Draft

Request for Additional Information No. 110 (1295, 1331), Revision 0

10/20/2008

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

QUESTIONS for Technical Specification Branch (CTSB)

16-210

Resolve the apparent deviation from the definition and scope provided in 10 CFR 50.36 for limiting safety system settings (LSSS), as described in the BACKGROUND portion of B 3.3.1. Revise the text accordingly.

On page B 3.3.1-4, third full paragraph, it was proposed that: "Meeting the acceptable dose limit for an accident category is considered having acceptable consequences for that event. However, these values and their associated LTSPs are not considered to be LSSS as defined in 10 CFR 50.36." Contrary to this statement, 10 CFR 50.36 defines LSSS as settings for automatic protective devices related to those variables having significant safety functions. This would include settings for protective devices needed for initiation of engineered safety features to mitigate design basis accidents such that 10 CFR 100 limits are not exceeded.

16-211

Provide a cross-reference between the EPR TS Section 3.3 and the NUREG-1431 TS Section 3.3 showing how the nine original subsections of NUREG-1431 have been addressed by the three subsections of the EPR application.

NUREG-1431, Standard Technical Specifications for Westinghouse Plants, TS Section 3.3, Instrumentation, has the following nine subsections:

Reactor Trip System
Engineered Safety Feature Actuation System
Post Accident Monitoring Instrumentation
Remote Shutdown System
Loss of Power Diesel Generator Start Instrumentation
Containment Purge and Exhaust Isolation Instrumentation
Control Room Emergency Filtration System Actuation Instrumentation
Fuel Building Air Cleanup System Actuation Instrumentation
Boron Dilution Protection System

The corresponding TS Section 3.3 in the EPR Design Certification (DC) application addresses only the following three subsections:

Protection System
Post Accident Monitoring Instrumentation
Remote Shutdown System

This is required to ensure that the necessary specifications for Instrumentation and Controls have been addressed.

16-212

Provide a summary of the analysis or identify the summary of the anaylsis in the EPR FSAR.

In the EPR FSAR add a summary of the analysis (if needed) and identify in the EPR Bases, Section B 3.3.2 where the summary of the analysis can be found in the EPR FSAR to ensure that the EPR GTS, Table 3.3.2-1, Post Accident Monitoring Instrumentation includes the entire population of instruments required by GDC 13, 19 and 64 and the guidance included in IEEE 497-2002 and Regulatory Guide 1.97. that established the required instrumentation for post accident monitoring.

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

16-213

Provide additional information needed to clarify information in the EPR Bases, Section B 3.3.2, regarding secondary loop cooling.

The EPR Bases, Section B 3.3.2, LCO Section (pg B 3.3.2-3 and 4), Item 1, Cold Leg Temperature (Wide Range) states that "the key variables for monitoring core cooling are Hot Leg Temperature, Core Exit Temperature, and Steam Generator Pressure. Cold Leg Temperature provides backup temperature monitoring to Hot Leg Temperature and Core Exit Temperature when forced or verified natural circulation exists. Cold Leg Temperature is used with Hot Leg Temperature and Core Exit Temperature to verify natural circulation. Cold Leg Temperature is compared to the saturation temperature for steam generator pressure (Tsat) to determine primary to secondary loop coupling. Item 9, Hot Leg Temperature (Wide Range) states that "Hot Leg Temperature is required to monitor core cooling, to verify natural circulation, and to verify primary to secondary loop coupling along with steam generator pressure. Hot Leg temperature and RCS pressure are used to determine loop subcooling margin if the calculation is not available." Provide addition information to the EPR Bases, Section B 3.3.2, needed to clarify how Hot Leg Temperature can be used to confirm secondary loop cooling without Cold Leg Temperature.

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

16-214

Provide additional information to clarify the EPR Bases, Section B 3.3.2, Action Section reference to D.1 and D.2 in the EPR GTS, Table 3.3.2-1.

EPR Bases, Section B 3.3.2, Action Section reference to D.1 and D.2 states that "if the Required Action and associated Completion Time of Condition C are not met and Table 3.3.2-1 directs entry into Condition E, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. However, the EPR GTS, LCO 3.3.2, Action D.1 and D.2 do not reference Table 3.3.2-1. Clarification is needed to explain these inconsistencies between the EPR GTS and EPR Bases.

The additional information is needed to ensure accuracy and completeness of the EPT GTS and Bases.

