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MFN 07-536

Docket No. 52-010

November 12, 2007

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 97 and email Dated April 24, 2007 Related to ESBWR Design Certification Application – Technical Specifications – RAI Numbers 7.1-30 Supplement 1, 16.2-146, and 16.2-149**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) responses to the subject NRC RAIs transmitted via the Reference 1 letter. The DCD Tier 2 Draft Revisions are contained in Enclosure 2.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 07-292, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 97 Related to ESBWR Design Certification Application,* May 10, 2007

Enclosures:

1. MFN 07-536 – Response to Portion of NRC Request for Additional Information Letter No. 97 and email Dated April 24, 2007 Related to ESBWR Design Certification Application – Technical Specifications – RAI Numbers 7.1-30 Supplement 1, 16.2-146 and 16.2-149
2. MFN 07-536 – DCD Tier 2 Draft Revisions

cc:	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GEH (with enclosures)
	RE Brown	GEH (with enclosures)
	eDRF Sections	60-7079, 75-8352

Enclosure 1

MFN 07-536

Response to Portion of NRC Request for

Additional Information Letter No. 97 and email Dated April 24, 2007

Related to ESBWR Design Certification Application

- Technical Specifications -

RAI Numbers 7.1-30, Supplement 1, 16.2-146 and 16.2-149

NRC RAI 7.1-30

How is the ESBWR design in conformance with IEEE-603 Sense and Command Features 6.8, Setpoints?

IEEE-603-1991, Sense and Command Features 6.8, Setpoints:

The application document (DCD, Tier 2) analysis should confirm that an adequate margin exists between operating limits and setpoints, such that there is a low probability for inadvertent actuation of the system. The application document should include an analysis to confirm that an adequate margin exists between setpoints and safety limits, such that the system initiates protective actions before safety limits are exceeded. Regulatory Guide 1.105, Revision 3, 12/1999, "Setpoint for Safety-Related Instrumentation," provides guidance for setpoint determination. If some of the activities will be performed beyond the design certification stage, then the DCD, Tier 2, should identify the COL action requirements. Appropriate ITAAC acceptance criteria should be proposed to verify this commitment.

GE Response

The DCD Section 7.1 has been updated to demonstrate conformance with IEEE-603, Sense and Command 6.8, Setpoints.

NRC RAI 7.1-30, Supplement 1

Provide COL Applicant/COL Holder information item in DCD Section 7.1.6.6.1.24.

COL application or COL Holder should follow the GE Setpoint Methodology, and provide detailed instrument setpoint information for staff review

GEH Response

DCD Chapter 16, Technical Specification 5.5.11, Setpoint Control Program (refer to Enclosure 2), requires that the Nominal Trip Setpoints, Allowable Values, As-Found and As-Left Values, and the methodologies used to determine these values, shall be established and shall be documented in a Setpoint Control Program. The DCD retains brackets ("{...}") for the setpoint information which is indicative of information to be supplied at a future date. NUREG-0800, 'Standard Review Plan,' (SRP) Revision 2, Chapter 16, Section IV.4, provides an expected License Condition for a COL Holder that will ensure that "final wording of bracketed text shall be incorporated into the TS and TS Bases prior to the initial loading of fuel into the reactor pressure vessel."

In addition, DCD, Tier 1, Section 2.2.15, Revision 4, Table 2.2.15-2, ITAAC #10 provides for inspection(s), test(s), or analysis(es) report(s) for the IEEE-603, Criterion 6.8 systems listed in DCD, Tier 1, Section 2.2.15, Revision 4, Table 2.2.15-1, that conclude(s) that the safety-related systems' setpoints for safety-related functions are defined, determined and implemented based on a defined setpoint methodology.

With the Technical Specification Setpoint Control Program, the SRP mechanism for addressing bracketed items, and the ITAAC verification listed above, adequate controls exist to obviate the need for a COL applicant or COL Holder information item in the DCD.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 16.2-146

Specification 5.5.11, "Setpoint Control Program," requires establishing and documenting Nominal Trip Setpoints (NTSPs), Allowable Values (AVs), and As-Found and Leave Alone Tolerance Bands, and the methodologies used to determine these values for technical specification instrumentation functions in the following TS Sections: 3.3.1.1, RPS; 3.3.1.4, NMS; 3.3.5.1, ECCS; 3.3.5.3, ICS; 3.3.6.1, MSIV; 3.3.6.3, Isolation; and 3.3.7.1, CRHAVS. For these instrumentation functions, Channel Calibration tests must evaluate a channel to verify it is functioning as required, before returning it to service, when the as-found channel setpoint is found conservative with respect to the Allowable Value but outside its predefined As-Found Tolerance Band. Define the terms NTSP, AV, and As-Found and Leave Alone Tolerance Bands for the instrument functions in the above list of Specifications, and justify why these methodology terms were chosen for establishing digital protection channel operability during a Channel Calibration. Explain qualitatively, what is meant by a Leave Alone Tolerance Band (Specification 5.5.11.b) for a digital protection channel. This information is needed to understand how the proposed SCP will ensure that the requirements of 10 CFR 50.36.(c)(ii)(A) are met.

GEH Response

GEH has prepared Technical Report NEDE-33304P, "GEH ABWR/ESBWR Setpoint Methodology," which is based on previously NRC accepted GE Setpoint Methodology, NEDC-31336P-A, as updated to reflect a graded approach as provided in BTP HICB-12 and information contained in Regulatory Information Summary (RIS) 2006- 017, "NRC Staff Position on the Requirements of 10 CFR 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels." NEDE-33304P provides the definitions and discussions requested by the RAI that ensure the Channel Calibration Surveillance Requirements support compliance with 10 CFR 50.36(d)(3), "Surveillance Requirements." (Note that the August 28, 2007 Rule change revised certain paragraph numbering within 10 CFR 50.36.) This methodology applies to both analog and digital instrument functions.

As shown in Enclosure 2, the ESBWR DCD Tier 2 is being revised to reference NEDE-33304P for establishing the requirements and methodologies for determining and maintaining instrument setpoints. As required by the revised Technical Specification 5.5.11, "Setpoint Control Program," instrument nominal trip setpoints (NTSPs), allowable values (AVs), as-found tolerance (AFT), and as-left tolerance (ALT) are required to be determined by setpoint and safety-related analyses using this methodology. Note: The term, "Leave Alone Tolerance Band," is not applicable to new GEH plants and is replaced by the ALT term, as defined in NEDE-33304P. Also provided in Enclosure 2 are Bases changes to reflect consistency with NEDE-33304P.

The GEH setpoint methodology of NEDE-33304P, Section 4.0, contains the appropriate provisions that support required performance of Channel Calibrations and the determination of operability that were previously outlined in the Setpoint Control Program items 5.5.11 c.1 and c.2. As such, these requirements remain imposed by enforcing the methodology as referenced in Specification 5.5.11 and imposed in applicable Channel Calibration surveillance requirements.

Specifically, in response to the RAI assertion that "*the as-found channel setpoint is found conservative with respect to the Allowable Value but outside its predefined As-Found Tolerance Band*", NEDE-33304P Section 4.0 provides:

> "For Graded Approach Group A functions, when the as-found channel setpoint is outside the applicable AFT, evaluations are performed to consider whether the instrumentation channel is functioning as required (i.e., within the performance assumptions of the applicable setpoint calculations)."

It should be noted that for Graded Approach Group A, the GEH setpoint methodology establishes that the AV is equated to the AFT setting limit, so that the case discussed in the RAI does not occur (i.e., "*the as-found channel setpoint is found conservative with respect to the Allowable Value but outside its predefined As-Found Tolerance Band*" can not occur). However, for other than Graded Approach Group A, as summarized in NEDE-33304, Section 7.0 (see Item 3), if the setpoint is found conservative to the AV but outside the AFT, the setpoint is to reset to the NTSP (within the ALT), and a channel functionality determination is to be made.

DCD Impact

See the DCD Tier 2 draft proposed changes in Enclosure 2.

