Response to

Request for Additional Information No. 103 (1270), Revision 0

10/28/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 16 - Technical Specifications
Application Section: 16

QUESTIONS for Technical Specification Branch (CTSB)

Question 16-128:

LCO 3.3.1, Protection System

Provide additional information and any necessary changes needed to identify and include the Acquisition and Processing Unit (APU) functional assignments in the EPR Generic Technical Specification (GTS).

The EPR Protection System (PS) uses 20 APUs (5 per division) that support all Reactor Trip functions, ESFAS functions and permissives. An inoperable APU affects multiple safety functions simultaneously. APU guidance in the Table 3.3.1-1 (C.2) states "refer to Table 3.3.1-2" for each of the following columns:

- "Applicable Modes or Specified Conditions"
- "Minimum Required for Functional Capability"
- "Condition"

APU "functional assignments" need to be identified to determine which safety functions and permissives are affected when individuals APUs are declared inoperable.

This additional information is needed to ensure that the APU information is complete and accurate, so that the TS can be properly implemented.

Response to Question 16-128:

Functional assignments for acquisition and processing units (APUs) will be completed later in the design process in a way that maximizes functional diversity. The design rules that govern the assignment of reactor trip and Engineered Safety Features (ESF) functions are provided in Section 10 of ANP-10281P, "U.S. EPR Digital Protection System Topical Report" AREVA NP Inc., March 2007.

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications conservatively assume that the failure of any APU in a division renders all functions performed by the APUs in that division to be inoperable.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 16-129:

LCO 3.3.1, Protection System

Provide the additional information needed to explain the “Lockout” function with respect to inoperable APUs, Actuation Logic Units (ALUs), and Remote Acquisition Units (RAUs) in the EPR Bases, B 3.3.1.

A bad or invalid signal processor sensor input will automatically change the redundant voting logic from a “2 of 4” to a “2 of 3” logic. However, LCO 3.3.1, Required Action D.2, requires an inoperable signal processor to be placed in “Lockout” position. The “Lockout” position is more significant in that it affects multiple safety functions (Reactor Trip/ESFAS) as well as any related permissives.

The impact to safety functions and permissives resulting from placing each type of signal processing component (APUs, ALUs, and RAUs) in “Lockout” needs to be described in the Bases.

This additional information is needed to understand the effects of placing different signal processors in the “Lockout” position.

Response to Question 16-129:

A clarifying statement will be added to the description of signal processors in the U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases to describe the lockout function.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-130:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to explain the impact on the Protection System Trip/Actuation functions when APUs are declared inoperable under Condition D of the EPR GTS, LCO 3.3.1, Protection System. Provide a similar but separate discussion for Condition F of LCO 3.3.1.

The Protection System (PS) is an integrated digital Reactor Protection System and ESF Actuation System that detects the onset of Anticipated Operational Occurrences (AOOs) and postulated accidents, and actuates safety-related process systems required to mitigate the event. APUs in each division acquire sensor measurements, perform processing or calculations using these sensor measurements, and compare the results to relevant setpoints. If a setpoint is breached, a trigger is generated that can potentially affect multiple safety functions simultaneously. The impact to safety functions and permissives resulting from inoperable APUs needs to be described in the Bases.

This additional information is needed to understand the aggregate impact to plant safety resulting from multiple inoperable Reactor Trip and ESF Actuation System functions.

Response to Question 16-130:

As stated in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)":

> “Single failures upstream of the ALU layer that could result in an invalid signal being used in the reactor trip actuation are marked as faulted by modifying the vote in the ALU layer. For the reactor trip functions, the vote is always modified toward actuation.”

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be clarified with regard to how invalid signals are processed. As described in response to Question 16 -129, a clarifying statement will also be added to the description of signal processors in the Bases to describe the lockout function.

Taken together, these statements describe the impact on the Protection System Trip/Actuation functions when sensors or signal processors upstream of the actuation logic units (ALU), which includes the acquisition and processing units (APU), are declared inoperable and placed in lockout.

Refer to the response to Question 16-133 for a discussion of the impact of multiple inoperable functions. A summary of the Protection System Failure Modes and Effects Analysis (FMEA) is provided in U.S. EPR FSAR Tier 2, Sections 7.2.2.2 and 7.3.2.2.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-131:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to explain the impact on the Protection System Trip/Actuation Functions when ALUs are declared inoperable under Condition D of the EPR GTS, LCO 3.3.1, Protection System. Provide a similar but separate discussion for Condition F of LCO 3.3.1.

The Protection System (PS) is an integrated digital Reactor Protection System and ESF Actuation System that detects the onset of AOOs and postulated accidents, and actuates safety-related process systems required to mitigate the event. ALUs in each division acquire partial trigger signals from APUs in all four PS divisions. When partial triggers are provided from two or more divisions, the ALUs in all four divisions generate trip/actuation signals potentially affecting multiple safety functions simultaneously. The impact to safety functions and permissives resulting from inoperable ALUs needs to be described in the Bases.

This additional information is needed to understand the aggregate impact to plant safety resulting from multiple inoperable Reactor Trip and ESF Actuation System functions.

Response to Question 16-131:

Additional Conditions will be added to U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)", Table 3.3.1-1, Page 4 of 4, to appropriately reflect the required actions necessary when the minimum number of actuation logic units (ALU) does not satisfy functional capability requirements.

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to explain the impact on the Protection System Trip/Actuation Functions when ALUs are inoperable.

In Question 16-138, NRC requested AREVA provide a technical justification for the omission of permissive signals from LCO 3.3.1. Required Actions to address the impact of inoperable sensors and signal processors on permissives will be addressed in response to that question.

A summary of the Protection System Failure Modes and Effects Analysis (FMEA) is provided in U.S. EPR FSAR Tier 2, Sections 7.2.2.2 and 7.3.2.2.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-132:

LCO 3.3.1, Protection System

Provide the additional information needed to explain the impact of not “Locking Out” the inoperable signal processor associated with the EPR GTS, Table 3.3.1-2, Trip/Actuation Functions B.10.a and B.10.b, with respect to the remaining functions supported by that signal processor.

The EPR GTS, LCO 3.3.1, Required Action D.2, requires placing the inoperable signal processor in “Lockout” for all functions not associated with Table 3.3.1-2, Trip/Actuation Functions B.10.a and B.10.b. If the inoperable signal processor associated with Functions B.10.a and B.10.b is not placed in the “Lockout” position in accordance with Note D.2, then the remaining functions supported by that signal processor will not be subject to a “Lockout” condition. The aggregate impact of not placing the inoperable signal processor in “Lockout” needs to be described in the Bases.

This additional information is needed to understand the effects of not placing the inoperable signal processing component associated with Functions B.10.a and B.10.b in the “Lockout” position.

Response to Question 16-132:

Required Action D.2 in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)" and the associated U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to ensure signal processors are placed in "Lockout" if they are inoperable for reasons other than those specified in Condition C.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-133:

LCO 3.3.1, Protection System

Provide the additional information needed to describe the impact of EPR GTS, LCO 3.3.1, Required Action F.1, with respect to inoperable APUs and ALUs.

Required Action F.1, directs entry into the Conditions specified in Table 3.3.1-1. For inoperable APUs, this may require entering multiple LCOs as listed in Table 3.3.1-2. Depending upon which Trip/Actuation functions are affected based on APU functional assignments, the potential exists for implementation of Required Actions whose requirements are different and may conflict.

For inoperable ALUs, LCO 3.3.1, Required Action F.1, requires entry into Condition N. Condition N requires entry into Mode 3 within 6 hours and Mode 5 within 36 hours. Considering the fact that APUs and ALUs are both similar in that they support Reactor Trip functions, ESFAS functions, and Permissives, it is unclear as to why ALUs are not required to enter the same Condition(s). ALUs affect multiple safety functions just like the APUs. Upon loss of an ALU, entering Condition N alone does not appear to consider the potential affects on multiple safety functions.

This additional information is needed to address the potential for conflicting Required Actions associated with the implementation of Conditions specified in Table 3.3.1-1, and to ensure the accuracy and completeness of Required Actions relating to the failure of ALUs.

Response to Question 16-133:

As with the existing Standard Technical Specifications, conditions may warrant simultaneous entry into multiple LCOs and the implementation of Required Actions whose requirements are different and may conflict. In these cases, the most restrictive Required Actions are implemented. In no case are the Required Actions in LCO 3.3.1 mutually exclusive.

Additional Conditions for inoperable actuation logic units (ALU) will be added to U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)," Table 3.3.1-1 in response to Question 16-131. In Question 16-138, NRC requested AREVA NP provide a technical justification for the omission of permissive signals from LCO 3.3.1. Required Actions to address the impact of inoperable sensors and signal processors on permissives will be addressed in response to that question.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications will be revised as described in the response to Question 16-131 and indicated on the enclosed markups for that question.

Question 16-134:

LCO 3.3.1, Protection System

Provide a technical justification for not referencing ALUs and RAUs as signal processing components in Condition D of the EPR GTS, LCO 3.3.1.

LCO 3.3.1, Condition D states that “one or more signal processors inoperable for reasons other than Condition C.” Required Action D.1 only references APUs. Provide a technical justification for not referencing other signal processing components such as ALUs. Required Action D.2 only references APUs. Provide a technical justification for not referencing other signal processing components such as ALUs and RAUs.

This technical justification is needed to ensure the accuracy and completeness of the EPR GTS, LCO 3.3.1, Condition D, Required Actions D.1 and D.2.

Response to Question 16-134:

Condition D applies to "signal processors," which are defined in Section C of Technical Specification Table 3.3.1-1. Therefore, it applies to remote acquisition units (RAU), acquisition and processing units (APU), and actuation logic units (ALU).

Required Action D.1 applies to signal processors that impact the emergency diesel generator (EDG) Start functions. Required Action D.1 and the associated Bases will be revised to reference both APUs and ALUs.

As discussed in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)", the RAUs acquire signals from the Self-Powered Neutron Detectors and distribute those signals. As shown on U.S. EPR FSAR Tier 2, Figure 7.3-23, "EDG Actuation," the RAUs are not associated with EDG starting.

In response to Question 16 -132, the Note associated with Required Action D.2 has been deleted, so the Required Action applies to all signal processors.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification 3.3.1 will be revised as described in the response and indicated on the enclosed markup.

Question 16-135:

LCO 3.3.1, Protection System

Provide a technical justification for specifying “N/A” in the EPR GTS, Table 3.3.1-2, “Condition” column for functions B.10.a and B.10.b.

The EPR GTS, Table 3.3.1-2, Condition column specifies “N/A” for ESFAS functions B.10.a (Emergency Diesel Generator Start on Degraded Grid Voltage) and B.10.b (EDG Start on LOOP). It appears that Condition O, “Declare associated EDG inoperable,” at a minimum, should apply to both of these functions. Condition O is referenced in Table 3.3.1-1 (A.1) for the 6.9 Kv Bus Undervoltage Sensors which provide the associated input signals.

This technical justification is needed to ensure the accuracy and completeness of the EPR GTS, Table 3.3.1-2, Conditions B.10.a and B.10.b.

Response to Question 16-135:

U.S. EPR FSAR Tier 2 Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)" will be revised to specify the minimum required divisions for functional capability and Condition O will be taken if the minimum required number of divisions is not met.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 will be revised as described in the response and indicated on the enclosed markup.

Question 16-136:

LCO 3.3.1, Protection System

Provide the additional information or necessary changes to clarify the intent of EPR Bases, B 3.3.1-17 with respect to the High Core Power Level Reactor Trip Function.

The EPR GTS, Bases, B 3.3.1, Applicable Safety Analyses, LCO and Applicability, Section A.4 (High Core Power Level), states that “the LTSP is low enough for the system to maintain a margin to unacceptable fuel cladding damage due to an excessive reactivity increase from an intermediate high power level including nominal power.”

The wording, “from an intermediate high power level including nominal power” is not clear. Confirm that this statement is intended to include intermediate power levels and above, up to and including 100 percent power operation. If so, then revise the statement to more clearly explain this intent. If not, then an explanation of the actual intent and a revision of the Bases statement to more clearly reflect this intent is required.

This additional information is required to ensure the accuracy, completeness and clear presentation of the applicable Bases information.

Response to Question 16-136:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to clarify the coverage of the High Core Power Level reactor trip function.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-137:

LCO 3.3.1, Protection System

Provide a technical justification for the omission of safety-related Reactor Trip initiation signals in Table 3.3.1-2, Section A (Reactor Trip).

Table 3.3.1-2, Section A, does not identify the following safety-related Reactor Trip initiation signals:

- "Safety Injection System (SIS) Actuation"
- "Emergency Feedwater System (EFWS) Actuation"
- "Manual RT signals from SICS"

Each of these actuation signals are indentified in the FSAR, Section 7.2.1.2 (Pg 7.2-3) as safety-related Reactor Trip Initiation Signals. Provide a technical justification for not including these signals in Table 3.3.1-2, or revise Table 3.3.1-2, accordingly.

This technical justification is needed to ensure the accuracy and completeness of the Reactor Trip Initiation Signals referenced in the EPR GTS, Table 3.3.1-2.

Response to Question 16-137:

A response to this question will be provided by June 30, 2009.

Question 16-138:

LCO 3.3.1, Protection System

Provide a technical justification for the omission of Permissive Signals from LCO 3.3.1 "Protection System."

NUREG-1431, "Standard Technical Specifications Westinghouse Plants," includes "Permissives" and "Interlocks" in the STS, Section 3.3.1, "Reactor Trip System (RTS) Instrumentation," and Section 3.3.2, "Engineered Safety Features Actuation System (ESFAS) Instrumentation." The EPR Bases, B 3.3.1, Applicable Safety Analyses, LCO, and Applicability, Section C, "Protection System Permissives," page B 3.3.1-48, implies that the permissive functions are required to be operable in the same modes that associated Reactor Trip and ESFAS function operability is required on the basis of the statement "the permissive Functions do not need to be OPERABLE when the associated reactor trip or ESF functions are outside the applicable MODES." In addition, Permissive signals are used to enable, disable, or modify the operation of Reactor Trip and Engineered Safety Features Actuation functions based on plant conditions, which is relative to the information required to be included in TS.

The staff recognizes that the EPR Bases, B 3.3.1, Background Section, Sensors, last paragraph, states that permissive setpoints "are generally considered as nominal values without regard to measurement accuracy and are therefore not considered to be SL-LSSS" (setpoints that directly protect against violating reactor core or RCS pressure boundary safety limits). Although the staff does not want to debate the "degree of directness" to which Permissives affect the reactor core or RCS pressure boundary, we still believe this information is relative and necessary.

On the bases of this information, provide additional technical justification for omitting "Permissive" signals associated with specific Reactor Trip and ESFAS functions or revise Table 3.3.1-1 and Table 3.3.1-2, accordingly.

This technical justification is needed to determine whether or not Permissive signals should be included in the EPR GTS, Section 3.3.1, "Protection System."

Response to Question 16-138:

A response to this question will be provided by June 30, 2009.

Question 16-139:

LCO 3.3.1, Protection System

Provide the additional information needed to clarify the potential inconsistency in the EPR Bases, B 3.3.1, regarding the reactor trip contactors divisional references.

The EPR GTS, Bases, B 3.3.1, Background Section, page B 3.3.1-10, second bullet, states that "Division 1, 2, and 3 contains eleven groups of CRDMs." The references to Divisions 2 and 3 appear to be inconsistent with the EPR FSAR, Section 7.2.1.1 (pg 7.2-2, second bullet) and Figure 7.2-4.

This additional information is required to ensure the accuracy, completeness and clear presentation of the applicable Bases information.

Response to Question 16-139:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" Bases will be clarified to resolve the inconsistency.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-140:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to verify the EPR Bases, B 3.3.1 statement regarding the functions supported by the PS sensors, manual actuation switches, signal processors, and specified actuation devices.

The EPR GTS, Bases, B 3.3.1, Applicable Safety Analyses, LCO, and Applicability Section, page B 3.3.1-12, last paragraph, states that the "PS sensors, manual actuation switches, signal processors, and specified actuation devices that support reactor trips. . . ." The first sentence in the preceeding paragraph already states "the PS sensors, manual actuation switches, signal processors and specified actuation devices that support reactor trips. . ." Confirm the accuracy of this statement. Identify the correct functional reference and provide the reasoning behind this conclusion. Incorporate any additional information or changes to the Bases to clearly present this conclusion.

This additional information is required to ensure the accuracy, completeness and clear presentation of the applicable Bases information.

Response to Question 16-140:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be clarified to resolve the inconsistency.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-141:

LCO 3.3.1, Protection System

Provide the additional information regarding the LTSP values associated with the SG Pressure Drop function (A.14) in the EPR GTS, Table 3.3.1-2. Incorporate additional information in the EPR Bases document to better describe the variable low setpoint that decreases in a rate-limited manner.

In the EPR GTS, Table 3.3.1-2, the LTSP values associated with SG Pressure Drop Function (A.14), are 29 psi/min, 102 psi < SS, Max 1088 psia. The basis for the LTSP values of 102 psi < SS and Max 1088 psia and their relation to the SG Pressure Drop function are not described in the GTS Bases. In addition, the bases for the rate-limited variable low setpoint needs to be added to the GTS Bases as well.

This additional information is required to ensure the accuracy, completeness and clear presentation of the applicable Bases information.

Response to Question 16-141:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)" and U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to describe the calculation of the variable pressure drop associated with the SG Pressure Drop function (A.14).

FSAR Impact:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-142:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes needed to verify and correct the potential discrepancies associated with the setpoint value for permissive P13, Hot Leg Temperature, in the EPR Bases.

The EPR GTS Bases, Applicable Safety Analyses, LCO, and Applicability Section (A.17), page B 3.3.1-26, last sentence regarding Low SG Level, specifies a permissive Hot Leg Temperature (P13) of 200º F. The EPR FSAR, Section 7.2.1.3.8, specifies a P13 permissive setpoint of 203º F. Identify the correct setpoint and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the setpoint.

This additional information is required to verify and correct potential discrepancies between the EPR FSAR and Bases document.

Response to Question 16-142:

The setpoint for Permissive P13 will be revised in U.S. EPR FSAR Tier 2, Section 7.2.1.3.8, "P13 Permissive," to be consistent with the discussion in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)".

FSAR Impact:

The U.S. EPR FSAR Tier 2, Section 7.2.1.3.8, "P13 Permissive," will be revised as described in the response and indicated on the enclosed markup.

Question 16-143:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to verify and correct the potential discrepancies associated with the setpoint value for permissive P13, Hot Leg Temperature, in the EPR Bases.

The EPR GTS Bases, Applicable Safety Analyses, LCO, and Applicability Section (A.18), page B 3.3.1-27, fourth paragraph regarding High SG Level, specifies a permissive Hot Leg Temperature (P13) of 200º F. The EPR FSAR, Section 7.2.1.3.8, specifies a P13 permissive setpoint of 203º F. Identify the correct setpoint and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the setpoint.

This additional information is required to verify and correct potential discrepancies between the EPR FSAR and Bases document.

Response to Question 16-143:

See the response to Question 16-142.

FSAR Impact:

The U.S. EPR FSAR Tier 2, Section 7.2.1.3.8, "P13 Permissive," will be revised as described in the response and indicated on the enclosed markup.

Question 16-144:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, (A.10) mode applicability for Hot Leg Temperature Wide Range (WR) with respect to Reactor Trip functions A.17 (Low SG Level) and A.18 (High SG Level).

The EPR GTS, Table 3.3.1-1, specifies Mode 3(e) for Hot Leg Temperature WR. Hot Leg Temperature WR is used in Permissive P13. The P13 permissive signal (Figure 7.2-32) enables/disables Reactor Trip Functions A.17 (Figure 7.2-21) and A.18 (Figure 7.2-22) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1 and 2 for Reactor Trip Functions A.17 and A.18. Determine Hot Leg Temperature WR mode applicability required to support Reactor Trip Functions A.17 and A.18. Identify and correct any potential discrepancies that may exist.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support Reactor Trip functions in the applicable modes.

Response to Question 16-144:

A response to this question will be provided by June 30, 2009.

Question 16-145:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, Mode applicability for P6 permissive instrumentation, with respect to Reactor Trip Function A.8 (High Neutron Flux - Intermediate Range) and validate the LTSP value.

