**FENOC**
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July 24, 2002
L-02-077

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

**Subject: Beaver Valley Power Station, Unit No. 2**
**Docket No. 50-412, License No. NPF-73**
**License Amendment Request No. 179**

Pursuant to 10 CFR 50.90, FirstEnergy Nuclear Operating Company (FENOC) requests an amendment to the above license in the form of a change to the technical specifications. The proposed amendment modifies the surveillance requirements for the Main Steam Isolation Valves.

This change will enhance plant operation by reallocating response time limits consistent with safety analyses and by reducing plant risk by eliminating the potential for an inadvertent plant transient with the plant at power. The technical analysis and no significant hazards evaluation are presented in the Enclosure. The proposed technical specification changes are presented in Attachment A. Attachment B indicates that there are no new commitments made in this letter. Attachment C provides the proposed information-only changes to the Updated Final Safety Analysis Report (UFSAR) and Licensing Requirements Manual (LRM) that reflect the proposed license amendment.

This change has been reviewed by the Beaver Valley review committees. The change was determined to be safe and does not involve a significant hazard consideration as defined in 10 CFR 50.92 based on the attached safety analysis and no significant hazard evaluation.

FENOC requests approval of the proposed amendment by July 1, 2003, in order to support the next BVPS Unit No. 2 refueling outage 10 (2R10). Once approved, the amendment will be implemented within 60 days.

If there are any questions concerning this matter, please contact Mr. Larry R. Freeland, Manager, Regulatory Affairs/Corrective Action at 724-682-5284.

A001

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 24, 2002.

Sincerely,

Marc P. Pearson

Enclosure: FENOC Evaluation of the Proposed Change.

Attachments:
A. Proposed Technical Specification Changes (mark-ups)
B. List of Regulatory Commitments
C. Proposed LRM and UFSAR Mark-ups (Information only)

c: Mr. D. S. Collins, NRR Project Manager
Mr. D. M. Kern, NRC Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

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M. E. O'Reilly
Central File - *Keywords: LAR, Main Steam Isolation Valve, Stroke Time*

**ENCLOSURE**

Beaver Valley Power Station, Unit No. 2
License Amendment Request No. 2A-179

FirstEnergy Nuclear Operating Company Evaluation

Subject: Application for amendment of Technical Specification Surveillance Requirement 4.7.1.5 to increase the Main Steam Isolation Valves stroke time limit to 6 seconds and replace the quarterly partial stroke exercise requirement with a reference to Technical Specification 4.0.5.



Attachments

1. DESCRIPTION

FirstEnergy Nuclear Operating Company (FENOC) requests to amend Operating License NPF-73 for Beaver Valley Power Station (BVPS) Unit No. 2.

The proposed amendment would revise the BVPS Unit No. 2 Technical Specification (TS) Surveillance Requirement (SR) 4.7.1.5 to change the valve stroke time limit for full closure of each Main Steam Isolation Valve (MSIV) to within 6 seconds from its current 5 seconds limit and to replace the quarterly partial stroke exercise requirement with criteria to test each MSIV pursuant to Specification 4.0.5.

2. PROPOSED CHANGE

The proposed change will revise BVPS Unit No. 2 TS SR 4.7.1.5. The full closure stroke time limit for the Main Steam Isolation Valve specified in TS 4.7.1.5 will be increased to 6 seconds. The once per 92 day requirement to part-stroke exercise the MSIVs will be replaced with criteria to test each MSIV pursuant to Specification 4.0.5, which requires testing in accordance with ASME Section XI. The proposed changes are shown in Attachment A.

3. BACKGROUND

The BVPS Unit No. 2 Main Steam Isolation Valves (MSIVs) are designed to close within 5 seconds, as described in BVPS Unit No. 2 UFSAR Sections 10.3, 15.1.4, and 15.1.5.

The MSIVs are required to operate to meet the Engineered Safety Feature (ESF) function for Steam Line Isolation. Therefore, the MSIVs are required to meet ESF requirements as described in UFSAR Section 7.3.1.2.5, Minimum Performance Requirements. The specific overall ESF response times for BVPS Unit No. 2 are listed in Table 3.2-1 of the BVPS Unit 2 Licensing Requirements Manual (LRM). Table 3.2-1 of the LRM currently lists the response time limit for Steam Line Isolation as $\leq$ 7.0 seconds.

The MSIVs are also required to meet Containment Isolation Valve (CIV) requirements as described in UFSAR Section 6.2.4. The specific CIV response times are listed in Table 5.1-1 of the LRM. Table 5.1-1 of the LRM currently lists the maximum stroke time limit for 2MSS-AOV101A/B/C (which are the asset numbers for the MSIVs) as 5 seconds.

