



Public Service Company ^{of} Colorado

12015 East 46th Avenue, Suite 440; Denver, CO 80239

July 16, 1980
Fort St. Vrain
Unit No. 1
P-80218

Mr. James Miller
Chief, Special Projects Branch
Division of Project Management
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket No. 50-267

Subject: Fort St. Vrain Inservice
Inspection & Testing

- Reference: 1) PSC Letter, J.K. Fuller
to James Miller, P-80064,
dated March 31, 1980
- 2) PSC Letter, J.K. Fuller
to Steven A. Varga,
P-80034, dated
March 3, 1980

Gentlemen:

Enclosed for your review is the Reactor Auxiliary Cooling Water Systems inservice inspection and testing requirements analysis, which is the first of the Category II inservice inspection and testing program submittals for the Fort St. Vrain (FSV) High Temperature Gas-Cooled Reactor. The Reactor Auxiliary Cooling Water Systems include; System 41, Circulating Water System; System 42, Service Water System; System 45, Fire Protection System; System 46, Reactor Plant Cooling Water System; System 47, Purification Cooling Water System. This submittal contains draft modifications to the FSV Technical Specification Surveillance Requirements, along with an evaluation of the proposed requirements.

Enclosure 1 contains the draft revision of the FSV Technical Specification Surveillance Requirements for the Reactor Auxiliary Cooling Water Systems, which include the following sections:

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Enclosure (1)

- 5.2 - Primary Coolant System, Surveillance
- SR 5.2.10 - Fire Water System/Fire Suppression Water System, Surveillance
- SR 5.2.20 - ACM Diesel Driven Generator, Surveillance
- SR 5.2.21 - ACM Hand Valves, Surveillance
- SR 5.2.24 - Circulating Water Makeup Systems, Surveillance
- SR 5.2.28 - Reactor Auxiliary System Pumps, Surveillance
- SR 5.2.29 - Reactor Auxiliary System Valves, Surveillance
- SR 5.2.30 - Reactor Auxiliary System Instrumentation and Controls, Surveillance
- SR 5.2.31 - Refueling Penetration Hold-down Plates, Surveillance
- SR 5.3.3 - Bypass and Safety Valves, Surveillance
- SR 5.3.4 - Safe Shutdown Cooling Valves, Surveillance
- SR 5.4.4 - PCR/V Cooling Water System Temperature Scanner, Surveillance
- SR 5.4.5 - PCR/V Cooling Water System Flow Scanner, Surveillance

The revised portions are identified by vertical lines on the right-hand-side of the pages.

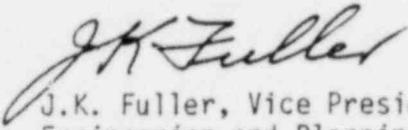
Enclosure (2) contains an evaluation of the additional or modified surveillance requirements which are the result of PSC's review of the current surveillance requirements for the Fort St. Vrain Reactor Auxiliary Cooling Water Systems (41, 42, 45, 46 & 47).

PSC has received no NRC response or comments on PSC's Category I submittals for the FSV ISI review program. PSC's work on the Category II submittals has been slowed considerably pending completion of the NRC's review of the Category I submittals. However, PSC will continue to make submittals, thereby fulfilling the NRC Licensing SER requirement to review the Fort St. Vrain inservice inspection program after five years of plant operation. Many manhours have been expended to date in conducting the review effort. As stated previously in References 1 & 2, NRC comments on the adequacy and acceptability of the approach being used to develop detailed ISI requirements, are needed to provide direction and complete the program in a timely manner.

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Please direct any questions or comments you may have concerning the submittals or the PSC ISI program to Mr. Mark A. Joseph, (303) 571-6671.

Very truly yours,


J.K. Fuller, Vice President
Engineering and Planning

JKF/MAJ:pa

Enclosures

FORT ST. VRAIN

INSERVICE INSPECTION AND TESTING

PROPOSED

TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS

FOR THE

REACTOR AUXILIARY COOLING WATER SYSTEMS

Draft Rev. 3
June 24, 1990

Attachment to report EE-46-0004

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5.2 PRIMARY COOLANT SYSTEM - SURVEILLANCE REQUIREMENTS

Applicability

Applies to the surveillance of the primary (helium) reactor coolant system, excluding the steam generators, and to the surveillance of the reactor auxiliary systems; i.e., the PCRV auxiliary system, helium circulator auxiliary system, helium purification and purified helium storage system, liquid nitrogen system, circulating water makeup system, service water system, firewater supply system, reactor plant cooling water system, and helium purification cooling water system.