P6 permissive instrumentation and applicable modes specified in the EPR GTS, Table 3.3.1-1, consist of the following:

Cold Leg Temperature NR	($\geq$ 10 percent RTP)
Hot Leg Temperature NR	(1, 2(c))
Hot Leg Pressure WR	(1, 2, 3)

P6 permissive (Figure 7.2-28) enables/disables Reactor Trip Function A.8 (Figure 7.2-13) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1(g), 2 and 3(e) for Reactor Trip Function A.8. Determine P6 permissive instrumentation mode applicability required to support Reactor Trip Function A.8 and validate function A.8 LTSP value on the basis of both the aforementioned and following list of inconsistencies:

a. Cold Leg Temperature NR mode applicability is $\geq$ 10 percent RTP in Mode 1. The EPR GTS, Table 3.3.1-2, Reactor Trip Function A.8 mode applicability is $\leq$ 10 percent RTP in Mode 1 (footnote (g), Table 3.3.1-2.)

b. Hot Leg Temperature NR mode applicability is 1, 2(c). The EPR GTS, Table 3.3.1-2, Reactor Trip Function A.8 Mode applicability is 2. Footnote (c) specifies $\geq$ 10 to the minus 5 percent power on Intermediate Range Detectors.

c. Reactor Trip Function A.8 LTSP is $\leq$ 15 percent RTP. The P6 permissive enables Reactor Trip Function A.8 below the low-power setpoint of 10 percent RTP.

d. Reactor Trip Function A.8 LTSP is $\leq$ 15 percent RTP. The EPR GTS, Table 3.3.1-2, Reactor Trip Function A.8 mode applicability is $\leq$ 10 percent RTP in Mode 1 (footnote (g) of Table 3.3.1-2.)

This additional information is required to ensure operability of permissive instrumentation necessary to support the associated Reactor Trip Function in the applicable modes and to validate Function A.8 LTSP value.

Response to Question 16-145:

A response to this question will be provided by June 30, 2009.

Question 16-146:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding EPR GTS, Table 3.3.1-1, mode applicability for P6 permissive instrumentation, with respect to Reactor Trip Function A.9 (Low Doubling Time - Intermediate Range (IR).)

P6 permissive instrumentation and applicable Modes specified in the EPR GTS, Table 3.3.1-1, consist of the following:

Cold Leg Temperature NR	($\geq$ 10 percent RTP)
Hot Leg Temperature NR	(1, 2(c))
Hot Leg Pressure WR	(1, 2, 3)

P6 permissive (Figure 7.2-28) enables/disables Reactor Trip Function A.9 (Figure 7.2-14) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1(g), 2 and 3(e) for Reactor Trip Function A.9. Determine P6 permissive instrumentation mode applicability required to support Reactor Trip Function A.9 on the basis of both the aforementioned and following list of inconsistencies:

Cold Leg Temperature NR mode applicability is $\geq$ 10 percent RTP in Mode 1. The EPR GTS, Table 3.3.1-2, Reactor Trip Function A.9 mode applicability is $\leq$ 10 percent RTP in Mode 1 (footnote (g), Table 3.3.1-2.)

Hot Leg Temperature NR mode applicability is 1, 2(c). The EPR GTS, Table 3.3.1-2, Reactor Trip Function A.9 Mode applicability is 2. Footnote (c) specifies $\geq$ 10 to the minus 5 percent power on Intermediate Range Detectors.

This additional information is required to ensure operability of permissive instrumentation necessary to support the associated Reactor Trip Function in the applicable modes.

Response to Question 16-146:

A response to this question will be provided by June 30, 2009.

Question 16-147:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, mode applicability for A.14 (Pressurizer Pressure Narrow Range (NR)) with respect to Reactor Trip Function A.13 (Low Hot Leg Pressure.)

The EPR GTS, Table 3.3.1-1 specifies Modes 1, 2, and 3(h) for Pressurizer Pressure NR (A.14). Pressurizer Pressure NR is used in Permissive P12. The P12 permissive signal (Figure 7.2-31) enables/disables Reactor Trip Function A.13 (Figure 7.2-17) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2, 3(e) and 3(h) for Reactor Trip Function A.13. Determine Pressurizer Pressure NR mode applicability required to support Reactor Trip Function A.13. Determination to include an evaluation of mode applicability both above and below 2500 psia in Mode 3. Identify and correct any potential discrepancies that may exist.

This additional information is required to ensure operability of permissive instrumentation necessary to support the associated Reactor Trip Function in the applicable modes.

Response to Question 16-147:

A response to this question will be provided by June 30, 2009.

Question 16-148:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, mode applicability for A.14 (Pressurizer Pressure Narrow Range (NR)) with respect to Reactor Trip Function A.15 (Low SG Pressure.)

The EPR GTS, Table 3.3.1-1 specifies Modes 1, 2, and 3(h) or Pressurizer Pressure NR (A.14). Pressurizer Pressure NR is used in Permissive P12. The P12 permissive signal (Figure 7.2-31) enables/disables Reactor Trip Function A.15 (Figure 7.2-19) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2, 3(e) and 3(h) for Reactor Trip Function A.15. Determine Pressurizer Pressure NR mode applicability required to support Reactor Trip Function A.15. Determination to include an evaluation of mode applicability both above and below 2500 psia in Mode 3. Identify and correct any potential discrepancies that may exist.

This additional information is required to ensure operability of permissive instrumentation necessary to support the associated Reactor Trip Function in the applicable modes.

Response to Question 16-148:

A response to this question will be provided by June 30, 2009.

Question 16-149:

LCO 3.3.1, Protection System

Provide a technical justification for not including the Safety Injection Signal (SIS) Actuation Signal on RCS Loop Low Level in the EPR GTS, Table 3.3.1-2 and associated Bases.

The EPR GTS, Section 3.3.1, Table 3.3.1-2 and the EPR Bases, Section B.3.3.1, do not include a SIS Actuation on RCS Loop Low Level. Supporting Hot Leg Loop Level sensors are missing from the EPR GTS, Table 3.3.1-2, and the EPR Bases as well. In accordance with the EPR FSAR, Section 7.2.1.2 (Pg 7.3-2), a SIS actuation is initiated by RCS water level measurements below a fixed setpoint in any two of the four Protection System divisions. Identify and correct any omissions in the EPR GTS and the EPR Bases. Include the necessary discussions to ensure a clear understanding of the bases.

This additional information is needed to ensure the completeness and accuracy of the EPR GTS, Table 3.3.1-2, and associated Bases.

Response to Question 16-149:

A response to this question will be provided by June 30, 2009.

Question 16-150:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to explain and correct inconsistencies associated with Emergency Safety Features Actuation Signal (ESFAS) Function B.3.b (SIS Actuation on Low Delta Psat) mode applicability in the EPR GTS, Table 3.3.1-1, Table 3.3.1-2, and EPR Bases.

The EPR GTS, Table 3.3.1-1, specifies mode applicability for sensors (including P12 and P15 permissive instrumentation) associated with ESFAS Function B.3.b. Corresponding Bases Section B.3.b, does not contain all the information regarding mode applicability for either the sensors or the function.

The EPR Bases, Section B.3.b (pg. B 3.3.1-34), states that these "sensors and processors are required to be OPERABLE in MODE 3 when Trip/Actuation Function B.3.a / SIS Actuation on Low Pressurizer Pressure is disabled." The Bases, Section B.3.b (pgs B 3.3.1-33 & 34), also states that "this function ensures SIS actuation in the Hot and Cold Shutdown conditions with LHSI/RHR in operation and at least one of the RCPs are operating" (Hot and Cold Shutdown conditions are Modes 4 and 5). The EPR GTS, Table 3.3.1-2, does not specify Modes 4 and 5 for function B.3.b, only Mode 3(k). In addition, ESF Function 9.b, Containment Isolation (Stage 1) on SIS Actuation, specifies Modes 1, 2, 3 and 4 which may be an indication that Mode 4 should be included.

In addition, the following potential inconsistencies in mode applicability have been identified in the EPR GTS, Table 3.3.1-1, regarding Delta Psat sensor instrumentation:

i. The EPR GTS, Table 3.3.1-1, Pressurizer Pressure NR (A.14) currently specifies Modes 1, 2 and 3(h). Pressurizer Pressure NR (A.14) would be required in Modes 3, 4 and 5 to support Permissive P12. This would indicate that Pressurizer Pressure NR would need to be operable during Modes 1, 2, 3, 4 and 5 to support ESFAS Functions B.3.a and B.3.b. The Pressurizer Pressure NR instrument range is 1615 – 2515 psia and cannot support both ESFAS Functions. Identify the intended Pressurizer Pressure NR application(s) for Modes 1, 2, 3, 4 and 5 in support of ESFAS Functions B.3.a and B.3.b.

   Determine which application(s) are consistent with Pressurizer Pressure NR capability and which application(s) (if any) are not consistent with its capability. Provide the necessary corrections for those beyond the Pressurizer Pressure NR capability in both the EPR GTS and FSAR. Provide any necessary corrections and sufficient descriptions in the EPR Bases for Pressurizer Pressure NR Mode applicablity in support of ESFAS Functions B.3.a and B.3.b.

ii. The EPR GTS, Table 3.3.1-1, Hot Leg Temperature WR (A.10) currently specifies Mode 3(e). Hot Leg Temperature WR (A.10) would be required in Modes 3(e), 4 and 5 to support the Delta Psat Function and Permissive P15. In addition, this instrumentation would also be required in Mode 5 to support the P15 Permissive input signal into the SIS Actuation on Low Hot Leg Loop Level Logic. Provide any necessary corrections in the EPR GTS and sufficient descriptions in the EPR Bases for Hot Leg Temperature WR (A.10) mode applicability in support of ESFAS Function B.3.b and Permissive P15.

iii. The EPR GTS, Table 3.3.1-1, Hot Leg Pressure WR (A.8) currently specifies Modes 1, 2, 3 and (d). Hot Leg Pressure WR (A.8) would be required in Modes 3(e), 4 and 5 to support the Delta Psat Function and Permissive P15. In addition, this instrumentation would also be required in Mode 5 to support the P15 Permissive input signal into the SIS Actuation on Low Hot Leg Loop Level Logic. Provide any necessary corrections in the EPR GTS and sufficient descriptions in the EPR Bases for Hot Leg Pressure WR (A.8) mode applicability in support of ESFAS Function B.3.b and Permissive P15.

iv. The EPR GTS, Table 3.3.1-1, RCP Current (A.17) currently specifies Modes 1, 2 and 3. RCP Current (A.17) would be required in Modes 3(e), 4 and 5 to support Permissive P15 . In addition, this instrumentation would also be required in Mode 5 to support the P15 Permissive input signal into the SIS Actuation on Low Hot Leg Loop Level Logic. Provide any necessary corrections in the EPR GTS and sufficient descriptions in the EPR Bases for RCP Current (A.17) mode applicability in support of Permissive P15.

This additional information is needed to ensure the completeness and the accuracy of the EPR GTS, Table 3.3.1-1, Table 3.3.1-2, and associated Bases, as well as the operability of all sensors (including permissive instrumentation) necessary to support Function B.3.b in the applicable modes.

Response to Question 16-150:

A response to this question will be provided by June 30, 2009.

Question 16-151:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to explain and correct inconsistencies associated with ESFAS Function B.3.b (SIS Actuation on Low Delta Psat) in the EPR Bases.

The EPR Bases, Applicable Safety Analyses, LCO, and Applicability Section, (pg B 3.3.1-34, 6th paragraph), states that the "P15 permissive automatically enables the SIS Actuation on Low Delta Psat function when at least two Reactor Coolant Pumps (RCP) are running, the hot leg pressure is greater than or equal to 464 psia, and when the hot leg temperature is greater than or equal to 365 degrees F." On the basis of a review of logic drawings 7.2-34 and 7.3-2, only one (not two) RCP pumps need to be running. In addition, the logic drawings indicate that the "and" should be replaced by an "or" in the statement "hot leg pressure is greater than or equal to 464 psia, *and* when the hot leg temperature . . ." Determine the technically correct information, provide any necessary details, and correct any errors in the EPR Bases and EPR FSAR.

This additional information is required to verify and correct potential discrepancies between the EPR Bases and EPR FSAR.

Response to Question 16-151:

A response to this question will be provided by June 30, 2009.

Question 16-152:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to explain and correct inconsistencies associated with a High Containment Pressure in the EPR Bases.

The EPR Bases, Applicable Safety Analyses, LCO, and Applicability Section, page B 3.3.1-27, last paragraph refers to a “High SG Pressure Trip.” On the basis of the paragraph content, it appears that the reference to the High SG Pressure Trip should read “High Containment Pressure Trip.” Verify the information in question and provide a technical justification for the reference to a "High SG Pressure Trip" or revise the paragraph to read “High Containment Pressure Trip.”

In addition, the last paragraph of the referenced EPR Bases Section should specify the Containment Service Compartment Pressure Sensor “instrument range” consistent with the EPR FSAR, Table 7.2-1 (Reactor Trip Variables).

This additional information is required to verify and correct potential discrepancies in the EPR Bases.

Response to Question 16-152:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to correct the inconsistency.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-153:

LCO 3.3.1, Protection System

Provide additional information needed to identify the mode applicability for sensors in the EPR GTS, Table 3.3.1-1 (including P12 and P15 permissive instrumentation), associated with ESFAS Function B.9.b. Provide any necessary changes to EPR Table 3.3.1-1 and Bases Section B.9.b to include the required sensor and mode applicability information.

The EPR GTS, Table 3.3.1-2, specifies Modes 1, 2, 3 and 4 for ESFAS Function B.9.b, Containment Isolation (Stage 1) on SIS Actuation. The EPR Bases, Section B.9.b (pg. B 3.3.1-42), does not specify the required sensors, including sensor modes of applicability necessary to support the SIS Actuation function.

SIS Actuation Functions consist of B.3.a (SIS Actuation on Low Pressurizer Pressure) and B.3.b (SIS Actuation on Low Delta Psat). SIS function, supporting instrumentation, and associated Modes of applicability are as follows:

- The EPR GTS, Table 3.3.1-2, Function B.3.a, SIS Actuation on Low Pressurizer Pressure, currently specifies Modes 1, 2, and 3(h).

  The EPR GTS, Table 3.3.1-1, Pressurizer Pressure NR (A.14) currently specifies Modes 1, 2 and 3(h). Pressurizer Pressure NR (A.14) would be required in Modes 1, 2 and 3 for Permissive P12 to support Function B.3.a and also to support Function B.3.a directly (sensor inputs). Pressurizer Pressure NR instrumentation operability should extend both above and below 2005 psia in Mode 3 in order to ensure Function B.9.b is not compromised with respect to function B.3.a.

- The EPR GTS, Table 3.3.1-2, (B.3.b) SIS Actuation on Low Delta Psat currently specifies Mode 3(k). Low Delta Psat would be required in Modes 3(k) and 4 to support Function B.9.b.

  Note: Mode applicability associated with SIS Actuation on Low Delta Psat (B.3.b) is being evaluated under a separate RAI on the basis of B.3.b Bases statements on pages B 3.3.1-33 and B 3.3.1-34 which state “this function ensures SIS actuation in the Hot and Cold Shutdown conditions with LHSI/RHR in operation and at least one of the RCPs are operating.” (Hot and Cold Shutdown conditions are Modes 4 and 5).

The EPR GTS, Table 3.3.1-1, Pressurizer Pressure NR (A.14) currently specifies Modes 1, 2 and 3(h). Pressurizer Pressure NR (A.14) would be required in Modes 3 and 4 for Permissive P12 to support Function B.3.b. Pressurizer Pressure NR instrumentation operability should extend both above and below 2005 psia in order to ensure Function B.9.b is not compromised with respect to function B.3.b. Pressurizer Pressure NR instrument range is 1615 – 2515 psia.

The EPR GTS, Table 3.3.1-1, Hot Leg Temperature WR (A.10) currently specifies Mode 3(e). Hot Leg Temperature WR (A.10) would be required in Modes 3(e), and 4 for Permissive P15 to support Function B.3.b and also to support Function B.3.a directly (sensor inputs).

The EPR GTS, Table 3.3.1-1, Hot Leg Pressure WR (A.8) currently specifies Modes 1, 2, 3 and (d). Hot Leg Pressure WR (A.8) would be required in Modes 3(e), and 4 for Permissive P15 to support Function B.3.b and also to support Function B.3.a directly (sensor inputs).

The EPR GTS, Table 3.3.1-1, RCP Current (A.17) currently specifies Modes 1, 2, and 3. RCP Current (A.17) would be required in Modes 3(e) and 4 for Permissive P15 to support function B.3.b.

This additional information is needed to ensure the completeness and accuracy of the EPR GTS, Table 3.3.1-1, Table 3.3.1-2, and associated Bases, as well as the operability of all sensors (including permissive instrumentation) necessary to support Function B.9.b in the applicable modes.

Response to Question 16-153:

A response to this question will be provided by June 30, 2009.

Question 16-154:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to identify the range of the Containment Service Compartment Pressure sensors in the EPR Bases Document, Section B.9.a, consistent with the EPR FSAR.

The EPR Bases, Applicable Safety Analyses, LCO, and Applicability Section (pg B 3.3.1-41), lists the sensors and processors required for the Stage 1 Isolation on High Containment Pressure Function. The Containment Service Compartment Pressure sensors should specify the "instrument range" consistent with the EPR FSAR, Table 7.3-1 (ESF Actuation Variables) to distinguish between sensor types.

This additional information is needed to ensure the completeness and accuracy of the EPR Bases document consistent with the EPR FSAR.

Response to Question 16-154:

A response to this question will be provided by June 30, 2009.

Question 16-155:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to validate instrumentation applicability and to identify the range of the Containment Service Compartment Pressure sensors in the EPR Bases Document, Section B.9.c consistent with the EPR FSAR.

The EPR Bases, Applicable Safety Analyses, LCO, and Applicability Section (pg B 3.3.1-42), lists the sensors and processors required for the Stage 2 Isolation on High-High Containment Pressure Function. The Containment Service Compartment Pressure sensors should specify the "instrument range" consistent with the EPR FSAR, Table 7.3-1 (ESF Actuation Variables) and to distinguish between sensor types.

In addition, verify the reference to "Containment Equipment Compartment Pressure Monitors" in the EPR Bases, Section B.9.c. There is no supporting information that these instruments are used in the High-High Containment Pressure Isolation Function (Figure 7.3-20). Provide a technical justification for referring to these instruments and revise the Bases as necessary to ensure consistency with the EPR FSAR.

This additional information is needed to ensure the completeness and accuracy of the EPR Bases document consistent with the EPR FSAR.

Response to Question 16-155:

A response to this question will be provided by June 30, 2009.

Question 16-156:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to identify Containment Pressure sensor designations associated with Containment Pressure (A.7) in the EPR GTS, Table 3.3.1-1, consistent with the EPR Bases.

The EPR GTS, Table 3.3.1-1, currently specifies four Containment Pressure sensors associated with Containment Pressure (A.7). The EPR Bases identifies a total of 12 Containment Pressure sensors (8 Service Compartment and 4 Equipment Compartment) that support Reactor Trip and ESFAS Containment Isolation functions (Figure 7.2-23 and Figure 7.3-20). The 12 Containment Pressure sensors include the follows:

a. Containment Service Compartment Pressure Narrow Range (4)
b. Containment Service Compartment Pressure Wide Range (4)
c. Containment Equipment Compartment Pressure (4)

This additional information is needed to ensure the completeness and accuracy of the EPR GTS, Table 3.3.1-1, consistent with the EPR Bases information.

Response to Question 16-156:

A response to this question will be provided by June 30, 2009.

Question 16-157:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes needed to verify and correct the potential discrepancies associated with the setpoint value for Permissive P13, Hot Leg Temperature, in the EPR Bases and EPR FSAR.

The EPR GTS Bases, Applicable Safety Analyses, LCO, and Applicability Section, page B 3.3.1-37, first paragraph regarding EFWS Actuation on Low-Low SG Level, specifies a permissive Hot Leg Temperature (P13) of 200º F. The EPR FSAR, Section 7.2.1.3.8, specifies a P13 permissive setpoint of 203º F. Identify the correct setpoint and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the setpoint.

This additional information is needed to ensure the completeness and accuracy of the EPR Bases document consistent with the EPR FSAR.

Response to Question 16-157:

See the response to Question 16-142.

FSAR Impact:

The U.S. EPR FSAR Tier 2, Section 7.2.1.3.8, "P13 Permissive," will be revised as described in the response to question 16-142 and indicated on the enclosed markup.