NRC RAI 16.2-149

Provide analysis to show that elements of the Setpoint Control Program are sufficient to ensure that the requirements of 10 CFR 50.36(c)(3) will be met including an appropriate basis for Setpoint Design Basis for each instrumentation function with a specified instrument calibration performed in accordance with the Setpoint Control Program.

GEH Response

GEH has prepared Technical Report NEDE-33304P, "GEH ABWR/ESBWR Setpoint Methodology," which is based on previously NRC accepted GE Setpoint Methodology, NEDC-31336P-A, as updated to reflect a graded approach as provided in BTP HICB-12 and information contained in Regulatory Information Summary (RIS) 2006- 017, "NRC Staff Position on the Requirements of 10 CFR 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels." NEDE-33304P provides the methodology for the analyses requested by the RAI.

DCD Tier 2, Chapter 16 instrument function Channel Calibration Surveillance Requirements for required automatic protection functions, contain an explicit reference to Specification 5.5.11, "Setpoint Control Program" (which is revised to reference NEDE-33304P). These requirements for the applicable channel calibrations assure the assumptions and methodologies of NEDE-33304 are imposed and therefore, that the Channel Calibration Surveillance Requirements support compliance with 10 CFR 50.36(d)(3), "Surveillance Requirements." (Note that the August 28, 2007 Rule change revised certain paragraph numbering within 10 CFR 50.36.)

Additionally, Revision 4 of DCD Tier 1 provides ITAAC #10 in Table 2.2.15-2 that requires inspection(s), test(s), and/or analysis(es) will be performed to verify that the setpoints for safety-related functions are defined, determined and implemented based on this setpoint methodology.

DCD Impact

See the DCD Tier 2 draft proposed changes in Enclosure 2.

Enclosure 2

MFN 07-536

DCD Tier 2 Draft Revisions

7.1.3.1.2 Q-DCIS Power Generation (Nonsafety-Related) Design Basis

The power generation design basis for the Q-DCIS is to transmit plant parameters and other safety-related system data through safety-related isolation devices to the gateways/datalinks to the N-DCIS that provide interfaces to nonsafety-related system logic and displays for power generation.

7.1.3.1.3 Q-DCIS Setpoint Methodology

To determine setpoints and select I&C, the following are considered: range, accuracy, resolution, instrument drift, environmental conditions at the sensor location, changes in the process, testability, and repeatability. The recommended test frequency is greater for instrumentation that demonstrates a stronger tendency to drift. Adequate margin between safety~~-related~~ limits and instrument setpoints is provided to allow for instrument error. The response time of the instrument is assumed in the safety analysis and verified in plant-specific surveillance testing. The amount of instrument error is determined by test and experience. The setpoint is selected based on a known error; the Q-DCIS equipment is microprocessor based with discrete setpoints that do not drift.

The actual settings are determined from operating experience or conservative analyses when specific instrument operating experience is not available. The settings are far enough from the values expected in normal operation to preclude inadvertent initiation of the safety-related action. At the same time, they are far enough from the analyzed trip values to ensure that appropriate margins are maintained between the actual settings and the analyzed values. The margin between the limiting safety-related system settings and the actual safety~~-related~~ limits (where applicable) include consideration of the maximum credible transient in the process being measured.

The periodic test frequency for each variable is determined from historical data on setpoint drift and from quantitative reliability requirements for each system and its components. Setpoints are established for the Q-DCIS systems in accordance with ~~proven instrument error and setpoint calculation methodology described in "General Electric Instrument Setpoint Methodology",~~ Reference 7.1-9.

7.1.3.2 Q-DCIS Description

The Q-DCIS provides the data processing and transmission network that encompasses the four independent and separate data multiplexing divisions, Divisions 1, 2, 3, and 4, corresponding to the four divisions of safety-related electrical and I&C equipment. Each Q-DCIS division consists of the RMUs, the fiber optic cable signal transmission path, the SSLC cabinets, the RTIF cabinets, the cabinet power supplies, the safety-related VDUs, and safety-related fiber optic CIMs.

The Q-DCIS contains multiple dual redundant fiber optic cable networks for each of the four divisions. The networks connect the RMUs with the following: divisional safety-related VDUs; the RPS and NMS Digital Trip Modules (DTMs); the SSLC/ESF CIMs; the RPS, the NMS, and the SSLC/ESF Test Cabinets located in the safety-related Q-DCIS equipment rooms in the RB and CB; and the N-DCIS through isolated digital gateways/datalinks.

7.1.6.6.1.16 Reliability (IEEE Std. 603, Section 5.15)

The degree of redundancy, diversity, testability, and quality of the safety-related I&C design achieves the necessary functional reliability. Safety-related equipment is provided under GEH's 10 CFR 50 Appendix B quality program. The BTP-14 guidance followed for software development processes achieves reliable software design and implementation. To achieve defense against common mode failure, the design includes many defense-in-depth and diversity measures including the incorporation of the DPS described in Section 7.8. Reference 7.1-4, provides specific information on the redundancy and diversity used in safety-related I&C systems. Q-DCIS is included in the consideration of the Probabilistic Risk Assessment (PRA). (Refer to Chapter 19.)

7.1.6.6.1.17 Automatic Control (IEEE Std. 603, Sections 6.1 and 7.1)

The RPS and SSLC/ESF logic automatically initiates reactor scram trip and actuates the engineered safety features to mitigate the consequences of the AOOs and DBEs. These automatic protection actions are implemented through two-out-of-four voting logic whenever one or more process variables reach the scram or ESF actuation setpoint. Variables are monitored and measured by each of the RPS and SSLC/ESF divisions.

Plant-specific setpoint analyses evaluate whether the protection systems' precision is adequate. Instrument setpoints are determined by ~~setpoint and safety-related analyses~~the methodology described in Reference 7.1-9. The GEH ~~S~~setpoint ~~M~~methodology uses plant-specific setpoint analyses to ensure that the characteristics of the instruments such as range, accuracy and resolution meet the performance requirements assumed for the safety-related control system components and systems of the safety-related I&C analyses in Chapter 15. The response times of the I&C systems are assumed in the safety-related analyses and verified by plant specific surveillance testing or system analyses. The Q-DCIS internal and external communication system design ensures that the real-time performance of the safety-related control systems is deterministic.

7.1.6.6.1.18 Manual Control (IEEE Std. 603, Sections 6.2 and 7.2)

Each protective action can be manually initiated at the system level, in conformance with RG 1.62, and at the division level in conformance with IEEE Std. 603, Sections 6.2 and 7.2. The manual initiation satisfies divisional rules for independence and separation. Two manual actions, each in a separate division, are required in order to satisfy the two-out-of-two system logic or the two-out-of-four division logic that initiates a reactor trip in the RPS and ESF functions of the SSLC/ESF system.

The operator can manually initiate the ESF functions by actuating manual switches in two-out-of-four divisions; thus, satisfying the two-out-of-two system initiation logic. The ESF functions that use squib valves use a redundant two-step arm and fire sequence. This prevents single failures from firing or from inhibiting the firing of the squib valves. The squib valves are the GDCS pool injection valves, the suppression pool injection valves, the GDCS deluge valves, the ADS DPV, and the SLC injection valves. To manually initiate the GDCS short-term and long-term injection systems, a low-pressure signal must be present in the RPV. This prevents inadvertent manual initiation of the system during normal reactor operation.

7.1.6.6.1.23 Maintenance Bypass (IEEE Std. 603, Sections 6.7 and 7.5)

Maintenance bypass capability is incorporated in the design of the Q-DCIS. This permits equipment maintenance, testing, and repair of one individual division/channel with the plant operating and without initiating any protection functions. The single failure criterion is met under this bypass condition. Although it is possible to bypass only one division at a time, the Q-DCIS design is able to supply its safety-related functions even with a two-division failure. Maintenance bypass is always alarmed or indicated in the MCR. Maintenance bypass for safety-related I&C systems is typically applied through a joystick bypass switch with exclusive logic that allows only one channel, out of four, to be bypassed at any given time. Maintenance bypasses are initiated manually by the plant operator per administrative control. Specific descriptions of safety-related system maintenance bypasses are included in Subsections 7.2.1.5.2.2 and 7.3.5.2.

