Duke Power
A Duke Energy Company

Duke Power
7800 Rochester Highway
Seneca, SC 29672
(864) 885-3000

November 8, 2000

U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Subject: Automatic Feedwater Isolation System License Amendment Request - Replacement Pages Reflecting Amendment 315

The Automatic Feedwater Isolation System license amendment request (LAR) was submitted on July 18, 2000. This proposed amendment would affect TS 3.3.11, 3.3.12, and 3.3.13 - Main Steam Line Break Detection and Main Feedwater Isolation Circuitry. Our submittal contained the required mark-ups and retyped pages for those Technical Specifications (TS).

On September 18, 2000, the Commission issued Amendment No. 315. This amendment changed TS 3.3.11, 3.3.12, and 3.3.13.

Because of this, we are providing corrected mark-ups and retyped pages to reflect Amendment 315. Nothing in Amendment 315 affects our July 18, 2000 LAR. Therefore this is strictly an administrative matter.

Please replace the appropriate pages in Attachments 1 and 2 of our July 18, LAR with the enclosed corrected pages.

If there are any questions regarding this submittal, please contact Eric Johnson at (864) 885-4716.

Very truly yours,

L.E. Nicholson, Regulatory Compliance Manager

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cc: Mr. D. E. LaBarge, Project Manager
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-14 H25
Washington, D. C. 20555

Mr. L. A. Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission - Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, Georgia 30303

Mr. M. C. Shannon
Senior Resident Inspector
Oconee Nuclear Station

Mr. Virgil R. Autry, Director
Division of Radioactive Waste Management
Bureau of Land and Waste Management
Department of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201

**Attachment 1**

**Technical Specification**

**Replacement Pages Reflecting**

**Amendments 315, 315, and 315**

## 3.3 INSTRUMENTATION

### 3.3.25 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Instrumentation

LCO 3.3.25 Three MSLB Detection and Feedwater Isolation instrumentation channels per steam generator (SG) shall be OPERABLE.

----------NOTE----------
Applicable on each Unit until after completion of the Automatic Feedwater Isolation System modification on the respective Unit.
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APPLICABILITY: MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig except when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG (Feedwater Isolation Function).
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| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One or more Feedwater Isolation Functions with one channel inoperable. | A.1 Place channel(s) in trip. | 4 hours |
| B. One or more Feedwater Isolation Functions with two or more channels inoperable.<br><br>OR<br><br>Required Action and associated Completion Time not met. | B.1 Be in MODE 3.<br><br>AND<br><br>B.2.1 Reduce main steam header pressure to < 700 psig.<br><br>OR<br><br>B.2.2 Close all MFCVs and SFCVs. | 12 hours<br><br><br><br>18 hours<br><br><br><br>18 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.3.25.1 | Perform CHANNEL CHECK. | 12 hours |
| SR 3.3.25.2 | ----------NOTE----------<br>Only applicable when modifications are implemented that allow online testing.<br>----------<br><br>Perform CHANNEL FUNCTIONAL TEST. | <br><br><br><br>31 days |
| SR 3.3.25.3 | Perform CHANNEL CALIBRATION. | 18 months |

## 3.3 INSTRUMENTATION

### 3.3.26 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Manual Initiation

LCO 3.3.26 Two MSLB Detection and Feedwater Isolation manual initiation switches shall be OPERABLE.

----------NOTE----------
Applicable on each Unit until after completion of the Automatic Feedwater Isolation System modification on the respective Unit.
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APPLICABILITY: MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig except when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One manual initiation switch inoperable. | A.1 Restore manual initiation switch to OPERABLE status. | 72 hours |
| B. Two manual initiation switches inoperable.<br><br>OR<br><br>Required Action and associated Completion Time of Condition A not met. | B.1 Be in MODE 3.<br><br>AND<br><br>B.2.1 Reduce main steam header pressure to < 700 psig.<br><br>OR<br><br>B.2.2 Close all MFCVs and SFCVs. | 12 hours<br><br><br><br>18 hours<br><br><br><br>18 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.3.26.1 | Perform CHANNEL FUNCTIONAL TEST. | 18 months |

## 3.3 INSTRUMENTATION

### 3.3.27 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Logic Channels

LCO 3.3.27 Two MSLB Detection and Feedwater Isolation Logic channels shall be OPERABLE.

----------NOTE----------
Applicable on each Unit until after completion of the Automatic Feedwater Isolation System modification on the respective Unit.
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APPLICABILITY: MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig except when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One logic channel inoperable. | A.1 Restore channel to OPERABLE status. | 72 hours |
| B. Two logic channels inoperable.<br><br>OR<br><br>Required Action and associated Completion Time of Condition A not met. | B.1 Be in MODE 3.<br><br>AND<br><br>B.2.1 Reduce main steam header pressure to < 700 psig.<br><br>OR<br><br>B.2.2 Close all MFCVs and SFCVs. | 12 hours<br><br><br><br>18 hours<br><br><br><br>18 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.3.27.1 | Perform CHANNEL FUNCTIONAL TEST. | 18 months |

## B 3.3 INSTRUMENTATION

### B 3.3.25 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Instrumentation

BASES

BACKGROUND

The MSLB Detection and Feedwater Isolation instrumentation is designed to address containment overpressurization and steam generator tube load concerns by isolating main feedwater (MFW) and stopping the turbine-driven emergency feedwater pump (TDEFW) from delivering feedwater to both steam generators during an MSLB and to mitigate core overcooling concerns. In addition, the MSLB Detection and Feedwater Isolation instrumentation provides runout protection for the TDEFW pump in the event of a MSLB and certain large MFW line breaks with the pump in the automatic mode of operation.