TS Surveillance 4.7.1.5.b requires that the Main Steam Isolation Valve (MSIV) be verified to fully close within 5 seconds. This time frame is well within the 7 seconds valve closure time frame credited in the design basis accident analyses provided in the BVPS Unit No. 2

Updated Final Safety Analysis Report (UFSAR). This is also discussed in the TS Bases Section 3/4.7.1.5.

4. TECHNICAL ANALYSIS

The Unit 2 MSIVs are designed to close within 5 seconds of receipt of automatic close signal input. The valve design standard for the MSIVs is not being changed. BVPS supplied a plant-specific value of 5 seconds, consistent with the MSIV design, for the original TS surveillance 4.7.1.5 value when the original BVPS Unit No. 2 TS were first developed prior to initial plant startup. Measured valve stroke test values for BVPS Unit No. 2 MSIVs typically have occurred in the range of 4.5 seconds to 4.9 seconds. However, the response times have marginally exceeded the 5 second limit in the past which required follow-up corrective activities through the corrective action program. The current criteria provides very little margin for small changes in the valve closure response time, without exceeding the TS SR 4.7.1.5 limit. The inservice testing program from ASME Section XI, 1989 Edition, defines the acceptance criteria for valve performance for BVPS Unit No. 2. ASME Section XI, Section IWV-1000 refers to ASME/ANSI Operations and Maintenance Standard Part 10 [OM-10] for inservice testing criteria to assess the operational readiness of safety related valves used in nuclear power plants. Section 4.2.1.8 of this reference states "Other power-operated valves {other than electric-motor-operated valves} with reference stroke times less than or equal to 10 seconds shall exhibit no more than ± 50% change in stroke time when compared to the reference value." This industry standard acknowledges that some increase above a valve's design stroke value can be accepted and should not be a sole basis to declare the valve inoperable. The proposed increase in the MSIVs stroke time limit to 6 seconds is well within the limits allowed by this standard for a valve with a design stroke time of 5 seconds.

The safety analyses for the design basis accidents described in the BVPS Unit No. 2 UFSAR credit the ESF function of Steam Line Isolation. Inherent in the assumption for Steam Line Isolation is the time delay for automatic MSIV closure signal generation/transmission and the time delay for the MSIVs to physically close. The surveillance test at BVPS Unit No. 2 which measures the time delay involved in generating an automatic MSIV closure signal includes sensor response time and channel time (relay delay time is grouped with the MSIV closure time in the surveillance test). Measured test values for BVPS Unit No. 2 instrumentation time to generate an automatic MSIV closure signal typically occur in the range of 0.10 seconds to 0.20 seconds.

The safety analyses for the design basis accidents (DBA) described in the BVPS Unit No. 2 UFSAR credit a total delay of 7.0 seconds for the ESF function of Steam Line Isolation to occur. With the current TS surveillance 4.7.1.5.b criteria for each MSIV stroke time to be less than 5 seconds, this leaves a minimum of 2 seconds for generation of an automatic

MSIV closure signal in order to meet the overall analysis-assumed delay of 7.0 seconds for Steam Line Isolation. Two seconds for signal generation provides a very large margin from the typical measured values for this type of signal generation as described in the above paragraph.

This License Amendment Request (LAR) proposes to provide more time (margin) for the MSIV closure time requirement while retaining the current total delay of 7.0 seconds for the ESF function of Steam Line Isolation. The MSIV stroke time limit for TS surveillance 4.7.1.5 is proposed to be increased from 5 seconds to 6 seconds. This would result in a reduction in the maximum margin remaining available for automatic MSIV closure signal generation from 2 seconds to 1 second; however, the signal generation margin would still be quite large given the typically measured values. The current safety analyses which credit Steam Line Isolation will remain unaffected since the analyses only address the overall delay time which combines both the signal generation and the MSIV valve closure times, and does not individually address signal generation nor valve stroke time. Hence, the proposed change to the MSIV stroke time in TS SR 4.7.1.5 is consistent with the existing Design Basis Accident safety analyses. Increasing the MSIV valve stroke time limit to 6 seconds remains within the UFSAR-referenced ASME standard for this valve design for being operationally acceptable.

No physical changes are being proposed for the BVPS Unit No. 2 MSIVs. Therefore, the existing valve classifications for seismic and safety classes will remain unchanged. The valve actuators and control arrangements are not affected by this LAR. Hence, the criteria for the valves' independence, redundancy, failure modes, indication/instrumentation and remote manual control will remain unchanged.