7.1.6.6.1.24 Setpoints (IEEE Std. 603, Section 6.8)

Instrument setpoints are determined by ~~setpoint and safety-related analyses~~the methodology described in ~~using~~ Reference 7.1-9, which is based on previously NRC approved GE Setpoint Methodology, NEDC 31336P-A (Reference 7.1-11), as updated to reflect a graded approach as provided in BTP HICB-12 and information contained in Regulatory Information Summary (RIS) 2006-017, "NRC Staff Position on the Requirements of 10 CFR 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels." The GEH ~~S~~setpoint ~~M~~methodology uses plant-specific setpoint analyses to ensure that the instruments' range, accuracy, and resolution meet the performance requirements assumed for the safety-related control system components and systems in the safety-related analyses in Chapter 15. This methodology meets the requirements of IEEE Std. 603, Section 6.8. The response times of the I&C systems are assumed in the safety-related analyses and verified by plant specific surveillance testing or system analyses.

7.1.6.6.1.25 Electrical Power Sources (IEEE Std. 603, Section 8.1)

The Q-DCIS protection system cabinets and components are supported by two independent power sources. Each division of safety-related I&C is powered by two uninterruptible power supplies that can supply 120 VAC from either offsite power, diesel generator power, or safety-related batteries (for 72 hours). Either of the two power sources allows Q-DCIS operation. Two divisions of the uninterruptible 120 VAC are also used as the power sources for the solenoids of the scram pilot valves. Two divisions of power sources are used for the backup scram valves solenoids, for scram reset permissive logic. Specific descriptions of safety-related system power sources are included in Subsections 7.2.1.2.3 and 7.2.2.2.3, as well as in Chapter 8.

7.1.6.6.1.26 Non-electrical Power Sources (IEEE Std. 603, Section 8.2)

To perform the scram protection function, each Hydraulic Control Unit (HCU) furnishes pressurized water for the hydraulic scram, following a signal from the RPS. With low CRD HCU Accumulator Charging Pressure, the CRD system sounds an alarm in the MCR. A loss of nitrogen decreases the nitrogen pressure and actuates a pressure switch. Additionally, a float type level switch actuates an alarm if water leaks past the piston barrier and collects in the

7.1.8 References

7.1-1 USNRC, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," NUREG-0800.

7.1-2 General Electric Company, "General Electric Environmental Qualification Program," NEDE-24326-1-P, Revision 1, Class III (Proprietary), January 1983.

7.1-3 Deleted

7.1-4 GE Energy Licensing Topical Report (LTR) entitled, "ESBWR I&C Defense-In-Depth and Diversity Report." NEDO-33251, Class I (Non-proprietary), Revision 0, July 2006.

7.1-5 Deleted

7.1-6 Deleted

7.1-7 Deleted

7.1-8 GE Energy, "ESBWR Cyber Security Program Plan," NEDO-33295, Class I (Non-Proprietary); and "ESBWR Cyber Security Program Plan," NEDE-33295-P, Class III (Proprietary).

7.1-9 ~~GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," NEDC 31336P-A, Class III (Proprietary), September 1996~~GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDO-33304, Class I (Non-proprietary); and "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision 0, October 2007.

7.1-10 GE Energy Nuclear, "ESBWR I&C Software Quality Assurance Plan," NEDO-33245, Class I (Non-proprietary); and "ESBWR I&C Software Quality Assurance Plan," NEDE-33245P, Class III (Proprietary), Revision 2, July 2007.

7.1-11 GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," NEDO-31336, Class I (Non-proprietary); and "General Electric Instrument Setpoint Methodology," NEDC-31336P-A, Class III (Proprietary), September 1996.~~Deleted~~

7.1-12 GE Energy Nuclear, "ESBWR I&C Software Management Plan," NEDO-33226, Class I (Non-proprietary); and "ESBWR I&C Software Management Plan," NEDE-33226P, Class III (Proprietary), Revision 2, July 2007.

7.1-13 GE Energy Nuclear, "ESBWR Man-Machine Interface System and Human Factors Engineering Implementation Plan," Revision 3, NEDO-33217.

Testing is included on a periodic basis when equipment associated with the display is tested.

RG 1.53 - Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems:

- Conformance: Compliance with Nuclear Regulatory Commission (NRC) RG 1.53 is satisfied by specifying, designing, and constructing the RPS to meet the single-failure criterion of IEEE Std. 603, Section 5.1, and IEEE Std. 379. Redundant sensors are used and the logic is arranged to ensure that a failure in a sensing element, decision logic, or an actuator does not prevent protective action. Separated channels are employed so a fault affecting one channel does not prevent the other channels from operating properly.

RG 1.62 - Manual Initiation of Protective Actions:

- Conformance: Means are provided for manual initiation of reactor scram through the use of two control switches and the Reactor Mode Switch (IEEE Std. 603, Section 6.2). Reactor scram is accomplished by operation of both pushbutton switches, or by placing the Reactor Mode Switch in the Shutdown position. These controls are located on the main control console.

  The common equipment required for initiation of both manual scram and automatic scram is limited to actuator load power sources, actuator loads, and cabling between the two. There is no shared trip or scram logic equipment for manual scram and automatic scram (IEEE Std. 603, Sections 5.6 and 6.2). No single failure in the manual, automatic, or common portions of the protection system would prevent initiation of reactor scram by manual or automatic means.

  Manual initiation of reactor scram, once initiated, goes to completion as required by IEEE Std. 603, Section 5.2.

RG 1.75 - Physical Independence of Electric Systems:

- Conformance: The RPS complies with the criteria set forth in IEEE Std. 603, Section 5.6, and RG 1.75, which endorses IEEE Std. 384. Safety-related circuits and safety-related associated circuits are identified and separated from redundant and nonsafety-related circuits. Isolation devices are provided where an interface exists between redundant safety-related divisions and between safety-related or safety-related associated circuits and nonsafety-related circuits. See chapter 8.0 Subsection 8.3.1.4.1 for RPS separation requirements.

RG 1.105 - Setpoints for Safety-Related Instrumentation:

- Conformance: The RPS initiation setpoints are consistent with this guide. ~~A licensing topical report "General Electric Instrument Setpoint Methodology" (~~Reference 7.2-1~~)~~ provides a detailed description of ~~this~~ the GEH setpoint methodology.

RG 1.118 - Periodic Testing of Electric Power and Protection System:

- Conformance: The SPTM design conforms with the BTP identified.

7.2.3.3.6 TMI Action Plan Requirements

In accordance with the SRP for 7.2 and with Table 7.1-1, only I.D.3 applies to the SPTM subsystem. This is addressed in Subsection 7.2.3.3.1 for 10 CFR 50.34(f)(2)(v). However, TMI action plan requirements are generically addressed in Table 1A-1 of Chapter 1, Appendix 1A.

7.2.3.4 Testing and Inspection Requirements

Proper functioning of analog temperature sensors is verified by channel cross-comparison during the plant normal operation mode. The bulk pool temperatures are continuously compared between divisions and alarmed (for inconsistency) by the PCF.

Each of four SPTM safety-related divisions is testable during plant normal operation to determine the operational availability of the system. Each safety-related SPTM division has the capability for testing, adjustment, and inspection during a plant outage.

7.2.3.5 Instrumentation and Controls Requirements

The instrumentation and control requirements related to SPTM are addressed in Subsections 7.2.3.1 and 7.2.3.2.

7.2.4 COL Information

None

7.2.5 References

7.2-1 ~~GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," Licensing Topical Report NEDC-31336P-A, Class III (GE Proprietary), September 1996~~GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDO-33304, Class I (Non-proprietary); and "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision 0, October 2007.

7.2-2 GE Nuclear Energy, NUMAC LTR, NEDO-33288, "Application of Nuclear Measurement Analysis and Control (NUMAC) for the ESBWR Reactor Trip System, March 2007".

7.2-3 GE Nuclear Energy, "ESBWR I&C Software Management Plan," NEDO-33226, Class I (Non-proprietary); and "ESBWR I&C Software Management Plan," NEDE-33226P, Class III (Proprietary), Revision 2, July 2007.