Steam generator header pressure is used as input signals to the MSLB circuitry for detection and feedwater isolation. When a MSLB is sensed, or upon manual actuation, the main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) will be closed to isolate the MFW flow paths to both steam generators. In addition, the MFW pumps are tripped. The TDEFW pump will be inhibited from auto-starting or will be auto-stopped if it has already started. A manual override for the TDEFW pump inhibit is provided to allow the operator to subsequently start the TDEFW pump if necessary for decay heat removal. These functions are credited for mitigating an MSLB. The function of closing the main and startup feedwater block valves is not credited in the MSLB analysis. However, the MSLB Detection and Feedwater Isolation circuitry performs this function.

There are three pressure transmitters per steam generator with each feeding a steam pressure signal to a signal isolator (when used) and bistable. These bistables are calibrated to provide an ON/OFF signal at the desired setpoint for actuation of the feedwater isolation circuitry. A pressure transmitter and its associated signal isolator(s) and bistable(s) constitute a MSLB detection analog channel.

The six MSLB detection analog channels feed two redundant feedwater isolation digital channels consisting of two single failure proof two-out-of-three logic circuits. If the logic is satisfied, a master relay coil is energized. The use of an energized master relay ensures that a loss of power to the

BASES

BACKGROUND (continued)

digital channels will not result in an in advertent feedwater isolation. If either digital channel is actuated, a feedwater isolation (i.e., MFW pumps trip, MFCVs and SFCVs close, and TDEFW pump inhibited from auto-starting or auto-stopped if running) will occur. Energizing the master relay results in closure of contacts in various control circuits for systems and components. Therefore, when the master relay is energized, the systems and components perform their isolation functions. Other features of the digital channels include a test/manual actuation pushbutton, a circuit seal-in after the master relay is energized, a 2 second time delay to prevent spurious actuation, and an "enable" or "arming" switch. The two two-out-of-three logic circuits, along with their associated enable switch, master relay, seal-in, time delay, and test/manual actuation pushbutton are considered a feedwater isolation digital channel.

The feedwater isolation digital channels are enabled and disabled administratively rather than automatically. Appropriate operating procedures contain provisions to enable/disable the digital channels.

APPLICABLE SAFETY ANALYSES

The MSLB Detection and Feedwater Isolation instrumentation is utilized to isolate main feedwater and stop the TDEFW pump from supplying feedwater to both steam generators in the event a MSLB occurs. This function is credited in the MSLB analyses regarding containment response and steam generator tube loads.

Steam generator header pressure is used as input to the MSLB circuitry for detection and feedwater isolation. When a MSLB is sensed, or upon manual actuation, the MFCVs and SFCVs are closed to isolate the MFW flow paths to both steam generators. In addition, the MFW pumps are tripped. The TDEFW pump will be inhibited from auto-starting or will be auto-stopped if it has already started. A manual override for the TDEFW pump inhibit is provided to allow the operator to subsequently start the TDEFW pump if necessary for decay heat removal. All of these functions are credited for mitigating a MSLB inside containment.

The MSLB Detection and Feedwater Isolation Instrumentation satisfies Criterion 3 of 10 CFR 50.36 (Ref. 1).

LCO

This LCO requires that instrumentation necessary to initiate a feedwater isolation (i.e., trip the MFW pumps, close the MFCVs and SFCVs, inhibit the auto-start of or auto-stop the TDEFW pump) shall be OPERABLE. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the Function.

BASES

LCO (continued)

Three analog channels per SG are required to be OPERABLE to ensure that no single failure prevents actuation of the MSLB Detection and Feedwater Isolation instrumentation. Each MSLB Detection and Feedwater Isolation instrumentation channel includes the sensor and measurement channel.

This LCO is modified by a Note, which indicates the requirements are not applicable to a Unit after the completion of the Automatic Feedwater Isolation System Modification on the respective Unit. This is necessary since the specification is no longer based on the Unit's design after implementation of the modification.

APPLICABILITY

The MSLB Detection and Feedwater Isolation Function shall be OPERABLE in MODES 1 and 2, and MODE 3 with main steam header pressure ≥ 700 psig, because there is significant mass and energy in the RCS and steam generators. Once the steam header pressure has decreased below 700 psig, additional time is available for the operator to manually isolate main and emergency feedwater to the affected steam generator. Thus, the Feedwater Isolation Function can be bypassed to avoid actuation during normal unit cooldowns. Also during MODE 3, the Feedwater Isolation Function is not required to be OPERABLE when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed since the function of the instrumentation is already fulfilled. In MODE 3 when the turbine header pressure is < 885 psig, automatic actuation of the TDEFW pump is blocked. In MODES 4, 5, and 6, the energy level is low and the secondary side feedwater flow rate is low or nonexistent. In MODES 4, 5, and 6, the primary system temperatures are too low to allow the SGs to effectively remove energy and MSLB Detection and Feedwater Isolation instrumentation is not required to be OPERABLE.