16-215

Provide an EPR FSAR summary of the analysis or identify the EPR FSAR summary of the anaylsis in the EPR Bases.

In the EPR FSAR add a summary of the analysis (if not already documented) and identify in the EPR Bases, Section B 3.3.3 where the summary of the analysis can be found in the EPR FSAR. Insure the summary of analysis includes the required functions, required control circuits, required transfer switches and required instruments required by GDCs 1, 2, 3, 4 and 19 and the guidance contained in RG 1.155 and 1.189 that established the required instrumentation for the Remote Shutdown System.

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

16-216

Provide additional information needed to clarify the completion of a reactor trip and confirm the reactor trip from the remote shutdown station (RSS) in the EPR Bases, Section B3.3.3.

The EPR Bases, Section B 3.3.3, Applicable Safety Analyses Section, state that the RSS provides the control room operator with sufficient instrumentation and controls to place and maintain the unit in a safe shutdown condition, however, the Bases does not provide any information on the achievment of a safe shutdown condition or maintaining the safe shutdown condition from the RSS.

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

16-217

LCO 3.3.1, Protection System

Confirm that the reactor trip and ESF actuation functions credited in the accident analysis are specifically identified by FSAR Table 7.2-1, "Reactor Trip Variables," and

Table 7.3-1, ESF Actuation Variables, and identify any exceptions or additions relative to these tables, based on the FSAR Chapter 15 accident analysis. Revise the text accordingly, to provide a more explicit description of credited functions and supporting references.

On page B 3.3.1-11, the proposed Applicable Safety Analyses section provides a general reference to FSAR Sections 7.2 and 7.3 for the bases of functions not credited in the accident analysis and the bases for exclusion from the Technical Specifications. However, these references were not sufficiently explicit to provide traceability to the accident analysis with respect to credited functions and associated instrumentation.

16-218

LCO 3.3.1, Protection System

Resolve the inconsistency between TS Table 3.3.1-1, "Protection System Sensors, Manual Action Switches, Signal Processors, and Actuation Devices," and the TS Bases (page B3.3.1-15 and Table B 3.3.1-1) as well as with FSAR Table 7.2-1 and FSAR Figure 7.2-5, with respect to rod cluster control assembly (RCCA) position, which was not included in Table 3.3.1-1 as a reactor protection sensor.

Table B 3.3.1-1, "Protection System Functional Dependencies," FSAR Table 7.2-1, "Reactor Trip Variables," and FSAR Figure 7.2-5, "Low DNBR," identify RCCA position as a monitored variable used as an input for the low DNBR protective function. However, RCCA position was not included as a sensor in TS Table 3.3.1-1. Resolution is required to demonstrate consistency of the proposed Technical Specification with the reactor protection design and licensing basis.

16-219

Confirm, in the Background portion of B 3.3.1, that the acceptable limits during accidents are such that the offsite dose shall be maintained within an acceptable fraction of [emphasis added] 10 CFR 100 limits, based on the probability of occurrence of the specific accident category. Revise the text accordingly, or justify the deviation.

The proposed wording on page B 3.3.1-4, third full paragraph, does not identify the need for margins to 10 CFR 100 limits, based on probability of occurrence of the specific accident. This appears to deviate from the Bases in NUREG-1431 (WOG STS p. B 3.3.1-3), which includes this provision.

16-220

Clarify what is meant by "associated instrumentation" in the Background portion of B 3.3.1, where it is stated that one type of module is "sensors, which include associated instrumentation." Describe the hardware and software boundaries for this type of module. Revise the text accordingly.

The reference to sensors and associated instrumentation appears on pp. B 3.3.1-4 and B 3.3.1-5. It was not evident what hardware or software would be included in this description. For example, state if this includes analog filters and analog-to-digital converters, or if these components are included in the remote acquisition units (RAUs) and / or the acquisition and processing units (APUs). Because the term "sensors" is used throughout the TS for LCOs and surveillance requirements, it is necessary to define the term actually included in this terminology.

16-221

Clarify the basis for processing data from "three or four" redundant divisions of APU outputs in the voter computers (ALUs). Confirm that this simply means that there are some protection functions implemented with three divisions rather than four, or provide an alternate explanation. Revise the text accordingly.

