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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 343 Related to ESBWR Design Certification Application – Technical Specifications – RAI Number 16.2-145 S02**

Enclosures 1 and 2 contain the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI transmitted via the Reference 1 letter.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

A handwritten signature in cursive script that reads "Richard E. Kingston".

Richard E. Kingston
Vice President, ESBWR Licensing

Reference:

1. MFN 09-347, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 343 Related to ESBWR Design Certification Application*, May 19, 2009

Enclosures:

1. MFN 09-519 – Response to Portion of NRC Request for Additional Information Letter No. 343 Related to ESBWR Design Certification Application – Technical Specifications – RAI Number 16.2-145 S02
2. MFN 09-519 – DCD Markups for RAI Number 16.2-145 S02

cc: AE Cabbage USNRC (with enclosures)
JG Head GEH (with enclosures)
DH Hinds GEH (with enclosures)
eDRF 104-1707

Enclosure 1

MFN 09-519

Response to Portion of NRC Request for

Additional Information Letter No. 343

Related to ESBWR Design Certification Application

- Technical Specifications -

RAI Number 16.2-145 S02

NRC RAI 16.2-145S02

In its response to RAI 16.2-145 S01 (MFN 09-071, February 3, 2009), GEH revised the ESBWR GTS instrumentation channel functional test (CFT) and channel check surveillance requirement (SR) frequencies to be consistent with the BWR/6 STS, and removed language from the bases for CFT and channel check SRs that credited the online self diagnostic design feature as a means of accomplishing a CFT and channel check. However, the bases retained the online self diagnostic design feature as part of the basis for CFT and channel check SR frequencies; for example, the bases for GTS SR 3.3.1.1.2, to perform a CFT, states:

"The Frequency of 92 days is based on the reliability of the channels and the self-diagnostic features that monitor the channels for proper operation."

Because of insufficient design information, the staff cannot conclude that the capabilities of the self-diagnostic design feature can be credited in the bases to help justify the CFT and channel check SR frequencies. The staff also cannot conclude, based solely on instrument reliability that the ESBWR instrumentation can use the BWR/6 CFT SR frequencies, since BWR/6 instrumentation channel reliability is supported by NRC-approved topical reports, which only apply to analog instrumentation systems used in BWR/6 and earlier BWR plant designs. For these reasons, GEH is requested to do the following:

- Remove references taking credit for the online-self diagnostic design feature from the bases for instrumentation SR frequencies for all channel checks and CFTs. The staff will accept a channel check SR frequency of 12 hours and a CFT SR frequency of 7 days based solely on the reliability of the ESBWR instrumentation channels.*
- Revise the CFT SR frequencies of 92 days to 31 days, which the staff will accept based solely on the reliability of the ESBWR instrumentation channels*

GEH Response

Chapter 16, Technical Specifications, and Chapter 16B, Bases, will be revised as requested.

DCD Impact

DCD Chapters 16 and 16B will be revised as shown in Enclosure 2. For convenience, the markups in Enclosure 2 show only the differences relative to the markups that were provided in the response to RAI 16.2-145 S01 (MFN 09-071, February 3, 2009).

Enclosure 2

MFN 09-519

DCD Markups for

RAI Number 16.2-145 S02

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action B.1 and referenced in Table 3.3.1.1-1.	D.1 Reduce THERMAL POWER to < 25% RTP.	4 hours
E. As required by Required Action B.1 and referenced in Table 3.3.1.1-1.	E.1 Be in MODE 2.	6 hours
F. As required by Required Action B.1 and referenced in Table 3.3.1.1-1.	F.1 Be in MODE 3.	12 hours
G. As required by Required Action B.1 and referenced in Table 3.3.1.1-1.	G.1 Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

- NOTE -

Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.1	Perform CHANNEL CHECK on each required channel.	12 hours
SR 3.3.1.1.2	Perform CHANNEL FUNCTIONAL TEST on each required channel.	31 92 days

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency is based upon operating experience that demonstrates channel failure is rare ~~and the self diagnostic features that monitor the channels for proper operation~~. The CHANNEL CHECKs every 12 hours supplement less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the DTM function.

The RPS is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

The Frequency of 3192 days is based on the reliability of the channels ~~and the self diagnostic features that monitor the channels for proper operation~~.