Objective

To ensure the capability of the components of the primary reactor coolant system to maintain the primary reactor coolant envelope as a fission product barrier and to ensure the capability to cool the core under all modes of operation.

Specification SR 5.2.10 - Fire Water System/Fire Suppression Water System,
Surveillance Requirement

- a) The fire water system shall be verified operable as follows:
- 1) The motor driven and engine driven fire pumps shall be functionally tested monthly. The associated instruments and controls shall be functionally tested monthly and calibrated annually.
 - 2) The diesel engine fuel shall be inventoried monthly and sampled and tested quarterly.
 - 3) The diesel engine shall be inspected during each refueling shutdown.
 - 4) The diesel engine starting battery and charger shall be inspected weekly for proper electrolyte level and overall battery voltage. The battery electrolyte shall be tested quarterly for proper specific gravity.
 - 5) The batteries, cell plates, and battery racks, shall be inspected each refueling cycle for evidence of physical damage or abnormal degradation. The battery-to-battery and terminal connections shall be verified to be clean, tight, free of corrosion, and coated with anti-corrosion material each refueling cycle.
- b) The fire suppression water system shall be verified operable as follows:
- 1) Monthly by verifying that each valve (manual, power operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

(Note: This revised SR 5.2.10 is part of Attachment 1 to PSC letter Ref. P-79170 dated August 13, 1979)

Specification SR 5.2.10 - Fire Water System/Fire Suppression Water System,
Surveillance Requirement (continued)

- 2) Semi-annually by performance of a fire suppression water system flush.
- 3) Annually by cycling each testable valve in the fire suppression water system flow path through at least one complete cycle of full travel.
- 4) Each refueling cycle by performing a fire suppression water system functional test which includes simulated automatic actuation of the system throughout its operating sequence, and:
 - (a) Verifying that each automatic valve in the flow path actuates to its correct position.
 - (b) Verifying that each fire water pump develops at least 1,500 gpm at a system head of 290 feet.
 - (c) Cycling each valve in the flow path that is not testable during plant operation through at least one complete cycle of full travel.
 - (d) Verifying that each fire water pump starts sequentially to maintain the fire suppression water system pressure at greater than or equal to 125 psig.
- 5) Each three years by performing a flow test.

Specification SR 5.2.10 - Fire Water System/Fire Suppression Water System,
Surveillance Requirement (continued)

Basis for Specification SR 5.2.10

The fire water pumps are required to supply water for fire suppression and safe shutdown cooling. The specified testing interval is sufficient to ensure proper operation of the pumps and controls. The motor driven pump routinely operates intermittently.

The operability of the fire suppression water system ensures that adequate fire suppression and emergency safe shutdown cooling capability is available. The specified testing interval is sufficient to ensure proper operation of the system when required.

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(*) Specification SR 5.2.20 ACM Diesel Driven Generator, Surveillance Requirements

- a) The diesel driven ACM generator shall be checked weekly by starting, and obtaining design speed and voltage.
- b) The generator shall be tested monthly under load for a minimum of two hours. The load under this condition shall be at least 100 percent of design ACM equipment full load.
- c) Those electrical transfer switches that must be manually positioned to implement the ACM shall be tested annually, or at the next scheduled plant shutdown if the test was not performed during the previous year.

Basis for specification SR 5.2.20

A weekly check of the Alternate Cooling Method generator, to demonstrate its capability to start, and a monthly test of the generator under load provides adequate assurance that the Alternate Cooling Method generator will be available to supply electrical power under the highly degraded loss of forced circulation situation. In the event that the ACM must be implemented, it is necessary to manually reposition electrical transfer switches.

Specification SR 5.2.21 ACM Hand Valves, Surveillance

Those manual valves and manual overrides of power operated valves, that must be positioned to implement the ACM mode of operation shall be tested annually, or at the next scheduled plant shutdown if the test was not performed during the previous year.

(*) Note: Even though modified to include surveillance requirements previously in SR 5.2.21, technical specification SR 5.2.20 is not in the scope of this review.

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Basis for specification SR 5.2.21

In the event that the ACM must be implemented, it is necessary to position valves manually, including some normally power operated valves. The test frequency is adequate to provide assurance that such manual actuation will be possible in the event such operation is required.