Question 16-158:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed to explain and correct inconsistencies associated with Permissive P13 as it applies to ESF Function B.6.b (EFWS Actuation on Loss of Offsite Power and SIS Actuation) in the EPR Bases.

The EPR FSAR, Section 7.3.1.2.2 and logic drawing 7.3-3, indicate that the EFWS is actuated on either “Low-Low SG Level” or “Loss of Offsite Power and SIS Actuation.” The EPR FSAR, Section 7.3.1.2.2 states that “in both cases, EFWS actuation is bypassed when hot leg temperature is below the P13 permissive setpoint.” The EPR Bases, Section B.6.b (pg B 3.3.1-37, last sentence) states that “there are no automatic permissives associated with this function.” These statements are inconsistent. The correct permissive logic needs to be identified and documented consistently throughout the EPR Bases and FSAR. Conflicting statements need to be corrected with sufficient information to provide a clear understanding of the facts, as appropriate.

This additional information is needed to ensure the accuracy, completeness and consistency between the EPR Bases and FSAR.

Response to Question 16-158:

A response to this question will be provided by June 30, 2009.

Question 16-159:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding EPR GTS, Table 3.3.1-1, (A.10) mode applicability for Hot Leg Temperature Wide Range with respect to ESFAS Function B.6.a (EFWS Actuation on Low-Low SG Level).

The EPR GTS, Table 3.3.1-1, specifies Mode 3(e) for Hot Leg Temperature WR. Hot Leg Temperature WR is used in Permissive P13. The P13 permissive signal (Figure 7.2-32) enables/disables ESFAS Function B.6.a (Figure 7.3-3) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2 and 3 for ESFAS Function B.6.a. Determine Hot Leg Temperature WR mode applicability required to support ESFAS Function B.6.a and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-159:

A response to this question will be provided by June 30, 2009.

Question 16-160:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding EPR GTS, Table 3.3.1-1, (A.10) mode applicability for Hot Leg Temperature Wide Range with respect to ESFAS Function B.6.c (EFWS Isolation on High SG Level).

The EPR GTS, Table 3.3.1-1, specifies Mode 3(e) for Hot Leg Temperature WR. The Hot Leg Temperature WR is used in Permissive P13. The P13 permissive signal (Figure 7.2-32) enables/disables the ESFAS Function B.6.c (Figure 7.3-5) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2 and 3 for ESFAS Function B.6.c. Determine Hot Leg Temperature WR mode applicability required to support ESFAS Function B.6.c and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of Mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-160:

A response to this question will be provided by June 30, 2009.

Question 16-161:

LCO 3.3.1, Protection System

Provide the additional information or necessary changes to clarify the intent of EPR Bases, B.5, with regards to the LTSP for Partial Cooldown Actuation.

The EPR GTS, Table 3.3.1-2, identifies Partial Cooldown Function B.5 LTSP value as “N/A.” The EPR Bases, Applicable Safety Analyses, LCO, and Applicability Section B.5, (pg B 3.3.1-36), states that the “LTSP for Partial Cooldown Actuation on SIS Actuation is set high enough to avoid spurious operation but low enough to ensure adequate flow from the MHSI pumps to maintain core cooling.” The information in Table 3.3.1-2 and Bases B.5 is not consistent. Determine the correct application for Partial Cooldown Function B.5 LTSP and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the Partial Cooldown Actuation.

This additional information is required to ensure the accuracy and completeness of the applicable EPR GTS and EPR Bases information.

Response to Question 16-161:

Safety Injection System (SIS) Actuation is composed of separate functions whose individual LTSPs are provided in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1, Table 3.3.1-2. In the context of the Bases discussion for the Partial Cooldown Actuation on SIS Actuation, the SIS Actuation should be treated as a signal and not a separate function with a unique setpoint. The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to delete the setpoint discussion.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-162:

LCO 3.3.1, Protection System

Provide additional information needed to identify the mode applicability for sensors in the EPR GTS, Table 3.3.1-1 (including Permissives P12 and P15 instrumentation) associated with ESFAS Function B.5. Provide any necessary changes to EPR Table 3.3.1-1 and Bases Section B.5 to include the required sensor and mode applicability information.

The EPR GTS, Table 3.3.1-2, specifies Modes 1, 2 and 3 for ESFAS Function B.5, Partial Cooldown Actuation on SIS Actuation. The EPR Bases, Section B.5 (pg B.3.3.1-36), does not specify the required sensors, including sensor modes of applicability necessary to support the SIS Actuation function.

SIS Actuation Functions consist of B.3.a (SIS Actuation on Low Pressurizer Pressure) and B.3.b (SIS Actuation on Low Delta Psat). SIS function, supporting instrumentation, and associated modes of applicability are as follows:

- The EPR GTS, Table 3.3.1-2, Function B.3.a, SIS Actuation on Low Pressurizer Pressure, currently specifies Modes 1, 2 and 3(h).

  The EPR GTS, Table 3.3.1-1, Pressurizer Pressure NR (A.14), currently specifies Modes 1, 2 and 3(h). Pressurizer Pressure NR (A.14) would be required in Modes 1, 2 and 3 for Permissive P12 to support Function B.3.a and to support Function B.3.a directly (sensor inputs). Pressurizer Pressure NR instrumentation operability should extend both above and below 2005 psia in Mode 3 in order to ensure Function B.5 is not compromised with respect to Function B.3.a.

- The EPR GTS, Table 3.3.1-2, Function B.3.b, SIS Actuation on Low Delta Psat, currently specifies Mode 3 (k).

  The EPR GTS, Table 3.3.1-1, Pressurizer Pressure NR (A.14), currently specifies Modes 1, 2 and 3(h). Pressurizer Pressure NR (A.14) would be required in Mode 3 for Permissive P12 to support function B.3.b. Pressurizer Pressure NR instrumentation operability should extend both above and below 2005 psia in Mode 3 in order to ensure Function B.5 is not compromised with respect to Function B.3.b.

  The EPR GTS, Table 3.3.1-1, Hot Leg Temperature WR (A.10) instrumentation currently specifies Mode 3(e). Hot Leg Temperature WR (A.10) would be required in Mode 3(e) for Permissive P15 to support Function B.3.b and also to support Function B.3.b directly (sensor inputs).

  The EPR GTS, Table 3.3.1-1, Hot Leg Pressure WR (A.8), currently specifies Modes 1, 2, 3 and (d). Hot Leg Pressure WR would be required in Mode 3(e) for Permissive P15 to support Function B.3.b and to support Function B.3.b directly (sensor inputs).

  The EPR GTS, Table 3.3.1-1, RCP Current (A.17) currently specifies Modes 1, 2, and 3. RCP Current (A.17) would be required in Mode 3(e) for Permissive P15 to support function B.3.b.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of all sensors (including permissive instrumentation) necessary to support Function B.5 in the applicable modes.

Response to Question 16-162:

A response to this question will be provided by June 30, 2009.

Question 16-163:

LCO 3.3.1, Protection System

Provide the additional information and any corrections necessary to clarify the intent of the EPR GTS, Table 3.3.1-2, footnote regarding ESFAS Functions B.8.a and B.8.b.

The EPR GTS, Table 3.3.1-2, Footnote (l), “Except when all MSIVs are closed”, specifies Mode 3 for ESF Function B.8.b (MSIV Closure on Low SG Pressure). Footnote (l) does not specify Mode 3 for ESF Function B.8.a (MSIV Closure on SG Pressure Drop). Footnote (l) wording is included in Bases B.8.b (pg B 3.3.1-41) but not in Bases B.8.a. Provide clarification with respect to the footnote and Bases. Explain why Footnote (l) does not apply to both ESF functions. Provide the changes needed to ensure that the referenced information is clearly stated in the EPR GTS and Bases.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases.

Response to Question 16-163:

A response to this question will be provided by June 30, 2009.

Question 16-164:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, (A.10) mode applicability for Hot Leg Temperature Wide Range with respect to ESFAS Function B.7.a (MSRT Actuation on High SG Pressure).

The EPR GTS, Table 3.3.1-1 specifies Mode 3(e) for Hot Leg Temperature WR. The Hot Leg Temperature WR is used in Permissive P14. Permissive signal P14 (Figure 7.2-33) determines which value of "Max1p" is selected to provide SG overpressure protection for ESFAS Function B.7.a (Figures 7.3-9 & 7.3-10). Table 3.3.1-2 specifies Modes 1, 2 and 3 for ESFAS Function B.7.a. Determine Hot Leg Temperature WR mode applicability required to support ESFAS Function B.7.a and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-164:

A response to this question will be provided by June 30, 2009.

Question 16-165:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, (A.14) mode applicability for Pressurizer Pressue Narrow Range (NR) with respect to ESFAS function B.7.b (MSRT Isolation on Low SG Pressure).

The EPR GTS, Table 3.3.1-1 specifies Modes 1, 2 and 3(h) for Pressurizer Pressure NR . Pressurizer Pressure NR is used in Permissive P12. Permissive signal P12 (Figure 7.2-31) enables/disables ESFAS Function B.7.b (Figure 7.3-13) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2 and 3(h) for ESFAS Function B.7.b.

Determine Pressurizer Pressure NR mode applicability required to support ESFAS Function B.7.b. The determination is to include an evaluation of mode applicability both above and below 2500 psia in Mode 3 in order to ensure Function B.7.b is not compromised. Identify and correct any potential discrepancies that may exist. Include any discussions necessary to ensure a clear understanding of mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-165:

A response to this question will be provided by June 30, 2009.

Question 16-166:

LCO 3.3.1, Protection System

Provide additional information regarding the LTSP values associated with ESFAS Function B.8.a (MSIV Closure on SG Pressure Drop) in EPR GTS, Table 3.3.1-2. Incorporate additional information in the EPR Bases document to better describe the variable low setpoint that decreases in a rate-limited manner.

In the EPR GTS, Table 3.3.1-2, the LTSP values associated with MSIV Closure on SG Pressure Drop, Function B.8.a, are 29 psi/min, 102 psi < SS, Max 1088 psia. The basis for the LTSP values of 102 psi < SS and Max 1088 psia and how they relate to the SG Pressure Drop are not described in the GTS Bases. In addition, the bases for the rate-limited variable low setpoint need to be added to the GTS Bases as well.

This additional information is required to ensure the accuracy, completeness and clear presentation of the applicable Bases information.

Response to Question 16-166:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)" and U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to describe the calculation of the variable pressure drop associated with engineered safety feature actuation system (ESFAS) Function B.8.a (MSIV Closure on SG Pressure Drop).

FSAR Impact:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-167:

LCO 3.3.1, Protection System

Provide additional information regarding the LTSP values associated with ESFAS Function B.2.c (Startup and Shutdown Feedwater Isolation on SG Pressure Drop) in EPR GTS, Table 3.3.1-2. Incorporate additional information in the EPR Bases document to better describe the variable low setpoint that decreases in a rate-limited manner.

In the EPR GTS, Table 3.3.1-2, the LTSP values associated with Startup and Shutdown Feedwater Isolation on SG Pressure Drop, Function B.2.c, are 29 psi/min, 247 psi < SS, Max 943 psia. The basis for the LTSP values of 247 psi < SS and Max 943 psia and how they relate to the SG Pressure Drop are not described in the GTS Bases. In addition, the bases for the rate-limited variable low setpoint need to be added to the GTS Bases as well.

This additional information is required to ensure the accuracy, completeness and clear presentation of the applicable Bases information.

Response to Question 16-167:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)" and U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to describe the calculation of the variable pressure drop associated with engineered safety feature actuation system (ESFAS) Function B.2.c (Startup and Shutdown Feedwater Isolation on SG Pressure Drop).

FSAR Impact:

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-168:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, (A.14) mode applicability for Pressurizer Pressue Narrow Range (NR) with respect to ESFAS Function B.8.b.(MSIV Closure on Low SG Pressure).

The EPR GTS, Table 3.3.1-1 specifies Modes 1, 2 and 3(h) for Pressurizer Pressue NR . Pressurizer Pressue NR is used in Permissive P12. The P12 permissive signal (Figure 7.2-31) enables/disables ESFAS Function B.8.b (Figure 7.3-14 and Figure 7.2-19) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2 and 3(l) for ESFAS Function B.8.b.

Determine Pressurizer Pressure NR mode applicability required to support ESFAS Function B.8.b. Determination to include an evaluation of mode applicability both above and below 2500 psia in Mode 3 in order to ensure Function B.8.b is not compromised. Identify and correct any potential discrepancies that may exist. Include any discussions necessary to ensure a clear understanding of mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-168:

A response to this question will be provided by June 30, 2009.

Question 16-169:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to clarify the applicability of the EPR GTS, Table 3.3.1-1, Footnote (g), to Mode 2 for Reactor Trip Circuit Breaker Position Indication (A.21).

The EPR GTS, Table 3.3.1-1, Footnote (g) states that "with the Reactor Control, Surveillance and Limitation (RCSL) System capable of withdrawing a Rod Cluster Control Assembly (RCCA) or one or more RCCAs not fully inserted." Mode 2 is classified as "Startup" with a Reactivity Condition of Keff $\geq$ 0.99 and a RTP $\leq$ 5 percent. Under normal conditions, one or more RCCAs would have to be "not fully inserted" in order to achieve a Keff $\geq$ 0.99. Provide clarification and any changes needed to resolve the applicability of this footnote with respect to Mode 2 for Reactor Trip Circuit Breaker Position Indication in the EPR GTS and Bases.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases.

Response to Question 16-169:

A response to this question will be provided by June 30, 2009.

Question 16-170:

LCO 3.3.1, Protection System

Provide additional information and any corrections needed to explain the “10-second time delay” in the LTSP column of the EPR GTS, Table 3.3.1-2, for ESFAS Function B.2.b.

The EPR GTS, Table 3.3.1-2, specifies a 10-second time delay in the LTSP column for ESFAS Function B.2.b, MFW Full Load Closure on High SG Level. This time delay does not appear in the logic diagram (Figure 7.3-16) and is not described in either the EPR Bases or EPR FSAR, Section 7.3.1.2.8. Determine the applicability of this 10 second time delay and correct the EPR GTS, or provide the necessary discussion in the EPR Bases and FSAR to ensure a clear understanding for this time delay.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS, Bases and FSAR.

Response to Question 16-170:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)" Table 3.3.1-2 will be revised to correct the setpoint for engineered safety feature actuation system (ESFAS) Function B.2.b, MFW Full Load Closure on High SG Level.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 will be revised as described in the response and indicated on the enclosed markup.

Question 16-171:

LCO 3.3.1, Protection System

Provide the additional information and any corrections needed to explain the reference to “low load isolation valves” in the EPR Bases, Section B.2.b.

The EPR Bases, Section B.2.b, Applicable Safety Analyses, LCO, and Applicability Section (pg B 3.3.1-29, last paragraph), states that “except when all MFW full load and low load isolation valves are closed.” This statement is confusing in that the low load isolation valves are not isolated by ESFAS Function B.2.b. The statement also conflicts with Modes 2 and 3, Footnote (i), which states “except when all MFW full load isolation valves are closed.” Determine the correct statement and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the correct statement.

This additional information is needed to ensure the accuracy and completeness of the EPR Bases.

Response to Question 16-171:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to delete the reference to low load isolation valves in the description of engineered safety feature actuation system (ESFAS) Function B.2.b, MFW Full Load Closure on High SG Level.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-172:

LCO 3.3.1, Protection System

Provide additional information and any necessary changes regarding EPR GTS, Table 3.3.1-1, (A.10) Mode applicability for Hot Leg Temperature Wide Range with respect to ESFAS function B.2.b (MFW Full Load Closure on High SG Level).

The EPR GTS, Table 3.3.1-1 specifies Modes 3(e) for Hot Leg Temperature WR. Hot Leg Temperature WR is used in Permissive P13. The P13 permissive signal (Figure 7.2-32) enables/disables ESFAS Function B.2.b (Figure 7.3-16) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Mode 1, 2(i) and 3(i) for ESFAS Function B.2.b. Determine Hot Leg Temperature WR mode applicability required to support ESFAS Function B.2.b and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of Mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-172:

A response to this question will be provided by June 30, 2009.

Question 16-173:

LCO 3.3.1, Protection System

Provide additional information and any corrections needed to accurately describe ESFAS Function B.2.c in the EPR GTS, Table 3.3.1-2, and EPR Bases, Section B.2.c with respect to the "All SGs" designation.

The EPR GTS, Table 3.3.1-2, ESF Function B.2.c (Startup and Shutdown Feedwater Isolation on SG Pressure Drop) currently specifies "All SGs." In addition, the EPR Bases, Section B.2.c, Applicable Safety Analyses, LCO, and Applicability Section (pg B 3.3.1-30, title line and first paragraph), specifies "All SGs" as well. The EPR FSAR, Section 7.3.1.2.8 (pg 7.3-11, bottom paragraph) and applicable logic diagram (Figure 7.3-17) indicate that ESF Function B.2.c should specify "Affected SGs." Determine the correct SG applicability and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding associated with SG functional references in the Bases and FSAR documents.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS, Bases and FSAR.

Response to Question 16-173:

A response to this question will be provided by June 30, 2009.

Question 16-174:

LCO 3.3.1, Protection System

Provide additional information and any corrections needed to explain the reference to “full load isolation valves” in the EPR Bases, Section B.2.c. Reformat the Bases sensor operability and mode information.

The EPR Bases, Section B.2.c, Applicable Safety Analyses, LCO, and Applicability Section (pg B 3.3.1-30, last paragraph), states that “except when all MFW full load and low load isolation valves are closed.” This statement is confusing in that the full load isolation valves are not isolated by ESFAS Function B.2.c. This statement also conflicts with Modes 2 and 3, Footnote (j), which states “(e)xcept when all MFW low load isolation valves are closed.” Determine the correct statement and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the correct statement.

Reformat Bases B.2.c “sensor operability and mode information” on pg B 3.3.1-30 so that the presentation is similar to the layout in Bases section B.2.d (pg B 3.3.1-31) which is very clear and concise.

This additional information is needed to ensure the accuracy and completeness of the EPR Bases and to improve the clarity of information.

Response to Question 16-174:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to:

- Delete the reference to full load isolation valves in the description of engineered safety feature actuation system (ESFAS) Function B.2.c, and

- Clarify the description of ESFAS Function B.2.c to match the format and content of the descriptions of other functions.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-175:

LCO 3.3.1, Protection System

Provide additional information and any necessary changes regarding EPR GTS, Table 3.3.1-1, (A.14) mode applicability for Pressurizer Pressue Narrow Range (NR) with respect to ESFAS Function B.2.d (Startup and Shutdown Feedwater Isolation on Low SG Pressure).

The EPR GTS, Table 3.3.1-1, specifies Modes 1, 2 and 3(h) for Pressurizer Pressure NR . Pressurizer Pressure NR is used in Permissive P12. Permissive signal P12 (Figure 7.2-31) enables/disables ESFAS Function B.2.d (Figure 7.3-17) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2(j) and 3(h)(j) for ESFAS Function B.2.d.

Determine Pressurizer Pressure NR mode applicability required to support ESFAS Function B.2.d. The determination is to include an evaluation of mode applicability both above and below 2500 psia in Mode 3 in order to ensure Function B.2.d is not compromised. Identify and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in applicable modes.

Response to Question 16-175:

A response to this question will be provided by June 30, 2009.

Question 16-176:

LCO 3.3.1, Protection System

Provide additional information and any corrections needed to accurately describe ESFAS Function B.2.d in the EPR GTS, Table 3.3.1-2, and EPR Bases, Section B.2.d with respect to the "All SGs" designation.

The EPR GTS, Table 3.3.1-2, ESF Function B.2.d (Startup and Shutdown Feedwater Isolation on Low SG Pressure), currently specifies "All SGs." In addition, the EPR Bases, Section B.2.d, Applicable Safety Analyses, LCO, and Applicability Section (pg B 3.3.1-31, title line and first paragraph), specifies "All SGs" as well. The EPR FSAR, Section 7.3.1.2.8 (pg 7.3-11, bottom paragraph) and applicable logic diagram (Figure 7.3-17) indicate that ESF Function B.2.d should specify "Affected SGs." Determine the correct SG applicability and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding associated with SG functional references in the Bases and FSAR documents.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS, Bases and FSAR.