7.2-4 GE Nuclear Energy, "ESBWR I&C Software Quality Assurance Plan," NEDO-33245, Class I (Non-proprietary); and "ESBWR I&C Software Quality Assurance Plan," NEDE-33245P, Class III (Proprietary), Revision 2, July 2007.

7.3.1.1.3.3 Staff Requirements Memorandum

SRM to SECY 93-087, Item II.Q Defense Against Common-Mode Failures in Digital Instrument and Control Systems:

- Conformance: Implementation of a Diverse I&C System, the DPS is described in Section 7.8.

7.3.1.1.3.4 Regulatory Guides

RG 1.22 - Periodic Testing of Protection System Actuation Functions:

- Conformance: Components are tested periodically during refueling outages every two years. The ADS conforms with this RG with the clarification that for the DPVs, periodic testing is interpreted to mean testing of the squib initiators in a laboratory after removal from the squib valves. Refer also to Subsection 7.3.1.1.4.

RG 1.47 - Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems:

- Conformance: The ADS meets the guidance of RG 1.47. Automatic indication is provided in the MCR to inform the operator the system is inoperable or a division is bypassed.

RG 1.53 - Application of the Single-Failure Criterion to Nuclear Power Protection Systems:

- Conformance: The ADS meets the guidance of RG 1.53 and (IEEE Std. 603, Section 5.1) and (IEEE Std. 379).

RG 1.62 - Manual Initiation of Protective Actions:

- Conformance: The ADS conforms with this RG. Manual actuation of ADS requires the operator to actuate at least two dual action switches. This ensures that manual initiation of ADS is a premeditated act.

RG 1.75 - Physical Independence of Electric Systems:

- Conformance: The ADS design conforms with RG 1.75. See chapter 8.0 Subsections 8.3.1.3 and 8.3.1.4 for a discussion of how the design meets the requirements of RG 1.75.

RG 1.105 - Instrument Setpoints for Safety Related Systems:

- Conformance: The setpoints used to initiate ADS are consistent with this guide. Because the discrete setpoints in the ADS logic do not drift, most of the variation is expected to be in the process transmitters. Setpoints are continuously monitored and alarmed by the plant computer functions (PCF). ~~The GE design document, "General Electric Instrument Setpoints Methodology",~~ Reference 7.3-2~~,~~ provides a detailed description of ~~this~~the GEH setpoint methodology.

RG 1.118 - Periodic Testing of Electric Power and Protection Systems:

Control programs for each microprocessor-controlled instrument are in the form of software residing in non-volatile memory. The storage medium is in general Programmable Read-Only Memory (PROM). Programs are under the control of a real-time operating system residing in non-volatile memory. The equipment is qualified with a verification and validation program conforming with applicable codes and standards.

Logic and controls for SSLC/ESF are located on each divisional SSLC/ESF cabinet in the equipment room in the CB, with key controls and system operating status available on the operator interface section in the MCR. The SSLC/ESF controls are used infrequently. Such controls typically do not require operator action during plant operation or during accident or transient conditions, and mainly are used for test and maintenance purposes. However, conditions such as equipment failure, maintenance, or testing, may require the operator manually to bypass a division of sensors or a division of trip logic. Under the bypass status, SSLC/ESF continues to run in automatic mode using the unaffected logic in the remaining divisions.

The following minimum required SSLC/ESF displays are provided in the MCR (per division):

- Division-of-sensors in bypass;
- SSLC/ESF controller inoperative (DTM or VLU), and
- Communication Interface Module (CIM) inoperative.

7.3.6 COL Information

None

7.3.7 References

7.3-1 Triconex Topical Report 7286-545-1-a, "Qualification Summary Report", March 08, 2002.

7.3-2 ~~GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," NEDC 31336P-A, Class III (Proprietary), September 1996~~GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDO-33304, Class I (Non-proprietary); and "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision 0, October 2007.

7.3-3 GE Energy Nuclear, "ESBWR I&C Software Management Plan," NEDO-33226, Class I (Non-proprietary), and "ESBWR I&C Software Management Plan," NEDE-33226P, Class III (Proprietary), Revision 2, July 2007.

7.3-4 GE Energy Nuclear, "ESBWR I&C Software Quality Assurance Plan," NEDO-33245, Class I (Non-proprietary), and "ESBWR I&C Software Quality Assurance Plan," NEDE-33245P, Class III (Proprietary), Revision 2, July 2007.

7.4.1.3.2 General Design Criteria.

In accordance with Table 7.1-1, the following General Design Criteria (GDC) are addressed for the SLC system:

GDC 1, 2, 4, 13, 19 and 24:

- Conformance: The SLC system conforms with these GDC.

7.4.1.3.3 Regulatory Guides

RG 1.22 – Periodic Testing of Protection System Actuation Functions:

- Conformance: The SLC system conforms with RG 1.22.

RG 1.47 – Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems:

- Conformance: The SLC system conforms with RG 1.47.

RG 1.53 – Application of the Single-Failure Criterion to Nuclear Power Protection Systems:

- Conformance: The SLC system is a redundant backup to the reactor control and scram systems, and performs an ECCS function. The SLC system has two redundant and parallel squib-type valves in each loop. Only one valve in each loop is required for the safety-related function of the SLC system. The SLC system instrumentation assuring operability of the system also is redundant.

RG 1.62 – Manual Initiation of Protective Actions:

- Conformance: The SLC system conforms with RG 1.62. Dual (key-locked) control switches are provided, to actuate the SLC system.

RG 1.75 – Physical Independence of Electric Systems:

- Conformance: The SLC system conforms with RG 1.75. See Chapter 8 for a general discussion of compliance with RG 1.75.

RG 1.105 – Setpoints for Safety-Related Instrumentation:

- Conformance: The SLC system conforms with RG 1.105, as described in ~~GE Nuclear Energy, "General Electric Instrument Setpoint Methodology" LTR NEDC 31336P-A, Class III (GE Proprietary), September 1996~~Reference 7.4-2.

RG 1.118 – Periodic Testing of Electric Power and Protection Systems:

- Conformance: The SLC system conforms with RG 1.118.

RG 1.151 – Instrument Sensing Lines:

- Conformance: The SLC system conforms with RG 1.151.

RG 1.153 – Criteria for Power, Instrumentation, and Control Portions of Safety Systems:

- Conformance: The I&C design does not use innovative means for accomplishing safety functions.:

7.4.4.3.2 General Design Criteria

In accordance with the SRP for Section 7.4 and Table 7.1-1, the following GDC are addressed for the ICS:

GDC 1, 2, 4, 13, 19 and 24:

- Conformance: The ICS conforms with these GDC.

7.4.4.3.3 Regulatory Guides

RG 1.22 – Periodic Testing of Protection System Actuation Functions:

- Conformance: The ICS system conforms with RG 1.22.

RG 1.47 – Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems:

- Conformance: The ICS conforms with RG 1.47.

RG 1.53 - Application of the Single-Failure to Nuclear Power Protection Systems:

- Conformance: The ICS meets the requirements of RG 1.53.

RG 1.62 – Manual Initiation of Protective Actions:

- Conformance: The ICS conforms with RG 1.62.

RG 1.75 - Physical Independence of Electric Systems:

- Conformance: Separation within the ICS is such that controls, equipment, and wiring are segregated into four separate safety-related logic groups. See chapter 8.0 Subsections 8.3.1.3 and 8.3.1.4 for further discussion of how the design meets the requirements of RG 1.75.

RG 1.105 - Instrument Setpoints for Safety-Related Systems:

- Conformance: The setpoints used to initiate ICS automatic operation or isolation are established consistent with this guide. Reference 7.4-2 provides a detailed description of ~~this~~ the GEH methodology.

RG 1.118 - Periodic Testing of Electric Power and Protection Systems:

- Conformance: The ICS conforms with RG 1.118.

RG 1.152 - Criteria for Digital Computers in Safety Systems of Nuclear Power Plants:

- Conformance: The ICS conforms with RG 1.152.