(*) Specification SR 5.2.24 - Circulating Water Makeup Systems, Surveillance Requirement

The circulating water makeup system shall be verified operable as follows:

- a) The circulating water makeup pond inventory shall be verified monthly. The pond level instrumentation shall be functionally tested monthly and calibrated annually.
- b) The circulating water makeup pumps shall be functionally tested monthly. The pump controls and instrumentation including the fire water pump pit instrumentation shall be functionally tested monthly and calibrated annually.
- c) The valve lineup of the flow path between the circulating water storage ponds and the fire water pump pits shall be verified correct monthly.
- d) Alignment and settlement of the circulating water makeup pond embankments shall be verified at least once every five years. The embankments and the water structures shall be examined, at the same interval, for abnormal erosion, cracks, seepage, leakage, accumulation of silt or debris, as applicable, which might indicate a deterioration of structural safety or operational adequacy of the storage pond.

Basis for Specification SR 5.2.24

The circulating water makeup system is required to supply water for fire suppression and safe shutdown cooling. The specified testing interval is sufficient to ensure proper operation of the pumps and controls. The system routinely operates during normal plant operation.

(Note: SR 5.2.24 is Attachment 2 to PSC letter Ref. P-79170 dated August 13, 1979. Additional recommended surveillance requirements, included as part of this review, are identified by a double vertical line in the margin).

Measuring the position of survey markers and evaluating the changes in position of these markers will allow changes in embankment alignment and settlement to be determined, as well as their possible impact on the structural integrity of the storage pond. Examination of the embankments and of the water structures will provide for an additional verification that no phenomenon occurs which might be detrimental to the ability of the storage pond to perform its safety function. Measurement of the silt accumulation in the storage pond will allow a verification that the minimum water inventory required by LCO 4.3.5 is available for Safe Shutdown Cooling of the reactor.

5.2-26

Specification SR 5.2.28 - Reactor Auxiliary System Pumps,
Surveillance

- a) The storage basin circulating water makeup pumps connectable to the ACM bus, the service water pumps, the reactor plant cooling water pumps, and the purification cooling water pumps shall have their hydraulic and mechanical performance verified once each month.
- b) The firewater pumps shall have their hydraulic and mechanical performance verified once each quarter.
- c) All the pumps in (a) and (b) above shall have their bearing temperature measured annually, if practical.

Basis for Specification SR 5.2.28

In addition to normal operation, verification of pump hydraulic performance, by measurement of pump pressure differential and flow (or helium temperature at outlet of the purification coolers for the purification cooling water pumps) and comparison of the measurements to reference values or to the pump characteristic, provides further assurance that the pumps will supply the flow required under accident conditions. Verification of pump mechanical performance, by measurement of vibration amplitude and bearing temperature (if practical), and by observation of lubrication fluid level or pressure as applicable, and by comparison of the measurements to reference values, also provides further assurance that the mechanical integrity of the pumps has not degraded, so that mechanical failure can be avoided when operation of a pump is called upon for the fulfillment of a safety function.

5.2-27

Specification SR 5.2.29 - Reactor Auxiliary System Valves,
Surveillance

- a) Power operated valves used for secondary containment isolation in the reactor auxiliary systems shall be tested annually with the plant shutdown, or at the next scheduled shutdown if the test was not performed during the previous year to demonstrate their ability to automatically close upon receiving the appropriate isolation signals. The related instrumentation and controls shall be functionally tested and calibrated at the same frequency, except for the PCRV liner cooling water system flow scanner circuits whose surveillance is governed by Technical Specification SR 5.4.5.
- b) Safety valves installed in the reactor auxiliary systems shall be tested at least once every five years to verify their set point.

Basis for Specification SR 5.2.29

The PCRV liner cooling system subheader isolation valves are automatically closed, in the event of a possible liner and cooling tube failure, upon high pressure in the reactor plant cooling water system when the reactor is pressurized, or upon low flow or low surge tank level when the reactor is depressurized and the water flow remote manually redistributed. A low subheader flow in the latter case only isolates the affected subheader.

A helium purification cooler is automatically isolated in case of high pressure in the corresponding purification cooling

5.2-28

water subheader, which would indicate a tube failure in that heat exchanger. To prevent spurious isolation, the expansion tank cover pressure gas supply is automatically isolated in case of a malfunction which would increase the cooling water system pressure above normal.