Response to Question 16-176:

A response to this question will be provided by June 30, 2009.

Question 16-177:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, (A.10) mode applicability for Hot Leg Temperature Wide Range with respect to ESFAS function B.2.e (Startup and Shutdown Isolation on High SG Level for Period of Time).

The EPR GTS, Table 3.3.1-1, specifies Mode 3(e) for Hot Leg Temperature WR. Hot Leg Temperature WR is used in Permissive P13. The P13 permissive signal (Figure 7.2-32) enables/disables ESFAS Function B.2.e (Figure 7.3-16) as designated in the EPR GTS, Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2(j) and 3(j) for ESFAS Function B.2.e. Determine Hot Leg Temperature WR mode applicability required to support ESFAS Function B.2.e, and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-177:

A response to this question will be provided by June 30, 2009.

Question 16-178:

LCO 3.3.1, Protection System

Provide a technical justification for the omission of the Steam Generator Isolation function from the EPR GTS, Table 3.3.1-2, and the corresponding Bases.

In accordance with the EPR FSAR, during a SG tube rupture, partial cooldown is initiated to depressurize the RCS to the point where Medium Head Safety Injection (MHSI) becomes effective. The SG containing the tube rupture is isolated after the partial cooldown is initiated if a high SG level or high main steam activity is detected. This is done to prevent the release of contaminated fluid from the affected SG, and to prevent other water sources from adding to the uncontrolled SG level increase. SG isolation consists of the following ESF actuations/actions:

a. “MSRT opening setpoint increase”

b. “MSIV, MSIV bypass and SG blowdown closure”

c. “MFW and SSS Isolation”

d. “EFWS isolation”

The EPR GTS, Table 3.3.1-2, Section B (Engineered Safety Features Actuation System Signals), and the corresponding EPR Bases do not include the Steam Generator Isolation function or the main steam activity sensors that input directly into the SG isolation logic.

On the bases of this information, provide additional technical justification for omission of the Steam Generator Isolation function and associated main steam activity sensors or revise the EPR GTS, Table 3.3.1-2, the corresponding Bases, and the EPR FSAR accordingly to ensure consistency among these documents and sufficient detailed information to adequately explain this function.

This additional information is needed to ensure the accuracy, completeness, and consistency amongst the EPR GTS, Bases and FSAR.

Response to Question 16-178:

A response to this question will be provided by June 30, 2009.

Question 16-179:

LCO 3.3.1, Protection System

Provide additional information needed to adequately explain if the SG isolation function is bypassed below the P13 setpoint consistent with logic Figure 7.3-25.

The EPR FSAR, Section 7.3.1.2.14 (pg 7.3-20), states there is no operating bypass explicitly associated with the SG isolation function. This statement is inconsistent with logic Figure 7.3-25 which identifies Permissive P13 as a functional input into the isolation logic. The SG isolation is bypassed below the P13 setpoint according to the logic. Determine if the bypass function exists and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of this function.

The EPR GTS and Bases make no mention of this bypass function. If the SG isolation function is capable of being bypassed, this information will need to be added to both the EPR GTS and Bases.

This additional information is needed to ensure the accuracy, completeness, and consistency amongst the EPR GTS, Bases and FSAR.

Response to Question 16-179:

A response to this question will be provided by June 30, 2009.

Question 16-180:

LCO 3.3.1, Protection System

Provide the additional information and any necessary changes regarding the EPR GTS, Table 3.3.1-1, (A.6) mode applicability for Cold Leg Temperature Wide Range with respect to ESFAS Function B.11.a (CVCS Charging Line Isolation on High-High Pressurizer Level).

The EPR GTS, Table 3.3.1-1, specifies Modes 1 and 2(c) for Cold Leg Temperature WR. Cold Leg Temperature WR is used in Permissive P17. The P17 permissive signal (Figure 7.2-36) enables/disables ESFAS Function B.11.a (Figure 7.3-21) as designated in Table 3.3.1-2. Table 3.3.1-2 specifies Modes 1, 2 and 3 for ESFAS Function B.11.a. Determine Cold Leg Temperature WR mode applicability required to support ESFAS Function B.11.a and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of the mode applicability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases, as well as the operability of permissive instrumentation necessary to support the associated ESFAS function in the applicable modes.

Response to Question 16-180:

A response to this question will be provided by June 30, 2009.

Question 16-181:

LCO 3.3.1, Protection System

Provide a technical justification for omission of the ESFAS function for "CVCS Charging Isolation on Pressurizer Level above the Max1p setpoint" from the EPR GTS, Table 3.3.1-2, and Bases.

The EPR FSAR, Section 7.3.1.2.10, states that the CVCS Charging isolation is performed in two stages with staggered setpoints. The following initiating conditions are used to perform this two-stage CVCS isolation:

a. "Pressurizer Level > Max1p"

b. "Pressurizer Level > Max2p"

If two out of four level measurements exceed the Max1p setpoint, the normal and auxiliary pressurizer spray lines are isolated. If two out of four level measurements exceed the Max2p setpoint, the CVCS charging flow is isolated as well (ESFAS function B.11.a).

The EPR FSAR information regarding the CVCS Charging isolation functions is not consistent with omission of the ESFAS function for "CVCS Charging Isolation on Pressurizer Level above the Max1p setpoint" from the EPR GTS, Table 3.3.1-2 and Bases. Determine if omission of this function is warranted and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of this function.

The EPR GTS and Bases make no mention of the "CVCS Charging isolation on Pressurizer Level above the Max1p setpoint" function. If omission of the function is unwarranted, then information will need to be added to the EPR GTS and Bases. Include any discussions necessary to ensure a clear understanding of this function.

This additional information is needed to ensure the accuracy, completeness, and consistency amongst the EPR GTS, Bases and FSAR.

Response to Question 16-181:

A response to this question will be provided by June 30, 2009.

Question 16-182:

LCO 3.3.1, Protection System

Provide a technical justification for omission of the ESF Function for "CVCS Isolation on Anti-Dilution Mitigation (ADM) at Power Operation" from the EPR GTS, Table 3.3.1-2 and Bases.

In accordance with the EPR FSAR, an on-line calculation of the boron concentration in the RCS is performed during power operation based on the boron concentration measurements in the CVCS charging line and the measured CVCS charging flow. The calculated boron concentration is compared to a fixed setpoint corresponding to the critical boron concentration of the core at hot zero power with the highest worth rod not inserted.

The EPR FSAR information regarding the CVCS Isolation for Anti-Dilution functions is not consistent with omission of the ESFAS function for "CVCS Isolation on Anti-Dilution Mitigation (ADM) at Power Operation" from the EPR GTS, Table 3.3.1-2 and Bases. Determine if omission of this function is warranted and correct any potential discrepancies. Include any discussions necessary to ensure a clear understanding of this function.

The EPR GTS and Bases make no mention of the "CVCS Isolation on ADM at Power Operation" Function. If omission of the function is unwarranted, then information will need to be added to the EPR GTS and Bases. Include any discussions necessary to ensure a clear understanding of this function.

This additional information is needed to ensure the accuracy, completeness, and consistency amongst the EPR GTS, Bases and FSAR.

Response to Question 16-182:

A response to this question will be provided by June 30, 2009.

Question 16-183:

LCO 3.3.1, Protection System

Provide the additional information and any corrections necessary to clarify the intent of the EPR GTS, Table 3.3.1-1 and Table 3.3.1-2 footnote applicability for RCP operation with respect to "CVCS Isolation on ADM at Shutdown Condition" ESFAS Functions.

The EPR GTS, Table 3.3.1-1, sensors A.2, A.3, A.4. A.6 and A.19 support ESFAS Functions B.11.b and B.11.c. The footnotes from Table 3.3.1-1 and 3.3.1-2 that are associated with Reactor Coolant Pump operation are not applied consistently and appear to conflict in several cases. Specific examples include the following:

a. The EPR GTS, Table 3.3.1-1, A.6 (Cold Leg Temperature WR), specifies Footnote (b) for Mode 6 (Refueling with one or more reactor vessel head closure bolts less than fully tensioned). Footnote (b) states that "with three or more reactor coolant pumps (RCPs) in operation." It is highly unlikely that there would be three or more RCPs in operation in Mode 6. The EPR GTS, Table 3.3.1-1, A.2 (Boron Concentration) and A.3 (Boron Temperature) both do not include Footnote (b) during Mode 6 operation.

b. The EPR GTS, Table 3.3.1-1, A.6 (Cold Leg Temperature WR), does not specify Footnote (b) during Modes 3, 4, and 5, however, Footnote (b) is specified during Modes 3 and 4 for sensors A.2 and A.3, and during Modes 3, 4, and 5 for sensor A.4. Aside from the fact that Footnote (b) is not applied uniformly with respect to sensors that support ESFAS Functions B.11.b and B.11.c, an operational situation could develop requiring the operability of sensors A.2, A.3, and A.4 during Modes 3(b), 4(b), and 5(b) with two or less RCPs in operation.

c. The EPR GTS, Table 3.3.1-1, A.19 (RCP speed sensor) mode applicability is $\geq$ 10 percent RTP. Sensor A.19 Mode applicability should include Modes 3, 4, and 5 (and possibly Mode 6) to align with the applicable modes and footnotes specified for sensors A.2, A.3, and A.4.

d. The EPR GTS, Table 3.3.1-2, Function B.11.c does not specify Footnote (o) during Mode 3 operations. However, EPR Bases, B.11.c (pg B 3.3.1-46), states "MODE 3, with three or more RCPs in operation."

Provide clarification associated with footnote applicability. Explain why the footnotes are not applied consistently. Provide the changes needed to ensure that the referenced information is made consistent and clearly stated in the EPR GTS and Bases.

This additional information is needed to ensure the accuracy, completeness and consistency of the EPR GTS and Bases.

Response to Question 16-183:

A response to this question will be provided by June 30, 2009.

Question 16-184:

LCO 3.3.1, Protection System

Provide a technical justification as to how the “Minimum Required for Functional Capability” requirements specified in EPR GTS Table 3.3.1-2 for ESFAS Functions B.11.b and B.11.c are met with respect to the Actuation Logic Units (ALUs).

The EPR GTS, Table 3.3.1-2, “Minimum Required For Functional Capability” column specifies three divisions for ESFAS Functions B.11.b (CVCS Charging Line Isolation on ADM at Shutdown Condition, RCP not operating) and B.11.c (CVCS Charging Line Isolation on ADM at Standard Shutdown Conditions).

In the EPR GTS, Table 3.3.1-2, there are four divisions of APUs that generate partial trigger signals for Functions B.11.b and B.11.c compared to only two divisions of ALUs (divisions 1 and 4) that generate actuation signals for Functions B.11.b and B.11.c. This is consistent with the information provided in Logic Figure 7.3-22 and EPR Bases, Sections B.11.b (pg B 3.3.1-46) and B.11.c (B 3.3.1-47). However, a technical justification is needed in the EPR Bases (at a minimum) to explain how two divisions of ALUs (1 and 4) can support the three division “Minimum Requirement for Functional Capability” specified in the EPR GTS, Table 3.3.1-2 for ESFAS Functions B.11.b and B.11.c.

This additional information is needed to ensure the accuracy, completeness and consistency of the EPR GTS, Bases and FSAR.

Response to Question 16-184:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications (TS) Table 3.3.1-1 (Page 4 of 4) specifies the minimum number of actuation logic units (ALU) required for functional capability. Four divisions with three ALUs per division are specified in the table. As discussed in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)":

> “Each PS division contains four ALUs, two assigned to each subsystem. Two ALUs of the same subsystem within a division are redundant and perform the same processing using the same inputs. The outputs of two redundant ALUs are combined in a hardwired “functional AND” logic for reactor trip functions and in a hardwired OR logic for ESF functions. This avoids both unavailability of ESF functions and spurious reactor trips. The data processing computers then send their outputs to two independent voter computer units (ALUs) in each division.”

Thus, for the chemical and volume control system (CVCS) isolation functions cited in the question, the U.S. EPR Technical Specifications allow operation with one inoperable ALU in Division 1 and one inoperable ALU in Division 4. A single failure in either division would not preclude the unaffected division from initiating the safety function.

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Table 3.3.1-1, Page 4 of 4, specifies the minimum number of Acquisition and Processing Units (APU) required for functional capability by providing a reference to TS Table 3.3.1-2.

TS Table 3.3.1-2 specifies the minimum number of APU divisions required for functional capability for each trip/actuation function. Three divisions of APUs are specified for the CVCS isolation functions cited in the question. A single failure in one of the three operable APU divisions would not preclude the remaining divisions from voting for an Engineered Safety Feature (ESF) actuation.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 16-185:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to clarify the EPR GTS, Table 3.3.1-2, LTSP values for ESFAS Functions B.11.b and B.11.c.

The EPR GTS, Table 3.3.1-2, ESFAS Function B.11.b (CVCS Charging Line Isolation on ADM at Shutdown Condition, RCP not operating), specifies a LTSP value of 927 ppm. The EPR GTS, Table 3.3.1-2, ESFAS Function B.11.c (CVCS Charging Line Isolation on ADM at Standard Shutdown Conditions), specifies a LTSP value referenced in Footnote (d), "[a]s specified in the COLR." Provide an explanation as to why the LTSP values for ESFAS Functions B.11.b and B.11.c are not both specified as either specific valves or Footnotes referencing the COLR.

This additional information is needed to ensure the accuracy, and completeness of the EPR GTS.

Response to Question 16-185:

A response to this question will be provided by March 19, 2009.

Question 16-186:

LCO 3.3.1, Protection System

Provide the additional information and any corrections necessary to clarify and correct a potential discrepancy identified in the EPR FSAR, ESFAS Function B.11.b and B.11.c Anti-Dilution Mitigation Logic Diagram.

The EPR FSAR, ESFAS Function B.11.b and B.11.c Anti-Dilution Mitigation Logic Diagram, Figure 7.3-22, appears to have a missing electrical connection tie between the "Temperature Compensation of Boron Measurement" block and the "Calculation of Reactor Coolant Boron Concentration Variable Coolant Mass" block. Verify the overall correctness of Figure 7.3-22. Correct the logic diagram as necessary. If it is determined that an electrical connection tie is not needed between the "Temperature Compensation of Boron Measurement" block and the "Calculation of Reactor Coolant Boron Concentration Variable Coolant Mass" block, provide an explanation as to how the "Reactor Coolant Boron Concentration Variable Coolant Mass" can be calculated without a "Temperature Compensated Boron Measurement" input.

This additional information is needed to ensure the accuracy, and completeness of the EPR FSAR.

Response to Question 16-186:

A response to this question will be provided by June 30, 2009.

Question 16-187:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to clarify and correct a potential discrepancy identified in the EPR Bases, Section B 3.3.1, ACTIONS Section, Subparagraph F.1.

The EPR Bases, ACTIONS Section, Subparagraph F.1 (pg B 3.3.1-67), last sentence, references Required Action C.1. Should this reference be “Required Action F.1?” If the reference needs to be corrected, change as appropriate. If the correct reference is not “Required Action F.1,” provide a technical justification for the different reference.

This additional information is needed to ensure the accuracy, and completeness of the EPR Bases.

Response to Question 16-187:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.3.1 "Protection System (PS)" will be revised to correct the referenced Required Action.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Section 3.3.1 Bases will be revised as described in the response and as indicated on the enclosed markup.

Question 16-188:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to clarify and correct a potential inconsistency regarding the completion time between the EPR GTS, L.C.O 3.3.1, and the associated Bases.

The EPR GTS, L.C.O 3.3.1, Condition “I” specifies a 6-hour Completion Time to be in Mode 2. The EPR Bases, Section 3.3.1, ACTIONS Section I.1 (pg B 3.3.1-68) states that “the allowed Completion Time of 8 hours is reasonable, based on operating experience, to reach MODE 2 from full power conditions in an orderly manner and without challenging unit systems.” Six hours is a typical Completion Time for reaching Mode 3 throughout the EPR GTS.

This additional information is needed to ensure the accuracy, completeness and consistency of the EPR GTS and Bases.

Response to Question 16-188:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.3.1 "Protection System (PS)" will be revised to specify a six hour Completion Time.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Section 3.3.1 Bases will be revised as described in the response and as indicated on the enclosed markup.

Question 16-189:

LCO 3.3.1, Protection System

Provide additional information needed to identify the mode applicability for sensors in the EPR GTS, Table 3.3.1-1 (including P12 and P15 permissive instrumentation) associated with ESFAS Function B.4. Provide any necessary changes to the EPR, Table 3.3.1-1, and Bases Section B.4, to include the required sensor and mode applicability information.

The EPR GTS, Table 3.3.1-2, specifies Modes 1, 2 and 3 for ESFAS Function B.4, RCP Trip on Low Delta P across RCP with SIS Actuation. The EPR Bases, Section B.4 (pg B 3.3.1-35) does not specify the required sensors, including sensor modes of applicability necessary to support the SIS Actuation function.

SIS Actuation Functions consist of B.3.a (SIS Actuation on Low Pressurizer Pressure) and B.3.b (SIS Actuation on Low Delta Psat). SIS function, supporting instrumentation, and associated modes of applicability are as follows:

The EPR GTS, Table 3.3.1-2, Function B.3.a, SIS Actuation on Low Pressurizer Pressure, currently specifies Modes 1, 2, and 3(h).

The EPR GTS, Table 3.3.1-1, Pressurizer Pressure NR (A.14) currently specifies Modes 1, 2 and 3(h). Pressurizer Pressure NR (A.14) would be required in Modes 1, 2 and 3 for Permissive P12 to support Function B.3.a and also to support Function B.3.a directly (sensor inputs). Pressurizer Pressure NR instrumentation operability should extend both above and below 2005 psia in Mode 3 in order to ensure Function B.4 is not compromised with respect to Function B.3.a.

The EPR GTS, Table 3.3.1-2, Function B.3.b, SIS Actuation on Low Delta Psat, currently specifies Mode 3(k).

The EPR GTS, Table 3.3.1-1, Pressurizer Pressure NR (A.14) currently specifies Modes 1, 2 and 3(h). Pressurizer Pressure NR (A.14) would be required in Mode 3 for Permissive P12 to support Function B.3.b. Pressurizer Pressure NR instrumentation operability should extend both above and below 2005 psia in Mode 3 in order to ensure Function B.4 is not compromised with respect to Function B.3.b.

The EPR GTS, Table 3.3.1-1, Hot Leg Temperature WR (A.10) instrumentation currently specifies Mode 3(e). Hot Leg Temperature WR (A.10) would be required in Mode 3(e) for Permissive P15 to support Function B.3.b and also to support Function B.3.b directly (sensor inputs).

The EPR GTS, Table 3.3.1-1, Hot Leg Pressure WR (A.8) currently specifies Modes 1, 2, 3 and (d). Hot Leg Pressure WR would be required in Mode 3(e) for Permissive P15 to support Function B.3.b and also to support Function B.3.b directly (sensor inputs).

The EPR GTS, Table 3.3.1-1, RCP Current (A.17) currently specifies Modes 1, 2, and 3. RCP Current (A.17) would be required in Mode 3(e) for Permissive P15 to support function B.3.b.

This additional information is needed to ensure the accuracy, completeness and consistency within the EPR GTS and Bases, as well as the operability of all sensors (including permissive instrumentation) necessary to support Function B.4 in the applicable modes.

Response to Question 16-189:

A response to this question will be provided by June 30, 2009.

Question 16-190:

LCO 3.3.1, Protection System

Provide additional information and any necessary changes to clarify and correct potential inconsistencies associated with EPR Bases Table B 3.3.1-1. Provide a description of the purpose, scope, and proposed use of the table in the Bases.

The EPR Bases, Table B 3.3.1-1, Protection System (PS) Functional Dependencies, was apparently compiled to identify functions with multiple inputs and functions that do not have four divisions of Actuation Logic Units (ALUs). The table may be used as an aid to assess divisional operability in applying EPR GTS, Table 3.3.1-2 Footnote (a), which states that "[a] division is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/Actuation Function are OPERABLE; and b) the associated APU is OPERABLE." This information is relevant and needs to be included in the text of the Bases.

