Test Program

Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000336/2021004-03 Open/Closed	[H.11] - Challenge the Unknown	71111.15

The inspectors identified a Green finding and associated NCV of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," when PORV 2-RC-402 failed to meet surveillance test requirements and the unsatisfactory test results were not documented and adequately evaluated to assure that test requirements were satisfied in accordance with WC 9, "Station Surveillance Program," Revision 7, and SP 2610M, "PORV Hot Functional Test," Revision 6.

Description: On October 7, 2021, at 8:50 p.m., while Millstone Unit 2 was in Mode 3, pressurizer PORV (2-RC-402) failed to meet the acceptance criteria during exercise testing to satisfy Surveillance Requirement 4.4.3.1.c. This test is performed every 18 months at conditions representative of Modes 3 or 4 using SP 2610M, "PORV Hot Functional Test," Revision 6. Additionally, the control and administration of the Millstone Station surveillance test program is established by administrative procedure WC 9, "Station Surveillance Program," Revision 7.

After the failed attempt to cycle the PORV, control room operators considered the valve inoperable, consulted with the valve test team in the field, and informed the outage control center. No issues were found with the test setup, and field personnel confirmed that the valve did not open, but the pilot valve actuated. The operating crew confirmed that the test configuration and test sequence were in accordance with the surveillance test procedure. The licensee could not determine the cause of the failed test but believed that performing the test with the block valve closed could result in an insufficient differential pressure across the valve; therefore, the operating crew decided to perform a second test after cycling the block valve to demonstrate operability.

At 9:22 p.m., operators re-performed SP 2610M, and on the second attempt, the PORV indicated open after approximately 20 seconds, and then reclosed successfully. However, during both attempts to stroke the valve, the solenoid coil current exhibited oscillations which were not consistent with previous tests. The normal stroke time for the valve was approximately 5 seconds. However, because stroke time was not part of the test acceptance criteria, the licensee considered the second attempt as a satisfactory test, opened the PORV block valve, and declared the PORV operable at 9:19 p.m. The licensee continued to operate in Mode 3 until 12:38 a.m. October 8, 2021, at which time Unit 2 entered Mode 4.

Step 4.1.16 and 4.1.17 of SP 2610M directed operators to compare the test results to the inservice test (IST) acceptance criteria, document the results on the surveillance test record (Form SP 2610M-001), and if the results were unsatisfactory, perform applicable actions in accordance the Attachment 1. Attachment 1, "Actions for IST Data Outside 'Acceptable' Limits," required operators to consider the PORV not OPERABLE, notify the IST Coordinator and System Engineer, and initiate a CR, which in turn would direct the shift manager to perform an operability determination in accordance with Dominion Nuclear Fleet Procedure OP-AA-102, "Operability Determination," Revision 15. The inspectors identified that the

licensee did not document the unsatisfactory test on the surveillance test record as required by SP 2610M.

Section 1.6 of WC 9, "Station Surveillance Program," Revision 7, states that "the re-performance of surveillance steps following unsatisfactory results, using the same surveillance form to achieve or document satisfactory test results, is not permitted, unless specific guidance is given in the procedure for re-performance of steps and the form has 'As Found' and 'As Left' provisions." The inspectors determined that SP 2610M did not include direction for the re-performance of surveillance test steps. WC 9 also states "if adjustments are not allowed by procedure, failure to meet 'as found' TS or TRM acceptance criteria results in a failed surveillance." The inspectors noted that SP 2610M did not allow for adjustments. The inspectors identified that the licensee re-performed surveillance steps following unsatisfactory results using the same surveillance form to document satisfactory test results contrary to WC 9.

The Millstone Unit 2 technical specification (TS) bases for Surveillance Requirement 4.4.3.1c explains that this test is normally performed with the block valve closed and that stroking the PORV through a complete cycle of full travel demonstrates its function. The inspectors reviewed CR1182178, past test results, and the results of the October 2021 test. Unit 2 PORV past performance history indicated that prior to the October 2021 test, both Unit 2 PORVs had been successfully stroked with the block valves closed during previous outages. Additionally, while stroke time was not part of the test acceptance criteria, the 20 second stroke time observed during the second test was much greater than the typical 5 second stroke time seen during this test for both Unit 2 PORVs. The inspectors also noted that the other PORV, 2-RC-404, successfully completed its test on October 7, 2021, and stroked within the typical 5 seconds.