Testing the valves and related instrumentation and controls will provide assurance that secondary containment isolation will occur should there be a failure in the reactor coolant boundary affecting these auxiliary cooling water systems.

Valve testing will include, as applicable, full stroking each valve, or an observation that the valve stem or disc travels from the valve normal operating position to the position required to perform the safety function, and an observation that the remote position indicators accurately reflect valve position.

Safety valves protect the integrity of those portions of the reactor auxiliary cooling water systems required to operate in case of accidents. Testing the safety valve set points will assure that the pressure within the systems remain within design limits.

When practical, testing of the safety valves will be scheduled during the surveillance interval, so that testing of one (or more) safety valve(s) of similar type and operating conditions, several times during the interval, will provide additional confidence in safety valve reliability and adequate overpressure protection.

5.2-29

Technical Specification SR 5.2.30 - Reactor Auxiliary System
Instrumentation and Controls, Surveillance

- a) Local indicators used to monitor operation of the reactor auxiliary systems during ACM mode of operation shall be checked quarterly and calibrated annually, except for the PCRV liner cooling system subheader temperature indicators whose surveillance is governed by Technical Specification SR 5.4.4.
- b) Instrumentation and controls used to monitor and/or control operation of reactor auxiliary systems required for Safe Shutdown Cooling, to verify compliance with Technical Specification Limiting Conditions of Operation, or to monitor system structural integrity shall be calibrated annually.

Basis for Specification SR 5.2.30

The frequency specified for surveillance of the above instrumentation will assure that they perform their expected functions, that the operator will be provided with accurate information to monitor operation under accident conditions, and that plant equipment required to operate under such accident conditions are capable of performing their safety functions.

Specification SR 5.2.31 - Refueling penetration holddown plates surveillance

The refueling penetration holddown plate bolting shall be visually examined at each refueling shutdown, after the hold-down plates have been removed, for indications of surface damage which could be detrimental to their structural integrity.

Basis for Specification SR 5.2.31

Visual examination of the holddown plates bolting will provide assurance that the holddown plates integrity is not degraded due to frequent removal and reinstallation.

Note: Since technical specification SR 5.2.24 was created in PSC letter P-79170, this technical specification which is part of enclosure 1 to PSC letter P-80034 has been renumbered SR 5.2.31 and is attached even though it is not in the scope of this review).

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* Basis for Specification SR 5.3.3

The specified secondary (steam) coolant system bypass valves and pressure relief valves will be tested during plant shutdown as follows:

- a) The main steam and hot reheat steam power operated pressure relief valves will be tested by exercising the relief.
- b) The six hot reheat steam bypass valves will be tested by exercising each valve to ensure freedom of movement.
- c) The main steam bypass valves will be tested for operability by cycling the valves.

The main steam bypass valves divert up to 77% steam flow (via desuperheaters) to the bypass flash tank on turbine trip or loop isolation, so that the steam is available for driving helium circulators, boiler feed pump turbines, etc. The main steam power operated relief valves divert the remaining steam flow to atmosphere.

The six hot reheat steam bypass valves and the power operated pressure relief valve ensure a continuous steam flow path from the helium circulators for decay heat removal.

The tests required on the above valves will demonstrate that each valve will function properly. Test frequency is considered adequate for assuring valve operability at all times.

Specification SR 5.3.4 - Safe Shutdown Cooling Valves,

Surveillance

Those valves that are pneumatically, hydraulically, or electrically operated, and those manual valves that are required

- * (Note: SR 5.3.3 and SR 5.3.4 were previously reviewed as part of PSC submittal Ref. P-80064 (Enclosure 3). Additional surveillance requirements, included in SR 5.3.4 as a result of this review, are identified by a double vertical line in the margin).

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for actuation of the Safe Shutdown Cooling mode of operation, shall be tested annually, or at the next scheduled plant shutdown if these valves have not been tested during the previous year.

In addition, the above test shall include the normally closed check valves which are required to open for actuation of the Safe Shutdown Cooling mode of operation, when such testing is practical.

Basis for Specification SR 5.3.4

The Safe Shutdown Cooling mode of operation utilizes systems or portions of systems that are in use during normal plant operation. In many cases, those valves required to initiate Safe Shutdown Cooling are not called upon to function during normal operation of the plant, except to stand fully closed or open.

Testing of these valves will assure their operation if called upon to initiate the Safe Shutdown Cooling mode of operation, or to isolate non safety class 1 portions of systems which may have failed.