Provide a technical justification and the necessary corrections for the following apparent inconsistencies:

a. The EPR Bases (pgs. B 3.3.1-79, 80), regarding Reactor Coolant Pump Speed, specifies "1 of 2" sensors per division. The EPR GTS, Table 3.3.1-1 (A.19), specifies a total of 4 RCP Speed sensors (one per pump). EPR FSAR Figure 7.2-12 is consistent with Section 7.2.1.2.7 of the FSAR which states that "[t]he loss of four RCPs is detected based on measurements of RCP speed (one measurement per pump)."

b. The EPR Bases (pg. B 3.3.1-82), regarding Hot Leg Temperature NR instrumentation associated with the "Low Saturation Margin" Reactor Trip Function, does not specify the minimum number of sensors required for functional capability. However, EPR Bases Table B 3.3.1-1, Item 4 (pg B 3.3.1-81), "High Core Power Level" Reactor Trip, specifies "3 of 4" sensors per division, indicating a total of 16 sensors (4 per division). The EPR GTS, Table 3.3.1-1 (A.9), specifies a minimum of 3 per division.

c. The EPR Bases (pgs. B 3.3.1-79, 80, 81, 82), regarding RCS Loop Flow, specifies "3 of 4" sensors. EPR FSAR Figures 7.2-10 and 7.2-11, RCS Loop Flow Logics, show four different loop flow sensors (one for each of the RCS loops) per division, not four flow sensors within the same loop per division. The EPR GTS, Table 3.3.1-1 (A.20), specifies a minimum of "3 sensors per loop."

   These inconsistencies are a potential problem if the "minimum number of sensors required for functional capability" is based on "3 of 4" loop flow sensors within the same division. If two RCS Loop Flow sensors within the same loop (different divisions) became inoperable, the "Minimum Required for Functional Capability" specified in the EPR GTS, Table 3.3.1-1, would be less than the three required (resulting in entry into Condition "J"). While this configuration would satisfy the "3 of 4" minimum DIVISIONAL requirement of Bases Table B 3.3.1-1, it would be non-conservative with respect to the intent of the table. If the intent is to interpret/evaluate "3 of 4" as the minimum sensors required for functional capability for all sensors providing input to the Trip Function (all divisions across the board as opposed to individual divisions), then the integrity of the table is maintained. The "3 of 4" logic as currently presented in the EPR GTS, Table B 3.3.1-1, is not clear with respect to the RCS Loop Flow Function.

d. The EPR Bases (pg. B 3.3.1-84), regarding RCP Current, specifies “2 of 3” sensors. EPR FSAR Figure 7.2-27, RCP Current Logic, shows three different current sensors (each associated with a different RCP) per division, not three current sensors for the same pump per division. The EPR GTS, Table 3.3.1-1 (A.17), specifies a minimum of “2 sensors per RCP.”

   These inconsistencies are a potential problem if the “minimum number of sensors required for functional capability” is based on “2 of 3” RCP current sensors within the same division. If two RCP Current sensors associated with the same pump (different divisions) became inoperable, the “Minimum Required for Functional Capability” specified in the EPR GTS, Table 3.3.1-1, would be less than the two required (resulting in entry into Condition “M”). While this configuration would satisfy the “2 of 3” minimum DIVISIONAL requirement of Bases Table B 3.3.1-1, it would be non-conservative with respect to the intent of the table. If the intent is to interpret/evaluate “2 of 3” as the minimum sensors required for functional capability for all sensors providing input to the trip function (all divisions across the board as opposed to individual divisions), then the integrity of the table is maintained. The “2 of 3” logic as currently presented in the EPR GTS, Table B 3.3.1-1, is not clear with respect to the RCP Current Function.

e. The EPR Bases, Table B 3.3.1-1 (pg B 3.3.1-84), regarding ESFAS Function B.11.a, shows two divisions of ALUs (1 and 4). It appears that there are actually four divisions of ALUs associated with ESFAS Function B.11.a, Divisions 2 and 3 to isolate the Normal Pressurizer Spray Lines, and Divisions 1 and 4 to isolate the Auxiliary Spray Lines and the Charging Line. Verify Division 2 and 3 ALU applicability with respect to ESFAS Function B.11.a and either provide a technical justification for not including these ALUs in Bases Table 3.3.1-1 or revise the table accordingly. In addition, a value of “2” is specified in the EPR Bases, Table B 3.3.1-1, under the column “Complete Divisions For Functional Capability-Sensors / Processors.” Two appears to be the correct number for ESFAS Function B.11.a with respect to ALU functional assignments. However, an informational note should be added to the table to clarify the fact that this column value applies to the individual pairing of ALUs within either divisions “1 and 4” or “2 and 3”.

f. The EPR Bases, Table B 3.3.1-1 (pages B 3.3.1-79, 80), specifies “One Remote Acquisition Unit per division with a required OPERABLE SPND.” This information does not appear to be consistent with EPR FSAR Logic Figures 7.2-2 and 7.2-7. In accordance with the Logics, RAUs in each division acquire one-fourth (18) of the total SPND measurements and distribute those measurements to APU in all four divisions allowing for an accurate calculation over the whole reactor core in each division. If this information is correct, the table should read “One Remote Acquisition Unit per division with the required OPERABLE SPNDs.”

This additional information is needed to ensure the accuracy, completeness and consistency of the EPR Bases.

Response to Question 16-190:

A response to this question will be provided by June 30, 2009.

Question 16-191:

LCO 3.3.1, Protection System

Provide the technical justifications and necessary corrections for apparent inconsistencies in the EPR GTS, Tables 3.3.1-1 and 3.3.1-2.

CONDITION assignments appear to have been applied inconsistently throughout Tables 3.3.1-1 and 3.3.1-2 of the EPR GTS. The Required Actions associated with the Conditions specified do not always encompass all modes of applicability and appear to conflict in a number cases as indicated in the following examples:

a. The EPR GTS, Table 3.3.1-1 (A.15), Radiation Monitor – Containment High Range, specifies Condition "K" which requires being in MODE 3 and "Opening" the reactor trip breakers within 6 hours. Function A.15 modes of applicability are Modes 1, 2, 3, 4. Required Action for Condition "K" does not include Mode 4 operations. In addition, Mode 4 operation is not required for either the Reactor Trip Circuit Breakers or Reactor Trip Circuit Breaker Position Indication in accordance with the EPR GTS, Tables 3.3.1-1, D.2 and 3.3.1-1, A.21 respectively.

b. The EPR GTS, Table 3.3.1-1 (A.16), Radiation Monitor – Control Room HVAC Intake Activity, specifies Condition "N" while in Modes 1, 2, 3, 4 and Condition "R" while in Modes 5, 6(i). Required Action for Condition "R" requires declaring both Control Room Emergency Filtration trains inoperable (immediately). It would appear that declaration of CREF inoperability (Condition "R") is applicable in Modes 1, 2, 3 and 4 as well.

c. The EPR GTS, Table 3.3.1-2 (B.13), Control Room HVAC Reconfiguration to Recirculation Mode on High Intake Activity, specifies Condition "N" while in Modes 1, 2, 3, 4 and Condition "R" while in Modes 5, 6(r). Required Action for Condition "R" requires declaring both Control Room Emergency Filtration trains inoperable (immediately). It would appear that declaration of CREF inoperability (Condition "R") is applicable in Modes 1, 2, 3 and 4 as well.

d. The EPR GTS, Table 3.3.1-1 (C.3), Actuation Logic Units, specifies Condition "N" while in Modes 1, 2, 3, 4 and Condition "T" in Modes 5, 6(i). Required Action for Condition "T" requires declaring the associated Actuation Logic Units inoperable (Immediately) and "Opening" reactor trip breakers within 1 hour. It would appear that declaration of ALU inoperability (Condition "T") is applicable in Modes 1, 2, 3 and 4 as well. In addition, operability is not required for either the Reactor Trip Circuit Breakers or Reactor Trip Circuit Breaker Position Indication in Modes 4, 5 and 6(i) in accordance with the EPR GTS, Tables 3.3.1-1, D.2 and 3.3.1-1, A.21 respectively.

e. The EPR GTS, Table 3.3.1-2, ESFAS functions B.10.a (EDG Start on Degraded Grid Voltage) and B.10.b (EDG Start on LOOP) both specify a Condition of "N/A." It would appear that Condition "O" is applicable. Condition "O" requires declaring the associated EDG inoperable (Immediately). Condition "O" is specified in the EPR GTS, Table 3.3.1-1 (A.1), for the 6.9 kV Bus Voltage sensors that support both of these functions.

f. The EPR GTS, Table 3.3.1-1 (B.1), Reactor Trip Manual Actuation Switches, specifies Condition "S" while in Modes 4(g), 5(g). Required Action for Condition "S" requires "Opening" the reactor trip breakers within 1 hour. Operability is not required for either the Reactor Trip Circuit Breakers or Reactor Trip Circuit Breaker Position Indication in

Modes 4(g) and 5(g) in accordance with the EPR GTS, Tables 3.3.1-1, D.2 and 3.3.1-1, A.21 respectively.

g. The EPR GTS, Table 3.3.1-2 (B.11.a), CVCS Charging Line Isolation on High-High Pressurizer Level, specifies Condition "M" while in Modes 1, 2, and 3. Required Action for Condition "P" which is specified for ESFAS Functions B.11.b and B.11.c, requires declaring the associated Chemical and Volume Control System isolation valve(s) inoperable (Immediately)." It would appear that declaration of CVCS isolation valve inoperability (Condition "P") is applicable to ESFAS Function B.11.a as well, in Modes 1, 2 and 3.

This additional information is needed to ensure accuracy, completeness and consistency within the EPR GTS.

Response to Question 16-191:

A response to this question will be provided by June 30, 2009.

Question 16-192:

LCO 3.3.1, Protection System

Provide additional information to improve the EPR GTS, REQUIRED ACTION guidance associated with LCO Conditions O, P, Q, R and T.

The EPR GTS, LCO 3.3.1, Required Actions associated with Conditions O, P, Q, R and T are to "Immediately" declare affected equipment and components inoperable. Additional guidance is needed to ensure the operator clearly understands the equipment and components required to be declared inoperable.

This additional information is needed to ensure the accuracy, completeness and consistency of the EPR GTS.

Response to Question 16-192:

The Required Actions associated with Conditions O, P, Q, R, and T in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 "Protection System (PS)" will be revised to provide additional guidance and U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will also be clarified.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-193:

LCO 3.3.1, Protection System

Provide additional information in the EPR Bases to describe the overall approach to Surveillance Requirement Testing with respect to Protection System Instrumentation. Include an explanation as to how that approach ensures that all Reactor Trip and ESFAS functions in the EPR GTS, Table 3.3.1-2, are adequately tested. Provide a figure which depicts a "Summary of Protection System Testing."

The Protection System (PS) is an integrated digital Reactor Protection System and ESF Actuation System. The PS detects plant conditions that indicate the occurrence of AOOs and postulated events, and actuates safety-related process systems required to mitigate an event. The PS maximizes use of the TELEPERM XS (TXS) digital I&C platform design features, including continuous on-line self-testing and diagnostics that allow early detection of failure.

Additional information is needed that describes the approach to PS Surveillance Requirement Testing with respect to the following specifics:

a. The EPR GTS, Table 3.3.1-1, use of common components/sensors by the PS to support all Reactor Trip functions, ESFAS functions and Permissives. Surveillance Requirements are specified in the EPR GTS, Table 3.3.1-1, for components/sensors only. Surveillance Requirements are not specified in EPR GTS, Table 3.3.1-2, for any of the individual Reactor Trip or ESFAS functions. This is a deviation from NUREG-1431 (WOG STS). It is unclear how Surveillance Requirement Testing specified at the component/sensor level ensures that each of the Reactor Trip Functions, ESFAS Functions, and associated permissives are properly surveilled.

b. The absence of Reactor Trip and ESFAS System "Response Time Testing." Response Time Testing ensures actuation response times are less than or equal to the maximum values assumed in the accident analysis.

c. The absence of Channel Checks. Channel Check Surveillance Requirements associated with Reactor Trip and ESFAS Instrumentation have not been included. This is a deviation from NUREG-1431.

d. The transition from a "Channelized" concept to a "Divisional" concept as it relates to surveillance testing requirements applicable to the TXS digital I&C platform design, specifically:

    1. Performance of a "CALIBRATION" vice "CHANNEL CALIBRATION"

    2. Performance of a "DIVISION OPERATIONAL TEST" vice "CHANNEL OPERATIONAL TEST"

    3. Performance of an “ACTUATING DEVICE OPERATIONAL TEST” vice “TRIP ACTUATING DEVICE OPERATIONAL TEST”

    4. Addition of a "SENSOR OPERATIONAL TEST"

e. The absence of the "DIVISIONAL OPERATIONAL TEST" from the Surveillance Requirements of LCO 3.3.1. The "DIVISIONAL OPERATIONAL TEST" is specified in the EPR GTS, "Definitions" Section of 1.0, USE AND APPLICATIONS (pg 1.1-2).

This additional information is needed to ensure that all Reactor Trip and ESFAS functions are being properly surveilled under the TELEPERM XS digital I&C platform, especially considering the fact that these functions (including permissives) share common components/sensors.

Response to Question 16-193:

A response to this question will be provided by March 19, 2009.

Question 16-194:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to better describe the Limiting Trip Setpoint (LTSP) values and references to “SENSOR OPERATIONAL TEST” and “channel” in the EPR Bases.

The EPR Bases, Background Section (pg B 3.3.1-3, first paragraph), states that the “LTSP is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded.” The last paragraph on page B 3.3.1-3 states that “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 LTSP specified in Table 3.3.1-2 is the least conservative value of the as-found setpoint that a channel can have during testing such that a channel is OPERABLE if the trip setpoint is found conservative with respect to the Allowable Value during a SENSOR OPERATIONAL TEST (SOT). As such, the Allowable Value differs from the LTSP by an amount greater than or equal to the expected instrument channel uncertainties, such as drift, during the surveillance interval.” The phrase “this LTSP specified in Table 3.3.1-2 is the least conservative value” implies that the least conservative values of the LTSPs have been specified in the table. Would this statement be more accurate if it stated “this as-found value of the LTSP specified in Table 3.3.1-2 is the least conservative value.”

The reference to SENSOR OPERATIONAL TEST (SOT) should be replaced by DIVISION OPERATIONAL TEST (DOT) based on the definitions in the EPR GTS, Section 1.1, “1.0, USE AND APPLICATIONS.” The DOT definition states that the test “shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints required for division OPERABILITY such that the setpoints are within the necessary range and accuracy.” The SOT definition makes no reference to setpoints.

In the EPR Bases, Background Section (pg B 3.3.1-3 last paragraph), the two references to "channel" in the Bases statement should be replaced by the word "division." The TELEPERM XS digital I&C platform utilizes a "divisional approach" as opposed to "channelized approach.”

This additional information is needed to ensure the accuracy, completeness and consistency of the EPR Bases.

Response to Question 16-194:

A response to this question will be provided by March 19, 2009.

Question 16-195:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to justify the Self-Powered Neutron Detector (SPND) value specified in the EPR GTS, Table 3.3.1-1, for "Minimum Required for Functional Capability."

The EPR GTS, Table 3.3.1-1, specifies 51 SPNDs as the "Minimum Required for Functional Capability." In accordance with the EPR FSAR, Section 7.1.1.5.2, there are 72 SPNDs that continuously measure the neutron flux at given positions in the core to provide a three-dimensional flux distribution. Remote Acquisition Units (RAUs) in each division acquire one-fourth (18) of the total SPND measurements and distribute those measurements to APUs in all four divisions allowing for an accurate calculation over the whole core in each division. Provide additional information or corrections as necessary to address the minimum number of SPNDs required.

This additional information is needed to ensure accuracy, completeness and consistency within the EPR GTS and FSAR.

Response to Question 16-195:

A response to this question will be provided by March 19, 2009.

Question 16-196:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to justify the Limiting Trip Setpoint (LTSP) time range specified in the EPR GTS, Table 3.3.1-2, for ESFAS Function B.10.a.

The EPR GTS, Table 3.3.1-2, ESFAS Function B.10.a (EDG Start on Degraded Grid Voltage), specifies a LTSP time range of $\geq$ 270 seconds and $\leq$ 300 seconds without a Safety Injection System actuation signal. On the basis of engineering judgment, this time frame appears to be excessive considering the consequences associated with an extended degraded voltage condition. Provide additional information or corrections as necessary to address the length of time specified.

This additional information is needed to ensure the accuracy of the EPR GTS.

Response to Question 16-196:

A response to this question will be provided by March 31, 2009.

Question 16-197:

LCO 3.3.2, Post Accident Monitoring (PAM) Instrumentation

Provide a technical justification for omission of the Channel Check Surveillance Requirement from LCO 3.3.2.

Performance of a CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison between the parameter indicated on one channel to a similar parameter on other channels. The surveillance is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviation between the two instrument channels could be an indication of excessive instrument drift in one of the channels or an indication of something more serious. CHANNEL CHECKS will detect gross channel failure and are therefore important in verifying that instrumentation continues to operate properly between CALIBRATIONS. This is a deviation from NUREG-1431, “Standard Technical Specifications Westinghouse Plants.”

This additional information is needed to ensure that PAMs instrumentation is being properly surveilled and that deviations from STS are adequately justified.

Response to Question 16-197:

Extensive continuous self-testing is performed by the TELEPERM XS Digital Reactor Protection System that eliminates the need for a manual CHANNEL CHECK.

Siemens letter NRC:99:056, dated December 28, 1999, which submitted report EMF-2341(P), (Adams accession # ML003670839) "Generic Strategy for Periodic Surveillance Testing of TELEPERM XS Systems in U.S. Nuclear Generating Stations," stated in Subsection 2.2.4, the following:

> “Equivalent analog signals of different measuring channels (i.e., redundant channels) can be compared with each other to detect and monitor deviations. This includes the entire instrument chain consisting of sensor, transducer, input signal module and the associated equipment for signal transfer.
>
> Consistency checks comprise monitoring values of redundantly measured analog signals: If within a pre-defined tolerance range (not all of the corresponding redundant signals have the same value), alarm signals are generated that indicate the deviating signal (Figure 2.1).
>
> The consistency checks are designed as part of the functional diagrams in the application software.”

Reference List:

1. The CHANNEL CHECK surveillance requirements were subsequently approved by NRC Safety Evaluation, dated May 5, 2000, Acceptance for Referencing of Licensing Topical Report EMF-2110(NP), Revision 1, "TELEPERM XS: A Digital Reactor Protection System" (Adams accession # ML003732662). CHANNEL CHECK was addressed in Section 4.2, Surveillance Testing of the TXS System.

2. Additional information was also provided in response to RAI 3 in AREVA letter, dated August 21, 2007, Response to a Request for Additional Information Regarding ANP-10281P, "U.S. EPR Digital Protection System Topical Report" (Adams accession # ML0734106004).

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 16-198:

LCO 3.3.3, Remote Shutdown System (RSS)

Provide a technical justification for omission of the Channel Check Surveillance Requirement from LCO 3.3.3.

Performance of a CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison between the parameter indicated on one channel to a similar parameter on other channels. This surveillance is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviation between the two instrument channels could be an indication of excessive instrument drift in one of the channels or an indication of something more serious. CHANNEL CHECKS will detect gross channel failure and are therefore important in verifying that instrumentation continues to operate properly between CALIBRATIONS. This is a deviation from NUREG-1431, “Standard Technical Specifications Westinghouse Plants.”

This additional information is needed to ensure that Remote Shutdown System instrumentation is being properly surveilled and that deviations from STS are adequately justified.

Response to Question 16-198:

A response to this question will be provided by June 30, 2009.

Question 16-199:

LCO 3.3.2, Post Accident Monitoring (PAM) Instrumentation

Provide additional information necessary to explain how CONDITION "C" is implemented with respect to PAM Functions 1, 4, 5, 7, 8, 9 and 15 in the EPR GTS, Table 3.3.2-1.

The EPR GTS, LCO 3.3.2, Condition "C" states that with "One or more Functions with two required divisions inoperable," perform Required Action C.1 to "Restore one division to OPERABLE status" within 7 days. The EPR GTS, Table 3.3.2-1, "Required Number of Divisions" column specifies "1 per loop" (Functions 1, 5, 7, 8, 9), "1 per pool" (Function 4), and "1 per line" (Function 15). The correlation between "1 per loop, 1 per pool, 1 per line" and the "Required Number of Divisions," is not explained with respect to the implementation of Condition "C". This information needs to be added to the EPR Bases, LCO 3.3.2, ACTIONS Section C.1.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases.