RG 1.153 - Criteria for Power, Instrumentation, and Control Portions of Safety Systems:

- Temperatures of steam and condensate return lines,
- Temperatures of IC top and bottom vent lines, and
- Valve positions.

The following manual controls are provided by the ICS (IEEE Std. 603, Sections 6.2 and 7.2) to:

- Open/close condensate return valves,
- Close condensate return isolation valves,
- Close steam supply isolation valves,
- Open/close all bottom vent valves,
- Open/close all top vent valves, and
- Open/close purge line valve.

7.4.5 COL Information

None

7.4.6 References

7.4-1 USNRC, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plant" NUREG-0800, Section 7.4.

7.4-2 ~~GE-Nuclear Energy, "General Electric Instrument Setpoint Methodology," Licensing Topical Report NEDC-31336P-A, Class III (GE proprietary), September 1996~~GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDO-33304, Class I (Non-proprietary); and "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision 0, October 2007.

SURVEILLANCE		FREQUENCY
SR 3.6.1.6.4	Perform CHANNEL CALIBRATION of each vacuum breaker flow path isolation function consistent with Specification 5.5.11, "Setpoint Control Program (SCP)."	24 months
SR 3.6.1.6.5	Perform a system functional test of each vacuum breaker flow path isolation function.	24 months

SURVEILLANCE		FREQUENCY
SR 3.7.6.3	Perform a system functional test for the SRI Function.	24 months
SR 3.7.6.4	Verify electrical insertion rate is within limits for each required FMCRD over the required insertion range.	24 months
SR 3.7.6.5	Perform CHANNEL CALIBRATION of each SCRRI/SRI initiation Function required channel consistent with Specification 5.5.11, "Setpoint Control Program (SCP)."	24 months

5.5 Programs and Manuals

5.5.10 Battery Monitoring and Maintenance Program

This Program provides for battery restoration and maintenance, based on the recommendations of IEEE Standard 1188-2005, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications," of the following:

a. Actions to restore battery cells with float voltage < 2.18 V, and

b. Actions to determine the cause and correct when cell temperatures deviate more than 3°C (5°F) from each other.

5.5.11 Setpoint Control Program (SCP)

a. The Nominal Trip Setpoints (NTSPs), Allowable Values (AVs), ~~and~~ As-Found Tolerance (AFT), ~~and Leave Alone~~ As-Left Tolerance (ALT) ~~Bands~~, and the methodologies used to determine these values shall be established and shall be documented in the SCP for each ~~of the~~ required Technical Specification automatic protection function. ~~Instrumentation Functions in the following:~~

~~1.Specification 3.3.1.1, "Reactor Protection System (RPS) Instrumentation,"~~
~~2.Specification 3.3.1.4, "Neutron Monitoring System (NMS) Instrumentation,"~~
~~3.Specification 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation,"~~
~~4.Specification 3.3.5.3, "Isolation Condenser System (ICS) Instrumentation,"~~
~~5.Specification 3.3.6.1, "Main Steam Isolation Valve (MSIV) Instrumentation,"~~
~~6.Specification 3.3.6.3, "Isolation Instrumentation," and~~
~~7.Specification 3.3.7.1, "Control Room Habitability Area (CRHA) Heating, Ventilation, and Air Conditioning (HVAC) Subsystem (CRHAVS) Instrumentation."~~

5.5 Programs and Manuals

b. [---------- **REVIEWER'S NOTE** ----------
The SCP will contain the complete identification for the referenced methodology (i.e., report number, title, revision, date, and any supplements).
----------]

The analytical methods used to determine the NTSPs, ~~and~~ AVs, AFTs, and ALTs ~~and As-Found and Leave Alone Tolerance Bands~~ shall be those previously reviewed and approved by the NRC in NEDE-33304P, "GEH ABWR/ESBWR Setpoint Methodology."

~~, specifically those described in the following document[s]:~~

~~5.5.11 Setpoint Control Program (SCP) (continued)~~

~~{---------- **REVIEWER'S NOTE** ----------~~
~~The applicant must identify the Topical Report(s) by number and title or identify the staff Safety Evaluation Report for a plant specific methodology by NRC letter and date. The SCP will contain the complete identification for each of the Technical Specification referenced topical reports used to prepare the LTSPs, AVs, NTSPs (where applicable), and As-Found and As-Left Tolerance Bands included in the SCP (i.e., report number, title, revision, date, and any supplements).~~
~~----------}~~

~~{1. NEDC-31336P-A, "General Electric Instrument Setpoint Methodology."}~~

~~c. The SCP shall also establish provisions for:~~

~~1. Evaluation of an instrumentation channel to verify it is functioning as required, before return to service, when the as-found channel setpoint is found conservative with respect to the Allowable Value but outside its predefined As-Found Tolerance Band; and~~

~~2. Resetting an instrumentation channel setpoint to a value that is within the Leave Alone Tolerance Band of the associated NTSP or of a value that is more conservative than the NTSP or, otherwise, declaring the channel to be inoperable.~~

BASES

BACKGROUND (continued)

However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value is specified in the SCP, as required by Specification 5.5.11, in order to define OPERABILITY of the devices and is designated as the Allowable Value which is the least conservative value of the as-found setpoint that a channel can have during CHANNEL CALIBRATION. The actual NTSP values and Allowable Values (derived from the Setting Basis specified in Table 3.3.1.1-1) and the methodology for calculating the "~~leave alone~~as-left" and "as-found" tolerances will be maintained in the SCP, as required by Specification 5.5.11.

The Allowable Valuable is the least conservative value that the setpoint of the channel can have when tested such that a channel is OPERABLE if the setpoint is found conservative with respect to the Allowable Value during the CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established "~~leave alone~~as-left" tolerance of the NTSP and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the NTSP by an amount equal to or greater than the "as-found" tolerance value. In this manner, the actual setting of the device will ensure that a SL is not exceeded or that automatic protective actions will initiate consistent with the design basis at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to be non-conservative with respect to the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The RPS, as shown in Reference 1, is divided into four redundant divisions of sensor (instrument) channels, trip logics and trip actuators, and two divisions of manual scram controls and scram logic circuitry. The sensor channels, divisions of trip logic, divisions of trip actuators, and associated portions of the divisions of scram logic circuitry together constitute the RPS automatic scram and air header dump (backup scram) initiation logic. The divisions of manual scram controls and associated portions of the divisions of scram logic circuitry together constitute the RPS manual scram and air header dump initiation logic. The automatic and manual scram initiation logics are independent of each other and use diverse methods and equipment to initiate a reactor scram.

BASES

SURVEILLANCE REQUIREMENTS (continued)

CHANNEL CALIBRATION leaves the required channel adjusted to the NTSP within the "~~leave alone~~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~~ and has been shown to be acceptable by Reference 13~~.

~~For selected Functions, the SCP provides additional requirements for the evaluation of the performance of required channels. The selected Functions are those Functions whose instruments are not totally mechanical devices. Mechanical devices (e.g., devices which have an "on" or "off" output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions that would indicate drift of the component setpoint. These devices are considered not trendable and the requirements of TS 5.5.11.c.1 and TS 5.5.11.c.2 are not applicable to these mechanical components. Where a non-trendable component provides signal input to other channel components that can be trended, the remaining components must be evaluated in accordance with the SCP. As indicated in TS 5.5.11.c.1 evaluation of channel performance is required for the condition where the "as-found" setting for the channel is outside its "as-found" tolerance but conservative with respect to the Allowable Value. For digital channel components, the "as-found" tolerance may be identical to the "leave alone" tolerance because drift may not be an expected error. In these cases, a channel "as-found" value outside the "leave alone" tolerance may be cause for component assessment. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program.~~

~~Entry into the Corrective Action Program will ensure required review and documentation of the condition for OPERABILITY. TS 5.5.11.a requires that the Allowable Values and the methodology for calculating the "as-found" tolerances be in the SCP. As indicated in TS 5.5.11.c.2, the as-left setting for the instrument is required to be returned to within the "leave alone" tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in plant surveillance procedures, the "leave alone" and "as-found" tolerances, as applicable, will be applied to the surveillance~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~procedure setpoint. This will ensure that sufficient margin to the Analytical / Design Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the "leave alone" tolerance, then the instrument channel shall be declared inoperable. TS 5.5.11.a requires that the NTSP and the methodology for calculating the "leave alone" and the "as-found" tolerances be in the SCP.~~

SR 3.3.1.1.4

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 RPS RESPONSE TIME acceptance criteria are included in Reference 14.