ACTIONS

If a channel's trip setpoint is found nonconservative with respect to the Allowable Value, or any of the transmitter or signal processing electronics, are found inoperable, then the Function provided by that channel must be declared inoperable and the unit must enter the appropriate Conditions.

A Note has been added to the ACTIONS indicating that a separate Condition entry is allowed for instrumentation channels associated with each SG (feedwater isolation function).

BASES

A.1

Condition A applies to failures of a single MSLB Detection and Feedwater Isolation instrumentation channel in one or more Feedwater Isolation Functions.

With one channel inoperable in one or more MSLB Detection and Feedwater Isolation Function, the channel(s) must be placed in trip within 4 hours. Tripping the affected channel places the Function in a one-out-of-two configuration. Operation in this configuration may continue indefinitely since the MSLB Detection and Feedwater Isolation Function is capable of actuating in the presence of any single random failure. The Completion Time of 4 hours is adequate to perform Required Action A.1.

B.1, B.2.1, and B.2.2

With two channels in one or more MSLB Detection and Feedwater Isolation Function inoperable or the Required Action and associated Completion Time of Condition A not met, the unit must be placed in MODE 3 within 12 hours and main steam header pressure must be reduced to less than 700 psig or all MFCVs and SFCVs must be closed within 18 hours. The allowed Completion Time is reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.25.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION.

Agreement criteria are based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the transmitter or the signal processing equipment has drifted outside its limit. If the channels are

BASES

within the criteria, it is an indication that the channels are OPERABLE. If the channels are normally off scale during times when surveillance is required, the CHANNEL CHECK will only verify that they are off scale in the same direction. Off scale low current loop channels are verified, where practical, to be reading at the bottom of the range and not failed downscale.

The Frequency, about once every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel OPERABILITY during normal operational use of the displays associated with the LCO required channels.

SR 3.3.25.2

A CHANNEL FUNCTIONAL TEST is performed on each required instrumentation channel to ensure the channel will perform its intended function.

The Frequency of 31 days is based on operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel in any 31 day interval is a rare event.

This SR is modified by a Note indicating that it is only applicable when modifications are implemented that allow online testing.

SR 3.3.25.3

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The test verifies the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

BASES (continued)

REFERENCES

1. 10 CFR 50.36.
2. UFSAR Section 6.2.1.4.
3. UFSAR Section 5.2.3.4.

B 3.3 INSTRUMENTATION

B 3.3.26 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Manual Initiation

BASES

BACKGROUND

The MSLB Detection and Feedwater Isolation manual initiation capability provides the operator with the capability to actuate the isolation function from the control room. This Function is provided in the event the operator determines that the Function is needed and does not automatically actuate. This is a backup Function to the automatic Feedwater isolation.

The MSLB Detection and Feedwater Isolation manual initiation circuitry satisfies the manual initiation and single-failure criterion requirements of IEEE-279-1971 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The Feedwater Isolation Function credited in the safety analysis is automatic. However, the manual initiation Function is required by design as backup to the automatic Function and allows operators to actuate Feedwater Isolation whenever the Function is needed. Furthermore, the manual initiation of Feedwater Isolation may be specified in unit operating procedures.

The MSLB Detection and Feedwater Isolation manual initiation function satisfy Criterion 3 of 10 CFR 50.36 (Ref. 2).

LCO

One manual initiation switch per actuation channel (A and B) is required to be OPERABLE. The Feedwater Isolation function, has two actuation or "trip" channels, channels A and B. Within each channel actuation logic there is one manual trip switch. When the manual switch is depressed, a full trip of actuation channel A or B occurs.

This LCO is modified by a Note, which indicates the requirements are not applicable to a Unit after the completion of the Automatic Feedwater Isolation System Modification on the respective Unit. This is necessary since the specification is no longer based on the Unit's design after implementation of the modification.

APPLICABILITY

The Feedwater Isolation manual initiation Function shall be OPERABLE in MODES 1 and 2, and MODE 3 with main steam header pressure ≥ 700 psig because there is significant mass and energy in the RCS and steam

BASES

APPLICABILITY (continued)

generators. Once the steam header pressure has decreased below 700 psig, additional time is available for the operator to manually isolate main and emergency feedwater to the affected steam generator. Thus, the Feedwater Isolation Function can be bypassed to avoid actuation during normal unit cooldowns. During MODE 3, the Feedwater Isolation manual initiation Function is not required to be OPERABLE when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed since its function is already fulfilled. In MODE 3 when the turbine header pressure is < 885 psig, automatic actuation of the turbine-driven emergency feedwater pump is blocked. In MODES 4, 5, and 6, the SG energy level is low and secondary side feedwater flow rate is low or nonexistent.