SR 3.3.1.1.3

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the required channel responds to the measured parameter within the necessary range and accuracy.

CHANNEL CALIBRATION leaves the required channel adjusted to the $NTSP_F$ within the "as-left" tolerance to account for instrument drifts between successive calibrations consistent with the methods and assumptions required by the SCP.

The Frequency is based upon the assumption of a 24-month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SURVEILLANCE REQUIREMENTS

- NOTE -

Refer to Table 3.3.1.4-1 to determine which SRs apply for each NMS Instrumentation Function.

SURVEILLANCE		FREQUENCY
SR 3.3.1.4.1	Perform CHANNEL CHECK on each required channel.	12 hours
SR 3.3.1.4.2	<p style="text-align: center;">- NOTE -</p> <p>Not required to be performed until 12 hours after THERMAL POWER \geq 25% RTP.</p> <p>Verify absolute difference between the average power range monitor (APRM) channels and calculated power \leq 2% RTP while operating at \geq 25% RTP for each required channel.</p>	7 days
SR 3.3.1.4.3	<p style="text-align: center;">- NOTE -</p> <p>Not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2.</p> <p>Perform CHANNEL FUNCTIONAL TEST on each required channel.</p>	7 days
SR 3.3.1.4.4	Perform CHANNEL FUNCTIONAL TEST on each required channel.	31 92 days
SR 3.3.1.4.5	Calibrate local power range monitors on each required channel.	750 MWD/T average core exposure

BASES

SURVEILLANCE REQUIREMENTS (continued)

A CHANNEL CHECK will detect gross channel failure; thus, it is the key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication, and readability. If a channel is outside the match criteria, it may be an indication that the instrument has drifted outside its limit.

The Surveillance Frequency is based upon operating experience that demonstrates channel failure is rare ~~and the self-diagnostic features that monitor the channels for proper operation.~~ The CHANNEL CHECKS every 12 hours supplement less formal, but more frequent checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.4.2

To ensure the APRMs are accurately indicating the true core average power, the APRMs are calibrated to the reactor power calculated from a heat balance. The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.4.4 (LPRM calibrations).

A Note is provided which only requires performance of the SR to be met at $\geq 25\%$ RTP because it is difficult to accurately determine core THERMAL POWER from a heat balance when $< 25\%$ RTP. At low power levels, a high degree of accuracy is unnecessary because of the large, inherent margin to thermal limits (MCPR). At $\geq 25\%$ RTP, the surveillance is required to have been satisfactorily performed within the last 7 days in accordance with SR 3.0.2. A Note is provided which allows an increase in THERMAL POWER above 25% if the 7-day Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after reaching or exceeding 25% RTP. The 12 hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.4.3

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function when required. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the NMS DTM function.

The NMS is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

As noted, for Functions 1.a, 1.b, and 2.a, SR 3.3.1.4.3 is not required to be performed when entering MODE 2 from MODE 1 because testing of the MODE 2 required SRNM and APRM Functions cannot be performed in MODE 1. This allows entry into MODE 2 if the 24-month Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after entering MODE 2 from MODE 1. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

A Surveillance Frequency of 7 days provides an acceptable level of system average unavailability over the Surveillance Frequency interval ~~and the self diagnostic features that monitor the channels for proper operation.~~

SR 3.3.1.4.4

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the NMS DTM function.

The NMS is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency of ~~3192~~ days is based on the ~~reliability of the~~ reliability of the channels ~~and the self-diagnostic features that monitor the channels for proper operation.~~

SR 3.3.1.4.5

LPRM gain settings are determined from the local flux profiles measured by the automated fixed incore probe (AFIP) subsystem of NMS. This establishes the relative local flux profile for appropriate representative input to the APRM system. The 750 MWD/T Surveillance Frequency is based on operating experience with LPRM sensitivity changes.

SR 3.3.1.4.6

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the required channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the required channel adjusted to the $NTSP_F$ within the "as-left" tolerance to account for instrument drifts between successive calibrations consistent with the methods and assumptions required by the SCP.