RPS RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or total channel measurements. This test encompasses the sensor channels up through the DTMs and overlaps the testing required by SR 3.3.1.2.2 to ensure complete testing of instrument channels and actuation circuitry.

However, some sensors for Functions are allowed to be excluded from specific RPS RESPONSE TIME measurement if the conditions of Reference 15 are satisfied. If these conditions are satisfied, sensor response time may be allocated based on either assumed design sensor response time or the manufacturer's stated design response time. When the requirements of Reference 15 are not satisfied, sensor response time must be measured. Furthermore, measurement of the instrument loops response times is not required if the conditions of Reference 16 are satisfied.

RPS RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS for four channels. The Frequency of 24 months on a STAGGERED TEST BASIS ensures that the channels associated with each division are alternately tested. The 24 month test

Frequency is consistent with the refueling cycle and has been shown to be acceptable by Reference 13.

REFERENCES

1. Chapter 7, Figure 7.2-1.
2. Chapter 15.

BASES

BACKGROUND (continued)

However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value is specified in the SCP, as required by Specification 5.5.11, in order to define OPERABILITY of the devices and is designated as the Allowable Value which is the least conservative value of the as-found setpoint that a channel can have during CHANNEL CALIBRATION. The actual NTSP values and Allowable Values (derived from the Setting Basis specified in Table 3.3.1.4-1) and the methodology for calculating the "~~leave alone~~as-left" and "as-found" tolerances will be maintained in the SCP, as required by Specification 5.5.11.

The Allowable Valuable is the least conservative value that the setpoint of the channel can have when tested such that a channel is OPERABLE if the setpoint is found conservative with respect to the Allowable Value during the CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established "~~leave alone~~as-left" tolerance of the NTSP and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the NTSP by an amount equal to or greater than the "as-found" tolerance value. In this manner, the actual setting of the device will ensure that a SL is not exceeded or that automatic protective actions will initiate consistent with the design basis at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to be non-conservative with respect to the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The NMS is composed of the startup range neutron monitor (SRNM) and the average power range monitor (APRM). SRNM trip signals and APRM trip signals from each of the four divisions of NMS equipment are provided to the four divisions of RPS trip logic (Ref. 1).

The SRNM provides trip signals to the RPS to cover the range of plant operation from source range through startup range (i.e., more than 10% of reactor rated power). Three SRNM conditions, monitored as a function of the NMS, comprise the SRNM trip logic output to the RPS. These conditions are as follows: SRNM Neutron Flux High (high count rate when selected to the non-coincidence mode or high flux level when selected to the coincidence mode); Neutron Flux Short (fast) Period; and

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.4.5

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 within the "~~leave alone~~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, 1.c, 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 and has been shown to be acceptable by Reference 6.

~~For selected Functions, the SCP provides additional requirements for the evaluation of the performance of required channels. The selected Functions are those Functions whose instruments are not totally mechanical devices. Mechanical devices (e.g., devices which have an "on" or "off" output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions that would indicate drift of the component setpoint. These devices are considered not trendable and the requirements of TS 5.5.11.c.1 and TS 5.5.11.c.2 are not applicable to these mechanical components. Where a non-trendable component provides signal input to other channel components that can be trended, the remaining components must be evaluated in accordance with the SCP. As indicated in TS 5.5.11.c.1 evaluation of channel performance is required for the condition where the "as-found" setting for the channel is outside its "as-found" tolerance but conservative with~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~respect to the Allowable Value. For digital channel components, the "as-found" tolerance may be identical to the "leave alone" tolerance because drift may not be an expected error. In these cases, a channel "as-found" value outside the "leave alone" tolerance may be cause for component assessment. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for OPERABILITY. TS 5.5.11.a requires that the Allowable Values and the methodology for calculating the "as-found" tolerances be in the SCP. As indicated in TS 5.5.11.c.2, the as-left setting for the instrument is required to be returned to within the "leave alone" tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in plant surveillance procedures, the "leave alone" and "as-found" tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Analytical / Design Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the "leave alone" tolerance, then the instrument channel shall be declared inoperable. TS 5.5.11.a requires that the NTSP and the methodology for calculating the "leave alone" and the "as-found" tolerances be in the SCP.~~

SR 3.3.1.4.6

The APRM Simulated THERMAL POWER - High Function uses time constant to generate a signal proportional to the core THERMAL POWER from the APRM neutron flux signal. This time constant is representative of the fuel heat transfer dynamics that produce the relationship between the neutron flux and the core THERMAL POWER. The time constant must be verified to ensure that the channel is accurately reflecting the desired parameter.

The 24 month Frequency is based on engineering judgment considering the reliability of the components and has been shown to be acceptable by Reference 6.

BASES

BACKGROUND (continued)

Use of the NTSP to define "as-found" OPERABILITY under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted. However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value is specified in the SCP, as required by Specification 5.5.11, in order to define OPERABILITY of the devices and is designated as the Allowable Value which is the least conservative value of the as-found setpoint that a channel can have during CHANNEL CALIBRATION. The actual NTSP values and Allowable Values (derived from the Setting Basis specified in Table 3.3.5.1-1) and the methodology for calculating the "~~leave alone~~as-left" and "as-found" tolerances will be maintained in the SCP, as required by Specification 5.5.11.

The Allowable Valuable is the least conservative value that the setpoint of the channel can have when tested such that a channel is OPERABLE if the setpoint is found conservative with respect to the Allowable Value during the CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established "~~leave alone~~as-left" tolerance of the NTSP and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the NTSP by an amount equal to or greater than the "as-found" tolerance value. In this manner, the actual setting of the device will ensure that a SL is not exceeded or that automatic protective actions will initiate consistent with the design basis at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to be non-conservative with respect to the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

As described in Reference 1, the Safety System Logic and Control (SSLC) System controls the initiation signals and logic for ECCS. SSLC is a four-division, separated protection logic system designed to provide a very high degree of assurance to both ensure ECCS initiation when required and prevent inadvertent initiation.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 within the "~~leave alone~~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~~ and has been shown to be acceptable by Reference 4~~.

~~For selected Functions, the SCP provides additional requirements for the evaluation of the performance of required channels. The selected Functions are those Functions whose instruments are not totally mechanical devices. Mechanical devices (e.g., devices which have an "on" or "off" output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions that would indicate drift of the component setpoint. These devices are considered not trendable and the requirements of TS 5.5.11.c.1 and TS 5.5.11.c.2 are not applicable to these mechanical components. Where a non-trendable component provides signal input to other channel components that can be trended, the remaining components must be evaluated in accordance with the SCP. As indicated in TS 5.5.11.c.1 evaluation of channel performance is required for the condition where the "as-found" setting for the channel is outside its "as-found" tolerance but conservative with respect to the Allowable Value. For digital channel components, the "as-found" tolerance may be identical to the "leave alone" tolerance because drift may not be an expected error. In these cases, a channel "as-found" value outside the "leave alone" tolerance may be cause for component assessment. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for OPERABILITY. TS 5.5.11.a requires that the Allowable Values and the methodology for calculating the "as-found" tolerances be in the SCP. As indicated in TS 5.5.11.c.2, the as-left~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~setting for the instrument is required to be returned to within the "leave alone" tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in plant surveillance procedures, the "leave alone" and "as-found" tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Analytical / Design Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the "leave alone" tolerance, then the instrument channel shall be declared inoperable. TS 5.5.11.a requires that the NTSP and the methodology for calculating the "leave alone" and the "as-found" tolerances be in the SCP.~~

SR 3.3.5.1.4

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 ECCS RESPONSE TIME acceptance criteria are included in Reference 5.