ACTIONS

A.1

With one manual initiation switch inoperable, the manual initiation switch must be restored to OPERABLE status within 72 hours. The Completion Time of 72 hours is based on unit operating experience and administrative controls, which provide alternative means of MSLB Detection and Feedwater Isolation Function initiation via individual component controls. The 72 hour Completion Time is consistent with the allowed outage time for the components actuated by the MSLB Detection and Feedwater Isolation Function.

B.1

With both manual initiation switches inoperable or the Required Action and associated Completion Time of Condition A not met, the unit must be placed in MODE 3 within 12 hours and the main steam header pressure reduced to less than 700 psig or all MFCVs and SFCVs must be closed within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.26.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. The Frequency of 18 months is based on engineering judgment and operating experience that determined testing on an 18 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during unit operation is avoided.

BASES (continued)

REFERENCES

1. IEEE-279-1971, April 1972.
2. 10 CFR 50.36.
3. UFSAR Section 6.2.1.4.
4. UFSAR Section 5.2.3.4.

B 3.3 INSTRUMENTATION

B 3.3.27 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Logic Channels

BASES

BACKGROUND

The six MSLB detection analog channels feed two redundant feedwater isolation digital channels consisting of two single failure proof two-out-of-three logic circuits. If the logic is satisfied, a master relay coil is energized. The use of an energized master relay ensures that a loss of power to the digital channels will not result in an inadvertent feedwater isolation. If either digital channel is actuated, a Feedwater isolation will occur. Energizing the master relay results in closure of contacts in various control circuits for systems and components. Therefore, when the master relay is energized, the systems and components perform their isolation functions. Other features of the digital channels include a test/manual actuation pushbutton, a circuit seal-in after the master relay is energized, a 2 second time delay to prevent spurious actuation, and an "enable" or "arming" switch. Each of the two two-out-of-three logic circuits, along with their associated enable switch, master relay, seal-in, and time delay is considered a feedwater isolation digital channel.

APPLICABLE SAFETY ANALYSES

The MSLB Detection and Feedwater Isolation instrumentation is utilized to isolate main feedwater and stop the TDEFW pump from supplying feedwater to both steam generators in the event a MSLB occurs. This function is credited in the MSLB analyses regarding containment response and steam generator tube loads.

Steam generator outlet pressure is used as input to the MSLB circuitry for detection and feedwater isolation. When a MSLB is sensed, or upon manual actuation, the MFCVs and SFCVs will be closed to isolate the MFW flow paths to both steam generators. In addition, the MFW pumps are tripped. The TDEFW pump will be inhibited from auto-starting or will be auto-stopped if it has already started and the switch for MS-93 is in the AUTO position. A manual override for the TDEFW pump inhibit is provided to allow the operator to subsequently start the TDEFW pump if necessary for heat removal. All of these functions are credited for mitigating a MSLB inside containment.

The MSLB Detection and Feedwater Isolation logic channels satisfy Criterion 3 of 10 CFR 50.36 (Ref. 1).

BASES (continued)

LCO

Two channels of MSLB Detection and Feedwater Isolation automatic actuation logic shall be OPERABLE. There are only two channels of automatic actuation logic. Therefore, violation of this LCO could result in a complete loss of the automatic Function assuming a single failure of the other channel.

This LCO is modified by a Note, which indicates the requirements are not applicable to a Unit after the completion of the Automatic Feedwater Isolation System Modification on the respective Unit. This is necessary since the specification is no longer based on the Unit's design after implementation of the modification.

APPLICABILITY

The MSLB Detection and Feedwater Isolation automatic actuation logic channels shall be OPERABLE in MODES 1 and 2, and MODE 3 with main steam header pressure ≥ 700 psig because there is significant mass and energy in the RCS and steam generators. Once the steam header pressure has decreased below 700 psig, additional time is available for the operator to manually isolate main and emergency feedwater to the affected steam generator. Thus, the Feedwater Isolation Function can be bypassed to avoid actuation during normal unit cooldowns. Also, during MODE 3, the Feedwater Isolation function is not required to be OPERABLE when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed since its function is already fulfilled. In MODE 3 when the turbine header pressure is < 885 psig, automatic actuation of the TDEFW pump is blocked. In MODES 4, 5, and 6, the energy level is low and the secondary side feedwater flow rate is low or nonexistent.

ACTIONS

A.1

With one automatic actuation logic channel inoperable, the channel must be restored to OPERABLE status within 72 hours. The Completion Time of 72 hours is based on unit operating experience and administrative controls, which provide alternative means of MSLB Detection and Feedwater Isolation Function initiation via individual component controls. The 72 hour Completion Time is consistent with the allowed outage time for the components actuated by the MSLB Detection and Feedwater Isolation Function.