Response to Question 16-199:

In the U.S. EPR design, there are:

- Four Colds Legs (Function 1),
- Four Emergency Feedwater trains and Storage Pools (Functions 4 and 5),
- Four Hot Legs (Functions 7, 8, and 9), and
- Four Main Steam Lines (Function 15).

With respect to the U.S. EPR Technical Specifications, LCO 3.3.2, Post Accident Monitoring (PAM) Instrumentations, Condition A requires with one or more Functions with one required division inoperable, the Required Action is to restore the required division to OPERABLE status within 30 days. With respect to the functions described above, if any function in any division becomes inoperable, it must be restored to OPERABLE status within 30 days.

Condition C requires with one or more Functions with two required division inoperable, the Required Action is to restore one division to OPERABLE status within 7 days. With respect to the functions described above, if any function in any two divisions becomes inoperable, one of the functions in one division must be restored to OPERABLE status within 7 days.

The Conditions, Required Actions, and Completion Times in the U.S. EPR Technical Specifications are consistent with the Standard Technical Specifications for Westinghouse Plants (NUREG-1431). The level of detail contained in the U.S. EPR Technical Specifications Bases is consistent with the Standard Technical Specification Bases for Westinghouse Plants (NUREG-1431).

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 16-200:

LCO 3.3.1, Protection System

Provide additional information and the necessary changes to explain the frequency referenced in the EPR Bases, SURVEILLANCE REQUIREMENTS, Section SR 3.3.1.8 information.

The EPR GTS, SR 3.3.1.8, “Perform ACTUATION DEVICE OPERATIONAL TEST” (ADOT), specifies a frequency of 24-months. The EPR Bases, Surveillance Requirements, Section SR 3.3.1.8 (pg B 3.3.1-77), states the requirements for “performance of an ADOT every 31 days.” An ADOT is already being performed every 31 days in accordance with SR 3.3.1.3. NUREG-1431, “Standard Technical Specifications Westinghouse Plants,” specifies an 18-month frequency for a TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT) which appears to be consistent with the EPR GTS, SR 3.3.1.8 frequency of 24-months. Identify the correct frequency, provide a technical justification for the frequency selected, and make any necessary corrections.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases.

Response to Question 16-200:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to clarify the scope of SR 3.3.1.8 and correct the specified frequency.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-201:

LCO 3.3.1, Protection System

Provide additional information necessary to adequately explain the EPR Bases, ACTIONS Section P.1, LCO related information.

The EPR Bases, ACTIONS Section P.1 (pg B 3.3.1-69), states that “if Table 3.3.1-1 directs entry into Condition P, the associated CVCS isolation valves are immediately declared inoperable. The actions of LCO 3.4.9, “Pressurizer,” provide adequate compensatory actions to assure unit safety.” This information does not provide sufficient detail to adequately explain the intent. The EPR Bases needs additional information regarding the “adequacy of compensatory actions” provided by LCO 3.4.9 with respect to CVCS Charging Valve and Auxiliary Spray Valve inoperability.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS and Bases.

Response to Question 16-201:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications LCO 3.4.9, Pressurizer, Required Action C.1 requires the chemical and volume control system (CVCS) flow path be isolated within six hours when the associated valves are declared inoperable. When another LCO provides the compensatory actions, the rationale for their adequacy is not duplicated in both locations.

In the Standard Technical Specifications for Westinghouse Plants (NUREG-1431), the Bases for LCO 3.3.5, LOP DG Start Instrumentation, Action C.1 (Page B 3.3.5-5), states:

> "In these circumstances the Conditions specified in LCO 3.8.1, "AC Sources - Operating," or LCO 3.8.2, "AC Sources - Shutdown," for the DG made inoperable by failure of the LOP DG start instrumentation are required to be entered immediately. The actions of those LCOs provide for adequate compensatory actions to assure unit safety."

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 16-202:

LCO 3.3.1, Protection System

Provide additional information and any corrections necessary to explain the EPR Bases, SURVEILLANCE REQUIREMENTS, Section SR 3.3.1.1 surveillance reference.

The EPR Bases, Surveillance Requirements, Section SR 3.3.1.1 (pg B 3.3.1-73), references SR 3.3.1.2 in the first paragraph. It appears as though the actual reference should be SR 3.3.1.1 as opposed to SR 3.3.1.2. Determine the appropriate reference, provide a technical justification, and make corrections, as applicable.

This additional information is needed to ensure the accuracy and completeness of the EPR Bases.

Response to Question 16-202:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to specify the correct reference in SR 3.3.1.1.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-203:

LCO 3.3.1, Protection System

Provide a technical justification for the omission of the “Source Range Neutron Flux” Reactor Trip function from the EPR GTS, LCO 3.3.1.

In accordance with NUREG-1431, “Standard Technical Specifications Westinghouse Plants,” the Source Range Neutron Flux Reactor Trip function ensures protection against an uncontrolled RCCA bank withdrawal accident from a subcritical condition during startup. The applicable modes are Modes 2(d), 3(a), 4(a), and 5(a).

The EPR GTS, LCO 3.3.1, Protection System Reactor Trip functions “High Neutron Flux (Intermediate Range)” and “Low Doubling Time (Intermediate Range),” both protect against excessive reactivity additions during reactor startup from a subcritical or low power startup condition. Applicable modes associated with both of these functions are Modes 1(g), 2, 3(e). Although the Reactor Trip Functions are similar between NUREG-1431 and the EPR GTS, the mode applicability is different. The EPR Protection System does not provide protection against excessive reactivity additions from a subcritical condition during reactor startup in Modes 4 and 5. Provide a technical justification for this deviation from the STS and include any corrections necessary to resolve this apparent discrepancy.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS.

Response to Question 16-203:

A response to this question will be provided by March 31, 2009.

Question 16-204:

LCO 3.3.1, Protection System

Provide a technical justification for the omission of the "Overtemperature Delta T" Reactor Trip function from the EPR GTS, LCO 3.3.1.

In accordance with NUREG-1431, "Standard Technical Specifications Westinghouse Plants," an "Overtemperature Delta T" Reactor Trip function ensures that the design limit DNBR is met. The applicable modes are Modes 1 and 2.

The EPR GTS, LCO 3.3.1, Protection System Reactor Trip on "Low Departure from Nucleate Boiling Ratio," protects the fuel against the risk of departure from nucleate boiling during events that lead to a decrease in the DNBR value. The EPR GTS, Table 3.3.1-2 mode applicability is Mode 1 ($\geq$ 10 percent) for Functions A.1.a through A.1.e. Although the Reactor Trip functions are similar between NUREG-1431 and the EPR GTS, the mode applicability is different. The EPR Protection System does not provide protection against Low DNBR in either Mode 1 (< 10 percent power) or Mode 2. Provide a technical justification for this deviation from the STS and include any corrections necessary to resolve this apparent discrepancy.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS.

Response to Question 16-204:

A response to this question will be provided by March 31, 2009.

Question 16-205:

LCO 3.3.1, Protection System

Provide a technical justification for the omission of the "Overpower Delta T" Reactor Trip function from the EPR GTS, LCO 3.3.1.

In accordance with NUREG-1431, "Standard Technical Specifications Westinghouse Plants," an "Overpower Delta T" Reactor Trip function ensures the integrity of the fuel (i.e., no fuel pellet melting and less than 1 percent cladding strain) under all possible overpower conditions. The applicable modes are Modes 1 and 2.

The EPR GTS, LCO 3.3.1, Protection System Reactor Trip on "High Linear Power Density," protects the fuel against melting at the center of the fuel pellet during events which lead to an increase in the linear power density within the core. The EPR GTS, Table 3.3.1-2 mode applicability is Mode 1 ($\geq$ 10 percent) for Function A.2. Although the Reactor Trip functions are similar between NUREG-1431 and the EPR GTS, the mode applicability is different. The EPR Protection System does not provide protection against fuel pellet melting in either Modes 1 (< 10 percent power) or Mode 2. Provide a technical justification for this deviation from the STS and include any corrections necessary to resolve this apparent discrepancy.

This additional information is needed to ensure the accuracy and completeness of the EPR GTS.

Response to Question 16-205:

A response to this question will be provided by March 31, 2009.

Question 16-206:

LCO 3.3.1, Protection System (4507)

Provide the additional information and any changes needed regarding the EPR GTS, Table 3.3.1-2, and associated Bases, use of the term “Limiting Trip Setpoint” (LTSP) and the LTSP values specified.

The EPR GTS, Table 3.3.1-2, and Bases BACKGROUND Section (pg B 3.3.1-3, first paragraph), states that “the LTSP is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded.”

The EPR Bases, Background Section (pg B 3.3.1-2, REVIEWER’S NOTE), states that the term “limiting Trip Setpoint (LTSP)” is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term LTSP indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the term Nominal Trip Setpoint is preferred.” The EPR Bases, Background Section (pg B 3.3.1-3, last paragraph), states that "[t]his LTSP specified in Table 3.3.1-2 is the least conservative value of the as-found setpoint that a channel can have during testing such that the channel is OPERABLE if the trip setpoint is found conservative with respect to the Allowable Value during a SENSOR OPERATIONAL TEST (SOT).”

Although an approved EPR instrument setpoint methodology exits, it is unclear how a calculated LTSP value can be specified based on instrumentation uncertainties when those uncertainties would not ordinarily be determined until after completion of the detailed design. Provide a technical justification for use of the term LTSP and validate the LTSP values provided in the EPR GTS, Table 3.3.1-2. Include any discussions necessary to ensure a clear understanding of how the LTSP values specified ensure that an Allowable Value will not be exceeded and that an Analytical Limit will not be challenged.

This information is needed to ensure the completeness and accuracy of the EPR GTS, Table 3.3.1-2, and associated Bases.

Response to Question 16-206:

A response to this question will be provided by March 31, 2009.

Question 16-207:

LCO 3.3.1, Protection System

Provide the additional information and any changes needed regarding the EPR GTS, Table 3.3.1-2, footnote (c), and the associated Bases.

The EPR GTS, Table 3.3.1-2, footnote (c), states that “setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and as-left tolerances are specified in a document controlled under 10 CFR 50.59.”

The EPR Bases, Background Section, REVIEWER’S NOTE (pgs B 3.3.1-2, B 3.3.1-3), states that “where the LTSP is not included in Table 3.3.1-2 for the purpose of compliance with 10 CFR 50.36, the plant-specific term for the Limiting or Nominal Trip Setpoint must be cited in Note b of Table 3.3.1-2. The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the LTSP and the methodology for calculating the as-left and as-found tolerances, for the phrase “a document controlled under 10 CFR 50.59” in the specifications.”

The ERP GTS, Table 3.3.1-2, does not contain any bracketed items associated with the LTSP as stated in the Reviewer’s Note. In addition, it appears as though the Reviewer’s Note reference to footnote (b) should actually be footnote (c), on the basis of the footnote contents.

Plant-specific instrumentation setpoint methodologies will not be controlled in accordance with the 10 CFR 50.59 process as implied in both footnote (c) and the Bases Reviewer’s Note. NRC staff has concluded that instrumentation setpoint processes and methodologies will be contained within the technical specifications (i.e. the Technical Specification Administrative Controls Section) rather than external to the technical specifications. As such, all references to “instrumention setpoint methodology documents controlled under 10 CFR 50.59” in the EPR GTS, Table 3.3.1-2, footnote (c), and associated Bases, BACKGROUND Section, REVIEWER’S NOTE, are not applicable.

Provide the changes needed to ensure that the referenced information is made consistent and clearly stated in both the EPR GTS and associated Bases.

Response to Question 16-207:

The referenced REVIEWER'S NOTE in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.3.1 "Protection System (PS)" will be revised to specify footnote "c" instead of footnote "b" and the reference to bracketed items will be deleted.

With regards to control of the setpoint methodologies documents, the approach utilized to address setpoints for the U.S. EPR Technical Specifications is to follow the ongoing NRC/industry setpoint developments. The related Technical Specification Task Force (TSTF) Traveler (TSTF- 493) was originally submitted to NRC on January 27, 2006. The approach and wording of the Bases utilized in the development of the U.S. EPR Technical Specifications was

based on Revision 2 of TSTF- 493. The wording cited by the NRC in the above question was included in TSTF-493, Revision 2, and is consistent with TSTF-493, Revision 3. AREVA is not aware of a more suitable industry guidance document, approved NRC policy, or precedent on which to base an update to this approach.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 3.3.1 Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-208:

LCO 3.3.1, Protection System

Provide the additional information and any changes necessary regarding the EPR GTS, Table 3.3.1-2, use of footnote (d) as a LTSP value for the Low DNBR Reactor Trip function. Incorporate additional information in the EPR Bases document to describe the COLR setpoint reference.

The EPR GTS, Table 3.3.1-2, Low Departure From Nucleate Boiling Ratio (A.1.a through A.1.e), LTSP column, specifies footnote (d) which states “as specified in the COLR.” The methodology for determining the Low DNBR Reactor Trip setpoint in accordance with the COLR, does not appear to be controlled under an approved program contained in Technical Specification Administrative Controls Section 5.5 (Programs and Manuals). The EPR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY Section A.1, makes no reference to or mention of the COLR with respect to the Low DNBR LTSP values.

Provide a technical justification for the use of footnote (d) in Table 3.3.1-2 as a valid Low DNBR Reactor Trip LTSP value. Include the necessary discussion in the Bases to ensure a clear understanding of the COLR as it relates to the LTSP value.

This additional information is needed to ensure the completeness and accuracy of the EPR GTS and associated Bases.

Response to Question 16-208:

Specifying the Core Operating Limits Report (COLR) as the location for the Low Departure from Nucleate Boiling Ratio (DNBR) setpoint without including the COLR in the Technical Specifications Administrative Controls Section 5.5 (Programs and Manuals) is consistent with multiple examples contained in the Standard Technical Specifications for Westinghouse Plants (NUREG-1431).

NUREG-1431, LCO 3.1.1 states:

> "SDM shall be within the limits specified in the COLR."

NUREG-1431, LCO 3.1.5 states:

> "Each shutdown bank shall be within insertion limits specified in the COLR."

The COLR is not listed in the Technical Specifications Administrative Controls Section 5.5 (Programs and Manuals) of NUREG -1431. However, both the U.S. EPR Technical Specifications and NUREG-1431 list the COLR in Section 5.6, Reporting Requirements.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 16-209:

LCO 3.3.1, Protection System

Provide the additional information and any changes necessary regarding the EPR GTS, Table 3.3.1-2, use of footnote (q) as a LTSP value for the Pressure Safety Relief Valve (PSRV) ESF Actuation function. Incorporate additional information in the EPR Bases document to describe the PTLR setpoint reference.

The EPR GTS, Table 3.3.1-2, PSRV Actuation (B.12.a and B.12.b), LTSP column, specifies footnote (q) which states “the LTOP arming temperature specified in the PTLR.” The methodology for determining the PSRV ESF Actuation setpoint in accordance with the PTLR, does not appear to be controlled under an approved program contained in Technical Specification Administrative Controls Section 5.5 (Programs and Manuals). The EPR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY Section B.12, makes no reference to or mention of the PTLR with respect to the PSRV Actuation LTSP values.

Provide a technical justification for the use of footnote (q) in Table 3.3.1-2 as a valid PSRV Actuation LTSP value. Include the necessary discussion in the Bases to ensure a clear understanding of the PTLR as it relates to the LTSP value.

This additional information is needed to ensure the completeness and accuracy of the EPR GTS and associated Bases.

Response to Question 16-209:

Specifying the Pressure-Temperature Limits Report (PTLR) as the location for the Low Temperature Overpressure Protection (LTOP) arming temperature without including the PTLR in the Technical Specifications Administrative Controls Section 5.5 (Programs and Manuals) is consistent with the Standard Technical Specifications for Westinghouse Plants (NUREG-1431).

NUREG-1431, LCO 3.4.12 states:

> "An LTOP System shall be OPERABLE with a maximum of [one] [high pressure injection (HPI)] pump [and one charging pump] capable of injecting into the RCS and the accumulators isolated and one of the following pressure relief capabilities:
>
> a. Two power operated relief valves (PORVs) with lift settings within the limits specified in the PTLR, …"

The PTLR is not listed in the Technical Specifications Administrative Controls Section 5.5 (Programs and Manuals) of NUREG-1431. However, both the U.S. EPR Technical Specifications and NUREG - 1431 list the PTLR in Section 5.6, Reporting Requirements.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

U.S. EPR Final Safety Analysis Report Markups

7.2.1.3.7 P12 Permissive

The P12 permissive defines the transition from hot shutdown to cold shutdown with respect to RCS pressure.

Pressurizer pressure (NR) measurements are compared to the P12 setpoint (2005 psia). When three-out-of-four of the measurements are less than the setpoint, the operator is prompted to manually validate the permissive.

This permissive is P-MANU with respect to validation and P-AUTO with respect to inhibition.

Figure 7.2-31—P12 Permissive Logic P12 illustrates the logic for the P12 Permissive.

7.2.1.3.8 P13 Permissive

The P13 permissive defines when steam generator draining and filling operations are allowed.

16-142

Hot leg temperature (WR) measurements are compared to the P13 setpoint (2003 °F). When three-out-of-four of the measurements are less than the setpoint, the operator is prompted to manually validate the permissive.

This permissive is P-MANU with respect to validation and P-AUTO with respect to inhibition.

Figure 7.2-32—P13 Permissive Logic P13 illustrates the logic for the P13 permissive.

7.2.1.3.9 P14 Permissive

The P14 permissive defines when the residual heat removal system is allowed to be connected to the RCS.

Hot leg temperature (WR) and hot leg pressure (WR) measurements are each compared to a setpoint (356 °F, 464 psia). When three-out-of-four of the hot leg temperature (WR) measurements are less than the temperature setpoint, and three-out-of-four of the hot leg pressure measurements (WR) are less than the pressure setpoint, the operator is prompted to manually validate the permissive.

This permissive is P-MANU with respect to validation and inhibition.

Figure 7.2-33—P14 Permissive Logic P14 illustrates the logic for the P14 permissive.

7.2.1.3.10 P15 Permissive

The P15 permissive defines when SI actuation due to ΔP_{sat} is disabled and SI actuation due to low loop level is enabled.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One or more signal processors inoperable for reasons other than Condition C.	D.1 ----------NOTE---------- Only applicable for APUs and ALUs associated with Table 3.3.1-2, Trip/Actuation Functions B.10.a and B.10.b. ---------- Enter applicable Conditions and Required Actions of LCO 3.8.1 and LCO 3.8.2 for EDG made inoperable by inoperable APU or ALU.	1 hour
	AND	
	D.2 ~~----------NOTE---------- Not applicable for APUs associated with Table 3.3.1-2, Trip/Actuation Functions B.10.a and B.10.b. ----------~~ Place inoperable signal processor in lockout.	4 hours
E. One or more actuation devices inoperable.	E.1 Restore actuation device to OPERABLE status.	48 hours
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. OR Minimum functional capability specified in Table 3.3.1-1 not maintained.	F.1 Enter the Condition referenced in Table 3.3.1-1.	Immediately

16-134

16-132

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
M. As required by Required Action F.1 and referenced in Table 3.3.1-1.	M.1 Be in MODE 3. AND M.2 Be in MODE 4.	6 hours 12 hours
N. As required by Required Action F.1 and referenced in Table 3.3.1-1.	N.1 Be in MODE 3. AND N.2 Be in MODE 5.	6 hours 36 hours
O. As required by Required Action F.1 and referenced in Table 3.3.1-1.	O.1 Declare associated EDG inoperable. Enter applicable Conditions and Required Actions of LCOs 3.8.1, "AC Sources – Operating," and 3.8.2, "AC Sources – Shutdown".	Immediately
P. As required by Required Action F.1 and referenced in Table 3.3.1-1.	P.1 Declare associated Chemical and Volume Control System isolation valve(s) inoperable. Enter applicable Conditions and Required Actions of LCO 3.4.9, "Pressurizer".	Immediately
Q. As required by Required Action F.1 and referenced in Table 3.3.1-1.	Q.1 Declare associated Pressurizer Safety Relief Valve(s) inoperable. Enter applicable Conditions and Required Actions of LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP)".	Immediately

16-192

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
R. As required by Required Action F.1 and referenced in Table 3.3.1-1.	R.1 Declare both Control Room Emergency Filtration trains inoperable. Enter applicable Conditions and Required Actions of LCO 3.7.10, "Control Room Emergency Filtration (CREF)".	Immediately
S. As required by Required Action F.1 and referenced in Table 3.3.1-1.	S.1 Open reactor trip breakers.	1 hour
T. As required by Required Action F.1 and referenced in Table 3.3.1-1.	T.1 Declare functions on associated Actuation Logic Units inoperable. AND T.2 Open reactor trip breakers.	Immediately 1 hour

16-192

16-192

SURVEILLANCE REQUIREMENTS

----------NOTES----------

1. Refer to Table 3.3.1-1 to determine which SRs apply for each sensor, manual actuation switch, signal processor, or actuation device.

