ArevaEPRDCPEm Resource

From: Getachew Tesfaye
Sent: Friday, October 31, 2008 7:07 AM
To: Joseph DeMarshall; Michael Marshall; Peter Hearn; Joseph Colaccino; John Rycyna
Subject: FW: Response to U.S. EPR Design Certification Application RAI No. 74, FSAR Ch 16
Attachments: RAI 74 Response US EPR DC.pdf

From: WELLS Russell D (AREVA NP INC) [mailto:Russell.Wells@areva.com]
Sent: Thursday, October 30, 2008 4:46 PM
To: Getachew Tesfaye
Cc: John Rycyna; Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 74, FSAR Ch 16

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 74 Response US EPR DC.pdf " provides technically correct and complete responses to 49 of the 53 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 74 Questions 16-6, 16-7, 16-8, 16-9, 16-14, 16-17, 16-19, 16-27, 16-32, 16-34, 16-36, 16-39, 16-41, 16-42, 16-43, 16-44, 16-47, and 16-51.

The following table provides the page(s) in the response document, "RAI 74 Response US EPR DC.pdf " containing the response to each question.

Question #	Start Page	End Page
RAI 74 — 16-1	2	4
RAI 74 — 16-2	5	5
RAI 74 — 16-3	6	6
RAI 74 — 16-4	7	7
RAI 74 — 16-5	8	8
RAI 74 — 16-6	9	9
RAI 74 — 16-7	10	10
RAI 74 — 16-8	11	12
RAI 74 — 16-9	13	13
RAI 74 — 16-10	14	14
RAI 74 — 16-11	15	16
RAI 74 — 16-12	17	18
RAI 74 — 16-13	19	19
RAI 74 — 16-14	20	20
RAI 74 — 16-15	21	21
RAI 74 — 16-16	22	22
RAI 74 — 16-17	23	23
RAI 74 — 16-18	24	26
RAI 74 — 16-19	27	27
RAI 74 — 16-20	28	29
RAI 74 — 16-21	30	30
RAI 74 — 16-22	31	32
RAI 74 — 16-23	33	34

RAI 74 — 16-24	35	35
RAI 74 — 16-25	36	37
RAI 74 — 16-26	38	39
RAI 74 — 16-27	40	41
RAI 74 — 16-28	42	43
RAI 74 — 16-29	44	45
RAI 74 — 16-30	46	46
RAI 74 — 16-31	47	47
RAI 74 — 16-32	48	48
RAI 74 — 16-33	49	50
RAI 74 — 16-34	51	51
RAI 74 — 16-35	52	52
RAI 74 — 16-36	53	53
RAI 74 — 16-37	54	54
RAI 74 — 16-38	55	55
RAI 74 — 16-39	56	56
RAI 74 — 16-40	57	58
RAI 74 — 16-41	59	59
RAI 74 — 16-42	60	60
RAI 74 — 16-43	61	61
RAI 74 — 16-44	62	62
RAI 74 — 16-45	63	63
RAI 74 — 16-46	64	64
RAI 74 — 16-47	65	65
RAI 74 — 16-48	66	66
RAI 74 — 16-49	67	67
RAI 74 — 16-50	68	68
RAI 74 — 16-51	69	70
RAI 74 — 16-52	71	71
RAI 74 — 16-53	72	74

A complete answer is not provided for 4 of the 53 questions. The schedule for a technically correct and complete response to this question is provided below.

Question #	**Response Date**
RAI 74 — 16-24	February 5, 2009
RAI 74 — 16-28	February 5, 2009
RAI 74 — 16-29	December 17, 2008
RAI 74 — 16-31	December 17, 2008

Sincerely,

(Russ Wells on behalf of)

Ronda Pederson

ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
AREVA NP, Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694

Cell: 434-841-8788

From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, September 30, 2008 8:14 AM
To: ZZ-DL-A-USEPR-DL
Cc: Joseph DeMarshall; Michael Marshall; Peter Hearn; Joseph Colaccino; John Rycyna
Subject: U.S. EPR Design Certification Application RAI No. 74 (953), FSAR Ch16

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 9, 2008, and on September 29, 2008, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 190

Mail Envelope Properties (Getachew.Tesfaye@nrc.gov20081031070700)

Subject: FW: Response to U.S. EPR Design Certification Application RAI No. 74, FSAR Ch 16
Sent Date: 10/31/2008 7:07:11 AM
Received Date: 10/31/2008 7:07:00 AM
From: Getachew Tesfaye

Created By: Getachew.Tesfaye@nrc.gov

Recipients:
"Joseph DeMarshall" <Joseph.DeMarshall@nrc.gov>
Tracking Status: None
"Michael Marshall" <Michael.Marshall@nrc.gov>
Tracking Status: None
"Peter Hearn" <Peter.Hearn@nrc.gov>
Tracking Status: None
"Joseph Colaccino" <Joseph.Colaccino@nrc.gov>
Tracking Status: None
"John Rycyna" <John.Rycyna@nrc.gov>
Tracking Status: None

Post Office:

Files	**Size**	**Date & Time**
MESSAGE	4524	10/31/2008 7:07:00 AM
RAI 74 Response US EPR DC.pdf	318242	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 74 (953), Revision 0

9/30/2008

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

Question 16-1:

Tech Spec 3.8.1 AC Sources - Operating

Explain omission of the surveillance requirement for verifying the interval between each sequenced load block (for the load sequencier function) from the EPR SRs.

WOG SR 3.8.1.18 (Emergency Load Sequencer interval verification between each sequenced load block) is omitted from the EPR SRs.

a. 3.8.1 EPR Bases "Background" section states:

> "Following the trip of offsite power, the Protection System strips non permanent loads from the ESF bus. When the EDG is tied to the ESF bus, loads are then sequentially connected to its respective bus by the Protection System. The sequencing logic prevents overloading the EDG".

b. 3.8.1 EPR Bases "LCO" section states:

> "Proper sequencing of loads is a required function for EDG Operability".

c. WOG SR 3.8.1.18 Bases states:

> "Under accident [and loss of offsite power] conditions, loads are sequentially connected to the bus by the [automatic load sequencer]. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The [10]% load sequence time interval tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated."