SR 3.3.1.4.5 is modified by two Notes. Note 1 states, for Functions 1.a, 1.b, and 2.a, SR 3.3.1.4.5 is not required to be performed when entering MODE 2 from MODE 1 because testing of the MODE 2 required SRNM and APRM Functions cannot be performed in MODE 1. This allows entry into MODE 2 if the Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after entering MODE 2 from MODE 1. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR. Note 2 states that neutron detectors are excluded from CHANNEL CALIBRATION because of the difficulty of simulating a meaningful signal. Changes in neutron detector sensitivity are compensated for by performing the calorimetric calibration (SR 3.3.1.4.2) and the LPRM calibration (SR 3.3.1.4.4). The Surveillance Frequency of SR 3.3.1.4.5 is based upon the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

BASES

SURVEILLANCE REQUIREMENTS (continued)

communication bus interface checks, and checks on the application program (checksum).

A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the match criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency of once every 12 hours for SR 3.3.1.6.1 is based on operating experience that demonstrates channel failure is rare ~~and the self-diagnostic features that monitor the channels for proper operation.~~

While in MODES 3, 4, and 5, reactivity changes are not expected; therefore, the 12-hour Frequency is relaxed to 24 hours for SR 3.3.1.6.3. The CHANNEL CHECK supplements less formal, but more frequent checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.6.2

To provide adequate coverage of potential reactivity changes in the core, one SRNM is required to be OPERABLE in the quadrant where CORE ALTERATIONS are being performed and the other OPERABLE SRNM must be in an adjacent quadrant. Note 1 states that this SR is required to be met only during CORE ALTERATIONS. It is not required to be met at other times in MODE 6 since core reactivity changes are not occurring. This Surveillance consists of a review of plant logs to ensure that SRNMs required OPERABLE for given CORE ALTERATIONS are in fact OPERABLE. In the event that only one SRNM is required to be OPERABLE per Table 3.3.1.6-1, footnote (a), only the part 'a' portion of this SR is required. Note 2 clarifies that the three requirements can be met by the same or different OPERABLE SRNMs. The 12-hour Surveillance Frequency is based upon operating experience and supplements operational controls over refueling activities, which include steps to ensure the SRNMs required by the LCO are in the proper quadrant.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.6.4

This Surveillance consists of a verification of the plant SRNM instrument readout to ensure that the SRNM reading is greater than a specified minimum count rate. This ensures that the detectors are indicating count rates indicative of neutron flux levels within the core. With few fuel assemblies loaded, the SRNMs will not have a high enough count rate to satisfy the Surveillance Requirement. Therefore allowances are made for loading sufficient "source" material, in the form of irradiated fuel assemblies, to establish the minimum count rate.

To accomplish this, the SR is modified by a Note which states that the count rate is not required to be met on an SRNM that has less than or equal to four fuel assemblies adjacent to the SRNM and no other fuel assemblies are in the associated core quadrant. With four or less fuel assemblies loaded around each SRNM and no other fuel assemblies in the associated quadrant, even with a control rod withdrawn, the configuration will not be critical.

The Frequency is based upon channel redundancy and other information available in the control room and ensures the required channels are frequently monitored while core reactivity changes are occurring. When no reactivity changes are in progress, the Frequency is relaxed from 12 hours to 24 hours.

SR 3.3.1.6.5 and SR 3.3.1.6.6

Performance of a CHANNEL FUNCTIONAL TEST demonstrates that the associated channel will function properly.

The NMS is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

SR 3.3.1.6.5 is required in MODE 6. The 7-day Frequency ensures that the channels are OPERABLE while core reactivity changes could be in progress. The 7-day Frequency is based on operating experience and on other Surveillances (such as CHANNEL CHECK) that ensure proper

functioning between CHANNEL FUNCTIONAL TESTS, ~~and on the self-diagnostic features that monitor the channels for proper operation.~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.6.6 is required in MODES 3, 4, and 5. The Frequency for CFT has been extended from 7 days to 31 days because core reactivity changes do not normally take place in MODES 3, 4, and 5. The 31-day Frequency is based on operating experience and on other Surveillances (such as CHANNEL CHECK) that ensure proper functioning between CHANNEL FUNCTIONAL TESTS, ~~and on the self diagnostic features that monitor the channels for proper operation.~~

SR 3.3.1.6.7

Performance of a CHANNEL CALIBRATION verifies the performance of the SRNM detectors and associated circuitry. The 24-month Frequency considers the unit conditions required to perform the test, the ease of performing the test, the likelihood of a change in the system or component status. The neutron detectors may be excluded from the CHANNEL CALIBRATION because they cannot readily be adjusted. The detectors are regenerative fission chambers that are designed to have a relatively constant sensitivity over the range, and with an accuracy specified for a fixed useful life.