The conditions under which the ALUs would only process data from three divisions, rather than four, was not clear from the text on page B 3.3.1-7, fourth paragraph. As worded, it might suggest that one division could be ignored (vs. determined to have invalid data) and excluded from all processing. Or the description could imply that there are some protection functions implemented with three divisions rather than four, which is the case for a few components in Table 3.3.1-1.

16-222

Explain what is meant by the statement on page B 3.3.1-9, "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." Describe the complience with requirements for manual initiation identified in IEEE Std 603-1998. Revise the text accordingly.

IEEE Std 603-1998, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," Section 6.2, "Manual control," requires in part that "Means shall be provided in the control room to implement manual initiation at the division level of the automatically initiated protective actions." This is a fundamental functional and design requirement, which contains no consideration of priorities between automatic functions and manual system level initiation as suggested by the proposed Bases.

16-223

Describe the bases for LCOs and surveillance testing of the hardwired "AND" logic for reactor trip functions, and the hardwired "OR" logic for ESF actuation functions. Identify the specific LCO conditions and surveillance(s) that are credited for the instrumentation supporting these functions. Modify the text and Table 3.3.1-1, "Protection System Sensors, Manual Actuation Switches, Signal Processors, and Actuation Devices," as necessary to provide or clarify this information.

FSAR Figure 7.2-1, "Typical RT Actuation," and Figure 7.3-1, "Typical ESF Actuation," identify hardwired logic downstream of the ALUs. FSAR 7.2.2.2, Failure Modes and

Effects Analysis, notes that failures in the hardwired output logic are generally not detected automatically by the PS. This implies that the hardwired "AND" logic for reactor trip, the hardwired "OR" logic for ESF actuation functions, and other downstream logic require periodic surveillance. The specific LCO conditions and surveillances applicable to this instrumentation were not evident from the Bases or from Table 3.3.1-1.

16-224

The following are editorial and typographical errors discovered in the text of EPR GTS Section 3.3.

#1 On page B 3.3.1-6, second full paragraph, should be "Allowable Value,"not "Allowable Values."
#2 On page B 3.3.1-6, third full paragraph, should be "process transmitter," not "processing transmitter."
#3 On page B 3.3.1-9, last paragraph, should be "CRDM."

16-225

Delete the sentence, "Non-credited functions are purely equipment protective, and their use minimizes the potential for equipment damage."

The foregoing statement appears on page B 3.3.1-11. It is incorrect, because functions not credited in the accident analysis may also include, for example, anticipatory trips, control system functions, and other functions not considered equipment protective.

16-226

Confirm that in Modes 4 and 5, the protection system sensors, manual actuation switches, and specified actuation devices that support reactor trips are not required to be Operable, only if all rods are fully inserted, and only if the rod control system is placed in a configuration whereby inadvertent control rod withdrawal is precluded. Revise the text accordingly, to clarify the basis for not requiring that this instrumentation and devices be operable in Modes 4 & 5.

Page B 3.3.1-12 includes a statement that this instrumentation and devices are not required to be operable in Modes 4 & 5, and that the reactor is protected in these Modes by ensuring adequate shutdown margin. The statement needs to be clarified to confirm that the proposed basis is not less restrictive than similar bases in NUREG 1431 (WOG STS).

16-227

Correct as necessary the inequality signs associated with the limiting trip setpoints identified in Table 3.3.1-2.

In a few cases, the inequality sign associated with the proposed limiting trip setpoint (LTSP) was reversed. For example: the LTSP for reactor trip function 17, low steam

generator level, is shown as ≤ 20% narrow range, rather than ≥ 20% narrow range; the LTSP for reactor trip function 19 (high containment pressure) does not include an inequality sign.

16-228

Revise the Bases description of the low saturation margin reactor trip, to more closely reflect the accident analysis basis.

The Bases described for the low saturation margin trip (p. B 3.3.1-17, reactor trip no. 5) is presented as identical to the high core power level trip, but there is a significant difference. Per FSAR 7.2.1.2.4, "Reactor Trip on High Core Power Level or Low Saturation Margin," the high core power trip function calculates core thermal power from an enthalpy balance, using thermal hydraulic conditions. If saturation were to occur in a hot leg, this calculation would be invalid. This is a basis for the additional low saturation margin trip.

16-229

Clarify the means by which the emergency diesel generator start signals (LOOP and degraded voltage) are implemented in the protection system, and justify or otherwise explain the "NA" (not applicable) designation for minimum required divisions for functional capability, as presented in Table 3.3.1-2, "Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1." Revise the Technical Specifications and Bases accordingly.