Information required in order to ensure that a surveillance requirement designed to prevent diesel overloading during auto load sequencing is not missed.

Response to Question 16-1:

In existing plants, which form the basis for the Standard Technical Specifications for Westinghouse Plants (NUREG-1431), there is a separate physical component called a load sequencer, which includes relays and time delay circuits. The functionality of the associated physical components can degrade over time and, hence, a surveillance is required as part of the Electrical section of the Technical Specifications to periodically verify the operability of the function. The U.S. EPR does not have such a component. The load sequencing function is performed by the instrumentation and control (I&C) Protection System.

As described in U.S. EPR FSAR Tier 2, Section 7.3.1.2.12, *Emergency Diesel Generator (EDG) Actuation*:

> “In general, smaller loads that were energized before the loss of power automatically restart when power from the EDG becomes available. This functionality is provided by the PAC modules associated with each actuator. Large electrical loads are sequenced onto the EPSS according to diesel load steps (DLS) to maintain EDG output voltage and

> frequency reductions within acceptable limits. The PS performs the DLS functionality by maintaining an "off" signal to the actuators, and then removing the signal to a subset of actuators at each load step which allows them to be re-started."

Specifically, the software within the actuator logic units (ALU) will control the timing of electrical loads being sequenced on the EDG after a loss of offsite power. Thus, load sequencing is basically a software controlled function where loads are only allowed to be placed on the EDGs after specific conditions are met. The surveillance testing of the protection system (PS) is specified in U.S. EPR Technical Specification Section 3.3.1, *Protection System*. The software utilized by the PS is highly reliable. In addition, the U.S. EPR PS is designed with self-diagnostic test features to detect both hardware and software faults and assist in diagnostic and repair activities. The integrity of the software is checked cyclically as part of the processor self-monitoring programs. An Extended Self Test (U.S. EPR FSAR Tier 2, Chapter 16, Surveillance Requirement 3.3.1.7) is performed every cycle, which includes a verification of the operating system. Therefore, no additional Technical Specification surveillance tests are required for the load sequencing function.

Appropriate surveillance requirements for the ALUs are included within Limiting Conditions for Operation (LCO) 3.3.1. In addition, LCO 3.3.1 requires the PS to maintain the EDG Start on Degraded Grid Voltage function operable in Modes 1 through 4 or any time the associated EDG is required to be operable per LCO 3.8.2, AC Sources - Shutdown.

With regards to LCO 3.8.1:

- U.S. EPR Surveillance Requirement 3.8.1.11 demonstrates the as-designed operation of the standby power sources during loss of the offsite source. This test verifies actions encountered from the loss of offsite power (LOOP), including shedding of the nonessential loads and energization of the emergency buses and respective loads from the EDG. It further demonstrates the capability of the EDG to automatically achieve the required voltage and frequency within the specified time. This surveillance satisfies Revision 4 of Regulatory Guide 1.9, "Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants," Section 2.2.5, *LOOP Test*.
- U.S. EPR Surveillance Requirement 3.8.1.18 demonstrates that each EDG starts on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated safety injection system actuation signal and permanently connected and auto-connected emergency loads are supplied for greater than or equal to five minutes. This surveillance satisfies Revision 4 of Regulatory Guide 1.9, "Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants," Section 2.2.6, *Combined SIAS and LOOP Test*.

In summary, the surveillance requirement for verifying the interval between each sequenced load block (for the load sequencer function) has not been inadvertently omitted from the U.S. EPR Technical Specifications. The necessary surveillance requirements for the PS, which performs the load sequencing function, are included in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification 3.3.1 and appropriate electrical system testing is included in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification 3.8.1. The location and content of these surveillances more appropriately reflects how and where functions are performed by the U.S. EPR when compared to the plants that are reflected in the Standard Technical Specifications for Westinghouse Plants.

FSAR Impact:

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

Question 16-2:

Tech Spec 3.8.1 AC Sources - Operating

Explain 5% versus 10% difference in steady state voltage upper limit.

EPR SR 3.8.1.12.b specifies a steady state voltage upper limit of 7260 V which is 5% above rated voltage (6900 V). WOG SR 3.8.1.12.b specifies a steady state upper limit of 10% above rated voltage. Lower limits are 90% of rated voltage for both EPR and WOG STSs. Provide a discussion in the EPR Bases regarding the 5% difference.

Additional information required in order to ensure EDG Operability is not adversely impacted by failing to perform surveillance testing requiring adherence to a tighter band of +/-5% as opposed to the existing + 5% and -10%.

Response to Question 16-2:

As stated on U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases Page B 3.8.1-13:

> "Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of 6210 V is 90% of the nominal 6.9 kV output voltage. This value, which is specified in ANSI C84-1, allows for voltage drop to the terminals of 6600 V motors whose minimum operating voltage is specified as 90% or 5940 V. It also allows for voltage drops to motors and other equipment down through the 120 V level where minimum operating voltage is also usually specified as 90% of name plate rating. The specified maximum steady state output voltage of 7260 V is equal to the maximum operating voltage specified for 6600 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 6600 V motors is no more than the maximum rated operating voltages."

The maximum operating voltage is specified as 110% of the motor rating of 6600 volts (i.e., 6600 V x 1.1 = 7260 V).

FSAR Impact:

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

Question 16-3:

Tech Spec 3.8.1 AC Sources - Operating

Explain 5% versus 10% difference in steady state voltage upper limit.

EPR SR 3.8.1.11.c.3 specifies a steady state voltage upper limit of 7260 V which is 5% above rated voltage (6900 V). WOG SR 3.8.1.11.c.3 specifies a steady state upper limit of 10% above rated voltage. Lower limits are 90% of rated voltage for both EPR and WOG STSs. Provide a discussion in the EPR Bases regarding the 5% difference.

Additional information required in order to ensure EDG Operability is not adversely impacted by failing to perform surveillance testing requiring adherence to a tighter band of +/-5% as opposed to the existing + 5% and -10%.

Response to Question 16-3:

See the response to Question 16-2.

FSAR Impact:

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

Question 16-4:

Tech Spec 3.8.1 AC Sources - Operating

Explain 5% versus 10% difference in steady state voltage upper limit.