2. When a sensor, manual actuation switch, signal processor, or actuation device is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Trip/Actuation Function maintains functional capability.

Table 3.3.1-1 (page 4 of 4)
Protection System Sensors, Manual Actuation Switches,
Signal Processors, and Actuation Devices

COMPONENT	REQUIRED NUMBER OF SENSORS, SWITCHES, SIGNAL PROCESSORS, OR ACTUATION DEVICES	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM~~UM~~ REQUIRED FOR FUNCTIONAL CAPABILITY	CONDITION	SURVEILLANCE REQUIREMENTS
C. Signal Processors					
1. Remote Acquisition Units (RAUs)	2 per division, 4 divisions	≥ 10% RTP	1 per division, 4 divisions	H	SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.10
2. Acquisition and Processing Units (APUs)	5 per division, 4 divisions	Refer to Table 3.3.1-2	Refer to Table 3.3.1-2	Refer to Table 3.3.1-2	SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10
3. Actuation Logic Units (ALUs)	4 per division, 4 divisions	1,2,3,4	3 per division, 4 divisions	N,O,P, Q,R,T	SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.10
	4 per division, 4 divisions	5,6,(i)	3 per division, 4 divisions	O,P,Q,R,T	SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.10
D. Actuation Devices					
1. Reactor Coolant Pump Bus and Trip Breakers	2 per pump	1,2,3,4	1 per pump	N	SR 3.3.1.8 SR 3.3.1.10
2. Reactor Trip Circuit Breakers	4	1,2,3[(g)]	3	K	SR 3.3.1.3 SR 3.3.1.10
3. Reactor Trip Contactors	4 per set, 23 sets	1,2,3[(g)]	3 per set, 23 sets	K	SR 3.3.1.3 SR 3.3.1.10

16-131

(g) With the RCSL capable of withdrawing a RCCA or one or more RCCAs not fully inserted.

(i) During movement of irradiated fuel assemblies.

(j) Except when all main feedwater (MFW) isolation valves are closed.

Table 3.3.1-2 (page 2 of 6)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

	TRIP/ACTUATION FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[a]	LIMITING TRIP SETPOINT[b][c]	CONDITION
9.	Low Doubling Time (Intermediate Range)	1[g],2,3[e]	3 divisions	≥ 20 Sec.	K
10.	Low Pressurizer Pressure	≥ 10% RTP	3 divisions	≥ 2005 psia	H
11.	High Pressurizer Pressure	1,2	3 divisions	≤ 2415 psia	J
12.	High Pressurizer Level	1,2	3 divisions	≤ 75% Measuring Range	J
13.	Low Hot Leg Pressure	1,2,3[e][h]	3 divisions	≥ 2005 psia	L
14.	Steam Generator (SG) Pressure Drop	1,2	3 divisions	≤ 29 psi/min; 102 psi<~~ss~~steady state; Max 1088 psia	J
15.	Low SG Pressure	1,2,3[e][h]	3 divisions	≥ 725 psia	L~~M~~
16.	High SG Pressure	1	3 divisions	≤ 1385 psia	I
17.	Low SG Level	1,2	3 divisions	~~≤~~≥ 20% Narrow Range	J
18.	High SG Level	1,2	3 divisions	~~≥~~≤ 69% Narrow Range ~~for 10 sec.~~	J
19.	High Containment Pressure	1,2	3 divisions	≤ 18.7 psia	J

16-141

(a) A division is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/Actuation Function are OPERABLE; and b) the associated APU is OPERABLE.

(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.

(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the Trip/Actuation Function shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.

(e) With the RCSL System capable of withdrawing a RCCA or one or more RCCAs not fully inserted.

(g) ≤ 10% RTP.

(h) With pressurizer pressure ≥ 2005 psia.

Table 3.3.1-2 (page 3 of 6)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

	TRIP/ACTUATION FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[a]	LIMITING TRIP SETPOINT[b][c]	CONDITION
B.	ENGINEERED SAFETY FEATURES ACTUATION SYSTEM (ESFAS) SIGNALS				
1.	Turbine Trip on Reactor Trip (RT)	1	3 divisions	RT for 1 sec.	I
2.a.	Main Feedwater Full Load Closure on Reactor Trip (All SGs)	1,2[i]	3 divisions	NA	J
2.b.	Main Feedwater Full Load Closure on High SG Level (Affected SGs)	1,2[i],3[i]	3 divisions	~~≥~~ ≤ 69% Narrow Range ~~for 10 sec.~~	M
2.c.	Startup and Shutdown Feedwater Isolation on SG Pressure Drop (All SGs)	1,2[j],3[j]	3 divisions	≥ 29 psi/min; 247 psi<~~ss~~steady state; Max 943 psia	M
2.d.	Startup and Shutdown Feedwater Isolation on Low SG Pressure (~~All~~Affected SGs)	1,2[j],3[(h)(j)]	3 divisions	≥ 580 psia	L
2.e.	Startup and Shutdown Feedwater Isolation on High SG Level for Period of Time (Affected SGs)	1,2[j],3[j]	3 divisions	~~≥ 69%~~ ≤ 65% Narrow Range for 10 sec.	M
3.a.	Safety Injection System (SIS) Actuation on Low Pressurizer Pressure	1,2,3[h]	3 divisions	≥ 1668 psia	L
3.b.	SIS Actuation on Low Delta Psat	3[k]	3 divisions	≥ 220 psia	M
4.	RCP Trip on Low Delta P across RCP with SIS Actuation	1,2,3	3 divisions	≥ 80% Nominal Pressure	M
5.	Partial Cooldown Actuation on SIS Actuation	1,2,3	3 divisions	NA	M

16-170

16-167

(a) A division is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/Actuation Function are OPERABLE; and b) the associated APU is OPERABLE.

(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.

(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the Trip/Actuation Function shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.

(h) With pressurizer pressure ≥ 2005 psia.

(i) Except when all MFW full load isolation valves are closed.

(j) Except when all MFW low load isolation valves are closed.

(k) When Trip/Actuation Function B.3.a is disabled.

Table 3.3.1-2 (page 4 of 6)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

	TRIP/ACTUATION FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[a]	LIMITING TRIP SETPOINT[b][c]	CONDITION
6.a.	Emergency Feedwater System (EFWS) Actuation on Low-Low SG Level (All SGs)	1,2,3	3 divisions	≥ 40% Wide Range	M
6.b.	EFWS Actuation on Loss of Offsite Power (LOOP) and SIS Actuation (All SGs)	1,2	3 divisions	NA	J
6.c.	EFWS Isolation on High SG Level (Affected SG)	1,2,3	3 divisions	≤ 89% Wide Range	M
7.a.	Main Steam Relief Train (MSRT) Actuation on High SG Pressure	1,2,3	3 divisions	≤ 1385 psia	M
7.b.	MSRT Isolation on Low SG Pressure	1,2,3[h]	3 divisions	≥ 580 psia	L
8.a.	Main Steam Isolation Valve (MSIV) Closure on SG Pressure Drop (All SGs)	1,2,3	3 divisions	≤ 29 psi/min; 102 psi<~~ss~~steady state; Max 1088 psia	M
8.b.	MSIV Closure on Low SG Pressure (All SGs)	1,2,3[(h)(l)]	3 divisions	≥ 725 psia	L
9.a.	Containment Isolation (Stage 1) on High Containment Pressure	1,2,3	3 divisions	≤ 18.7 psia	M
9.b.	Containment Isolation (Stage 1) on SIS Actuation	1,2,3,4	3 divisions	NA	N
9.c.	Containment Isolation (Stage 2) on High-High Containment Pressure	1,2,3	3 divisions	≤ 36.3 psia	M
9.d.	Containment Isolation (Stage 1) on High Containment Radiation	1,2,3,4	3 divisions	≤ 100 x background	N

16-166

(a) A division is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/Actuation Function are OPERABLE; and b) the associated APU is OPERABLE.

(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.

(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the Trip/Actuation Function shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.

(h) With pressurizer pressure ≥ 2005 psia.

(l) Except when all MSIVs are closed.

Table 3.3.1-2 (page 5 of 6)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP/ACTUATION FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[a]	LIMITING TRIP SETPOINT[b][c]	CONDITION
10.a. Emergency Diesel Generator (EDG) Start on Degraded Grid Voltage	1,2,3,4~~,(m)~~	~~NA~~4 divisions	≥ 6210 V and ≤ 6350 V;	~~NA~~O
	(m)	2 divisions	≥ 7 sec. and ≤ 11 sec. w/SIS, ≥ 270 sec. and ≤ 300 sec. wo/SIS	O
10.b. EDG Start on LOOP	1,2,3,4~~,(m)~~	~~NA~~4 divisions	≥ 4830 V and ≤ 4970 V;	~~NA~~O
	(m)	2 divisions	≥ 0.4 sec. and ≤ 0.6 sec.	O
11.a. Chemical and Volume Control System (CVCS) Charging Line Isolation on High-High Pressurizer Level	1,2,3	3 divisions	≤ 80% Measuring Range	M
11.b. CVCS Charging Line Isolation on Anti-Dilution Mitigation (ADM) at Shutdown Condition (RCP not operating)	5[(n)],6	3 divisions	927 ppm	P
11.c. CVCS Charging Line Isolation on ADM at Standard Shutdown Conditions	3,4[(o)],5[(o)]	3 divisions	(d)	P

16-135

(a) A division is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/Actuation Function are OPERABLE; and b) the associated APU is OPERABLE.

(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.

(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the Trip/Actuation Function shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.

(d) As specified in the COLR.

(m) When associated EDG is required to be OPERABLE by LCO 3.8.2.

(n) With two or less RCPs in operation.

(o) With three or more RCPs in operation.

BASES

BACKGROUND (continued)

Three of the four divisions are necessary to meet the redundancy and testability of GDC 21 in 10 CFR 50, Appendix A (Ref. 3). The fourth division provides additional flexibility by allowing one division to be removed from service for maintenance or testing while still maintaining a minimum two-out-of-three logic. Thus, even with a division inoperable, no single additional failure in the PS can either cause an inadvertent trip/ESF or prevent a required trip/ESF from occurring.

The protection and monitoring systems have been designed to ensure safe operation of the reactor. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the PS, as well as LCOs on other reactor system parameters and equipment performance. The subset of LSSS that directly protect against violating the reactor core and RCS pressure boundary safety limits during AOOs are referred to as Safety Limit LSSS (SL-LSSS).

Technical Specifications are required by 10 CFR 50.36 to contain LSSS defined by the regulation as "...settings for automatic protective devices...so chosen that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

---------- REVIEWER'S NOTE ----------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term LTSP indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the term Nominal Trip Setpoint is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint.

16-207

Where the LTSP is not included in Table 3.3.1-2 for the purpose of compliance with 10 CFR 50.36, the plant-specific term for the Limiting or Nominal Trip Setpoint must be cited in Note ~~b~~c of Table 3.3.1-2. ~~The brackets indicate plant-specific terms may apply, as reviewed and approved by the NRC.~~ The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance.

BASES

BACKGROUND (continued)

Signal Processors

The PS is a distributed, redundant computer system. It consists of four independent redundant data-processing automatic paths (divisions), each with layers of operation and running asynchronous with respect to each other. In addition to the computers associated with the automatic paths, there are two redundant message and service interface computers to interface with each division.

The measurement channels or signal acquisition layer (which includes the RAUs) in each division acquires analog and binary input signals from sensors in the plant (such as for temperature, pressure, and level measurements). Each signal acquisition computer distributes its acquired and preprocessed input signals to the PS logic and controls, which includes the data processing computers (APUs).

The data-processing computers (APUs) perform signal processing for plant protective functions such as signal online validation, limit value monitoring and closed-loop control calculations. Each PS division contains four ALUs, two assigned to each subsystem. Two ALUs of the same subsystem within a division are redundant and perform the same processing using the same inputs. The outputs of two redundant ALUs are combined in a hardwired “functional AND” logic for reactor trip functions and in a hardwired OR logic for ESF functions. This avoids both unavailability of ESF functions and spurious reactor trips. The data processing computers then send their outputs to two independent voter computer units (ALUs) in each division.

In the voter computers, the outputs of the data-processing computers of redundant ~~(three or four)~~ divisions are processed together. A voter computer controls a set of actuators. Each voter receives the actuation signal from each of the redundant data-processing computers. The voter's task is to compare this redundant information and compute a validated (voted) actuating signal, which is used for actuating the end devices.

16-129

When a signal processor is placed in lockout, network outputs are marked as invalid and are disregarded in downstream processing. For example, a two out of four voting function that receives one faulty input votes two out of three on the remaining non-faulty inputs. Hardwired outputs (i.e., ALU outputs) are forced to a no output state, resulting in a “reactor trip output” and no ESF actuation. No manual actions, beyond placing the signal processor in lockout, are required for the downstream processing to properly accommodate the signal processor in a lockout condition.

BASES

BACKGROUND (continued)

The reactor trip outputs of the two redundant ALUs in a subsystem are combined in a hardwired functional AND configuration. This requires both ALUs to output the reactor trip order for the associated reactor trip device to be actuated. The outputs of the functional AND from both subsystems within a division are combined in a functional OR logic. The functional AND provides protection against spurious reactor trip while maintaining the ability to actuate a trip if an ALU has failed.

16-131

ESF Trip Logic

The ESF trip logic senses accident situations and initiate the operation of necessary features. The ESF along with reactor trip ensure the following:

- The integrity of the reactor coolant pressure boundary;
- The capability to shut down the reactor and maintain it in a safe shutdown condition; and
- The capability to prevent or mitigate the consequences of accidents which could result in potential off-site exposures.

DELETED MATERIAL
"...marked as faulted by modifying the vote in the ALU layer. For the ESF functions, the vote is modified toward actuation except:
* The Main Steam Relief Train (MSRT) divisions, which degrade towards isolation; and
* Pressurizer Safety Relief Valve (PSRV) opening for cold overpressure protection, which degrades towards non-actuation."

As with the reactor trip logic, critical plant parameters such as temperatures, pressures, and levels are sensed, acquired, and converted to electrical signals by the PS. When prohibited operating conditions exist, an ESF signal is generated from the PS. In addition to the automatic ESF actuation functions performed by the PS, the capability to manually initiate these functions is provided in the MCR. These manual functions are implemented at the system level and perform the same actions as the automatic functions. The implementation of manual system level actuation of ESF functions and the priority between the automatic functions of the PS and the manual system level initiation is determined on a case-by-case basis.

Single failures upstream of the ALU layer that could result in an invalid signal being used in the ESF actuation are accommodated by modifying the vote in the ALU layer. Each ESF actuation function is evaluated on a case-by-case basis to determine whether the vote is modified toward actuation or no actuation. In cases where inappropriate actuation of an ESF function could challenge plant safety, the function is modified toward no activation. Otherwise, the function is modified toward activation.

16-130

The ESF actuation signals of the redundant ALUs in each subsystem are combined in a hardwired logical OR; therefore, either of the redundant ALU in a division can actuate an ESF function.

16-131

BASES

BACKGROUND (continued)

DELETED MATERIAL
"Four trip contactors combined in a 2- out-of-4 logic feed a group of four CRDM. Division 1, 2, and 3 contains eleven groups of four CRDMs. Division 4 contains eleven groups of four CRDMs and one single CRDM for the central rod. There are a total of 92 contactors. Each trip contactor is switched off by a de-energized coil."

Actuation Devices

Reactor Trip Actuation Devices

The reactor trip actuation is performed by interrupting electrical power to the Control Rod Drive Mechanisms (~~CRMD~~CRDM). Electrical power to the CRDM is delivered by the Control Rod Drive Power Supply System (CRDPSS). The CRDPSS consists of 220 V DC distribution boards which are fed from the Uninterruptible Power Supply System.

The power supply of the CDRM can be switched off via the following features:

- Four main trip breakers distributed in two electrical divisions. Two breakers are located in Division 2, two others in Division 3. The main trip breakers can be opened by two coils: one with a de-energized logic using an under voltage coil and the other with an energized logic using a shunt trip coil.

- There are 23 sets of four trip contactors, each set capable of removing power to four CRDM power supplies. Eleven sets of contactors are located in physical division one and twelve sets are located in physical division four. Each division of the PS is assigned to one contactor in each of the 23 sets. Each set of four contactors is arranged to require two out of four PS reactor trip orders to drop the rods assigned to the contactor set.

16-139

- The electronics of the RodPilot can switch-off the power supply of four CRDMs. Two groups of four commands can actuate this electronic module, one with low active and one with high active logic. The electronics of the RodPilot is a non-safety device of the reactor trip but is the fastest switching device and allows the contactors and the trip breaker to open without stress.

- The under voltage coil of the main trip breakers is actuated by the automatic reactor trip signals of the PS and the manual trip from the SICS panel. The shunt coil of the main trip breakers is actuated by the automatic reactor trip signal from the SAS and the manual trip signal from the RSS. The shunt coil of the trip breakers receives two different signals from SAS and RSS combined in an "OR" logic performed at the level of trip breakers.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

included in the Technical Specifications are credited as part of the primary success path in the accident analysis. ~~Non-credited functions are purely equipment protective, and their use minimizes the potential for equipment damage.~~ Non-credited functions are not included in the Technical Specifications. Refer to FSAR Sections 7.2 and 7.3.

The LCO requires the PS sensors, manual actuation switches, signal processors, and specified actuation devices to be OPERABLE. The LCO ensures that each of the following requirements is met:

- A reactor trip or ESF function will be initiated when necessary; and
- Sufficient redundancy is maintained to permit a component to be out of service for testing or maintenance.

Failure of any sensors, signal processors, or actuation device reduces redundancy or renders the affected division(s) inoperable.

Trip Setpoints that directly protect against violating the reactor core or RCS pressure boundary SLs during AOOs are SL-LSSS. Permissive and interlock setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e. the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS. Each LTSP specified is more conservative than the analytical limit assumed in the safety analysis in order to account for instrument uncertainties appropriate to the trip Function. The methodologies for considering uncertainties are defined in References 1 and 4.

16-140

The PS sensors, manual actuation switches, signal processors, and specified actuation devices satisfy Criterion 3 of 10 CFR 50.36(~~d~~c)(2)(ii) .

The PS sensors, manual actuation switches, signal processors, and specified actuation devices that support ~~reactor trips~~ESFs are required to be OPERABLE in MODES 1, 2 and/or 3 because the reactor is or can be made critical in these MODES. The automatic reactor trip functions are designed to take the reactor subcritical, which maintains the SLs during AOOs and assists the ESF in providing acceptable consequences during accidents. The PS sensors, manual actuation switches, signal processors, and specified actuation devices that support automatic reactor trip functions are not required to be OPERABLE in MODES 4 and

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

fuel cladding damage due to an excessive reactivity increase from an intermediate power level including nominal power.

There are no permissives associated with this trip.

4. High Core Power Level

This function limits the consequences of an excessive reactivity increase from an intermediate high power level including nominal power. This trip protects against the following postulated accidents or AOOs:

- Increase in heat removal by the secondary system, and
- Reactivity and power distribution anomalies.

The High Core Power Level Trip requires four divisions of the following sensors and processors to be OPERABLE in MODES 1 and in MODE 2 when the nuclear power level is greater than or equal to 10^{-5}% power as indicated on the Intermediate Range monitors:

- Cold Leg Temperature sensors (Wide Range),
- Hot Leg Temperature (Narrow Range) sensors,
- Hot Leg Pressure (Wide Range) sensors,
- RCS Loop Flow sensors,
- APUs, and
- ALUs.

16-136

The LTSP is high enough to provide an operating envelope that prevents an unnecessary High Core Power Level reactor trip. The LTSP is low enough for the system to maintain a margin to unacceptable fuel cladding damage due to an excessive reactivity increase from ~~an~~ intermediate ~~high~~ power levels and above, up to and including 100 percent power operation ~~including nominal power~~.