REFERENCES None.

SURVEILLANCE REQUIREMENTS

- NOTES -

1. Refer to Table 3.3.2.1-1 to determine which SRs apply for each Control Rod Block Function.
2. When a required ATLM, RWM, or MRBM channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains control rod block capability.

SURVEILLANCE	FREQUENCY
SR 3.3.2.1.1 ----- <p style="text-align: center;">- NOTE -</p> Not required to be performed until one hour after THERMAL POWER is \geq 30% RTP. ----- Perform CHANNEL FUNCTIONAL TEST on each required channel.	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3192 days</div>
SR 3.3.2.1.2 ----- <p style="text-align: center;">- NOTE -</p> Not required to be performed until one hour after any control rod is withdrawn in MODE 2. ----- Perform CHANNEL FUNCTIONAL TEST on each required channel.	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3192 days</div>
SR 3.3.2.1.3 ----- <p style="text-align: center;">- NOTE -</p> Not required to be performed until one hour after THERMAL POWER is \leq 10% RTP. ----- Perform CHANNEL FUNCTIONAL TEST on each required channel.	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3192 days</div>

SURVEILLANCE		FREQUENCY
SR 3.3.2.1.4	<p>-----</p> <p style="text-align: center;">- NOTE -</p> <p>Not required to be performed until one hour after THERMAL POWER is \geq 30% RTP.</p> <p>-----</p> <p>Perform CHANNEL FUNCTIONAL TEST on each required channel.</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3192 days</div>
SR 3.3.2.1.5	Verify required RWM channels are not bypassed when THERMAL POWER is \leq 10% RTP.	24 months
SR 3.3.2.1.6	Verify required ATLM channels are not bypassed when THERMAL POWER is \geq 30% RTP.	24 months
SR 3.3.2.1.7	Verify required MRBM channels are not bypassed when THERMAL POWER is \geq 30% RTP.	24 months
SR 3.3.2.1.8	<p>-----</p> <p style="text-align: center;">- NOTE -</p> <p>Not required to be performed until one hour after reactor mode switch is in shutdown position.</p> <p>-----</p> <p>Perform CHANNEL FUNCTIONAL TEST on each required channel.</p>	24 months
SR 3.3.2.1.9	Verify the bypassing and movement of control rods required to be bypassed in the Rod Action Control Subsystem (RACS) cabinets by a second licensed operator or other qualified member of the technical staff.	Prior to and during the movement of control rods bypassed in RACS

BASES

SURVEILLANCE REQUIREMENTS (continued)

Condition entered and Required Actions taken. The allowance of this Note is based on the reliability of the channels and the average time required to perform the channel Surveillance, and the low probability of an event occurring coincident with a failure in the remaining OPERABLE channels.

SR 3.3.2.1.1

A CHANNEL FUNCTIONAL TEST is performed for each required ATLM channel to ensure that the entire channel will perform the intended function. It includes the RC&IS inputs. The associated controllers, displays, monitoring and input/output (I/O) communication interfaces continuously function during normal power operation. Abnormal operation of these components is detected and alarmed. In addition, the associated controllers are equipped with on-line diagnostic capabilities for cyclically monitoring the functionality of I/O signals, buses, power supplies, processors, and inter-processor communications.

The Frequency of ~~3192~~ days is based on the reliability of the channels ~~and the online diagnostic features that monitor the channels for proper operation.~~

As noted in the SR, SR 3.3.2.1.~~12~~ is not required to be performed until 1 hour after THERMAL POWER is $\geq 30\%$ RTP. This allows THERMAL POWER to be increased to $\geq 30\%$ RTP to perform the required Surveillance if the ~~3192~~-day Frequency is not met per SR 3.0.2. The 1-hour allowance is based on operating experience and in consideration of providing a reasonable time in which to complete the SRs.