The MSIVs perform a containment isolation function for the main steam lines which penetrate containment. Increasing the MSIVs stroke time limit to 6 seconds would not invalidate the current containment design requirements and the MSIVs will continue to be operated in the same manner. The MSIVs are on the main steam lines which are part of a sealed system that does not communicate directly with either the reactor coolant system or the containment atmosphere. The MSIVs will also continue to meet the criteria for General Design Criteria 54 and 57. The MSIVs will continue to meet the containment isolation valve criteria for very rapid closure of 10 seconds or less for lines which will not be used post-accident, as described in BVPS Unit No. 2 UFSAR Section 6.2.4.2. Increasing the MSIV stroke time limit to 6 seconds will not adversely affect the current results for radiological analyses, the effect on containment backpressure, or other containment related analyses since these analyses already assume a total delay for main steam line isolation of 7 seconds, which is not being altered by this LAR. If this LAR is approved, the BVPS Unit 2 UFSAR and the Licensing Requirements Manual (Table 5.1-1) will be revised accordingly to reflect the MSIV closure time limit of 6 seconds. The proposed UFSAR and Licensing

Requirements Manual mark-ups are provided in Attachment C for information only. It is noted that design criteria for the MSIVs in the UFSAR (Section 10.3) will continue to state that the MSIVs are designed to close within 5 seconds. This LAR will permit small increases in actual MSIV stroke times, consistent with current industry-accepted valve standards and the current BVPS Unit No. 2 safety analyses assumptions.

This LAR also proposes to replace the once per 92 day surveillance requirement to part-stroke exercise the MSIVs with the criteria to test each MSIV pursuant to Specification 4.0.5. Technical Specification Amendment No. 162 previously incorporated this change for BVPS Unit No. 1. This same change is being requested for BVPS Unit No. 2 for consistency with both BVPS Units. This change is consistent with the current BVPS Unit No. 1 Technical Specifications and the Standard Technical Specifications (NUREG-0452, Rev. 4). The proposed surveillance will require that the MSIVs be tested pursuant to TS 4.0.5. The MSIVs are ASME Code Class 3 valves. TS 4.0.5 requires that inservice testing be performed for ASME Code Class 3 valves in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50, Section 50.55a(f). This change is being proposed to reduce plant risk by eliminating the potential for an inadvertent plant transient which could occur during the part-stroke exercising currently required for the MSIVs with the plant at power. If a MSIV were to inadvertently fully close during partial stroke testing, a plant transient would result that would challenge the reactor trip system and likely cause an automatic ESF safety injection signal. This is an undesirable condition which has occurred at other plants, including BVPS Unit No. 1, in the past. The proposed change to the surveillance frequency does not adversely affect the Unit's Core Damage Frequency (CDF) or Large Early Release Frequency (LERF) used in the Probabilistic Risk Assessment (PRA). The proposed frequency would reduce the potential for an (inadvertent) event initiator of full MSIV closure and resulting plant transient while retaining a sufficient test frequency to identify potential MSIV malfunctions, based on industry operating experience.

The proposed surveillance change for BVPS Unit No. 2 to eliminate the quarterly exercise criteria is consistent with the current Improved Standard Technical Specification Bases provided for MSIV stroke time surveillance testing (SR 3.7.2.1) which states "The MSIVs should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power." This proposed surveillance change for BVPS Unit No. 2 is also consistent with NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants", Section 4.2.4, which references the above standard Technical Specification criteria that MSIVs should not tested at power. The testing criteria described in Section 10.3.4 of the BVPS Unit No. 2 UFSAR for MSIVs which describes various valve cycling requirements during both hot and cold conditions will continue to be applicable.

Based on the above analysis, the proposed change has been determined to be safe and will not reduce the safety of the plant.

5. REGULATORY SAFETY ANALYSIS

FirstEnergy Nuclear Operating Company proposes to amend the Operating License for Beaver Valley Power Station Unit No. 2. This License Amendment Request proposes to revise the surveillance criteria for the Main Steam Isolation Valves as described in Technical Specification (TS) Surveillance Requirement 4.7.1.5. This change will revise the valve stroke limit from 5 seconds to 6 seconds and replace the quarterly partial-stroke exercising test with criteria to test each Main Steam Isolation Valve pursuant to Specification 4.0.5, which requires the testing in accordance with ASME Section XI.