B.1, B.2.1, and B.2.2

With both logic channels inoperable or the Required Action and associated Completion Time not met, the unit must be placed in MODE 3 within 12 hours and the main steam header pressure must be reduced to less than

BASES (continued)

Actions

B.1, B.2.1, and B.2.2 (continued)

700 psig or all MFCVs and SFCVs must be closed within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.27.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. This test verifies Feedwater Isolation automatic actuation logics are functional. This test simulates the required inputs to the logic circuit and verifies successful operation of the automatic actuation logic. The Frequency of 18 months is based on engineering judgment and operating experience that determined testing on an 18 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during unit operation is avoided.

REFERENCES

1. 10 CFR 50.36.
2. UFSAR Section 6.2.1.4.
3. UFSAR Section 5.2.3.4

**Attachment 2**

**Technical Specification Markup**

**Replacement Pages Reflecting**

**Amendments 315, 315, and 315**

## 3.3 INSTRUMENTATION

### 3.3.~~11~~ 25 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Instrumentation

LCO 3.3.~~11~~ 25 Three MSLB Detection and Feedwater Isolation instrumentation channels per steam generator (SG) shall be OPERABLE.

APPLICABILITY: Add MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig except when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed.

NOTE
Applicable on each Unit until after completion of the Automatic Feedwater Isolation System modification on the respective Unit.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG (Feedwater Isolation Function).
---

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One or more Feedwater Isolation Functions with one channel inoperable. | A.1 Place channel(s) in trip. | 4 hours |
| B. One or more Feedwater Isolation Functions with two or more channels inoperable.<br><br>OR<br><br>Required Action and associated Completion Time not met. | B.1 Be in MODE 3.<br><br>AND<br><br>B.2.1 Reduce main steam header pressure to < 700 psig.<br><br>OR<br><br>B.2.2 Close all MFCVs and SFCVs. | 12 hours<br><br><br><br>18 hours<br><br><br><br>18 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.3.~~11~~ 25.1 | Perform CHANNEL CHECK. | 12 hours |
| SR 3.3.~~11~~ 25.2 | ----------NOTE----------<br>Only applicable when modifications are implemented that allow online testing.<br>----------<br><br>Perform CHANNEL FUNCTIONAL TEST. | 31 days |
| SR 3.3.~~11~~ 25.3 | Perform CHANNEL CALIBRATION. | 18 months |

## 3.3 INSTRUMENTATION

### 3.3.~~12~~ 26 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Manual Initiation

LCO 3.3.~~12~~ 26 Two MSLB Detection and Feedwater Isolation manual initiation switches shall be OPERABLE.

ADD NOTE Applicable on each Unit until after completion of the Automatic Feedwater Isolation System modification on the respective Unit.

APPLICABILITY: MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig except when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One manual initiation switch inoperable. | A.1 Restore manual initiation switch to OPERABLE status. | 72 hours |
| B. Two manual initiation switches inoperable.<br><br>OR<br><br>Required Action and associated Completion Time of Condition A not met. | B.1 Be in MODE 3.<br><br>AND<br><br>B.2.1 Reduce main steam header pressure to < 700 psig.<br><br>OR<br><br>B.2.2 Close all MFCVs and SFCVs. | 12 hours<br><br><br><br>18 hours<br><br><br><br>18 hours |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.3.~~12~~ 26.1 | Perform CHANNEL FUNCTIONAL TEST. | 18 months |

## 3.3 INSTRUMENTATION

### 3.3.~~18~~ 27 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Logic Channels

LCO 3.3.~~18~~ 27 Two MSLB Detection and Feedwater Isolation Logic channels shall be OPERABLE.

Add

APPLICABILITY: MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig except when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One logic channel inoperable. | A.1 Restore channel to OPERABLE status. | 72 hours |
| B. Two logic channels inoperable.<br><br>OR<br><br>Required Action and associated Completion Time of Condition A not met. | B.1 Be in MODE 3.<br><br>AND<br><br>B.2.1 Reduce main steam header pressure to < 700 psig.<br><br>OR<br><br>B.2.2 Close all MFCVs and SFCVs. | 12 hours<br><br><br><br>18 hours<br><br><br><br>18 hours |

NOTE
Applicable on each Unit until after completion of the Automatic Feedwater Isolation System modification on the respective Unit.

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.3.~~13~~ 27.1 | Perform CHANNEL FUNCTIONAL TEST. | 18 months |

B 3.3 INSTRUMENTATION

B 3.3.~~11~~ 25 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Instrumentation

BASES

BACKGROUND

The MSLB Detection and Feedwater Isolation instrumentation is designed to address containment overpressurization and steam generator tube load concerns by isolating main feedwater (MFW) and stopping the turbine-driven emergency feedwater pump (TDEFW) from delivering feedwater to both steam generators during an MSLB and to mitigate core overcooling concerns. In addition, the MSLB Detection and Feedwater Isolation instrumentation provides runout protection for the TDEFW pump in the event of a MSLB and certain large MFW line breaks with the pump in the automatic mode of operation.