SR 3.3.2.1.2 and SR 3.3.2.1.3

A CHANNEL FUNCTIONAL TEST is performed for each required RWM channel to ensure that the entire system will perform the intended function. The CHANNEL FUNCTIONAL TEST for the RWM is performed by attempting to withdraw a control rod not in compliance with the prescribed sequence and verifying a control rod block occurs. The associated controllers, displays, monitoring and input/output (I/O) communication interfaces continuously function during normal power operation. Abnormal operation of these components is detected and alarmed. In addition, the associated controllers are equipped with on-line diagnostic capabilities for cyclically monitoring the functionality of I/O signals, buses, power supplies, processors, and inter-processor communications.

BASES

SURVEILLANCE REQUIREMENTS (continued)

As noted in the SR, SR 3.3.2.1.2~~3~~ is not required to be performed until 1 hour after any control rod is withdrawn in MODE 2. As noted in the SR, SR 3.3.2.1.3~~4~~ is not required to be performed until 1 hour after THERMAL POWER is $\leq 10\%$ RTP. This allows entry into MODE 2 for SR 3.3.2.1.2~~3~~, and THERMAL POWER to be decreased to $\leq 10\%$ for SR 3.3.2.1.3~~4~~, to perform the required Surveillance if the 3192-day Frequency is not met per SR 3.0.2. The 1-hour allowance is based on operating experience and in consideration of providing a reasonable time in which to complete the SRs. The Frequencies of 3192 days are based on the reliability of the channels ~~and the online diagnostic features that monitor the channels for proper operation.~~

SR 3.3.2.1.4

A CHANNEL FUNCTIONAL TEST is performed for each required MRBM channel to ensure that the entire channel will perform the intended function. It includes the RC&IS inputs. The associated controllers, displays, monitoring and input/output (I/O) communication interfaces continuously function during normal power operation. Abnormal operation of these components is detected and alarmed. In addition, the associated controllers are equipped with on-line diagnostic capabilities for cyclically monitoring the functionality of I/O signals, buses, power supplies, processors, and inter-processor communications.

The Frequency of 3192 days is based on the reliability of the channels ~~and the online diagnostic features that monitor the channels for proper operation.~~

As noted in the SR, SR 3.3.2.1.4~~5~~ is not required to be performed until 1 hour after THERMAL POWER is $\geq 30\%$ RTP. This allows THERMAL POWER to be increased to $\geq 30\%$ RTP to perform the required Surveillance if the 3192-day Frequency is not met per SR 3.0.2. The 1-hour allowance is based on operating experience and in consideration of providing a reasonable time in which to complete the SRs.

SR 3.3.2.1.5

The required RWM channels are bypassed when power is above a specified value (LPSP). The power level is determined from the APRM signals. The RWM bypass setpoint must be verified periodically to be $> 10\%$ RTP (i.e., the RWM is not bypassed at or below the LPSP). If the RWM LPSP is nonconservative, then the affected RWM channel is

BASES

ACTIONS (continued)

D.1 and D.2

With both the drywell fission product monitoring system particulate channel and the drywell air cooler condensate flow rate monitor inoperable, the only means of detecting LEAKAGE is the drywell floor drain HCW sump monitoring system. This Condition does not provide the required diverse means of leakage detection. The Required Action is to restore either of the inoperable monitors to OPERABLE status within 30 days to regain the intended leakage detection diversity. The 30-day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

E.1 and E.2

If any Required Action and associated Completion Time of Condition A, B, C, or D cannot be met or if all required monitors are inoperable the plant must be placed in a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 5 within 36 hours. The Completion Time is reasonable, based on plant design, to reach required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTSSR 3.3.4.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. The associated controllers, displays, monitoring and input/output (I/O) communication interfaces continuously function during normal power operation. Abnormal operation of these components is detected and alarmed. In addition, the associated controllers are equipped with on-line diagnostic capabilities for cyclically monitoring the functionality of I/O signals, buses, power supplies, processors, and inter-processor communications.

A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

The Frequency is based upon operating experience that demonstrates channel failure is rare ~~and the online diagnostics that monitor the~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~channels for proper operation.~~ The CHANNEL CHECKs every 12 hours supplement less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.4.1.2

This SR requires the performance of a CHANNEL FUNCTIONAL TEST of the required RCS leakage detection instrumentation. The test ensures that the required channels can perform their intended function.