EPR SR 3.8.1.18.c.3 specifies a steady state voltage upper limit of 7260 V which is 5% above rated voltage (6900 V). WOG SR 3.8.1.19.c.3 specifies a steady state upper limit of 10% above rated voltage. Lower limits are 90% of rated voltage for both EPR and WOG STSs. Provide a discussion in the EPR Bases regarding the 5% difference.

Additional information required in order to ensure EDG Operability is not adversely impacted by failing to perform surveillance testing requiring adherence to a tighter band of +/-5% as opposed to the existing + 5% and -10%.

Response to Question 16-4:

See the response to Question 16-2.

FSAR Impact:

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

Question 16-5:

Tech Spec 3.8.1 AC Sources - Operating

EPR SR 3.8.1.9.b specifies a steady state voltage upper limit of 7260 V which is 5% above rated voltage (6900 V). WOG SR 3.8.1.9.b specifies a steady state upper limit of 10% above rated voltage. Lower limits are 90% of rated voltage for both EPR and WOG STSs. Provide a discussion in the EPR Bases regarding the 5% difference.

Explain 5% versus 10% difference in steady state voltage upper limit.

Additional information required in order to ensure EDG Operability is not adversely impacted by failing to perform surveillance testing requiring adherence to a tighter band of +/-5% as opposed to the existing + 5% and -10%.

Response to Question 16-5:

See the response to Question 16-2.

FSAR Impact:

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

Question 16-6:

Tech Spec 3.8.1 AC Sources - Operating

Reformat the NOTE associated with Required Action B.4 in accordance with Tech Spec Writer's Guide TSF-GG-05-01, Section 2.1.4.

NOTE placement and width incorrect for the NOTE pertaining to Required Action B.4.

Response to Question 16-6:

The NOTE associated with Required Action B.4 will be reformatted in accordance with TSF-GG-05-01, Writer's Guide for Plant-Specific Improved Technical Specifications, Section 2.1.4.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.1 “AC Sources - Operating,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-7:

Tech Spec 3.8.1 AC Sources - Operating

Validate EPR SR 3.8.1.9.a "Single largest load rejection" frequency value of 64.5 Hz.

EPR SR 3.8.1.9.a for "Single largest load rejection" specifies a frequency value of 64.5 Hz. WOG SR 3.8.1.9.a frequency is 63 Hz. EPR Bases and Reg Guide 1.9 both state:

> "During recovery from transients caused by disconnection of the largest single load, the speed of the diesel generator should not exceed the nominal speed plus 75 percent of the difference between nominal speed and the overspeed trip set point, or 115 percent of nominal (whichever is lower)."

Information required in order to ensure that the frequency requirement following load rejection (single largest load) is conservative when evaluating diesel operability.

Response to Question 16-7:

The purpose of U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Surveillance Requirement 3.8.1.9 is to demonstrate the Emergency Diesel Generator (EDG) load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency while maintaining a specified margin to the overspeed trip. The margin to the overspeed trip, as stated in the NRC question, is specified in Regulatory Guide 1.9 as EDG nominal speed plus a percentage (75%) of the difference between nominal speed and the overspeed trip setpoint, with an upper limit of 115% of the nominal speed. Since EDG frequency is proportional to speed, the maximum frequency resulting from an increase in EDG speed caused by a load rejection of the single largest load can be calculated. However, the frequency achieved at this highest allowable speed may exceed the frequency limits on equipment powered by the EDG. The Standard Technical Specifications for Westinghouse Plants (NUREG - 1431) specifies a value of 63 Hz (105% of nominal frequency), which is a generally accepted upper frequency limit for electrical components. ANSI C50.41 – 2000 “American National Standard for Polyphase Induction Motors for Power Generating Stations” has a requirement for motors to operate successfully under running conditions at rated load with variation in frequency of plus 5 percent of rated frequency.

The value for frequency resulting from the rejection of the largest single load on the EDGs will be revised to 63 Hz (105% of nominal frequency) to allow use of electrical equipment designed to industry standards.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.1 “AC Sources - Operating,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-8:

Tech Spec 3.8.1 AC Sources - Operating

Justify omission of Mode Restriction information from EPR Surveillance Requirement 3.8.1.8 and associated Bases.

EPR SR 3.8.1.8 omits the bracketed NOTE in WOG SR 3.8.1.8 which addresses Mode restrictions associated with performance of the surveillance. EPR Bases also omits a discussion explaining the purpose of the NOTE which is included as part of the corresponding WOG Bases.

Reviewer's NOTE in the WOG SR 3.8.1.9 Bases states that the Mode Restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the Restricted Modes can satisfy a specific set of criteria.

Explanation required based on the fact that the omitted information appears to be both relevant and applicable to EPR. Explanation to address the specifics of the Reviewer's NOTE in the Bases of WOG SR 3.8.1.9 when justifying omission of the Mode Restriction information from EPR SR 3.8.1.8.

Response to Question 16-8:

The Mode Restriction information associated with the performance of Surveillance Requirement 3.8.1.8 will be incorporated into the surveillance and the associated Bases.

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Surveillance Requirement 3.8.1.8 will be revised to add a note as follows:

> "NOTE This Surveillance shall not normally be performed in MODE 1 or 2. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR."

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases for Surveillance Requirement 3.8.1.8 will be revised to add the following information:

> "This SR is modified by a Note. The reason for the Note is that, during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILTY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and

startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR."

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.1 "AC Sources - Operating," and Bases B 3.8.1 "AC Sources - Operating," will be revised as described in the response and as indicated on the enclosed markups.

Question 16-9:

Tech Spec 3.8.1 AC Sources - Operating

Explain omission of surveillance requirement from EPR SR 3.8.1.12 for verifying energization of emergency loads via auto load sequencing and omission of the auto load sequencing discussion from the associated EPR Bases.

EPR SR 3.8.1.12 does not include a step similar to WOG SR 3.8.1.12.e for verifying that emergency loads are energized or auto-connected via automatic load sequencing from offsite power. EPR Bases omits the discussion contained in WOG Bases 3.8.1.12 associated with the energization of emergency loads from the offsite electrical power system on an ESF signal without a loss of offsite power.