The inspectors noted that the licensee documented that the PORV did not open on the first attempt in the corrective action program as CR1182178, but did not consider the functional testing of PORV 2-RC-402 unsatisfactory. As a result of not documenting the test failure properly, the licensee did not perform an adequate evaluation of the as-found test results to assure that the test requirements had been satisfied, and that the PORV could reliably perform its function. Therefore, the inspectors concluded that without an appropriate evaluation of the as-found condition of the PORV, operators had not established a reasonable expectation of operability in accordance with OP-AA-102, "Operability Determinations," and, as required by step 3.2.2.b of OP-AA-102, should have declared PORV 2-RC-402 inoperable and performed the appropriate TS actions.

Millstone Unit 2 TS 3.4.3 requires that while the plant is in Modes 1, 2, and 3, both PORVs and their associated block valves shall be operable. The TS ACTION statement 3.4.3.b.1 requires that with one PORV not capable of being manually cycled, "within 1 hour either restore the PORV to operable status or close its associated block valve and remove power from the block valve."

Despite not declaring the valve inoperable and entering the TS action statement for one inoperable PORV, after the valve failed to satisfy Surveillance Requirement 4.4.3.1.c, the licensee was in HOT SHUTDOWN (Mode 4) within the required TS action time (6 hours); therefore, the licensee was not in violation of TS 3.4.3, "Reactor Coolant System Relief Valves." The inspectors also noted that the other PORV, 2-RC-404, successfully passed its hot functional test and reactor coolant system pressure remained stable during this time.

Corrective Actions: The licensee entered the issue in its corrective action program and replaced the valve during the refueling outage.

Corrective Action References: CR1183277, CR1182178, CR1182301

Performance Assessment:

Performance Deficiency: The licensee did not consider the failure of PORV 2-RC-402 to stroke during performance of SP 2610M on October 7, 2021, as a failed surveillance, and re-performed the procedure using the same surveillance form to achieve and document satisfactory test results, which was contrary to WC-9, "Station Surveillance Program," Revision 7.

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 unsuccessful attempt to cycle the PORV, a failed surveillance test, was a condition that called into question the ability of the PORV to perform its function to relieve reactor coolant system pressure below the setting of the pressurizer code safety valves.

Significance: The inspectors assessed the significance of the finding using Appendix A, "The Significance Determination Process for Findings At-Power." The inspectors determined the finding was of very low safety significance (Green) because the finding: 1) was not a deficiency affecting the design or qualification of a mitigating structures, systems, and components, 2) did not represent a loss of the probabilistic risk assessment (PRA) function of a single train TS system for greater than its TS allowed outage time, 3) did not represent a loss of the PRA function of one train of a multi-train TS system for greater than its TS allowed outage time, 4) did not represent a loss of the PRA function of two separate TS systems for greater than 24 hours, 5) did not represent a loss of a PRA system and/or function, and 6) did not represent a loss of the PRA function of one or more non-TS trains of equipment designated as risk-significant in accordance with the licensee's maintenance rule program for greater than 3 days.

Cross-Cutting Aspect: H.11 - Challenge the Unknown: Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before proceeding. Specifically, control room operators did not stop and thoroughly evaluate why the PORV did not operate correctly on the first attempt.

Enforcement:

Violation: Criterion XI, "Test Control," of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," requires, in part, that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is performed in accordance with written test procedures, and test results shall be documented and evaluated to assure that test requirements have been satisfied.

Contrary to the above, on October 7, 2021, testing required to demonstrate that the pressurizer PORV 2-RC-402 will perform satisfactorily in service was not performed in accordance with written test procedures, and test results were not documented and evaluated to assure that test requirements were satisfied.

Enforcement Action: This violation is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy.