The associated controllers, displays, monitoring and input/output (I/O) communication interfaces continuously function during normal power operation. Abnormal operation of these components is detected and alarmed. In addition, the associated controllers are equipped with on-line diagnostic capabilities for cyclically monitoring the functionality of I/O signals, buses, power supplies, processors, and inter-processor communications.

The Frequency of 31 days is based on instrument reliability ~~and the online diagnostic features that monitor the channels for proper operation.~~

SR 3.3.4.1.3

This SR requires the performance of a CHANNEL CALIBRATION of the required RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside the drywell. The Frequency of 24 months is a typical refueling cycle and considers channel reliability. Operating experience has proven this Frequency is acceptable.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.
2. Regulatory Guide 1.45, May 1973.
3. Section 5.2.5.

SURVEILLANCE REQUIREMENTS

- NOTE -

Refer to Table 3.3.5.1-1 to determine which SRs apply for each ECCS Instrumentation Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.1.1	Perform CHANNEL CHECK on each required channel.	12 hours
SR 3.3.5.1.2	Perform CHANNEL FUNCTIONAL TEST on each required channel.	31 92 days
SR 3.3.5.1.3	Perform CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.11, "Setpoint Control Program (SCP)."	24 months
SR 3.3.5.1.4	Verify ECCS RESPONSE TIME of each required channel is within limits.	24 months on a STAGGERED TEST BASIS

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is based upon operating experience that demonstrates channel failure is rare ~~and the self-diagnostic features that monitor the channels for proper operation.~~ The CHANNEL CHECK every 12 hours supplements less formal, but more frequent checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure the entire channel will perform the intended function. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the DTM function.

The SSLC/ESF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

The Frequency of ~~3192~~ days is based on the reliability of the ECCS instrumentation channels ~~and the self-diagnostic features that monitor the channels for proper operation.~~

SR 3.3.5.1.3

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the required channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the required channel adjusted to the $NTSP_F$ within the "as-left" tolerance to account for instrument drifts between successive calibrations consistent with the methods and assumptions required by the SCP.

The Frequency is based upon the assumption of a 24-month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SURVEILLANCE REQUIREMENTS

- NOTES -

Refer to Table 3.3.5.3-1 to determine which SRs apply for each ICS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.3.1	Perform CHANNEL CHECK on each required channel.	12 hours
SR 3.3.5.3.2	Perform CHANNEL FUNCTIONAL TEST on each required channel.	31 92 days
SR 3.3.5.3.3	Perform CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.11, "Setpoint Control Program (SCP)."	24 months
SR 3.3.5.3.4	Verify ICS RESPONSE TIME of each required channel is within limits.	24 months on a STAGGERED TEST BASIS

BASES

SURVEILLANCE REQUIREMENTS (continued)

The SSLC/ESF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency is based upon operating experience that demonstrates channel failure is rare ~~and the self diagnostic features that monitor the channels for proper operation.~~ The CHANNEL CHECK every 12 hours supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.3.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the DTM function.

The SSLC/ESF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

The Frequency of 3192 days is based on the reliability of the channels ~~and the self diagnostic features that monitor the channels for proper operation.~~

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action B.1 and referenced in Table 3.3.6.1-1.	D.1 Declare associated MSIV(s) and main steam line drain isolation valve(s) inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

- NOTE -

Refer to Table 3.3.6.1-1 to determine which SRs shall be performed for each isolation Function.

SURVEILLANCE		FREQUENCY
SR 3.3.6.1.1	Perform CHANNEL CHECK on each required channel.	12 hours
SR 3.3.6.1.2	Perform CHANNEL FUNCTIONAL TEST on each required channel.	31 92 days
SR 3.3.6.1.3	Perform CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.11, "Setpoint Control Program (SCP)."	24 months
SR 3.3.6.1.4	Verify ISOLATION SYSTEM RESPONSE TIME for each required channel is within limits.	24 months on a STAGGERED TEST BASIS

BASES

ACTIONS (continued)

D.1

If the required channel(s) is not restored to OPERABLE status, or verified to be in trip within the allowed Completion Time, or if MSIV isolation capability is not maintained, plant operations may continue if the associated MSIV(s) and MSL drain isolation valve(s) are declared inoperable. Because this Function is required to ensure that the MSIVs and MSL drain isolation valves perform their intended function, sufficient remedial measures are provided by declaring the associated MSIV(s) and MSL drain isolation valves inoperable immediately.