Steam generator header pressure is used as input signals to the MSLB circuitry for detection and feedwater isolation. When a MSLB is sensed, or upon manual actuation, the main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) will be closed to isolate the MFW flow paths to both steam generators. In addition, the MFW pumps are tripped. The TDEFW pump will be inhibited from auto-starting or will be auto-stopped if it has already started. A manual override for the TDEFW pump inhibit is provided to allow the operator to subsequently start the TDEFW pump if necessary for decay heat removal. These functions are credited for mitigating an MSLB. The function of closing the main and startup feedwater block valves is not credited in the MSLB analysis. However, the MSLB Detection and Feedwater Isolation circuitry performs this function.

There are three pressure transmitters per steam generator with each feeding a steam pressure signal to a signal isolator (when used) and bistable. These bistables are calibrated to provide an ON/OFF signal at the desired setpoint for actuation of the feedwater isolation circuitry. A pressure transmitter and its associated signal isolator(s) and bistable(s) constitute a MSLB detection analog channel.

The six MSLB detection analog channels feed two redundant feedwater isolation digital channels consisting of two single failure proof two-out-of-three logic circuits. If the logic is satisfied, a master relay coil is energized. The use of an energized master relay ensures that a loss of power to the

BASES

BACKGROUND (continued)

digital channels will not result in an in advertent feedwater isolation. If either digital channel is actuated, a feedwater isolation (i.e., MFW pumps trip, MFCVs and SFCVs close, and TDEFW pump inhibited from auto-starting or auto-stopped if running) will occur. Energizing the master relay results in closure of contacts in various control circuits for systems and components. Therefore, when the master relay is energized, the systems and components perform their isolation functions. Other features of the digital channels include a test/manual actuation pushbutton, a circuit seal-in after the master relay is energized, a 2 second time delay to prevent spurious actuation, and an "enable" or "arming" switch. The two two-out-of-three logic circuits, along with their associated enable switch, master relay, seal-in, time delay, and test/manual actuation pushbutton are considered a feedwater isolation digital channel.

The feedwater isolation digital channels are enabled and disabled administratively rather than automatically. Appropriate operating procedures contain provisions to enable/disable the digital channels.

APPLICABLE SAFETY ANALYSES

The MSLB Detection and Feedwater Isolation instrumentation is utilized to isolate main feedwater and stop the TDEFW pump from supplying feedwater to both steam generators in the event a MSLB occurs. This function is credited in the MSLB analyses regarding containment response and steam generator tube loads.

Steam generator header pressure is used as input to the MSLB circuitry for detection and feedwater isolation. When a MSLB is sensed, or upon manual actuation, the MFCVs and SFCVs are closed to isolate the MFW flow paths to both steam generators. In addition, the MFW pumps are tripped. The TDEFW pump will be inhibited from auto-starting or will be auto-stopped if it has already started. A manual override for the TDEFW pump inhibit is provided to allow the operator to subsequently start the TDEFW pump if necessary for decay heat removal. All of these functions are credited for mitigating a MSLB inside containment.

The MSLB Detection and Feedwater Isolation Instrumentation satisfies Criterion 3 of 10 CFR 50.36 (Ref. 1).

LCO

This LCO requires that instrumentation necessary to initiate a feedwater isolation (i.e., trip the MFW pumps, close the MFCVs and SFCVs, inhibit the auto-start of or auto-stop the TDEFW pump) shall be OPERABLE. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the Function.

BASES

LCO (continued)

Three analog channels per SG are required to be OPERABLE to ensure that no single failure prevents actuation of the MSLB Detection and Feedwater Isolation instrumentation. Each MSLB Detection and Feedwater Isolation instrumentation channel includes the sensor and measurement channel.

Insert 1

APPLICABILITY

The MSLB Detection and Feedwater Isolation Function shall be OPERABLE in MODES 1 and 2, and MODE 3 with main steam header pressure ≥ 700 psig, because there is significant mass and energy in the RCS and steam generators. Once the steam header pressure has decreased below 700 psig, additional time is available for the operator to manually isolate main and emergency feedwater to the affected steam generator. Thus, the Feedwater Isolation Function can be bypassed to avoid actuation during normal unit cooldowns. Also during MODE 3, the Feedwater Isolation Function is not required to be OPERABLE when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed since the function of the instrumentation is already fulfilled. In MODE 3 when the turbine header pressure is < 885 psig, automatic actuation of the TDEFW pump is blocked. In MODES 4, 5, and 6, the energy level is low and the secondary side feedwater flow rate is low or nonexistent. In MODES 4, 5, and 6, the primary system temperatures are too low to allow the SGs to effectively remove energy and MSLB Detection and Feedwater Isolation instrumentation is not required to be OPERABLE.

ACTIONS

If a channel's trip setpoint is found nonconservative with respect to the Allowable Value, or any of the transmitter or signal processing electronics, are found inoperable, then the Function provided by that channel must be declared inoperable and the unit must enter the appropriate Conditions.

A Note has been added to the ACTIONS indicating that a separate Condition entry is allowed for instrumentation channels associated with each SG (feedwater isolation function).

A.1

Condition A applies to failures of a single MSLB Detection and Feedwater Isolation instrumentation channel in one or more Feedwater Isolation Functions.