Failure to Identify a Failed Auxiliary Feedwater Turbine Supply Check Valve that Resulted in an Unanalyzed Condition

Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000336/2021004-04 Open/Closed	[P.2] - Evaluation	71111.15

A self-revealed Green finding and associated NCV of 10 CFR Part 50, Appendix B, Criteria XVI, "Corrective Action," was identified on October 23, 2021, when the licensee did not promptly identify and correct a failure of the auxiliary feedwater turbine supply check valve from the #2 steam generator (2-MS-4B), a condition adverse quality.

**Description:** The Unit 2 TDAFW pump is supplied steam by two 4-inch lines that can each deliver 100 percent of the required steam flow to the pump. Each line taps off one of the two main steam lines upstream of the main steam isolation valve. These two 4-inch lines each contain a normally open motor operated valve (2-MS-201 and 2-MS-202) and a check valve (2-MS-4A and 2-MS-4B). These check valves must open to provide a flow path from the steam generator to the TDAFW pump steam turbine and close to prevent the blowdown of the isolated steam generator in the event of a main steam line break at the other steam generator. The TDAFW pump and associated steam supply check valves (2-MS-4A and 2-MS-4B) are risk-significant, safety-related components.

During Millstone Unit 2 Cycle 27 (June 2020 to October 2021), 2-MS-4B, the TDAFW steam supply check valve from the #2 steam generator, experienced disc chatter following three of the quarterly TDAFW pump surveillances. Chattering was observed following the November 2, 2020 (CR1159999), January 27, 2021 (CR1164709), and April 29, 2021 (CR1171461) surveillances. Check valve chatter was an unexpected condition and considered a condition adverse to quality. For each of these occurrences, operations personnel performed troubleshooting to reseal 2-MS-4B by isolating the valve and relieving pressure in the line. The troubleshooting successfully seated the check valve, and the chattering stopped each time.

On October 23, 2021, while Unit 2 was in Mode 0 for its planned refueling outage, the licensee performed an internal inspection of 2-MS-4B. The licensee discovered that the check valve had failed and was unable to perform its "close" safety function and could possibly have blocked steam flow in the forward direction impacting its ability to perform its "open" safety function. The valve was repaired during the outage, tested, and returned to service on November 9, 2021.

Additionally, on November 9, 2021, with the Unit in Mode 1 at approximately 89 percent power, 2-MS-4B began chattering again. On November 14, 2021, the licensee identified that the check valve could not perform its "close" safety function. The licensee isolated the valve and through visual inspection, identified damage to the valve internals that prevented it from fully closing.

For both the October 23 and November 14, 2021, failures, the licensee determined that the as-found conditions of 2-MS-4B constituted an unanalyzed condition that could result in

exceeding the containment design pressure in response to a main steam line break ([EN55565](#) and [EN55576](#)).

The licensee determined that the direct cause of both failures was mechanical damage due to valve chatter. The licensee suspects the cause of the chattering to be the piping configuration for 2-MS-4B. The licensee also determined that there was a lack of organizational awareness regarding the impact of 2-MS-4B chatter on the reliability of the valve.

No chattering was observed following the TDAFW pump surveillance test on July 28, 2021. Therefore, the licensee determined that the check valve disc became disconnected from the arm sometime between the troubleshooting on April 29, 2021, and the last Cycle 27 TDAFW quarterly IST performed on July 28, 2021. Unit 2 entered Mode 4 on October 8, 2021, at which point the TDAFW pump was no longer required to be operable.

The licensee noted in its causal evaluation that the 2-MS-4B failure could have been detected at this time (July 28, 2021) had they performed troubleshooting to verify disc closure. Licensee procedure PI-AA-200, "Corrective Action," establishes the measures to be taken to assure that conditions adverse to quality are promptly identified and corrected, as required by 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action." This procedure requires that conditions adverse to quality be promptly identified and corrected. After three consecutive occurrences of chattering during the TDAFW pump surveillance tests, the lack of chattering on July 28, 2021, was an abnormal or unexpected condition, which should have been entered into the corrective action program.