Information required in order to ensure that a surveillance requirement associated with the automatic load sequencing function is not missed for emergency loads energized via the offsite power system following a Safety Injection System actuation signal.

Response to Question 16-9:

A step will be added to include SR 3.8.1.12.e and a description added to the associated Bases for verifying that emergency loads are energized from offsite power.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.1 “AC Sources - Operating,” and Bases B 3.8.1 “AC Sources - Operating,” will be revised as described in the response and as indicated on the enclosed markups.

Question 16-10:

Tech Spec 3.8.1 AC Sources - Operating

Explain 5% versus 10% difference in steady state voltage upper limit.

EPR SR 3.8.1.15.b specifies a steady state voltage upper limit of 7260 V which is 5% above rated voltage (6900 V). WOG SR 3.8.1.15.b specifies a steady state upper limit of 10% above rated voltage. Lower limits are 90% of rated voltage for both EPR and WOG STSs. No discussion in the EPR Bases regarding the 5% difference.

Additional information required in order to ensure EDG Operability is not adversely impacted by failing to perform surveillance testing requiring adherence to a tighter band of +/-5% as opposed to the existing + 5% and -10%.

Response to Question 16-10:

See the response to Question 16-2.

FSAR Impact:

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

Question 16-11:

Tech Spec 3.8.1 AC Sources - Operating

Justify omission of Mode Restriction information from EPR Surveillance Requirement 3.8.1.10 and associated Bases.

EPR SR 3.8.1.10 omits bracketed NOTE 1 in WOG SR 3.8.1.10 which addresses Mode restrictions associated with performance of the surveillance. EPR Bases also omits the discussion which is included as part of the corresponding WOG Bases.

Reviewer's NOTE in the WOG SR 3.8.1.10 Bases states that the Mode Restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the Restricted Modes can satisfy a specific set of criteria.

Explanation required based on the fact that the omitted information appears to be both relevant and applicable to EPR. Explanation to address the specifics of the Reviewer's NOTE in justifying omission of the Mode Restriction information.

Response to Question 16-11:

The reviewer's note in the Standard Technical Specifications for Westinghouse Plants (NUREG-1431) Bases for Surveillance Requirement 3.8.1.10 indicates the mode restrictions may be deleted if it can be demonstrated to the staff that performing the surveillance requirement with the reactor in any of the restricted modes can satisfy the following criteria:

a) Performance of the surveillance requirement will not render any safety system or component inoperable,

b) Performance of the surveillance requirement will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems, and

c) Performance of the surveillance, or failure of the surveillance requirement, will not cause, or result in, an anticipated operational occurrence (AOO) with attendant challenge to plant safety systems.

AREVA has evaluated this surveillance requirement against these criteria and concluded the following:

- Performance of surveillance requirement 3.8.1.10 requires synchronizing, paralleling and loading the emergency diesel generator (EDG) with the offsite power source (via the associated emergency power supply system (EPSS) 6.9 kV bus) and then tripping the EDG output circuit breaker when full load has been achieved and verifying the EDG does not trip upon loss of the load.

- Operation of the EDG in parallel with the offsite power supply to perform surveillance requirement 3.8.1.10 is similar to performance of the monthly surveillance requirement 3.8.1.3, which does not have any mode restrictions. Additionally, the amount of time required for the EDG to be paralleled to the offsite power source for performance of

surveillance requirement 3.8.1.10 is much less than the time the EDG is paralleled when performing the monthly test required per surveillance requirement 3.8.1.3. Therefore, the performance of surveillance requirement 3.8.1.10 does not render any safety system or component inoperable beyond what is already allowed during monthly EDG surveillance testing.

- Two types of electrical distribution system perturbations are considered for performing surveillance requirement 3.8.1.10 without mode restrictions. The first is the potential of grid disturbances during the performance of the test. The potential for the occurrence of a grid disturbance during the relatively short period that the EDG is in parallel with offsite power per this surveillance requirement is remote. The occurrence of a grid disturbance is independent of testing performed as a result of this surveillance. Further, since there is only a remote probability that a grid disturbance will lead to EDG unavailability, the likelihood of an EDG being rendered unavailable as a result of a grid disturbance during testing is extremely remote. During the period the EDG is paralleled with offsite power, the remaining three EDGs are capable of mitigating design basis accident (DBA) or providing for safe shutdown of the unit. Additionally, during a DBA a safety injection signal will separate the EDG under test from offsite power and return it to standby condition running at rated speed and voltage.

  The second electrical distribution system perturbation considered is a voltage transient in the electrical distribution system when the EDG output circuit breaker is opened. Opening the EDG output circuit breaker during the performance of this surveillance separates the EDG from the emergency power supply system (EPSS) engineered safety feature buses and allows offsite power to continue to supply the bus. This evolution has little impact on plant loads. The EPSS equipment ratings (e.g., transformers, switchgear and circuit breakers) are sized to handle this load under normal and accident conditions. Industry experience shows that there is no significant electrical distribution system effect on the associated bus during a full load reject.

- Performance of surveillance requirement 3.8.1.10 has limited impact on the EPSS and does not challenge the system capability to mitigate a DBA. The testing is limited to a single EPSS division and EDG, and the performance or failure of the surveillance does not cause, or result in, an AOO or challenge plant safety systems. Failure of the surveillance is limited to the EDG under test becoming inoperable and any required actions taken as directed by plant technical specifications.

The proposed deviation from the Standard Technical Specifications for Westinghouse Plants mode restriction is justified based on the acceptable small risk associated with paralleling an EDG to offsite power for surveillance testing when considering the robust design features of the electrical distribution system and that three EDGs remain capable of mitigating a DBA and supporting safe shutdown of the nuclear power plant during the performance of this surveillance testing.

FSAR Impact:

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

Question 16-12:

Tech Spec 3.8.1 AC Sources - Operating

Explain 15-second EDG time requirement to achieve required voltage and frequency.