SURVEILLANCE
REQUIREMENTS

As noted at the beginning of the Surveillance Requirements, the SRs for each isolation instrumentation Function are located in the SRs column of Table 3.3.6.1-1.

SR 3.3.6.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred.

The RTIF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication, and readability. If a channel is outside the match criteria, it may be an indication that the instrument has drifted outside its limit.

The Surveillance Frequency is based on operating experience that demonstrates channel failure is rare ~~and the self-diagnostic features that monitor the channels for proper operation.~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

The CHANNEL CHECK supplements less formal, but more frequent checks of channels during normal operational use of the displays associated with the LCO required channels.

SR 3.3.6.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the DTM function.

The RTIF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

The Frequency of ~~3192~~ days is based on the reliability of the Isolation Instrumentation channels ~~and the self diagnostic features that monitor the channels for proper operation.~~

SR 3.3.6.1.3

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the required channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the required channel adjusted to the $NTSP_F$ within the "as-left" tolerance to account for instrument drifts between successive calibrations consistent with the methods and assumptions required by the SCP.

The Surveillance Frequency is based upon the assumption of a 24-month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.6.1.4

This SR ensures that the individual required channel response times are less than or equal to the maximum values assumed in the accident analysis. The instrument response times must be added to the associated closure times to obtain the ISOLATION SYSTEM RESPONSE

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. As required by Required Action B.1 and referenced in Table 3.3.6.3-1.	C.1 Declare associated containment isolation valves inoperable.	Immediately
D. As required by Required Action B.1 and referenced in Table 3.3.6.3-1.	D.1 Be in MODE 3.	12 hours
	<u>AND</u> D.2 Be in MODE 5.	36 hours
E. As required by Required Action B.1 and referenced in Table 3.3.6.3-1.	E.1 Initiate action to restore required channel to OPERABLE status.	Immediately
	<u>OR</u> E.2 Initiate action to isolate reactor water cleanup/shutdown cooling (RWCU/SDC) isolation valves.	Immediately

SURVEILLANCE REQUIREMENTS

- NOTE -

Refer to Table 3.3.6.3-1 to determine which SRs shall be performed for each isolation Function.

SURVEILLANCE	FREQUENCY
SR 3.3.6.3.1 Perform CHANNEL CHECK on each required channel.	12 hours
SR 3.3.6.3.2 Perform CHANNEL FUNCTIONAL TEST on each required channel.	3192 days

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.6.3.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred.

The SSLC/ESF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication, and readability. If a channel is outside the match criteria, it may be an indication that the instrument has drifted outside its limit.

The Surveillance Frequency is based on operating experience that demonstrates channel failure is rare ~~and the self-diagnostic features that monitor the channels for proper operation.~~

The CHANNEL CHECK supplements less formal, but more frequent checks of channels during normal operational use of the displays associated with the LCO required channels.

SR 3.3.6.3.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the channel will perform the intended function. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the DTM function.

The SSLC/ESF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks, communication bus interface checks, and checks on the application program (checksum).

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency of ~~3192~~ days is based on the reliability of the Isolation Instrumentation channels ~~and the self diagnostic features that monitor the channels for proper operation.~~

SR 3.3.6.3.3

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the required channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the required channel adjusted to the $NTSP_F$ within the "as-left" tolerance to account for instrument drifts between successive calibrations consistent with the methods and assumptions required by the SCP.

The Surveillance Frequency is based upon is based on the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.3.6.3.4

This SR ensures that the individual required channel response times are less than or equal to the maximum values assumed in the accident analysis. The instrument response times must be added to the associated closure times to obtain the ISOLATION SYSTEM RESPONSE TIME. ISOLATION SYSTEM RESPONSE TIME acceptance criteria are included in Reference 5.

ISOLATION SYSTEM RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or total channel measurements. This test encompasses the isolation instrumentation from the input variable sensors through the DTM function. This test overlaps the testing required by SR 3.3.6.4.2 to ensure complete testing of instrumentation channels and actuation circuitry.