Corrective Actions: The licensee repaired the check valve during the refueling outage and then implemented a design change to the check valve internals that improved the disc to disc-arm connection after the second failure. The licensee has developed an operability determination with compensatory actions to mitigate the check valve chattering and completed a cause evaluation (CA8816983) that recommends long-term corrective actions to reconfigure the TDAFW steam supply piping or modify the check valve design to eliminate valve 2-MS-4B chatter. Corrective actions also included revisions to SP 2610E, "Main Steam Isolation Valve Closure and Main Steam Valve Operational Readiness Testing," to verify 2-MS-4B and 2-MS-4A check valve seat following performance of quarterly TDAFW testing.

Corrective Action References: CR1183570, CR1185101, CR1185353, CR1185755, CR1185997

#### Performance Assessment:

Performance Deficiency: The licensee did not promptly identify and correct a failure of the auxiliary feedwater turbine supply check valve from the #2 steam generator (2-MS-4B), a condition adverse quality, as required by 10 CFR Part 50, Appendix B, Criterion XVI, and the licensee's corrective action program procedure PI-AA-200, "Corrective Action," Revision 36.

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, 2-MS-4B failed during the last operating cycle and was unable to perform its safety function resulting in an unanalyzed condition that could result in exceeding the containment design pressure in response to a main steam line break.

Moreover, operating while the check valve was failed, also represented a condition prohibited by technical specifications.

Significance: Using IMC 0609.04, "Initial Characterization of Findings," and Exhibit 2 of IMC 0609, Appendix A, "The Significance Determination Process for Findings at Power," the inspectors screened this finding for safety significance and determined that a detailed risk evaluation was required. Specifically, the degraded condition represented a loss of the PRA function of one train of a multi-train TS system for greater than its allowed outage time.

The regional senior reactor analyst (SRA) used the Systems Analysis Programs for Hands-on Evaluation (SAPHIRE), Revision 8.2.5, and the Standardized Plant Analysis Risk (SPAR) Model for Millstone Unit 2, Model Version 8.71, to conduct the internal events detailed risk evaluation and the licensee's Individual Plant Examination (IPE) for Severe Accident Vulnerabilities, dated December 1993, and the Individual Plant Evaluation External Events (IPEEE), dated December 1995, to assess the external events risk contribution for this performance deficiency.

The SRA made the following assumptions with respect to exposure time and system performance impact. The check valve chattering was first identified November 2, 2020, and during multiple subsequent surveillances; however, the valve was found to pass its functional isolation checks during licensee troubleshooting. The last functional isolation check occurred on April 29, 2021. On July 28, 2021, chattering was no longer noted from the check valve and its disk is presumed separated from the swing arm and assumed to block the 'B' train steam path to the TDAFW turbine. Millstone Unit 2 remained in Mode 1 until October 8, 2021, when it was shut down for a planned refueling outage. Since it could not be determined when the valve disk separated from the swing arm, time = T/2 was used from April 29 through July 28, 2021 ( $90 / 2 = 45$  days). The period from July 28 through October 8, 2021, is counted as time = T (T = 72 days), and this would be added to the 45 days to estimate the exposure time. The subsequent failure period in November 2021 is not considered a significant risk contribution considering the prompt identification of the failure and isolation of the valve for rework within the TS allowed outage time. Hence the exposure time considered is 117 days (April 29, 2021, to October 8, 2021).

The SRA assessed the forward-flow risk (assuming the valve disk would block steam flow from the 'B' steam generator to the TDAFW turbine), and the reverse-flow risk (failure of the check valve to seat, relying on operator actions to isolate a postulated faulted steam generator and prevent an inadvertent blowdown of an intact steam generator). The SRA made the following changes to the Millstone 2 SPAR model:

- Steam generator #2 steam inlet check valve (AFW-CKV-CC-MS4B) basic event failure was set to TRUE to reflect the possibility of complete 'B' train steam line blockage. Complete 'B' train blockage is a bounding assessment. The as-found valve disk and swing arm positions would present the possibility of blockage but a low probability of complete line blockage. The SRA conducted sensitivity studies of varying 'B' train steam line blockage percentages. These studies indicate the forward-flow risk impact to be dominated by the increase in common-cause failure of the two steam inlet check valves (2-MS-4A/2-MS-4B) and not the failure or degraded condition of an individual check valve. Each steam line is 100 percent redundant, but the automatic increase of the common-cause failure from adjusting 2-MS-4B from its nominal failure probability dominates the risk increase.