Insert 1

This LCO is modified by a Note, which indicates the requirements are not applicable to a Unit after the completion of the Automatic Feedwater Isolation System Modification on the respective Unit. This is necessary since the specification is no longer based on the Unit's design after implementation of the modification.

BASES

ACTIONS

A.1 (continued)

With one channel inoperable in one or more MSLB Detection and Feedwater Isolation Function, the channel(s) must be placed in trip within 4 hours. Tripping the affected channel places the Function in a one-out-of-two configuration. Operation in this configuration may continue indefinitely since the MSLB Detection and Feedwater Isolation Function is capable of actuating in the presence of any single random failure. The Completion Time of 4 hours is adequate to perform Required Action A.1.

B.1, B.2.1, and B.2.2

With two channels in one or more MSLB Detection and Feedwater Isolation Function inoperable or the Required Action and associated Completion Time of Condition A not met, the unit must be placed in MODE 3 within 12 hours and main steam header pressure must be reduced to less than 700 psig or all MFCVs and SFCVs must be closed within 18 hours. The allowed Completion Time is reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.~~11~~ 25.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION.

Agreement criteria are based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the transmitter or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE. If the channels are normally off scale during times when surveillance is

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.~~11~~ 25.1 (continued)

required, the CHANNEL CHECK will only verify that they are off scale in the same direction. Off scale low current loop channels are verified, where practical, to be reading at the bottom of the range and not failed downscale.

The Frequency, about once every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel OPERABILITY during normal operational use of the displays associated with the LCO required channels.

SR 3.3.~~11~~ 25.2

A CHANNEL FUNCTIONAL TEST is performed on each required instrumentation channel to ensure the channel will perform its intended function.

The Frequency of 31 days is based on operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel in any 31 day interval is a rare event.

This SR is modified by a Note indicating that it is only applicable when modifications are implemented that allow online testing.

SR 3.3.~~11~~ 25.3

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The test verifies the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

BASES (continued)

REFERENCES

1. 10 CFR 50.36.
2. UFSAR Section 6.2.1.4.
3. UFSAR Section 5.2.3.4.

B 3.3 INSTRUMENTATION

B 3.3.~~12~~ 26 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Manual Initiation

BASES

BACKGROUND

The MSLB Detection and Feedwater Isolation manual initiation capability provides the operator with the capability to actuate the isolation function from the control room. This Function is provided in the event the operator determines that the Function is needed and does not automatically actuate. This is a backup Function to the automatic Feedwater isolation.

The MSLB Detection and Feedwater Isolation manual initiation circuitry satisfies the manual initiation and single-failure criterion requirements of IEEE-279-1971 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The Feedwater Isolation Function credited in the safety analysis is automatic. However, the manual initiation Function is required by design as backup to the automatic Function and allows operators to actuate Feedwater Isolation whenever the Function is needed. Furthermore, the manual initiation of Feedwater Isolation may be specified in unit operating procedures.

The MSLB Detection and Feedwater Isolation manual initiation function satisfy Criterion 3 of 10 CFR 50.36 (Ref. 2).

LCO

One manual initiation switch per actuation channel (A and B) is required to be OPERABLE. The Feedwater Isolation function, has two actuation or "trip" channels, channels A and B. Within each channel actuation logic there is one manual trip switch. When the manual switch is depressed, a full trip of actuation channel A or B occurs. Insert 1

APPLICABILITY

The Feedwater Isolation manual initiation Function shall be OPERABLE in MODES 1 and 2, and MODE 3 with main steam header pressure ≥ 700 psig because there is significant mass and energy in the RCS and steam generators. Once the steam header pressure has decreased below 700 psig, additional time is available for the operator to manually isolate main and emergency feedwater to the affected steam generator. Thus, the

Insert 1

This LCO is modified by a Note, which indicates the requirements are not applicable to a Unit after the completion of the Automatic Feedwater Isolation System Modification on the respective Unit. This is necessary since the specification is no longer based on the Unit's design after implementation of the modification.

BASES

APPLICABILITY (continued)

Feedwater Isolation Function can be bypassed to avoid actuation during normal unit cooldowns. During MODE 3, the Feedwater Isolation manual initiation Function is not required to be OPERABLE when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed since its function is already fulfilled. In MODE 3 when the turbine header pressure is < 885 psig, automatic actuation of the turbine-driven emergency feedwater pump is blocked. In MODES 4, 5, and 6, the SG energy level is low and secondary side feedwater flow rate is low or nonexistent.

ACTIONS

A.1

With one manual initiation switch inoperable, the manual initiation switch must be restored to OPERABLE status within 72 hours. The Completion Time of 72 hours is based on unit operating experience and administrative controls, which provide alternative means of MSLB Detection and Feedwater Isolation Function initiation via individual component controls. The 72 hour Completion Time is consistent with the allowed outage time for the components actuated by the MSLB Detection and Feedwater Isolation Function.