ECCS RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or total channel measurements. This test encompasses the ECCS instrumentation from the input variable sensors through the DTM function. This test overlaps the testing required by SR 3.3.5.2.2 to ensure complete testing of instrument channels and actuation circuitry. However, the measurement of instrument loop response times may be excluded if the conditions of Reference 6 are satisfied.

ECCS RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS for four channels. The Frequency of 24 months on a STAGGERED TEST BASIS ensures that the channels associated with each division are alternately tested.

The 24 month test Frequency is consistent with the typical industry refueling cycle and has been shown to be acceptable by Reference 4.

REFERENCES

1. Chapter 7.
2. Chapter 15.
3. Chapter 6.

BASES

BACKGROUND (continued)

Use of the NTSP to define "as-found" OPERABILITY under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted. However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value is specified in the SCP, as required by Specification 5.5.11, in order to define OPERABILITY of the devices and is designated as the Allowable Value which is the least conservative value of the as-found setpoint that a channel can have during CHANNEL CALIBRATION. The actual NTSP values and Allowable Values (derived from the Analytical / Design Limits specified in Table 3.3.5.3-1) and the methodology for calculating the "~~leave alone~~as-left" and "as-found" tolerances will be maintained in the SCP, as required by Specification 5.5.11.

The Allowable Valuable is the least conservative value that the setpoint of the channel can have when tested such that a channel is OPERABLE if the setpoint is found conservative with respect to the Allowable Value during the CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established "~~leave alone~~as-left" tolerance of the NTSP and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the NTSP by an amount equal to or greater than the "as-found" tolerance value. In this manner, the actual setting of the device will ensure that a SL is not exceeded or that automatic protective actions will initiate consistent with the design basis at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to be non-conservative with respect to the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The ICS can be automatically or manually initiated. The ICS actuates automatically in response to signals from any of the following:

1. Reactor Steam Dome Pressure - High for 10 seconds,
2. RPV low water level (Level 2), with time delay,
3. RPV low low water level (Level 1),

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SURVEILLANCE REQUIREMENTS (continued)

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. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology as required by the SCP.

The Frequency of 184 days is based on the reliability of the channels and has been shown to be acceptable by Reference 2.

SR 3.3.5.3.3

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 within the "~~leave alone~~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~~ and has been shown to be acceptable by Reference 2~~.

~~For selected Functions, the SCP provides additional requirements for the evaluation of the performance of required channels. The selected Functions are those Functions whose instruments are not totally mechanical devices. Mechanical devices (e.g., devices which have an "on" or "off" output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions that would indicate drift of the component setpoint. These devices are considered not trendable and the requirements of TS 5.5.11.c.1 and TS 5.5.11.c.2 are not applicable to these mechanical components. Where a non-trendable component provides signal input to other channel components that can be trended, the remaining components must be evaluated in accordance with the SCP. As indicated in TS 5.5.11.c.1 evaluation of channel performance is required for the condition where the "as-found" setting for the channel is outside its "as-found" tolerance but conservative with respect to the Allowable Value. For digital channel components, the "as-found" tolerance may be identical to the "leave alone" tolerance because drift may not be an expected error. In these cases, a channel "as-found"~~

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~~value outside the "leave alone" tolerance may be cause for component assessment. Evaluation of instrument performance will verify that the~~

SURVEILLANCE REQUIREMENTS (continued)

~~instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program.~~

~~Entry into the Corrective Action Program will ensure required review and documentation of the condition for OPERABILITY. TS 5.5.11.a requires that the Allowable Values and the methodology for calculating the "as-found" tolerances be in the SCP. As indicated in TS 5.5.11.c.2, the as-left setting for the instrument is required to be returned to within the "leave alone" tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in plant surveillance procedures, the "leave alone" and "as-found" tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Analytical / Design Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the "leave alone" tolerance, then the instrument channel shall be declared inoperable. TS 5.5.11.a requires that the NTSP and the methodology for calculating the "leave alone" and the "as-found" tolerances be in the SCP.~~

SR 3.3.5.3.4

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 ICS RESPONSE TIME acceptance criteria are included in Reference 3. ICS RESPONSE TIME may be verified by actual response time measurements or any series of sequential, overlapping, or total channel measurements. This test encompasses the ICS instrumentation from the input variable sensors through the DTM function. This test overlaps the testing required by SR 3.3.5.4.2 to ensure complete testing of instrumentation channels and actuation circuitry. However, the measurement of instrument loop response times may be excluded if the conditions of Reference 4 are satisfied.
ICS SYSTEM RESPONSE TIME tests are conducted on a 24 month on a STAGGERED TEST BASIS for four channels. The 24 month test Frequency is consistent with the typical refueling cycle and has been shown to be acceptable by Reference 2.

BASES

BACKGROUND (continued)

value of the as-found setpoint that a channel can have during CHANNEL CALIBRATION. The actual NTSP values and Allowable Values (derived from the Analytical / Design Limits specified in Table 3.3.6.1-1) and the methodology for calculating the "~~leave alone~~as-left" and "as-found" tolerances will be maintained in the SCP, as required by Specification 5.5.11.

The Allowable Valuable is the least conservative value that the setpoint of the channel can have when tested such that a channel is OPERABLE if the setpoint is found conservative with respect to the Allowable Value during the CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established "~~leave alone~~as-left" tolerance of the NTSP and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the NTSP by an amount equal to or greater than the "as-found" tolerance value. In this manner, the actual setting of the device will ensure that a SL is not exceeded or that automatic protective actions will initiate consistent with the design basis at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to be non-conservative with respect to the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The MSIV Isolation circuitry, as shown in Reference 1, is divided into four redundant divisions of sensor (instrument) channels, four trip logics, and the hard wired MSIV solenoid logic circuitry. The MSIV Isolation circuitry is contained in the Reactor Trip and Isolation Function (RTIF) portion of the Safety-related Distributed Control and Information System (Q-DCIS) along with the Reactor Protection System (RPS). Functional diversity is provided by monitoring a wide range of dependent and independent parameters. The input parameters to the MSIV logic are from instrumentation that monitors (a) reactor vessel water level (Level 1 and Level 2), (b) main steam line pressure, main steam line flow, condenser pressure, main steam tunnel ambient temperature, main steam turbine area ambient temperature. The plant parameters that are required to be monitored for MSIV logic are each measured, independently, by four sensors. Each sensor is assigned to one of the four redundant instrument channels, which are in turn associated with four divisions of logic. For any monitored parameter, the sensor signals of at least two of

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 has been shown to be acceptable by Reference 9. Thus, performance of the CHANNEL CHECK ensures that undetected outright channel failure is limited to 24 hours.

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.

Any setpoint adjustment shall be consistent with the assumptions of the current plant-specific setpoint methodology as required by the SCP.

The Frequency of 184 days is based on the reliability of the Isolation Instrumentation channels and has been shown to be acceptable by Reference 9.

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 within the "~~leave alone~~as-left" tolerance to account for instrument drifts between successive calibrations consistent with the methods 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~~ and has been shown to be acceptable by Reference 9~~.