- 'Operator Fails to Isolate Faulted Steam Generator' basic events were set to 0.1 based on review of emergency operating procedures (EOPs), specifically EOP 2536, "Excessive Steam Demand Event," Revision 029, which proceduralized the use of train-specific valves (2-MS-201/2-MS-202) to isolate and mitigate conditions exacerbated by a failed check valve. This value was a result of a SPAR-H evaluation based on the review of procedures, expected indications, and time estimation for the operator action.
- Exposure time for the condition cases were set at 117 days.

Based on these model changes, the calculated forward-flow delta core damage frequency (delta CDF) is  $3.7\text{E-}7$  per year and the reverse-flow delta CDF is  $1.5\text{E-}8$  per year. Total internal risk delta CDF estimate is  $3.85\text{E-}7$  per year. The dominant accident sequence is loss of alternating current bus 24D, loss of main and auxiliary feedwater, and loss of once through cooling.

To evaluate the external events contribution for this performance deficiency, the SRA reviewed the Millstone Unit 2 IPE and IPEEE. Millstone Unit 2 does not have a fire PRA. From the IPE and IPEEE, the SRA determined that the importance of the TDAFW pump in mitigation of fire events is significantly higher than seismic and other external event hazards based upon the TDAFW pump being a protected (from fire) single train system.

Since the two TDAFW steam lines are redundant and the 'B' train isolation valve (2-MS-202) is de-energized open and administratively controlled for fire safe-shutdown, the fire risk impact focused on the spurious hot-short closure of the 'A' train TDAFW steam line isolation valve (2-MS-201). A closure of this valve would render TDAFW non-functional during a postulated fire with a potential blocked 'B' train TDAFW steam line. A review of the IPEEE indicated 2-MS-201 control and power cables are routed through fire zones AUX-2, A-10A/B/C, and T-6. This corresponds to 10 CFR Part 50, Appendix R, areas R-1, R-13, and R-17. Consistent with IMC 0609, Appendix F, "Fire Protection Significance Determination Process," dated May 2, 2018, a bounding fire risk estimate is the sum of the fire ignition frequencies multiplied by delta CDF contributions for each area multiplied by a hot-short probability for 2-MS-201 cables. A hot-short probability of 0.28 was used and obtained from NUREG/CR-7150, "Joint Assessment of Cable Damage and Quantification of Effects from Fire," Volume 2, Table 4-3, for a grounded alternating current motor operated valve with thermoset cable. The SRA used fire non-suppression screening and adjustment factors equal to 1.0 for each area. The combined delta CDF from fire and a consequential hot-short affecting 2-MS-201 is estimated ( $1.13\text{E-}6/\text{year} \times 0.28 \times 117/365 \text{ year}$ ) at  $1.0\text{E-}7$  per year.

Using SAPHIRE, the SRA estimated the increase in risk from seismic events at  $3\text{E-}9$  per year and from hurricane, high wind, and tornado combined events at  $2.9\text{E-}8$  per year.

The total delta CDF risk for internal and external events ( $3.85\text{E-}7/\text{year} + 1.0\text{E-}7/\text{year} + 3\text{E-}9/\text{year} + 2.9\text{E-}8/\text{year}$ ) is estimated at  $5.17\text{E-}7$  per year.

The SRA also used SAPHIRE and IMC 0609, Appendix H, "Containment Integrity Significance Determination Process," dated March 23, 2020, to determine the total increase in large early release frequency (LERF) of this Type-A finding. SAPHIRE calculated a combined (forward and reverse flow) result of  $1.4\text{E-}8$  per year based on internal events core damage sequences that contribute to LERF. An additional estimate of the fire (and other external events) contribution to LERF would not result in exceeding the  $1\text{E-}7/\text{year}$  very low safety significance threshold. Also, Millstone Unit 2 is a Combustion Engineering design

pressurized water reactor and hence a separate consequential steam generator tube rupture (C-SGTR) screening was performed. This is an independent assessment separate from the SAPHIRE calculated LERF. This was conducted 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, and with consultation by NRC headquarter risk analysts. The bounding calculated estimate for the increase in LERF from C-SGTR was 7E-8 per year.