Acquisition and processing functions, however implemented, would be required for emergency diesel generator (EDG) start signals and logic. In addition, Table 3.3.1-1 contradicts the Bases (p. 3.3.1-44, function 10, Emergency Diesel Generator), which states the following:

"The automatic EDG Start on Degraded Grid Voltage requires four divisions of the following processors to be OPERABLE in MODES 1, 2, 3, and 4 or when the associated EDG is required to be OPERABLE in accordance with
LCO 3.8.2, "AC Sources - Shutdown":

a. 6.9 kV voltage sensors,
b. APUs, and
c. ALUs

The Bases contains a similar statement (p. 3.3.1-44) for starting an EDG on a loss of offsite power (LOOP) condition.

The foregoing suggests that APUs and ALUs are involved in the processing of 6.9 kV bus voltage sensors, which appears contrary to the "NA" assignment in Table 3.3.1-2

16-230

Confirm that the continuous self-monitoring functions referenced in SR 3.3.1.7 will be verified during periodic functional tests, and that execution of the automatic tests will be

confirmed during plant operation. Revise the Bases and Technical Specifications accordingly.

The Bases for SR 3.3.1.7 identified Extended Self Tests performed at computer startup each cycle. This section also referenced (B 3.3.1 Reference 8) a general summary of features for continuous self-monitoring of the protection system. SR 3.3.1.7 was not applied to these self-monitoring features, nor was any other Surveillance Requirement evident for this purpose. If credit is taken for these features (for example, to perform channel checks or functional tests), then a means is required to confirm that these self-test features remain functional.

16-231

Provide the basis for the six hour delay permitted for entry into associated Conditions and Required Actions, when a sensor, manual actuation switch, signal processor, or actuation device is placed in an inoperable status solely for performance of required Surveillances.

Note 2 of the Surveillance Requirements stipulates 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."
The basis for Note 2 was not provided in the Bases for 3.3.1.

16-232

Revise the Bases to reference the versions or revisions of topical reports for which the Staff has issued an SER accepting the report.

The following references cited in the Bases for 3.3.1 were not versions accepted by the Staff via an SER:
a. Reference 4: ANP-10287, Incore Trip Setpoint and Transient Methodology for U.S. EPR, November 2007.
b. Reference 7: ANP-10271P, Revision 0, US EPR Nuclear Incore Instrumentation Systems Report, December 2006.
c. Reference 8: EMF-2341(P), Revision 1, Generic Strategy for Periodic Surveillance Testing of TELEPERM XS System in U.S. Nuclear Generating Stations, March 2000.

16-233

Provide a specific reference to the source document supporting the assertion that, 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, and that for the reactor trip functions, the vote is always modified toward actuation.

The foregoing assertion appears on page B 3.3.1-8, last paragraph. The supporting design and licensing basis was not evident in FSAR Chapter 7.

16-234

The EPR Bases, Section 3.3.2, SR 3.3.2.2 states that "the SOTshall 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." Additional information is needed to explain the intent of this statement because the PAM system contains monitoring instrumentation, not alarms, interlocks or trips.

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

16-235

The EPR Bases, Section 3.3.3, Applicability Section states that "this LCO is not applicable in MODE 4, 5, or 6. In these MODES, the unit is already subcritical and in the condition of reduced RCS energy. Under these conditions, considerable time is available to restore necessary instrument control Functions if control room instruments or control become unavailable." The Westinghouse STS states that "in MODES 4, 5,and 6, unit conditions are such that the likelihood of an event that would require PAM instrumetnation is low, therefore, the PAM instrumentation is not required to be OPERABLE in these MODEs." Provide a technical justification for the STS Bases statement not applying to the EPR design or revise the EPR Bases to reflect the wording in the STS.

This technical justification is need to ensure the accuracy and completeness of the EPR Bases and for consistency with amongst the GTS, STS, and PTS.

16-236

Confirm EPR EDG fuel oil capacity.

Confirm that 1350 gallons fuel oil tank capacity is sufficient for one EDG in each train to carry the alternate feed and operating loads for an entire division. The EPR GTS, SR 3.8.1.4, requires a minimum of 1350 gallons in each EDG day tank. This is required to ensure adequate fuel oil will be available.

Technical justification is needed to ensure the accuracy and completeness of the EPR GTS.

16-237

Provide additional information to confirm that the EPR EDG voltage acceptance criteria will result in acceptable voltage for all safety-related loads.