5.1 No Significant Hazards Consideration

FirstEnergy Nuclear Operating Company (FENOC) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   No. The proposed changes to the surveillance criteria for the Main Steam Isolation Valves (MSIVs) do not introduce any new initiator of a design basis accident. These proposed changes do not involve any physical modifications to the MSIVs. The proposed changes do not adversely affect accident initiators or precursors nor alter the configuration of the facility or the manner in which the plant is maintained. The proposed frequency change would reduce the potential for an (inadvertent) event initiator of full MSIV closure and resulting plant transient while retaining a sufficient test frequency to identify potential MSIV malfunctions, based on industry operating experience. Thus, the proposed changes do not involve a significant increase in the probability of an accident previously evaluated.

   The proposed changes do not alter or prevent the ability of structures, systems, and components (SSCs) from performing their intended function to mitigate the consequences of an initiating event within the assumed acceptance limits. The proposed changes are consistent with the safety analyses assumptions and resultant consequences. Accident analyses potentially affected by the proposed change have been reviewed and all applicable acceptance criteria continue to be met. Thus, the

proposed changes do not involve a significant increase in the consequences of an accident previously evaluated.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   No. The proposed change to the surveillance criteria for MSIVs do not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed). Subsequently, no new or different failure modes or limiting single failures are created. The plant will not be operated in a different manner due to the proposed change. All SSCs will continue to function as currently designed. Thus, the proposed changes do not create any new or different accident scenarios.

3. Does the proposed change involve a significant reduction in a margin of safety?

   No. The proposed change to the surveillance criteria for MSIVs do not involve revisions to any safety limit or safety system settings that would adversely impact plant safety. The proposed amendment does not alter the functional capabilities assumed in a safety analysis for any SSCs important to the mitigation and control of design basis accident conditions within the facility. The proposed frequency change would reduce the potential for an (inadvertent) event initiator of full MSIV closure and resulting plant transient while retaining a sufficient test frequency to identify potential MSIV malfunctions, based on industry operating experience.

   All of the applicable acceptance criteria for each of the analyses affected by the proposed changes continue to be met. The conclusions of the Updated Final Safety Analysis Report (UFSAR) remain valid. Thus, since the operating parameters and system performance will remain within design requirements and safety analysis assumptions, safety margin is maintained.

Based upon the above, FENOC concludes that the proposed amendment present no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

Applicable criteria and acceptance limits as they are related to the proposed changes are described below.

| General Design Criteria | | Assessment |
|---|---|---|
| 1 | Quality Standards | No Impact |
| 2 | Protection Against Natural Phenomena | No Impact |
| 4 | Environmental and Dynamic Effects | No Impact |
| 5 | Shared SSCs Important to Safety | No Impact |
| 16 | Containment Design | No Impact |
| 34 | Residual Heat Removal | No Impact |
| 35 | Emergency Core Cooling | No Impact |
| 54 | Piping Systems Penetrating Containment | No Impact |
| 57 | Closed System Isolation Valves | No Impact |

| Regulatory Guides | | Assessment |
|---|---|---|
| 1.26 | Quality Group Classifications and Standards | No Impact |
| 1.29 | Seismic Design Classification | No Impact |
| 1.115 | Protection Against Turbine Missiles | No Impact |
| 1.117 | Protection Against Tornado Missiles | No Impact |
| 1.141 | Containment Isolation Provisions | No Impact |

The above criteria is listed in Sections 6.2 and 10.3 of the BVPS Unit No. 2 UFSAR as design criteria for the MSIVs. The requested revisions to BVPS Unit No. 2 Technical Specification 4.7.1.5 will continue to provide adequate surveillance for the MSIVs consistent with the current BVPS Unit No. 1 Technical Specifications and the Standard Technical Specifications (NUREG-0452, Rev. 4). The proposed change will not impact the design or performance characteristics of the BVPS Unit No. 2 MSIVs since this modification does not include any physical changes to the current MSIVs. Hence the MSIVs will continue to meet the criteria for GDC 1, 2, 4, 5, 16, 34, 35, 54, and 57 and Reg. Guide 1.26, 1.29, 1.115, 1.117, and 1.141. The safety analyses in Chapter 15 of the BVPS Unit No. 2 UFSAR continue to remain valid since the overall time delay credited in safety analyses for Steam Line Isolation remains unchanged at $\leq$ 7.0 seconds. The MSIV surveillance change to reference Specification 4.0.5, which requires testing in accordance with the ASME Section XI inservice testing requirements, is consistent with the Standard Technical Specifications, NUREG-0452, Rev.4.

In conclusion, based upon the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the proposed amendment will not be inimical to the common defense and security or to the health and safety of the public.

6. ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. Revising the MSIV surveillance requirements does not change the release of effluents or change the radiation exposure to individuals. This request does not involve a significant change in the types or a significant increase in the amount of any effluents that may be released offsite and does not cause a significant increase in individual or cumulative occupational radiation exposure; thus, the categorical exclusion criteria of 10 CFR 50.22(c)(9) is satisfied. Therefore, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure.

Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7. REFERENCES

1. Beaver Valley Power Station Unit No. 2 Updated Final Safety Analysis Report, Sections 6.2.4, 7.3, 10.3, 15

2. Beaver Valley Power Station Unit No. 1 License Amendment 162, dated February 25, 1992, letter signed by A. W. De Agazio.

3. NUREG-1431, Vol. 2, Rev. 2, April 2001, Standard Technical Specifications Westinghouse Plants.

4. NUREG-0452, Revision 4, Fall 1981, Standard Technical Specifications for Westinghouse Pressurized Water Reactors

5. ASME Boiler and Pressure Vessel Code, 1989 Edition, Section XI

6. NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants", April, 1995

**ATTACHMENT A**

Beaver Valley Power Station, Unit No. 2
License Amendment Request No. 179

Proposed Technical Specification Change (marked-up)

The following is a list of the affected pages:

3/4 7-9

PLANT SYSTEMS

MAIN STEAM LINE ISOLATION VALVES

LIMITING CONDITION FOR OPERATION

3.7.1.5 Each main steam line isolation valve shall be OPERABLE.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

MODES 1 - With one main steam line isolation valve inoperable but open, POWER OPERATION may continue provided the inoperable valve is restored to OPERABLE status within 4 hours;

Otherwise, be in HOT SHUTDOWN within the next 12 hours.

MODES 2 and 3 - With one main steam line isolation valve inoperable, subsequent operation in MODES 2 or 3 may proceed after:

a. The inoperable isolation valve is restored to OPERABLE status, or

b. The isolation valve is maintained closed;

Otherwise, be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.7.1.5 Each main steam line isolation valve ~~that is open~~ shall be demonstrated OPERABLE by~~:~~

~~a. Part stroke exercising the valve at least once per 92 days, and~~

~~b.~~ ~~V~~verifying full closure within ~~5~~ seconds ~~on any automatic closure actuation signal while in HOT STANDBY with $T_{avg}$ ≥ 515°F during each reactor shutdown except that verification of full closure within 5 seconds need not be determined more often than once per 92 days~~ .

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when tested pursuant to Specification 4.0.5.

Amendment No.

**ATTACHMENT B**

Beaver Valley Power Station, Unit No. 2
License Amendment Request No. 179

[redacted]

Commitment List

The following list identifies those actions committed to by FirstEnergy Nuclear Operating Company (FENOC) for Beaver Valley Power Station (BVPS) Unit Nos. 1 and 2 in this document. Any other actions discussed in the submittal represent intended or planned actions by Beaver Valley. These other actions are described only as information and are not regulatory commitments. Please notify Mr. Larry R. Freeland, Manager, Regulatory Affairs/Corrective Actions, at Beaver Valley on (724) 682-5284 of any questions regarding this document or associated regulatory commitments.

| Commitment | Due Date |
| --- | --- |
| None. | None. |

**ATTACHMENT C**

Beaver Valley Power Station, Unit No. 2
License Amendment Request No. 179

[redacted]

Proposed Licensing Requirements Manual [LRM] Changes (marked-up)
Proposed Updated Final Safety Analysis Report [UFSAR] Changes (marked-up)
**For Information Only**

The following is a list of the affected pages:

LRM Page 3.2-3*
LRM Page 3.2-4*
LRM Page 5.1-7
LRM Page 5.1-8
LRM Page 5.1-9

UFSAR Page 10.3-3
UFSAR Page 10.3-5*
UFSAR Page 15.1-11*

* No changes are proposed; page provided for reference only.