During reactor operation, the instrumentation required to monitor and control the Safe-Shutdown mode of cooling is normally in use and any malfunction would be immediately brought to the attention of the operator. That instrumentation not normally in use is tested at intervals specified by other surveillance requirements in this Technical Specification.

Safe Shutdown Cooling, the systems or portions of systems involved, are discussed in Sections 10.3.9 and 10.3.10 of the FSAR and are represented in FSAR Figure 10.3-4.

Valve testing will include, as applicable, full stroking

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each valve, or an observation that the valve stem or disc travels from the valve normal operating position to the position required to perform the safety function, an observation that the remote position indicators accurately reflect actual valve position, and a measurement of the full stroke time for the hydraulically actuated automatic valves.

* Specification SR 5.3.5 - Hydraulic Power System Surveillance Requirements

The pressure indicators and low pressure alarms on the hydraulic oil accumulators pressurizing gas and on the hydraulic power supply lines shall be functionally tested once every three months and calibrated once per year.

Basis for Specification SR 5.3.5

The hydraulic power system is a normally operating system. Malfunctions in this system will normally be detected by failure of the hydraulic oil pumps or hydraulic oil accumulators to maintain a supply of hydraulic oil at or above 2500 psig. Functional tests and calibrations of the pressure indicators and low pressure alarms on the above basis will assure the actuation of these alarms upon a malfunction of the hydraulic power system which may compromise the capability of operating critical valves.

* Specification SR 5.3.6 - Instrument Air System - Surveillance Requirements

The pressure indicators and low pressure alarms on the instrument air receiver tanks and headers shall be functionally tested monthly and calibrated annually.

* NOT REVIEWED AS PART OF THIS SUBMITTAL.

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Specification SR 5.4.4 - PCRV Cooling Water System Temperature
Scanner - Surveillance Requirements

PCRV cooling water system temperature scanner readings shall be checked by comparison of representative liner cooling tube thermocouple outputs to their respective subheader temperatures and associated alarms tested once per month during power operation. A comparison shall also be performed of the water inlet temperature scanner readings with their respective header temperature indicators.

All thirty-six (36) outlet subheader temperature indicators, the four (4) inlet header temperature indicators, and the scanner shall be calibrated annually. In addition, ninety-seven (97) liner cooling tube outlet thermocouples shall be calibrated annually.

Basis for Specification SR 5.4.4

The temperature scanner for the PCRV cooling system provides for continuous monitoring of the outlet water temperature of each individual liner cooling tube and alarming of high outlet temperatures. It also continuously monitors water inlet temperature.

The surveillance interval specified is sufficient to detect any drift in the output of the individual thermocouples or scanner electronics to assure the temperature limitations of the PCRV cooling system are not exceeded.

The ninety-seven (97) thermocouples shall be distributed among the thirty-six (36) subheaders so that between 16.7% and 21.5% of the total in each subheader are calibrated each year. Thus, the maximum time between calibration of any one thermocouple, or any complete subheader, shall not exceed six (6)

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years. The overall percentage of thermocouples calibrated per year exceeds 18%.

The surveillance interval for calibration, combined with that for checking, assures sufficient accuracy of temperature measurement to adequately protect the PCRV concrete.

Specification SR 5.4.5 - PCRV Cooling Water System Flow Scanner -

Surveillance Requirement

A PCRV cooling system flow scanner readout shall be taken and normal mode alarms functionally checked monthly. The flow scanner, and both its sets of alarms, shall be calibrated annually. In addition, six subheader flowmeters shall be calibrated annually, or at the next scheduled plant shutdown if they were not calibrated during the previous year.

Basis for Specification SR 5.4.5

The flow scanner acts as a backup to the temperature scanner and initiates no automatic protective action, only an alarm, unless the PCRV cooling water system has been set remote manually in the redistribute mode of operation. The first set of alarms (normal mode) monitors flow restriction or blockage. The second set of alarms (redistribute mode) monitors possible PCRV cooling tube/liner leakage and also automatically isolates the affected subheader. Because a restriction or a leak would develop over a period of time, the monthly interval for comparing scanner readouts is sufficient to detect any long term change in the system. This interval, is also sufficient to monitor changes in the thermal barrier characteristics or integrity, which would be detected by changes in the heat load to subheaders cooling specific thermal barrier regions, as determined from the temperature instruments covered by SR 5.4.4 and from the above flow instrument