B.1

With both manual initiation switches inoperable or the Required Action and associated Completion Time of Condition A not met, the unit must be placed in MODE 3 within 12 hours and the main steam header pressure reduced to less than 700 psig or all MFCVs and SFCVs must be closed within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.~~12~~ 26.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. The Frequency of 18 months is based on engineering judgment and operating experience that determined testing on an 18 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during unit operation is avoided.

BASES (continued)

REFERENCES

1. IEEE-279-1971, April 1972.
2. 10 CFR 50.36.
3. UFSAR Section 6.2.1.4.
4. UFSAR Section 5.2.3.4.

B 3.3 INSTRUMENTATION

B 3.3.~~18~~ 27 Main Steam Line Break (MSLB) Detection and Feedwater Isolation Logic Channels

BASES

BACKGROUND

The six MSLB detection analog channels feed two redundant feedwater isolation digital channels consisting of two single failure proof two-out-of-three logic circuits. If the logic is satisfied, a master relay coil is energized. The use of an energized master relay ensures that a loss of power to the digital channels will not result in an inadvertent feedwater isolation. If either digital channel is actuated, a Feedwater isolation will occur. Energizing the master relay results in closure of contacts in various control circuits for systems and components. Therefore, when the master relay is energized, the systems and components perform their isolation functions. Other features of the digital channels include a test/manual actuation pushbutton, a circuit seal-in after the master relay is energized, a 2 second time delay to prevent spurious actuation, and an "enable" or "arming" switch. Each of the two two-out-of-three logic circuits, along with their associated enable switch, master relay, seal-in, and time delay is considered a feedwater isolation digital channel.

APPLICABLE SAFETY ANALYSES

The MSLB Detection and Feedwater Isolation instrumentation is utilized to isolate main feedwater and stop the TDEFW pump from supplying feedwater to both steam generators in the event a MSLB occurs. This function is credited in the MSLB analyses regarding containment response and steam generator tube loads.

Steam generator outlet pressure is used as input to the MSLB circuitry for detection and feedwater isolation. When a MSLB is sensed, or upon manual actuation, the MFCVs and SFCVs will be closed to isolate the MFW flow paths to both steam generators. In addition, the MFW pumps are tripped. The TDEFW pump will be inhibited from auto-starting or will be auto-stopped if it has already started and the switch for MS-93 is in the AUTO position. A manual override for the TDEFW pump inhibit is provided to allow the operator to subsequently start the TDEFW pump if necessary for heat removal. All of these functions are credited for mitigating a MSLB inside containment.

The MSLB Detection and Feedwater Isolation logic channels satisfy Criterion 3 of 10 CFR 50.36 (Ref. 1).

BASES (continued)

LCO

Two channels of MSLB Detection and Feedwater Isolation automatic actuation logic shall be OPERABLE. There are only two channels of automatic actuation logic. Therefore, violation of this LCO could result in a complete loss of the automatic Function assuming a single failure of the other channel.

Insert 1

APPLICABILITY

The MSLB Detection and Feedwater Isolation automatic actuation logic channels shall be OPERABLE in MODES 1 and 2, and MODE 3 with main steam header pressure ≥ 700 psig because there is significant mass and energy in the RCS and steam generators. Once the steam header pressure has decreased below 700 psig, additional time is available for the operator to manually isolate main and emergency feedwater to the affected steam generator. Thus, the Feedwater Isolation Function can be bypassed to avoid actuation during normal unit cooldowns. Also, during MODE 3, the Feedwater Isolation function is not required to be OPERABLE when all main feedwater control valves (MFCVs) and startup feedwater control valves (SFCVs) are closed since its function is already fulfilled. In MODE 3 when the turbine header pressure is < 885 psig, automatic actuation of the TDEFW pump is blocked. In MODES 4, 5, and 6, the energy level is low and the secondary side feedwater flow rate is low or nonexistent.

ACTIONS

A.1

With one automatic actuation logic channel inoperable, the channel must be restored to OPERABLE status within 72 hours. The Completion Time of 72 hours is based on unit operating experience and administrative controls, which provide alternative means of MSLB Detection and Feedwater Isolation Function initiation via individual component controls. The 72 hour Completion Time is consistent with the allowed outage time for the components actuated by the MSLB Detection and Feedwater Isolation Function.

B.1, B.2.1, and B.2.2

With both logic channels inoperable or the Required Action and associated Completion Time not met, the unit must be placed in MODE 3 within 12 hours and the main steam header pressure must be reduced to less than 700 psig or all MFCVs and SFCVs must be closed within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

Insert 1

This LCO is modified by a Note, which indicates the requirements are not applicable to a Unit after the completion of the Automatic Feedwater Isolation System Modification on the respective Unit. This is necessary since the specification is no longer based on the Unit's design after implementation of the modification.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.~~13~~ 27.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. This test verifies Feedwater Isolation automatic actuation logics are functional. This test simulates the required inputs to the logic circuit and verifies successful operation of the automatic actuation logic. The Frequency of 18 months is based on engineering judgment and operating experience that determined testing on an 18 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during unit operation is avoided.

REFERENCES

1. 10 CFR 50.36.
2. UFSAR Section 6.2.1.4.
3. UFSAR Section 5.2.3.4.