EPR SR 3.8.1.19.a specifies ≤ 15 seconds for each EDG to achieve required voltage and frequency upon a simultaneous start of the EDGs. Corresponding WOG SR 3.8.1.20.a specifies ≤ 10 seconds. Chapter 15 Table 15.0-8, Engineered Safety Features Functions Used in the Accident Analysis (Sheet 1 of 3), does not unequivocally specify the 15 second time requirement. The time delays listed in Table 15.0-8 for SIS Actuation Functions are 40 seconds for SIS delivery concurrent with a LOOP. EDG loading time is included in the 40 seconds.

Information required to:

1) Conclusively determine whether or not the 15 second start requirement supports the assumptions of the design basis LOCA analysis.
2) Conclusively validate the 15 second time requirement for achieving required voltage and frequency from the information provided in Chapter 15.

Response to Question 16-12:

In RAI 11, Question 08.03.01-15, the NRC previously requested AREVA address apparent discrepancies in the timing and sequencing of emergency diesel generator (EDG) loading between U.S. EPR FSAR Tier 2, Chapter 8 (Electric Power) and Chapter 15 (Transient and Accident Analyses). As stated by AREVA in the response to RAI 11, Question 08.03.01-15:

> "As indicated in U.S. EPR FSAR Tier 2, Section 8.3.1.1.5, in the Performance – Emergency Diesel Generators subsection and in U.S. EPR FSAR Chapter 16 Technical Specification Surveillance Requirement 3.8.1.7, the start-up time of an unloaded diesel generator, from the emergency start signal to nominal speed, rated generator frequency and voltage, is less than or equal to 15 seconds. Since the exact time of emergency diesel generator (EDG) output breaker closing may be less than 15 seconds, Note 13 in the U.S. EPR Tier 2, Section 8.3, Tables 8.3-4 through 8.3-7 indicates the timing sequence of each EDG load step group may be slightly different since the load sequence times are based on a Time = 0 equal to the EDG output breaker closing and not the EDG start signal.
>
> U.S. EPR FSAR Tier 2 Chapter 15 transient and accident analyses assume an EDG output breaker closing time of 15 seconds from the loss of offsite power (LOOP) condition. A review of U.S. EPR FSAR Tier 2 Chapter 15 found no timing inconsistency between U.S. EPR FSAR Tier 2 Chapter 15 and Tier 2 Chapter 8. A Safety Injection Signal (SIS) based on the parameter initiating the signal may not be the same time as the engineered safety feature component actuation. For example, U.S. EPR FSAR Tier 2, Section 15.6, Table 15.6-21—SBLOCA – Sequence of Events for 6.5 Inch Break with LOOP, indicates a reactor trip at approximately 4 seconds (initiation of LOOP). The SIS signal is generated at approximately 17 seconds. In this case the Medium Head Safety Injection (MHSI) pump breaker will close at 24 seconds (nominal), Low Head Safety-Injection pump breaker will close at 29 seconds (nominal), and so on as shown in the EDG load sequence based upon a maximum EDG start and ready to load time of 15 seconds. As shown in U.S. EPR FSAR Tier 2, Table 15.6-21, MHSI injection is not credited until 246 seconds into the event.

The EDG output breaker nominal closing time of 15 seconds following EDG start on LOOP signal is accurately reflected in the U.S. EPR FSAR and Tech Specs. This value is assumed in U.S. EPR transient and accident analyses as appropriate and bounds the credited safety function performance requirements. The EDG capability to provide power to the emergency power supply system buses in a loss of power condition is verified with U.S. EPR FSAR Tier 1, Section 2.5.1, ITAAC item 2.5.1.6.1."

The 15 second time from when the EDG receives a start signal to the closure of its output breaker is not explicitly discussed in Chapter 15 since it was not always explicitly modeled in the safety analysis as a discreet event. Instead, the safety analysis modeled the time between initiating events and the time when the Engineered Safety Features could start to perform their functions. However, in cases involving a loss of offsite power, the safety analysis models include the 15 seconds from when the EDG receives a start signal to the closure of its output breaker as part of the Engineered Safety Feature performance time.

FSAR Impact:

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

Question 16-13:

Tech Spec 3.8.1 AC Sources - Operating

Explain 15-second start time requirement for minimum voltage and frequency.

SR 3.8.1.7 EPR specifies a 15-second start time requirement for minimum voltage and frequency to be obtained. SR 3.8.1.7 WOG STS specifies a 10-second requirement. Chapter 15 Table 15.0-8, Engineered Safety Features Functions Used in the Accident Analysis (Sheet 1 of 3), does not unequivocally specify the 15 second time requirement. The time delays listed in Table 15.0-8 for SIS Actuation Functions are 40 seconds for SIS delivery concurrent with a LOOP. EDG loading time is included in the 40 seconds.

Information required to:

1) Conclusively determine whether or not the 15 second start requirement supports the assumptions of the design basis LOCA analysis.
2) Conclusively validate the 15 second time requirement for achieving required voltage and frequency from the information provided in Chapter 15.

Response to Question 16-13:

See the response to Question 16-12.

FSAR Impact:

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

Question 16-14:

Tech Spec 3.8.1 AC Sources - Operating

Provide Design-Based Justification for the 92-day SR Frequency for the fuel transfer systems .

Frequency established for EPR SR 3.8.1.6 is 92 days. The Frequency for this SR is variable, depending on individual system design, with up to a 92 day interval. The 92 day Frequency corresponds to the testing requirements for pumps as contained in the ASME Code for Operation and Maintenance of Nuclear Power Plants; however, the design of fuel transfer systems is such that pumps operate automatically or must be started manually in order to maintain an adequate volume of fuel oil in the day tanks during or following DG testing. In such a case, a 31 day Frequency is appropriate. Since proper operation of fuel transfer systems is an inherent part of DG OPERABILITY, the Frequency of this SR should be modified to reflect individual designs. EPR SR 3.8.1.6 Bases states that a 92-day frequency is appropriate considering the reliability and redundancies of the system.

Additional information required in order to determine which SR Frequency, 31-day or 92-day, is more appropriate based on the individual design of the Fuel Oil Transfer System.

Response to Question 16-14:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Surveillance Requirement 3.8.1.6 and the associated Bases will be revised to reflect a 31 day frequency.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.1 “AC Sources - Operating,” and Bases B 3.8.1 “AC Sources - Operating,” will be revised as described in the response and as indicated on the enclosed markups.