*Provided for Information Only.*

TABLE 3.2-1 (Continued)
ENGINEERED SAFETY FEATURES RESPONSE TIMES

| INITIATING SIGNAL AND FUNCTION | | | RESPONSE TIME IN SECONDS |
|---|---|---|---|
| 3. | Pressurizer Pressure-Low | | |
| | a. | Safety Injection (ECCS) | ≤ 27.0[3]/27.0[4] |
| | b. | Reactor Trip (from SI) | ≤ 2.0 |
| | c. | Feedwater Isolation | ≤ 7.0[6] |
| | d. | Containment Isolation-Phase "A" | ≤ 61.0[9]/115.0[10] |
| | e. | Auxiliary Feedwater Pumps | ≤ 60.0 |
| | f. | Service Water System | ≤ 72.0[7]/181.0[8] |
| 4. | Steam Line Pressure-Low | | |
| | a. | Safety Injection (ECCS) | ≤ 37.0[5]/27.0[4] |
| | b. | Reactor Trip (from SI) | ≤ 2.0 |
| | c. | Feedwater Isolation | ≤ 7.0[6] |
| | d. | Containment Isolation-Phase "A" | ≤ 61.0[9]/115.0[10] |
| | e. | Auxiliary Feedwater Pumps | ≤ 60.0 |
| | f. | Service Water System | ≤ 72.0[7]/181.0[8] |
| | g. | Steam Line Isolation | ≤ 7.0 |
| 5. | Containment Pressure--High-High | | |
| | a. | Containment Quench Spray | ≤ 85.5[10] |
| | b. | Containment Isolation-Phase "B" | Not Applicable |
| | c. | Control Room Ventilation Isolation | ≤ 22.0[9]/77.0[10] |
| 6. | Steam Generator Water Level--High High | | |
| | a. | Turbine Trip | Not Applicable |
| | b. | Feedwater Isolation | ≤ 7.0[6] |

**No Changes**

Provided for Information Only.

TABLE 3.2-1 (Continued)
ENGINEERED SAFETY FEATURES RESPONSE TIMES

| INITIATING SIGNAL AND FUNCTION | | | RESPONSE TIME IN SECONDS |
|---|---|---|---|
| 7. | Containment Pressure--Intermediate High-High | | |
| | a. | Steam Line Isolation | ≤ 7.0 |
| 8. | Steamline Pressure Rate--High Negative | | |
| | a. | Steamline Isolation | ≤ 7.0 |
| 9. | Loss of Power | | |
| | a. | 4.16kv Emergency Bus Undervoltage (Loss of Voltage) (Trip Feeder) | ≤ 1.3 sec. |
| | b. | 4.16kv and 480v Emergency Bus Undervoltage (Degraded voltage) | 90 ± 5 sec. |
| 10. | Steam Generator Water Level-Low-Low | | |
| | a. | Motor-driven Auxiliary Feedwater Pumps(1) | ≤ 60.0 |
| | b. | Turbine-driven Auxiliary Feedwater Pump(2) | ≤ 60.0 |
| 11. | Undervoltage RCP | | |
| | a. | Turbine-driven Auxiliary Feedwater Pump | ≤ 60.0 |
| 12. | Trip of Main Feedwater Pumps | | |
| | a. | Motor-driven Auxiliary Feedwater Pumps | ≤ 60.0 |
| 13. | Control Room High Radiation | | |
| | a. | Control Room Ventilation Isolation | ≤ 180.0(11) |

No Changes

*Provided for Information Only.*

**TABLE 5.1-1 (Cont.)**
**CONTAINMENT PENETRATIONS**

| PENT. No. | IDENTIFICATION DESCRIPTION | INSIDE VALVE | MAXIMUM STROKE TIME (SEC) | OUTSIDE VALVE | MAXIMUM STROKE TIME (SEC) |
|---|---|---|---|---|---|
| X-71 | Recirculation Pump Discharge | (2)(13)2RSS-31 | N/A | (10)(B)(2)2RSS-MOV156C<br>(6)2RSS-RV156C | < 60(4)<br>N/A |
| X-73 | Main Steam System "A" | Closed System | N/A | (2)2MSS-AOV101A | ~~5~~ 6 |
| | | Closed System | N/A | (2)2MSS-AOV102A | N/A |
| | | Closed System | N/A | (2)(17)2MSS-SOV105A | N/A |
| | | Closed System | N/A | (2)(15)2MSS-SOV120 | N/A |
| | | Closed System | N/A | (6)2MSS-SV101A | N/A |
| | | Closed System | N/A | (6)2MSS-SV102A | N/A |
| | | Closed System | N/A | (6)2MSS-SV103A | N/A |
| | | Closed System | N/A | (6)2MSS-SV104A | N/A |
| | | Closed System | N/A | (6)2MSS-SV105A | N/A |
| | Steam Drains System | Closed System | N/A | (2)2SDS-AOV111A-1 | < 60 |
| | | Closed System | N/A | (2)2SDS-AOV129B | < 60 |
| | Steam Vent System | Closed System | N/A | (6)2SVS-PCV101A | N/A |
| | | Closed System | N/A | (6)2SVS-HCV104 | N/A |