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~For selected Functions, the SCP provides additional requirements for the evaluation of the performance of required channels. The selected Functions are those Functions whose instruments are not totally mechanical devices. Mechanical devices (e.g., devices which have an "on" or "off" output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions that would indicate drift of the component setpoint. These devices are considered not trendable and the requirements of TS 5.5.11.c.1 and TS 5.5.11.c.2 are not applicable to these mechanical components. Where a non-trendable component provides signal input to other channel components that can be trended, the remaining components must be evaluated in accordance with the SCP. As indicated in TS 5.5.11.c.1 evaluation of channel performance is required for the condition where the "as-found" setting for the channel is outside its "as-found" tolerance but conservative with respect to the Allowable Value. For digital channel components, the "as-found" tolerance may be identical to the "leave alone" tolerance because drift may not be an expected error. In these cases, a channel "as-found" value outside the "leave alone" tolerance may be cause for component assessment. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for OPERABILITY. TS 5.5.11.a requires that the Allowable Values and the methodology for calculating the "as-found" tolerances be in the SCP. As indicated in TS 5.5.11.c.2, the as-left setting for the instrument is required to be returned to within the "leave alone" tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in plant surveillance procedures, the "leave alone" and "as-found" tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Analytical / Design Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the "leave alone" tolerance, then the instrument channel shall be declared inoperable. TS 5.5.11.a requires that the NTSP and the methodology for calculating the "leave alone" and the "as-found" tolerances be in the SCP.~~

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

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BACKGROUND (continued)

Use of the NTSP to define "as-found" OPERABILITY under the expected circumstances described above would result in actions required by both the rule and Technical Specifications that are clearly not warranted. However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value is specified in the SCP, as required by Specification 5.5.11, in order to define OPERABILITY of the devices and is designated as the Allowable Value which is the least conservative value of the as-found setpoint that a channel can have during CHANNEL CALIBRATION. The actual NTSP values and Allowable Values (derived from the Analytical / Design Limits specified in Table 3.3.6.3-1) and the methodology for calculating the "~~leave alone~~as-left" and "as-found" tolerances will be maintained in the SCP, as required by Specification 5.5.11.

The Allowable Valuable is the least conservative value that the setpoint of the channel can have when tested such that a channel is OPERABLE if the setpoint is found conservative with respect to the Allowable Value during the CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established "leave alone" tolerance of the NTSP and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the NTSP by an amount equal to or greater than the "as-found" tolerance value. In this manner, the actual setting of the device will ensure that a SL is not exceeded or that automatic protective actions will initiate consistent with the design basis at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to be non-conservative with respect to the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The containment isolation function is performed by the Leak Detection and Isolation (LD&IS) portion of the Logic and Control (SSLC) System. Functional diversity is provided by monitoring a wide range of independent parameters. Containment isolation occurs in response to signals from any of the following:

1. Reactor Vessel Water Level - Low, Level 2,
2. Reactor Vessel Water Level - Low, Level 1,

BASES

SURVEILLANCE REQUIREMENTS (continued)

CHECK ensures that undetected outright channel failure is limited to 24 hours.

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.

Any setpoint adjustment shall be consistent with the assumptions of the current plant-specific setpoint methodology as specified in the SCP.

The Frequency of 184 days is based on the reliability of the Isolation Instrumentation channels and has been shown to be acceptable by Reference 3.

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 within the "~~leave alone~~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~~ and has been shown to be acceptable by Reference 3~~.

~~For selected Functions, the SCP provides additional requirements for the evaluation of the performance of required channels. The selected Functions are those Functions whose instruments are not totally mechanical devices. Mechanical devices (e.g., devices which have an "on" or "off" output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions that would indicate drift of the component setpoint. These devices are considered not~~

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SURVEILLANCE REQUIREMENTS (continued)

~~trendable and the requirements of TS 5.5.11.c.1 and TS 5.5.11.c.2 are not applicable to these mechanical components. Where a non-trendable component provides signal input to other channel components that can be trended, the remaining components must be evaluated in accordance with the SCP. As indicated in TS 5.5.11.c.1 evaluation of channel performance is required for the condition where the "as-found" setting for the channel is outside its "as-found" tolerance but conservative with respect to the Allowable Value. For digital channel components, the "as-found" tolerance may be identical to the "leave alone" tolerance because drift may not be an expected error. In these cases, a channel "as-found" value outside the "leave alone" tolerance may be cause for component assessment. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for OPERABILITY. TS 5.5.11.a requires that the Allowable Values and the methodology for calculating the "as-found" tolerances be in the SCP. As indicated in TS 5.5.11.c.2, the as-left setting for the instrument is required to be returned to within the "leave alone" tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in plant surveillance procedures, the "leave alone" and "as-found" tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Analytical / Design Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the "leave alone" tolerance, then the instrument channel shall be declared inoperable. TS 5.5.11.a requires that the NTSP and the methodology for calculating the "leave alone" and the "as-found" tolerances be in the SCP.~~

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 10.

ISOLATION SYSTEM RESPONSE TIME may be verified by actual response time measurements in any series of sequential, overlapping, or

BASES

BACKGROUND (continued)

methodology for calculating the "~~leave alone~~as-left" and "as-found" tolerances will be maintained in the SCP, as required by Specification 5.5.11.

The Allowable Value is the least conservative value that the setpoint of the channel can have when tested such that a channel is OPERABLE if the setpoint is found conservative with respect to the Allowable Value during the CHANNEL CALIBRATION. Note that, although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to a value within the established "~~leave alone~~as-left" tolerance of the NTSP and confirmed to be operating within the statistical allowances of the uncertainty terms assigned in the setpoint calculation. As such, the Allowable Value differs from the NTSP by an amount equal to or greater than the "as-found" tolerance value. In this manner, the actual setting of the device will ensure that a SL is not exceeded or that automatic protective actions will initiate consistent with the design basis at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. If the actual setting of the device is found to be non-conservative with respect to the Allowable Value the device would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

{The Process Radiation Monitoring System (PRMS) and Safety System Logic and Control (SSLC) System controls the initiation signals and logic for CRHA isolation, CRHAVS actuation, and N-DCIS electrical load de-energization. Both PRMS and SSLC are designed to provide a very high degree of assurance to both ensure CRHA isolation, CRHAVS actuation, and N-DCIS electrical load de-energization when required, and prevent inadvertent isolation, actuation, and de-energization. The input and output trip determinations for all CRHA isolation, CRHAVS actuation, and N-DCIS electrical load de-energization functions are based upon a two–out–of–four logic arrangement.

Four separate PRMS (control room air intake radiation - high or SSLC (EFU air flow – low, extended loss of AC power, and CRHA temperature - high) instrument channels are used to monitor CRHA isolation, CRHAVS actuation, and N-DCIS electrical load de-energization parameters. Signals from sensors are multiplexed at the divisional level and the sensor data is then transmitted to the PRMS and SSLC/ESF digital trip module (DTM) function for setpoint comparison.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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.

Any setpoint adjustment shall be consistent with the assumptions of the current plant-specific setpoint methodology as specified in the SCP.

The Frequency of 184 days is based on the reliability of the CRHAVS instrumentation channels and has been shown to be acceptable by Reference 4.

SR 3.3.7.1.3

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 within the "~~leave alone~~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 ~~and has been shown to be acceptable by Reference 4~~.

~~For selected Functions, the SCP provides additional requirements for the evaluation of the performance of required channels. The selected Functions are those Functions whose instruments are not totally mechanical devices. Mechanical devices (e.g., devices which have an "on" or "off" output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions that would indicate drift of the component setpoint. These devices are considered not trendable and the requirements of TS 5.5.11.c.1 and TS 5.5.11.c.2 are not applicable to these mechanical components. Where a non-trendable component provides signal input to other channel components that can be trended, the remaining components must be evaluated in accordance with the SCP. As indicated in TS 5.5.11.c.1 evaluation of channel performance is required for the condition where the "as-found" setting for the channel is outside its "as-found" tolerance but conservative with~~

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~~respect to the Allowable Value. For digital channel components, the "as-found" tolerance may be identical to the "leave alone" tolerance~~

~~SURVEILLANCE REQUIREMENTS (continued)~~

~~because drift may not be an expected error. In these cases, a channel "as-found" value outside the "leave alone" tolerance may be cause for component assessment. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These channels will also be identified in the Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for OPERABILITY.~~

~~TS 5.5.11.a requires that the Allowable Values and the methodology for calculating the "as-found" tolerances be in the SCP. As indicated in TS 5.5.11.c.2, the as-left setting for the instrument is required to be returned to within the "leave alone" tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in plant surveillance procedures, the "leave alone" and "as-found" tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Analytical / Design Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the "leave alone" tolerance, then the instrument channel shall be declared inoperable. TS 5.5.11.a requires that the NTSP and the methodology for calculating the "leave alone" and the "as-found" tolerances be in the SCP.~~

REFERENCES

1. Section 6.4.

2. Section 9.4.1.

3. Section 15.4.

4. {NEDO-33201, "ESBWR Design Certification Probabilistic Risk Assessment."}