Question 16-15:

Tech Spec 3.8.1 AC Sources - Operating

Explain 5% versus 10% difference in steady state voltage upper limit.

EPR SR 3.8.1.2 specifies a steady state voltage upper limit of 7260 V which is 5% above rated voltage (6900 V). WOG SR 3.8.1.2 specifies a steady state upper limit of 10% above rated voltage. Lower limits are 90% of rated voltage for both EPR and WOG STSs. Provide a discussion in the EPR Bases regarding the 5% difference.

Additional information required in order to ensure EDG Operability is not adversely impacted by failing to perform surveillance testing requiring adherence to a tighter band of +/-5% as opposed to the existing + 5% and -10%.

Response to Question 16-15:

See the response to Question 16-2.

FSAR Impact:

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

Question 16-16:

Tech Spec 3.8.1 AC Sources - Operating

Explain and justify omission of Automatic Load Sequencers from LCO 3.8.1.

EPR STS LCO does not have a third condition "Charlie" for Automatic Load Sequencer Operability. Load sequencers condition is bracketed in both WOG STS and Bases:

> WOG STS - [c. Automatic load sequencers for Train A and Train B.]
>
> WOG Bases - [In addition, one required automatic load sequencer per train must be OPERABLE.]

3.8.1 EPR Bases "LCO" section states:

> "Proper sequencing of loads is a required function for EDG OPERABILITY."
>
> "Each EDG must be capable of accepting required loads within the assumed loading sequence intervals, and continue to operate until offsite power can be restored to the ESF buses."

3.8.1 EPR Bases "Background" section states:

> "Following the trip of offsite power, the Protection System strips nonpermanent loads from the ESF bus. When the EDG is tied to the ESF bus, loads are then sequentially connected to its respective bus by the Protection System. The sequencing logic prevents overloading the EDG".

Information required in order to fully understand the automatic load sequencing function as it relates to EDG operability and the Protection System. Although the auto load sequencing function is actually performed by the Protection System, there are no surveillance requirements in TS 3.3.1 to verify operability of the load sequencer. The load sequencing function is apparently verified under SR 3.8.1.11. If the load sequencer failed, the associated EDG would be rendered inoperable due to inability to successfully complete the SR. The fact that operability of the load sequencing function is neither included in or surveilled under Protection System LCO 3.3.1, as well as being excluded from AC Sources - Operating LCO 3.8.1, requires justification in order to clearly understand the operability issues as they relate to both LCOs. Additional information to include an explanation justifying why the LCO Condition for "Automatic Load Sequencer Inoperability" was omitted based on the "Reviewers Note" in Condition "F" of the WOG STS 3.8.1.

Response to Question 16-16:

See the response to Question 16-1.

FSAR Impact:

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

Question 16-17:

Tech Spec 3.8.1 AC Sources - Operating

Revise Required Action D.1 Condition reference.

Completion Time for Condition D.1 incorrectly references Condition "C" instead of "D".

Response to Question 16-17:

The Completion Time for Condition D.1 will be revised to reference Condition "D" instead of "C". No changes to the associated Bases discussion are required.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.1 “AC Sources - Operating,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-18:

Tech Spec 3.8.1 AC Sources - Operating

Enhance C.1/C.2 Bases discussion in order to provide a clearer understanding of how Required Actions C.1 and C.2 are able to ensure availability of sufficient standby AC sources to

1) power the minimum required ESF Functions, and
2) achieve completion of required safety functions following an AOO or postulated accident, regardless of which two diesels are inoperable.

C.1/C.2 Bases currently states that with one EDG in both divisional pairs inoperable and the alternate feeds not aligned, there may be no remaining standby AC sources for certain required safety systems, safety support systems, and components that do not have 100% four division redundancy. Bases goes on to state that completing Required Action C.1 restores the required redundancy in the AC power source for required safety systems, safety support systems, and components necessary to ensure completion of the safety function. Bases also states that if two diesels in one divisional pair are inoperable, the remaining operable divisional pair is capable of providing sufficient AC power to ensure the completion of all safety functions for a postulated accident in the absence of a single failure.

Although the Bases states that the onsite AC power system is able to ensure completion of required safety functions for different combinations of inoperable diesel pairs, it does not describe how this is done. From a safety system perspective, the Bases needs to clearly describe the individual system impact relative to the divisional pair concept when two diesels are inoperable, and the capabilities of the onsite AC power system to restore equipment power and functionality to each of these systems.

Bases enhancement is required in order to fully understand the onsite AC power system ability to accomplish completion of required safety functions following an AOO or postulated accident when two diesels are inoperable. Provide the necessary information in the Bases that demonstrates the onsite AC power systems ability to meet the required safety functions.

Response to Question 16-18:

The details regarding the safety analysis and assumptions regarding U.S. EPR operation with three operable emergency diesel generators (EDG) and the alternate feed aligned are provided in U.S. EPR FSAR Tier 2, Chapter 15 and Chapter 8.

With regards to the safety analysis, the assumptions regarding EDG availability are included, as appropriate, with each event. For example, U.S. EPR FSAR Tier 2, Section 15.6, addresses decrease in reactor coolant inventory events. U.S. EPR FSAR Tier 2, Section 15.6.1.2, *Methods of Analysis and Assumptions*, states:

> “The most reactive control rod is assumed not to insert at reactor trip (RT). A Loss of Offsite Power (LOOP) is assumed to occur with RT. Subsequent to an RT, the limiting single failure is taken as the failure of one emergency diesel generator (EDG), resulting in the unavailability of one train of pumped SIS (MHSI, LHSI, and EFWS). A second EDG is assumed to be under maintenance and therefore unavailable, causing a second train of pumped SIS to be unavailable.”