*Provided for Information Only.*

**TABLE 5.1-1 (Cont.)**
**CONTAINMENT PENETRATIONS**

| PENT. No. | IDENTIFICATION DESCRIPTION | INSIDE VALVE | MAXIMUM STROKE TIME (SEC) | OUTSIDE VALVE | MAXIMUM STROKE TIME (SEC) |
|---|---|---|---|---|---|
| X-74 | Main Steam System "B" | Closed System | N/A | (2)2MSS-AOV101B | ~~5~~ 6 |
| | | Closed System | N/A | (2)2MSS-AOV102B | N/A |
| | | Closed System | N/A | (2)(17)2MSS-SOV105B | N/A |
| | | Closed System | N/A | (2)(15)2MSS-SOV120 | N/A |
| | | Closed System | N/A | (6)2MSS-SV101B | N/A |
| | | Closed System | N/A | (6)2MSS-SV102B | N/A |
| | | Closed System | N/A | (6)2MSS-SV103B | N/A |
| | | Closed System | N/A | (6)2MSS-SV104B | N/A |
| | | Closed System | N/A | (6)2MSS-SV105B | N/A |
| | Steam Drains System | Closed System | N/A | (2)2SDS-AOV111B-1 | < 60 |
| | | Closed System | N/A | (2)2SDS-AOV129B | < 60 |
| | Steam Vent System | Closed System | N/A | (6)2SVS-PCV101B | N/A |
| | | Closed System | N/A | (6)2SVS-HCV104 | N/A |

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**TABLE 5.1-1 (Cont.)**
**CONTAINMENT PENETRATIONS**

| PENT. No. | IDENTIFICATION DESCRIPTION | INSIDE VALVE | MAXIMUM STROKE TIME (SEC) | OUTSIDE VALVE | MAXIMUM STROKE TIME (SEC) |
|---|---|---|---|---|---|
| X-75 | Main Steam System "C" | Closed System | N/A | (2)2MSS-AOV101C | ~~5~~ 6 |
| | | Closed System | N/A | (2)2MSS-AOV102C | N/A |
| | | Closed System | N/A | (2)(17)2MSS-SOV105C | N/A |
| | | Closed System | N/A | (2)(15)2MSS-SOV120 | N/A |
| | | Closed System | N/A | (6)2MSS-SV101C | N/A |
| | | Closed System | N/A | (6)2MSS-SV102C | N/A |
| | | Closed System | N/A | (6)2MSS-SV103C | N/A |
| | | Closed System | N/A | (6)2MSS-SV104C | N/A |
| | | Closed System | N/A | (6)2MSS-SV105C | N/A |
| | Steam Drains System | Closed System | N/A | (2)2SDS-AOV111C-1 | < 60 |
| | | Closed System | N/A | (2)2SDS-AOV129B | < 60 |
| | Steam Vent System | Closed System | N/A | (6)2SVS-PCV101C | N/A |
| | | Closed System | N/A | (6)2SVS-HCV104 | N/A |
| X-76 | Feedwater "A" | Closed System | N/A | (2)2FWS-HYV157A<br>(20)(6)2FWS-28 | 7(18)<br>N/A |

The performance requirements of the MSSS are shown on the heat balance diagram, Figure 10.1-1, with the design and performance characteristics shown in Table 10.1-1. The MSSS is designed for 1,100 psia and 560°F, and the environmental design criteria is specified in Section 3.11 for the Class 1E components.

10.3.2 Description

Steam from each of the three steam generators passes through 32-inch outside diameter (OD) carbon steel pipes. A steam flow meter, interconnected with a three-element feedwater control system, is provided in the main steamline at the outlet of each steam generator. A MSIV in each of the three main steamlines is located in the main steam valve house, immediately outside the reactor containment. Following the MSIVs, the three main steamlines enter a single, 38-inch OD manifold. Connections for the turbine steam bypass, turbine steam sealing system, reheater supply, and auxiliary steam supply are provided at the manifold. From this manifold, steam passes to the turbine stop trip valves and governor valves.

The MSIVs automatically prevent reverse flow of steam in case of accidental pressure reduction in any steam generator or its piping. If a steamline breaks between a MSIV and a steam generator, the affected steam generator continues to blow down while the isolation valve prevents blowdown from the other steam generator. In addition, the MSIVs prevent blowdown through a ruptured pipe downstream of the isolation valves. This steamline break accident is discussed in Section 15.1.5.