The total increase in CDF associated with the performance deficiency is the sum of internal and external conditional core damage frequencies (5.17E-7 per year), which is Green, or very low safety significance. The SAPHIRE calculated LERF result, and the C-SGTR screening (7E-8 per year) are both less than 1.0E-7 per year. Therefore, this finding is characterized as an issue of very low safety significance (Green).

Cross-Cutting Aspect: P.2 - Evaluation: The organization thoroughly evaluates issues to ensure that resolutions address causes and extent of conditions commensurate with their safety significance. Specifically, the licensee did not thoroughly evaluate the impact of valve chattering and consider the possible risk of operating with a check valve that had an internal failure that might not be able to perform its safety function.

Enforcement:

Violation: Criterion XVI, "Corrective Action," of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," requires, in part, that 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, from approximately July 28, 2021, to October 8, 2021, licensee measures did not assure that the failure of the auxiliary feedwater turbine supply check valve from the #2 steam generator (2-MS-4B), a condition adverse quality, was promptly identified and corrected.

Enforcement Action: This violation is being treated as an NCV, consistent with Section 2.3.2 of the Enforcement Policy.

Observation: Unit 2 Feedwater Heater Temperature Instrumentation Providing Inaccurate Readings	71152
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The plant calorimetric calculation takes the average of T5318 (feedwater heat 1B outlet temperature), T5317 (feedwater heater 1A out temperature), and T5262 (steam generator inlet temperature). In June 2020 after the Unit 2 refueling outage, the deviation between feedwater temperature transmitters T5317 and T5318 was approaching 2 degrees (about 1.85 degrees) and subsequently reached a 2-degree deviation for 32 days. A T5317 and T5318 drift greater than 2F may result in a non-conservative shift in the Unit 2 calorimetric indication. The calorimetric calculation is used to calculate reactor power and calibrate nuclear instruments.

The inspectors interviewed licensee staff and assessed the licensee's evaluation for the deviation. This evaluation was conducted between the Unit 2 feedwater instruments that exceeded 2 degrees Fahrenheit. This resulted in one of the three temperature instruments used as the average feedwater temperature input to the plant calorimetric calculation being

removed from the calculation. The calorimetric is used to calculate reactor power and calibrate nuclear instruments.

No findings or NRC violations were identified during this inspection.

## **EXIT MEETINGS AND DEBRIEFS**

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

- On October 21, 2021, the inspectors presented the radiation protection inspection results to Mr. Michael O'Connor, Plant Manager, and other members of the licensee staff.
- On November 23, 2021, the inspectors presented the Unit 2 feedwater heater temperature instrumentation providing inaccurate readings inspection results to Mr. Daniel C. Beachy, Licensing Engineer, and other members of the licensee staff.
- On December 28, 2021, the inspectors presented the Unit 2 inservice inspection results to Mr. John Daugherty, Site Vice President, and other members of the licensee staff.
- On January 27, 2022, the inspectors presented the integrated inspection results to Mr. John Daugherty, Site Vice President, and other members of the licensee staff.

## DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.01	Procedures	C OP 200.13	Seasonal Weather Operations	Revision 17
		OP 2268	Cold Weather Operations	Revision 8
		OP 2331	Plant Heating and Condensate Recovery System	Revision 11
71111.04	Corrective Action Documents	CR1169191		04/01/2021
	Corrective Action Documents Resulting from Inspection	CR1184375 CR1184991		10/31/2021
	Drawings	25203-26002	Main Steam from Generators	
		25203-26015	Safety Injection Tanks	Revision 31
		25203-26023	Piping and Instrumentation Diagram Spent Fuel Pool Cooling and Cleanup Sys	Revision 33
	Procedures	EOP 2541, Appendix 42	Restoring Spent Fuel Pool Cooling	Revision 2
		OP 2301H	Draining and Filling the RCS with Temporary RX Vessel Cover Installed	Revision 3
		OP 2305	Spent Fuel Pool Cooling and Purification System	Revision 34
		OP 2310A	Supplementing SFPC with SDC, Fuel in Vessel	Revision 4
		OP 2310B	SDC/SFPC Core Off-Loaded	Revision 5
		OP 2316A	Main Steam System	Revision 36
71111.06	Calculations	98-ENG-02411-C2	MP2 Evaluation of Flooding Outside Containment	Revision 1
71111.08P	Corrective Action Documents	CR0551282 CR1183563 CR1184006		
	Corrective Action Documents Resulting from Inspection	CR1182831 CR1183229		
	Drawings	MP-DWG-25203-11168, Sheet 0	Millstone Unit 2 Liner Plate Requirements Floor Plan and Details	Revision 0

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Engineering Evaluations	ETE-MP-2021-1120	Millstone Unit 2 Containment Floor Liner Leak Chase Channel Degraded Moisture Barrier Evaluation	Revision 0
	Miscellaneous	MP-24-CII-PRG	Millstone Station Containment Inservice Inspection Program Schedule/Detailed Plan	Revision 6
		U2-11-ISI-BAP01-Interval 5	Millstone Station Unit 2 Fifth Ten-Year Interval Inservice Inspection Plan	Revision 1
	Procedures	Welding Technique Number 103	Welding Procedure for Manual GTAW and SMAW of P-Number 1 Base Metals	Revision 9
71111.11Q	Procedures	OP 3304C	Primary Makeup and Chemical Addition	Revision 36
		OP-AA-100	Conduct of Operations	Revision 43
		SP 3446B12	Train B Solid State Protection System Operational Test	Revision 17
71111.12	Corrective Action Documents	CR1185090		11/06/2021
	Self-Assessments	CA8816943	MRule CR Evaluation U3 'B' Control Building Chiller Tripped	11/22/2021
	Work Orders	53203332070		11/12/2021
71111.13	Corrective Action Documents	CR0480199 CR0504575		10/03/2012
	Corrective Action Documents Resulting from Inspection	CR1181901 CR1185890		10/04/2021
	Procedures	CM-AA-SHK-101	Seismic Housekeeping	Revision 6
		OP 2301E	Draining the RCS (ICCE)	Revision 36
		SPROC OPS21-2-001	2R27 Shutdown Cooling System Total Outage (ICCE)	Revision 0
71111.15	Engineering Evaluations	ETE-MP-2021-1110	MPS 2R27 RCS Cooldown Transient During Transition from Concurrent Operation to SDC Only	Revision 0
71111.20	Corrective Action Documents	CR1183570		10/23/2021
	Corrective Action Documents Resulting from Inspection	CR1182404 CR1183210 CR1184214		10/10/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Procedures	FH 215	Refueling Machine Operation	Revision 8
		MA-AA-102	Foreign Material Exclusion	Revision 27
		MP 2704AA1	Unit 2 Reactor Head Removal and Installation (ICCE)	Revision 4
		OP 2206	Reactor Shutdown	Revision 17
		OP 2207	Plant Cooldown	Revision 51
		OP 2264	Conduct of Outages	Revision 14
		OP 2301E	Draining the RCS (ICCE)	Revision 36 and 37
		OU-M2-201	Shutdown Safety Assessment Checklist	Revision 27
71111.22	Corrective Action Documents Resulting from Inspection	CR1182301 CR1183277		
	Procedures	SP 2610M	PORV Hot Functional Testing	Revision 6
		WC 9	Station Surveillance Program	Revision 7
	Work Orders	53203313424		12/13/2021
71152	Corrective Action Documents	CR1152523 CR1152345 CR1152264 CR1151910 CR1151273 CR1149321		
	Corrective Action Documents Resulting from Inspection	CR1185830		
	Procedures	EN 21002	Core Heat Balance	Revision 019
	Work Orders	53203290017 53203290833 53203290806 53203288058		