The electrical aspects are described in U.S. EPR FSAR Tier 2, Chapter 8. For example, U.S. EPR FSAR Tier 2, Section 8.1.2, *Onsite Power System Description*, states:

> "An alternate feed is provided from EPSS division 2 to EPSS division 1 to supply a standby source of power to required safety related systems, safety-related support systems, or components that do not have four 100 percent redundant trains when the EPSS division 1 EDG or certain portions of the EPSS division 1 electrical distribution system are not available. A similar alternate feed provides standby power to EPSS division 2, from EPSS division 1 when the EPSS division 2 EDG or certain portions of the EPSS division 2 electrical distribution system are not available. Similar alternate feeds are used between EPSS division 3 and EPSS division 4. Implementation of the alternate feed is completed manually to satisfy single failure criteria when certain electrical components, including EDGs, are out of service.
>
> Each EDG automatically starts and connects to its EPSS 6.9 kV switchgear when a loss of power or a degraded voltage condition is detected at the respective division supply bus. An automatic start will also occur if a safety injection signal (SIS) is initiated from the protection system. The required safety-related loads are automatically sequenced onto the EDG when the generator has obtained nominal speed and voltage, and a loss of voltage or a degraded voltage signal is received. Each EDG has the capacity and capability to power the required safety-related loads when an alternate feed is implemented between divisions."

U.S. EPR FSAR Tier 2, Section 8.3.1.1.1, *Emergency Power Supply System*, states:

> "EPSS divisions are functionally independent and physically separated from the others during normal bus alignments. An alternate feed is provided between EPSS divisions 1 and 2 (first divisional pair) to provide the normal and standby source of power to required safety-related systems, safety-related support systems, or components that do not have the required redundancy when certain electrical components, including the division 1 emergency diesel generator (EDG), are out of service. A similar alternate feed provides standby power to EPSS division 2, from division 1 when certain electrical components, including the division 2 EDG are out of service. Similar alternate feeds are used between divisions 3 and 4 (second divisional pair)."

U.S. EPR FSAR Tier 2, Section 8.3.1.2.4, *Compliance with GDC 17*, states:

> "The EPSS has four divisions, normally powered from the preferred power source, each with an independent and redundant EDG assigned to their respective switchgear 31BDA, 32BDA, 33BDA, and 34BDA. The EPSS divisions combine to make two divisional pairs. Division 1 and 2 constitute the first divisional pair while Divisions 3 and 4 constitute the second divisional pair. The EPSS safety-related loads are separated between the divisional pairs and a loss of one divisional pair will not prevent the minimum safety-related functions from being performed.
>
> The four EPSS divisions are normally functionally independent and physically separated from each other. During periods a standby power source is out of service, or other similar maintenance activities, alternate feeds are provided between Division 1 and Division 2 or between Divisions 3 and Division 4 as appropriate for the out-of service EDG. The alternate feed configuration, consistent with separating the safety related loads between divisional

pairs, maintains the plant capability to complete safety-related functions coincident with a single failure."

Details regarding the engineered safety features systems are provided in U.S. EPR FSAR Tier 2, Section 7.3. As an illustrative example, the chemical and volume control system (CVCS) isolation for anti-dilution function is described in U.S. EPR FSAR Tier 2, Section 7.3.1.2.11. The functional logic for this feature is shown in U.S. EPR FSAR Tier 2, Figure 7.3-22. As shown in the figure, component actuation is only performed through Divisions 1 and 4. If the Division 1 and 4 EDGs were inoperable and an alternate feed not aligned, there would be no remaining standby AC sources to mitigate a postulated inadvertent boron dilution event (as described in U.S. EPR FSAR Tier 2, Section 15.4.6). Establishing the alternate feed in either divisional pair (Divisions 1 and 2 or Divisions 3 and 4) would restore power to the safety function.

The level of detail contained in the U.S. EPR Technical Specification Bases is consistent with the level of design detail provided in the Standard Technical Specifications for Westinghouse Plants.

FSAR Impact:

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

Question 16-19:

Tech Spec 3.8.1 AC Sources - Operating

Reformat NOTE associated with Required Action C.1 in accordance with Tech Spec Writer's Guide TSF-GG-05-01, Section 2.1.4.

NOTE placement and width incorrect for the NOTE pertaining to Required Action C.1.

Response to Question 16-19:

The NOTE associated with Required Action C.1 will be reformatted in accordance with Technical Specification Writer's Guide TSF-GG-05-01, Section 2.1.4.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.1 “AC Sources - Operating,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-20:

Tech Spec 3.8.1 AC Sources - Operating

Justify 15-second EDG energization time requirement on an actual or simulated LOOP. Clarify whether the 15 seconds is for the "energization of permanently connected loads" or the time requirement for achieving required voltage and frequency.

EPR SR 3.8.1.11.c.1 specifies </= 15 seconds for ENERGIZATION OF PERMANENTLY CONNECTED LOADS on an actual or simulated LOOP. WOG SR specifies </= 10 seconds. EPR 3.8.1.11 Bases states: "The EDG autostart time of 15 seconds is derived from requirements of the accident analysis to respond to a postulated large break LOCA."

Chapter 15 Table 15.0-8, Engineered Safety Features Functions Used in the Accident Analysis (Sheet 1 of 3), does not unequivocally specify the 15 second time requirement. The time delays listed in Table 15.0-8 for SIS Actuation Functions are 40 seconds for SIS delivery concurrent with a LOOP. EDG loading time is included in the 40 seconds.

Information required to:

1) Clarify whether the 15 seconds is for the "energization of permanently connected loads" as stated in SR 3.8.1.11.a or the time requirement for achieving required voltage and frequency, based on the 40 second diesel loading time specified in Table 15.0-8.
2) Conclusively determine whether or not the 15 second start requirement supports the assumptions of the design basis LOCA analysis.
3) Conclusively validate the 15 second time requirement from the information provided in Chapter 15.

Response to Question 16-20:

See the response to Question 16-12.

In addition, U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Surveillance Requirement 3.8.1.11 satisfies the acceptance criteria for the applicable loss of offsite power (LOOP) portion of RG 1.9, Revision 4, *Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants*. Table 1 of RG 1.9 shows that the LOOP test corresponds to IEEE 387, *IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations*, Clause 7.5.4, which states:

> “Demonstrate by simulating a loss of offsite power that:
>
> a) The emergency buses are de-energized and the loads are shed from the emergency buses.
>
> b) The diesel-generator unit starts on the auto-start signal from its standby conditions, attains the required voltage and frequency within acceptable limits and time, energizes the auto-connected shutdown loads through the load sequencer, and operates for a minimum of 5 min.”