The wye pattern globe type MSIVs are opened pneumatically and are held open by air pressure. If a pipe ruptures either upstream or downstream of an isolation valve, a main steamline isolation signal causes vent solenoids to release the air, closing the valve by spring force. Maximum closing time for the isolation valve upon receipt of the signal is ~~5~~ seconds. Valve closure prevents rapid cooling of the RCS by limiting SGB to a single steam generator. Isolation valve closure also ensures a supply of steam for the turbine-driven steam generator auxiliary feedwater pump.

Five ASME Code Section III safety valves are located in each main steamline outside the containment and upstream of the MSIVs. The combined relieving capacity of these safety valves will prevent maximum secondary system pressure from exceeding 110 percent of design pressure.

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Excess steam generated by the sensible heat in the nuclear steam supply system immediately following loss of load is bypassed directly to the turbine condenser (Section 10.4.1) by means of two turbine steam bypass lines (Section 10.4.4), which provide a total bypass capacity of 90 percent of full load steam flow.

Two normally closed, solenoid-operated trip valves are located in series in each steam supply line to the auxiliary feedwater pump. The valves receive a signal to open, as described in Section 10.4.9.5, and are of the fail open type; they are powered from the emergency power supply. Steam pressure is available at the valve inlet at all times. Check valves are provided in each steam supply line to ensure the availability of driving steam in the event of failure of a steam generator or a line break upstream of a MSIV. Indications of all operating conditions are available in the main control room. The turbine speed is automatically controlled by the turbine inlet governor valve. The operator adjusts feedwater flow by throttling valves at the pump discharge. Additional description of the steam generator auxiliary feedwater pump operation is contained in Section 10.4.9.

Steam leaving the high pressure turbine passes through four moisture separator/reheater units in parallel to the inlets of the two low pressure turbine cylinders. Each of the four steamlines between the reheater outlet and low pressure turbine inlet is provided with a crossover stop valve and a crossover intercept valve in series. These valves, operated by the turbine electro-hydraulic control system, function to prevent turbine overspeed. A safety valve is installed on each moisture separator/reheater to protect the separators/reheaters and crossover system from overpressure. The safety valves are designed to pass the flow resulting from closure of the crossover stop or intercept valves with the main turbine throttle valves wide open. These valves discharge to the condenser.

Branch connections from the main steamline between the main steamline trip valves and the turbine stop valves consist of the following:

1. Auxiliary steam supply,
2. Gland steam supply,
3. Reheater steam supply, and
4. Steam bypass (dump) to the condenser.

Each line is provided with shutoff capability and is classified as QA Category II. Additional data on these branch connections are given in Table 10.3-1.

10.3.3 Safety Evaluation

The MSSS is evaluated for environmental and accident conditions, high energy line breaks, and break exclusions in Section 3.6. Also, seismic and safety classifications are discus[illegible]n 3.2.

No Changes

The MSIVs are designed to close within 5 seconds. If a main steamline rupture occurs, a steamline low pressure signal causes the isolation valve in each of the three main steamlines to trip closed. If a rupture occurs downstream of the trip valve, valve closure stops the flow of steam through the pipe rupture, thus checking the sudden and large release of energy in the form of steam, which in turn



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reactor trip, a safety injection signal will rapidly close all feedwater control and bypass valves and backup feedwater isolation valves, trip the main feedwater pumps, and trip the turbine.

4. Trip of the fast-acting steam line stop valves (designed to close in less than 5 seconds) on any one of the following:

   a. Low steam line pressure,

   b. High negative steam pressure rate in any loop, or

   c. High-2 containment pressure.

No Changes

Systems and equipment which are available to mitigate the effects of the accident are also discussed in Section 15.0.8 and listed in Table 15.0-6.

15.1.4.2 Analysis of Effects and Consequences

Method of Analysis

The following analyses of a secondary system steam release are performed for this section:

1. A full plant digital computer simulation using the LOFTRAN Code (Burnett 1972) to determine RCS temperature and pressure during cooldown, and the effect of safety injection.

2. Analyses to determine that there is no damage to the core or RCS.

The following conditions are assumed to exist at the time of a secondary steam system release:

1. End-of-life shutdown margin at no-load, equilibrium xenon conditions, and with the most reactive RCCA stuck in its fully withdrawn position. Operation of RCCA banks during core burnup is restricted in such a way that addition of positive reactivity in a secondary system steam release accident will not lead to a more adverse condition than the case analyzed.

2. A negative moderator coefficient corresponding to the end-of-life rodded core with the most reactive RCCA in the fully withdrawn position. The variation of the coefficient with temperature and pressure is included. The $K_{eff}$ versus temperature at 1,000 psi corresponding to the negative moderator temperature coefficient used is shown on Figure 15.1-11.