The P5 permissive automatically enables the High Core Power Level Trip when the nuclear power level is greater than or equal to 10^{-5}% power. The P5 permissive also automatically disables the High Core Power Level Trip below this power.

5. Low Saturation Margin

This function limits the consequences of an excessive reactivity increase from an intermediate high power level including nominal power. This trip protects against the following postulated accidents or AOOs:

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

A RCS depressurization may lead to a risk of excessive boiling, thus a reactor trip is required to ensure fuel rod integrity and to adapt reactor power to the capacity of the safety systems. The LTSP is sufficiently below the full load operating value so as not to interfere with normal plant operation, but still high enough to provide the required protection in the event of abnormal conditions.

The P12 permissive automatically enables the Low Hot Leg Pressure Trip when the pressure is greater than or equal to 2005 psia.

14. Steam Generator Pressure Drop

In case of steam or feedwater system piping failure, the affected Steam Generator (SG) depressurizes leading to a RCS cooldown and hence a reactivity transient. A reactor trip is required in order to ensure the fuel rod integrity and to adapt the reactor power to the capacity of the safety systems. This trip protects against the following postulated accidents or AOOs:

- Increase in heat removal by the secondary system, and
- Decrease in heat removal by the secondary system.

The SG Pressure Drop Trip requires four divisions of the following sensors and processors to be OPERABLE in MODES 1 and 2:

- SG Pressure sensors,
- APUs, and
- ALUs.

16-141

In case of steam or feedwater system piping failure, the affected SG depressurizes leading to a RCS cooldown or heatup. A reactor trip is required in order to ensure the fuel rod integrity and to adapt the reactor power to the capacity of the safety systems.

The condition to be detected is an SG pressure drop greater than a specified value (Max1p). This is accomplished by using a variable low setpoint. The value of the variable setpoint is maintained lower than the measured pressure by a fixed amount, with a limitation placed on the rate of decrease of the setpoint value. The measured pressure will only fall below the setpoint if it decreases at a rate greater than that of the rate-limited setpoint for a given amount of time.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The setpoint algorithm is:

$$SP(t) = MIN\ [1088\ psia,\ S_2(t)]$$

Where:

$S_1(t) = P(t) - \Delta p$

$S_2(t) = MAX\ [S_1(t),\ S_2(t - C_t) - C_1R_l)]$

t = current time

$P(t)$ = measured SG pressure

Δp = 102 psi

C_t = processor cycle time in minutes

R_l = 29 psi/minute

$SP(t)$ = variable setpoint

16-141

The LTSP is sufficiently above~~below~~ the full load operating value so as not to interfere with normal plant operation, but still low~~high~~ enough to provide the required protection in the event of a pipe break.

There are no permissives associated with this trip.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

18. High SG Level

This trip protects the turbine against an excessive humidity in case of a Main Feedwater (MFW) malfunction causing an increase in feedwater flow or in case of SG level increase. This reactor trip ensures core integrity during these transients since an increase in feedwater flow leads to a RCS overcooling event and hence a reactivity insertion. This trip protects against an increase in heat removal by the secondary system.

The High SG Level Trip requires the following sensors and processors to be OPERABLE in MODE 1 and in MODE 2:

- SG Level (Narrow Range) sensors
- APUs, and
- ALUs.

This reactor trip ensures core integrity during transients involving a MFW malfunction that results in an increase in feedwater flow or in case of an SG level increase. The LTSP is sufficiently above~~below~~ the full load operating value so as not to interfere with normal plant operation, but still low~~high~~ enough to provide the required protection in the event of an abnormal condition.

The P13 permissive automatically enables the High SG Level Trip when the hot leg temperature is greater than or equal to 200ºF.

19. High Containment Pressure

In case of a postulated initiating event leading to water or steam discharge into the containment, a reactor trip is performed in order to ensure containment integrity and to adapt the reactor power to the capacity of the safety systems. This trip protects against the following postulated accidents or AOOs:

- Decrease in heat removal by the secondary system, and
- Decrease in reactor coolant inventory.

The High ~~SG~~ Containment Pressure Trip requires four divisions of the following sensors and processors to be OPERABLE in MODES 1 and 2:

16-152

- Containment Equipment Compartment and Containment Service Compartment pressure sensors,
- APUs, and
- ALUs.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

A turbine trip is required following any reactor trip in order to avoid a mismatch between primary and secondary power. Such a mismatch could result in an RCS cooldown transient, with a potential inadvertent return to critical conditions.

There are no automatic permissives associated with this function.

2. Main Feedwater

a. MFW Full Load Closure on Reactor Trip (All SGs)

After a reactor trip check-back, a MFW full load isolation is required. This avoids a mismatch between primary and secondary power. Such a mismatch could result in an RCS cooldown transient, with a potential inadvertent return to critical conditions.

The automatic MFW Full Load Closure on Reactor Trip function requires four divisions of the following processors to be OPERABLE in MODE 1 and MODE 2 except when the MFW full load isolation valves are closed:

- RTCB Position Indication sensor,
- APUs, and
- ALUs.

There are no automatic permissives associated with this function.

b. MFW Full Load Closure on High SG Level (Affected SG)

In the case of an increasing SG level event, the MFW supply to the affected SG is isolated in order to avoid filling the SG, and subsequently introducing water into Main Steam line and MSRT.

This function mitigates an increase in heat removal from the secondary system.

The automatic MFW Full Load Closure on High SG Level function requires four divisions of the following sensors and processors to be OPERABLE in MODE 1 and MODES 2 and 3, except when all MFW full load ~~and low load~~ isolation valves are closed:

- SG Level (Narrow Range) sensors,
- APUs, and
- ALUs.

16-171

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The MFW Full Load Closure on High SG Level LTSP is set high enough to avoid spurious actuation but low enough in order to prevent water level in the SG from rising and entering the steam line.

The P13 permissive automatically enables the MFW Full Load Closure on High SG Level function when the hot leg temperature is greater than or equal to 200 ºF.

c. Startup and Shutdown Feedwater Isolation on SG Pressure Drop (All SGs)

The affected SG depressurizes for the listed events, a reactor trip is initiated on an SG pressure drop signal. Also, the Startup and Shutdown Feedwater (SSS) isolation and control valves close in all the SGs.

A complete Feedwater system isolation in the affected SG limits the coolant provided into the affected SG by the MFW/SSS. This action minimizes the mass and energy released into the containment and RCS cooldown.

This function mitigates the following postulated accidents or AOOs:

- Excessive increase in secondary steam flow,
- Steam system piping failure, and
- Feedwater system piping failure.

The ~~automatic~~ SSS ~~Feedwater~~ Isolation on SG Pressure Drop function is required ~~four divisions of the following sensors and processors~~ to be OPERABLE in: ~~MODE 1 and MODES 2 and 3, except when all MFW full load and low load isolation valves are closed:~~

- MODE 1,
- MODE 2, except when all MFW low load isolation valves are closed, and
- MODE 3, except when all MFW low load isolation valves are closed.

The SSS Isolation on SG Pressure Drop function requires four divisions of the following sensors and processors to be OPERABLE:

- SG pressure sensors,
- APUs, and
- ALUs.

16-171 and 16-174

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

16-167

The LTSP is low~~high~~ enough to preclude spurious operation but high~~low~~ enough to terminate feedwater flow before overcooling of the primary system or depletion of secondary inventory.

The condition to be detected is an SG pressure drop greater than a specified value (Max1p). This is accomplished by using a variable low setpoint. The value of the variable setpoint is maintained lower than the measured pressure by a fixed amount, with a limitation placed on the rate of decrease of the setpoint value. The measured pressure will only fall below the setpoint if it decreases at a rate greater than that of the rate-limited setpoint for a given amount of time.

The setpoint algorithm is:

$$SP(t) = MIN\ [943\ psia,\ S_2(t)]$$

Where:

$S_1(t) = P(t) - \Delta p$

$S_2(t) = MAX\ [S_1(t),\ S_2(t - C_t) - C_1R_l)]$

t = current time

$P(t)$ = measured SG pressure

Δp = 247 psi

C_t = processor cycle time in minutes

R_l = 29 psi/minute

$SP(t)$ = variable setpoint

There are no automatic permissives associated with this function.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

16-161

The automatic Partial Cooldown on SIS Actuation function requires four divisions of the following processors to be OPERABLE in MODES 1, 2, and 3:

- APUs, and
- ALUs.

~~The LTSP for the Partial Cooldown Actuation on SIS Actuation function is set high enough to avoid spurious operation but low enough to ensure adequate flow from the MHSI pumps to maintain core cooling.~~

The P14 permissive automatically enables the Partial Cooldown on SIS Actuation function when the hot leg pressure is greater than or equal to 464 psia and the hot leg temperature is greater than or equal to 356 ºF.

6. Emergency Feedwater System

a. Actuation on Low-Low SG Level (All SGs)

In case of loss of MFW, the Emergency Feedwater System (EFWS) is actuated to remove residual heat via secondary side. With an EFWS actuation signal, SG blowdown is also isolated to conserve SG inventory. This function mitigates the following postulated accidents or AOOs:

- Loss of normal feedwater flow,
- Feedwater system piping failure, and
- LOOP.

The automatic EFWS Actuation on Low-Low SG Level function requires four divisions of the following sensors and processors to be OPERABLE in MODES 1, 2 and 3:

- SG level (Wide Range) sensors,
- APUs, and
- ALUs.

This function ensures heat is removed from the primary system through the SGs in the event of a loss of MFW or feedwater line break, as indicated by low SG level. The LTSP is low~~high~~ enough to provide an operating envelope that prevents unnecessary actuations but high~~low~~ enough to ensure sufficient make-up is provided to the SGs.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

This function mitigates the following postulated accidents or AOOs:

- Excessive increase in secondary steam flow,
- Spurious opening of one SG safety or relief valve,
- Steam system piping failure, and
- Feedwater system piping failure.

The automatic MSIV Closure on SG Pressure Drop function requires four divisions of the following sensors and processors to be OPERABLE in MODES 1, 2, and 3:

- SG Pressure sensors,
- APUs, and
- ALUs.

The LTSP for the MSIV Closure on SG Pressure Drop function is set low~~high~~ enough to avoid SG pressure fluctuations during normal operation and high~~low~~ enough to isolate an SG and limit the blowdown to the value assumed in the safety analysis.

A SG pressure drop is detected by using a variable low setpoint equal to the actual SG pressure minus a fixed value, with a limitation placed on the rate of decrease of the setpoint. The maximum value of the setpoint is also limited in order to avoid MSIV closure during a SG pressure decrease following reactor trip and turbine trip, which could result in a SG overpressure condition.

The setpoint algorithm is:

$$SP(t) = MIN\ [1088\ psia,\ S_2(t)]$$

16-166

Where:

$S_1(t) = P(t) - \Delta p$

$S_2(t) = MAX\ [S_1(t),\ S_2(t - C_t) - C_1R_l)]$

t = current time

$P(t)$ = measured SG pressure

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Δp = 102 psi

C_t = processor cycle time in minutes

R_l = 29 psi/minute

$SP(t)$ = variable setpoint

16-166

There are no automatic permissives associated with this function.

b. Closure on Low SG Pressure (All SGs)

For most Main Steam Line or Feedwater pipe breaks, the affected SG depressurizes. For small breaks, the setpoint for MSIV closure on SG pressure drop may not be reached. This function isolates all four SG on the main steam side in the event of a secondary side break in order to:

- Prevent draining of unaffected SGs,
- Limit the return to critical conditions due to a overcooling transient,
- Limit the release of radioactivity, and
- Limit mass and energy releases into the containment.

This function mitigates the following postulated accidents or AOOs:

- Excessive increase in secondary steam flow,
- Spurious opening of one SG safety or relief valve,
- Steam system piping failure, and
- Feedwater system piping failure.

BASES

ACTIONS (continued)

C.1 and C.2

Condition C applies to one or more APUs inoperable due to the LTSP for one or more Trip/Actuation Functions not met. In this condition, the hardware is still functional. The sensors have been calibrated and the ADOTs and SOTs have checked the function from sensor to actuation device. The manual actuation capability would be unaffected. If the inoperability affects the LTSP for either the EDG Start on Degraded Grid Voltage or the EDG Start on LOOP (Trip/Actuation Functions B.10.a or B.10.b), Required Action C.1 directs entry into the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown." The Completion Time of 1 hour is a reasonable time to allow the operator to diagnose and potentially correct the issue that caused the inoperability prior to entering LCO 3.8.1 or LCO 3.8.2. Restoring the LTSP to OPERABLE status within 24 hours for all other Trip/Actuation Functions is a reasonable timeframe considering the time necessary to change the setpoint parameter, load corrected software, or replace the unit. If the LTSP cannot be restored to OPERABLE status, the associated Trip/Actuation Function must be placed in lockout in the associated APU.

16-134

D.1 and D.2

Condition D applies to one or more signal processors inoperable for reasons other than Condition C. If the inoperability affects the APU or ALU associated with the EDG Start on Degraded Grid Voltage or the EDG Start on LOOP (Trip/Actuation Functions B.10.a or B.10.b), Required Action D.1 directs entry into the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown." The Completion Time of 1 hour is a reasonable time to allow the operator to diagnose and potentially correct the issue that caused the inoperability prior to entering LCO 3.8.1 or LCO 3.8.2. Restoring the Signal processor to OPERABLE status within 4 hours ~~for all other Trip/Actuation Functions~~ is a reasonable timeframe considering the time necessary to restore the signal processor to OPERABLE status. If the signal processor cannot be restored to OPERABLE status, the signal processor must be placed in lockout.

16-132

BASES

ACTIONS (continued)

E.1

Condition E applies to the RCP Bus and Trip Breakers, RTCBs, and Reactor Trip Contactors. With one ore more actuation devices inoperable, the actuation device must be restored to OPERABLE status within 48 hours. The Completion Time of 48 hours is reasonable considering that there are two automatic actuation divisions and the low probability of an event occurring during this interval.

F.1

If the Required Action and associated Completion Time of Condition A, B, C, D, or E or if the minimum functional capability (the value where the supported functions would not actuate during an AOO or postulated event coupled with a single failure) of the sensors, manual actuation switches, signal processors or actuation devices specified in Table 3.3.1-1 are not met, then the unit must be brought to a MODE in which the supported reactor trips or ESF functions are not required to be OPERABLE and any other specified actions must be taken.. The applicable Condition referenced in the table is sensor, manual actuation switch, signal processor, actuation device, and MODE dependent. Condition F is entered to provide for transfer to the appropriate subsequent Condition. Required Action ~~C~~F.1 directs entry into the appropriate Condition referenced in Table 3.3.1-1.

16-187

G.1

If Table 3.3.1-~~1~~2 directs entry into Condition G, the unit must be brought to a condition in which the Low-Low RCS Loop Flow Rate in One Loop function (Trip/Actuation Function A.6.a) is not required to be OPERABLE. The allowed Completion Time of 2 hours is reasonable, based on operating experience, to reduce THERMAL POWER from full power to less than 70% in an orderly manner and without challenging unit systems.

H.1

If Table 3.3.1-1 directs entry into Condition H, the unit must be brought to a condition in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reduce THERMAL POWER from full power to less than 10% in an orderly manner and without challenging unit systems.

BASES

ACTIONS (continued)

16-188

I.1

If Table 3.3.1-1 directs entry into Condition I, the unit must be brought to a MODE in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Time of ~~8~~6 hours is reasonable, based on operating experience, to reach MODE 2 from full power conditions in an orderly manner and without challenging unit systems.

J.1

If Table 3.3.1-1 directs entry into Condition J, the unit must be brought to a MODE in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging unit systems.

K.1 and K.2

If Table 3.3.1-1 directs entry into Condition K, the unit must be brought to a MODE in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and open the reactor trip breakers without challenging unit systems.

L.1 and L.2

If Table 3.3.1-1 directs entry into Condition L, the unit must be brought to a MODE in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Times are ~~of 6 hours is~~ reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and then reduce the pressurizer pressure to less than 2005 psia without challenging unit systems.

BASES

ACTIONS (continued)

M.1 and M.2

If Table 3.3.1-1 directs entry into Condition M, the unit must be brought to a MODE in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Time of 6 hours to reach MODE 3 and 12 hours to reach MODE 4 is reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

N.1 and N.2

If Table 3.3.1-1 directs entry into Condition N, the unit must be brought to a MODE in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Time of 6 hours to reach MODE 3 and 36 hours to reach MODE 5 is reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

O.1

If Table 3.3.1-1 directs entry into Condition O, the Conditions specified in LCO 3.8.1, "AC Sources - Operating," or LCO 3.8.2, "AC Sources - Shutdown," for the EDG made inoperable by failure of the 6.9 kV Bus Voltage sensors are required to be entered immediately. The actions of those LCOs provide adequate compensatory actions to assure unit safety.

P.1

If Table 3.3.1-1 directs entry into Condition P, the associated CVCS isolation valves are immediately declared inoperable. The actions of LCO 3.4.9, "Pressurizer," provide adequate compensatory actions to assure unit safety.

16-192

Q.1

If Table 3.3.1-1 directs entry into Condition Q, the associated PSRVs are immediately declared inoperable. The actions of LCO 3.4.1~~0~~1, "~~Pressurizer Safety Relief Valves~~Low Temperature Overpressure Protection," provide adequate compensatory actions to assure unit safety.

BASES

SURVEILLANCE REQUIREMENTS (continued)

sufficient margin to the SL and/or Analytical Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the as-left tolerance, then the Trip/Actuation Function shall be declared inoperable. The second Note also requires that the LTSP and the methodologies for calculating the as-left and the as-found tolerances be in a document controlled under 10 CFR 50.59.

The digital PS provides continual online automatic monitoring of each of the input signal in each division, perform software limit checking (signal online validation) against required acceptance criteria, and provide hardware functional validation so that a division check is continuously being performed. If any PS input signal is identified to be in a failure status, this condition is alarmed in the Control Room. As such, a periodic "channel check" is no longer necessary.

The Surveillances are modified by a Note to indicate that when a sensor, manual actuation switch, signal processor, or actuation device is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Trip/Actuation Function maintains functional capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the sensor, manual actuation switch, signal processor, or actuation device must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the overall system reliability and an assumption of the average time required to perform a Surveillance. The 6 hour testing allowance does not significantly reduce the probability that the PS will actuate when required.

SR 3.3.1.1

16-202

SR ~~3.3.1.2~~3.3.1.1 compares the calorimetric heat balance calculation to the power range division output every 24 hours. If the calorimetric heat balance calculation results exceed the power range division output by more than 2% RTP, the power range division is not declared inoperable, but must be adjusted. The power range division output shall be adjusted consistent with the calorimetric heat balance calculation results if the calorimetric calculation exceed the power range division output by more than + 2% RTP. If the power range division output cannot be properly adjusted, the division ~~I~~is declared inoperable.

If the calorimetric is performed at part power (< 70% RTP), adjusting the power range division indication in the increasing power direction will assure a reactor trip below the safety analysis limit (< 11% RTP). Making no adjustment to the power range division in the decreasing power

BASES

SURVEILLANCE REQUIREMENTS (continued)

normal CALIBRATION of the remaining adjustable devices in the division. The CALIBRATION may be performed by means of any series of sequential, overlapping, or total steps.

SR 3.3.1.7

The features of continuous self-monitoring of the PS system are described in Reference 8. Additional tests, which require the processor to be inoperable are not normally performed during operation. These EXTENDED SELF TESTS are performed at start-up of a computer each cycle. The startup sequence is as follows:

- Hardware basic test using the internal diagnosis monitor,
- Start-up self test of the operating system, and
- Switch over to normal operation after approximately two minutes.

Additional information is provided in Section 3 of Reference 8.

16-200

SR 3.3.1.8

SR 3.3.1.8 is the performance of an ADOT every ~~31 days~~24 months. ~~This test shall verify OPERABILITY by actuation of the RCP Bus and Trip Breakers.~~ The ADOT may be performed by means of any series of sequential, overlapping, or total steps.

SR 3.3.1.9

SR 3.3.1.9 verifies that the Limiting Trip Setpoint and Permissive values have been properly loaded into the applicable APU.

SR 3.3.1.10

SR 3.3.1.10 verifies that the individual division actuation response times are less than or equal to the maximum values assumed in the accident analysis. Response time testing acceptance criteria are included in a document controlled under 10 CFR 50.59. Individual component response times are not modeled in the analyses.