Surveillance Requirement 3.8.1.2 provided non-bracketed acceptance criteria for EDG steady state voltage and frequency indicating those values were applicable for all EPR sites. The BASES refers to American National Standards Institute Standard ANSI 84.1, Electric Power

Systems and Equipment - Voltage Ratings (60 Hz), as the reference for the acceptance for the permissible tolerances for voltage. ANSI C84.1 references National Electrical Manufacturers Association standard, NEMA MG-1, Motors and Generators. NEMA MG-1 provides minimum operating parameters specifically for motors and generators. NEMA MG-1 states that the acceptable voltage range is nominal voltage +/- 10% and the acceptable frequency range is 60 Hertz +/- 5%. However, NEMA MG-1 does not recognize using both extremes of voltage and frequency simultaneously. NEMA MG-1 does permit variations in both voltage and frequency if the total variation does not exceed a total of +/- 10 %. The applicant proposes to limit voltage to +5/- 10 % and limit frequency to +/- 2 %. This could result in a total negative variation of -12 % which is outside the total range permitted by NEMA MG-1. This is required to ensure that the safety related loads connected to the EDG will not require derating.

This technical justification is needed to ensure the accurace and completeness of the EPR GTS.

16-238

Provide a technical justification to explain the differences between the EPR GTS, EDG rating and the applicable STS.

The EPR GTS, SR 3.8.1.10 requires that the momentary voltage developed by the EDG following a full load rejection does not exceed 8280 V, which is 20% greater than rated voltage. The Westinghouse STS, SR 3.8.1.10 requires that the momentary voltage developed by the EDG following a full load rejection does not exceed 5000 V, which is 10% greater than rated voltage. Provide a technical justification for the higher (20%) voltage allowed for the EPR EDGS.

This technical justification is needed to ensure the accurace and completeness of the EPR GTS.

16-239

Provide additional information to verify the differences between the EPR GTS and the applicable STS.

Confirm that the EPR, EDG design supplied to EPR plants do not have an engine mounted fuel oil tank. If there is an engine mounted tank, an EPR GTS, Section 3.8 will require a SR to check and remove water from the EDG engine mounted fuel oil tank.

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

16-240

Provide additional information to justify differences between the EPR GTS, Sections 5.2.2.d and 5.2.2.f and the applicable STS.

Confirm that the responsibilities and organizational title change to "Senior Operator and the Operator" in the EPR GTS, Sections 5.1, 5.2, and 5.3 have not changed the structure of

command from the previous NRC designations of Senior Reactor Operator and Reactor Operator.

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

16-241

Provide rationale for omitting COLR limitations on the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature and pressurizer pressure from the EPR GTS, Section 2.1.1.

The EPR GTS, Section 2.1.1, Reactor Core SLs, COLR limitations on the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature and pressurizer pressure are not delineated in the technical specification. (Note: The EPR Bases, Section B 2.1.1 also discusses COLR requirements.)

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

16-242

Provide the additional information or changes to the EPR GTS, LCO 3.0.6 to make it consistent with the applicable STS.

The EPR Bases, LCO 3.0.6 first sentence of the first paragraph currently states that " LCO 3.0.6 establishes an exception to LCO 3.0.2 for support systems that have an LCO specified in the Technical Specifications (TS)." This sentence should read: "LCO 3.0.6 establishes an exception to LCO 3.0.2 for support systems that have a support system LCO specified in the Technical Specifications (TS)" to remain consistent with the applicable Bases for Westinghouse STS.

The EPR Bases, LCO 3.0.6 fourth paragraph has been edited to insert a new paragraph opening between the second and third sentences. The inserted paragraph should be added after the original fourth paragraph so that the intended meaning behind the fourth paragraph in the applicable bases of the Westinghouse STS remains intact.

Provide a technical justification for not including the Westinghouse STS Bases three Loss of Safety Function conditions a, b, & c and the respective three examples provided in NUREG-1431, Bases document (pg B3.0-8) in the EPR Bases.

Provide a technical justification for not including the Westinghouse STS Bases Figure B 3.0-1, Configuration of Trains and Systems, provided in NUREG-1431, Bases document (pg B3.0-9) in the EPR Bases.

This additional information, technical justifications, and revision are needed to ensure the accuracy and completeness of the EPR Bases and consistency amongst the GTS, STS, and PTS.