A Note to the Surveillance states that the radiation detectors may be excluded from ISOLATION SYSTEM RESPONSE TIME testing. This Note is necessary because of the difficulty of generating an appropriate detector input signal and because the principles of detector operation virtually ensure an instantaneous response time. Response Time for radiation detection channels shall be measured from detector output or the input of the first electronic component in the channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. As required by Required Action B.1 and referenced in Table 3.3.7.1-1.	C.1.1 Isolate CRHA boundary. <u>AND</u>	Immediately
	C.1.2 Place OPERABLE CRHAVS train in isolation mode. <u>OR</u>	Immediately
	C.2 Declare CRHAVS trains inoperable.	Immediately
D. As required by Required Action B.1 and referenced in Table 3.3.7.1-1.	D.1 Declare standby CRHAVS train inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

- NOTE -

Refer to Table 3.3.7.1-1 to determine which SRs apply for each CRHAVS Instrumentation Function.

SURVEILLANCE		FREQUENCY
SR 3.3.7.1.1	Perform CHANNEL CHECK on each required channel.	12 hours
SR 3.3.7.1.2	Perform CHANNEL FUNCTIONAL TEST on each required channel.	31 92 days
SR 3.3.7.1.3	Perform CHANNEL CALIBRATION on each required channel consistent with Specification 5.5.11, "Setpoint Control Program (SCP)."	24 months

BASES

SURVEILLANCE REQUIREMENTS (continued)

The SSLC/ESF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks and communication bus interface checks, and checks on the application program (checksum).

A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Frequency is based upon operating experience that demonstrates channel failure is rare ~~and the self diagnostic features that monitor the channels for proper operation.~~ The CHANNEL CHECK every 12 hours supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.7.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. This test ensures a complete CHANNEL FUNCTIONAL TEST of required instrument channels from the sensor input through the DTM function.

The SSLC/ESF is cyclically tested from the sensor input point to the logic contact output by online self-diagnostics. The self-diagnostic capabilities include microprocessor checks, system initialization, watchdog timers, memory integrity checks, input/output (I/O) data integrity checks and communication bus interface checks, and checks on the application program (checksum).

The Frequency of ~~3192~~ days is based on the reliability of the CRHAVS instrumentation channels ~~and the self diagnostic features that monitor the channels for proper operation.~~

3.3 INSTRUMENTATION

3.3.8.1 Diverse Protection System (DPS)

LCO 3.3.8.1 The DPS Functions in Table 3.3.8.1-1 shall be OPERABLE.

APPLICABILITY MODES 1, 2, 3, and 4

ACTIONS

- NOTE -

Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required DPS Functions inoperable.	A.1 Restore required DPS Function to OPERABLE status.	30 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u> B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.3.8.1.1 Perform CHANNEL CHECK	12 hours
SR 3.3.8.1.2 Perform CHANNEL FUNCTIONAL TEST.	31 92 days
SR 3.3.8.1.3 Perform CHANNEL CALIBRATION.	24 months

BASES

SURVEILLANCE
REQUIREMENTSSR 3.3.8.1.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of DPS has not occurred. The associated controllers, displays, monitoring and input/output (I/O) communication interfaces continuously function during normal power operation. Abnormal operation of these components is detected and alarmed. In addition, the associated controllers are equipped with on-line diagnostic capabilities for cyclically monitoring the functionality of I/O signals, buses, power supplies, processors, and inter-processor communications.

A CHANNEL CHECK will detect gross DPS failure; thus, it is key to verifying the DPS continues to operate properly between each CHANNEL CALIBRATION.

The Frequency is based upon operating experience that demonstrates failure of the DPS components is rare ~~and the on-line diagnostics that monitor the DPS for proper operation.~~ The CHANNEL CHECKS every 12 hours supplement less formal, but more frequent checks of DPS during normal operational use of the displays associated with the Functions required to be OPERABLE by the LCO.

SR 3.3.8.1.2

A CHANNEL FUNCTIONAL TEST is performed on the DPS to ensure that the entire DPS will perform the intended Functions. The associated controllers, displays, monitoring and input/output (I/O) communication interfaces continuously function during normal power operation. Abnormal operation of these components is detected and alarmed. In addition, the associated controllers are equipped with on-line diagnostic capabilities for cyclically monitoring the functionality of I/O signals, buses, power supplies, processors, and inter-processor communications.

The ~~3192~~-day Frequency is based on the reliability of the DPS ~~and the self-diagnostic features that monitor the DPS for proper operation.~~