RG 1.9, Section 2.2.5, *LOOP Test,* states that Clause 7.5.4 of IEEE Standard 387-1995 should be supplemented as follows:

> "This test involves simulating a LOOP to demonstrate that (1) the emergency buses are deenergized and the loads are shed from the emergency buses, and (2) the emergency diesel generator starts on the autostart signal from its standby conditions; attains the required voltage and frequency, and energizes permanently connected loads within acceptable limits and time; energizes all autoconnected shutdown loads through the load sequencer; and operates for greater than or equal to 5 minutes. If the required safety loads are not available, one or more equivalent load(s) may be used."

The wording of the U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Surveillance Requirement and associated Bases regarding the acceptance criteria for this surveillance is consistent with the wording of the Standard Technical Specifications for Westinghouse Plants (NUREG-1431).

FSAR Impact:

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

Question 16-21:

Tech Spec 3.8.1 AC Sources - Operating

Explain the 15-second time requirement for achieving required voltage and frequency upon receipt of an actual or simulated Safety Injection System Actuation signal.

EPR SR 3.8.1.12.a specifies </= 15 seconds for achieving required voltage and frequency upon receipt of an actual or simulated Safety Injection System Actuation Signal. WOG SR specifies </= 10 seconds. Chapter 15 Table 15.0-8, Engineered Safety Features Functions Used in the Accident Analysis (Sheet 1 of 3), does not unequivocally specify the 15 second time requirement. The time delays listed in Table 15.0-8 for SIS Actuation Functions are 40 seconds for SIS delivery concurrent with a LOOP. EDG loading time is included in the 40 seconds.

Information required to:

1) Conclusively determine whether or not the 15 second start requirement supports the assumptions of the design basis LOCA analysis.
2) Conclusively validate the 15 second time requirement for achieving required voltage and frequency from the information provided in Chapter 15.

Response to Question 16-21:

See the response to Question 16-12.

FSAR Impact:

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

Question 16-22:

Tech Spec 3.8.1 AC Sources - Operating

Justify omission of Mode Restriction information from EPR Surveillance Requirement 3.8.1.12 and associated Bases.

EPR SR 3.8.1.12 omits NOTE 2 in WOG SR 3.8.1.12 which addresses Mode Restrictions associated with performance of the surveillance. EPR Bases also omits the Mode Restriction discussion which is included as part of the corresponding WOG Bases.

Reviewer's NOTE in the WOG SR 3.8.1.9 Bases states that the Mode Restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the Restricted Modes can satisfy a specific set of criteria.

Explanation required based on the fact that the omitted information appears to be both relevant and applicable to EPR. Explanation to address the specifics of the Reviewer's NOTE in the Bases of WOG SR 3.8.1.9 when justifying omission of the Mode Restriction information from EPR SR 3.8.1.12.

Response to Question 16-22:

The reviewer's note in the Standard Technical Specifications (STS) for Westinghouse Plants Bases for Surveillance Requirement 3.8.1.9 indicates the mode restrictions may be deleted if it can be demonstrated to the staff that performing the surveillance requirement with the reactor in any of the restricted modes can satisfy the following criteria:

- Performance of the surveillance requirement will not render any safety system or component inoperable,
- Performance of the surveillance requirement will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems, and
- Performance of the surveillance, or failure of the surveillance requirement, will not cause, or result in, an anticipated operational occurrence (AOO) with attendant challenge to plant safety systems.

AREVA has evaluated this surveillance requirement against these criteria and concluded the following:

- Operation of the Emergency Diesel Generator (EDG) to perform Surveillance Requirement 3.8.1.12 is limited to an automatic fast start to standby conditions from an actual or simulated safety injection system actuation signal. This surveillance requirement does not require paralleling the EDG with offsite power, nor does this test require verification of load sequencing. There is no load shedding during the performance of this surveillance requirement. Test performance requires verification that the permanently connected loads remain energized from the offsite power supply. Since there in no load shedding or no sequencing of loads, or connection of the EDG to the emergency power supply system (EPSS), there is no impact to the EPSS by performing this surveillance requirement and no safety system or component is rendered inoperable.

- During the period the EDG is under test the remaining three EDGs are capable of mitigating a design basis accident (DBA) or providing for safe shutdown of the unit. Additionally, during the surveillance the EDG is operating at rated speed and voltage and is available to operators for accident mitigation. Since the EDG is not connected to the EPSS buses during the performance of this surveillance requirement, this evolution has no impact on plant loads. Therefore, performance of the surveillance requirement will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems.
- Performance of Surveillance Requirement 3.8.1.12 has no impact on the EPSS and does not challenge the system capability to mitigate a DBA. The testing is limited to a single EDG, and the performance or failure of the surveillance does not cause, or result in, an AOO or challenge plant safety systems. Failure of the surveillance is limited to the EDG under test becoming inoperable and any required actions taken as directed by plant technical specifications.

The proposed deviation from the Westinghouse Owner's Group (WOG) STS mode restriction is justified based on having no effect on the EPSS or plant loads, the availability of the EDG under test for accident mitigation, and that during testing three EDGs remain capable of mitigating a DBA and supporting safe shutdown of the unit.

FSAR Impact:

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

Question 16-23:

Tech Spec 3.8.1 AC Sources - Operating

Justify omission of Mode Restriction information from EPR Surveillance Requirement 3.8.1.13 and associated Bases.

EPR SR 3.8.1.13 omits the NOTE in WOG SR 3.8.1.13 which addresses Mode restrictions associated with performance of the surveillance. EPR Bases also omits the discussion which is included as part of the corresponding WOG Bases.

Reviewer's NOTE in the WOG SR 3.8.1.13 Bases states that the Mode Restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the Restricted Modes can satisfy a specific set of criteria.

Explanation required based on the fact that the omitted information appears to be both relevant and applicable to EPR. Explanation to address the specifics of the Reviewer's NOTE in justifying omission of the Mode Restriction information.

Response to Question 16-23:

The reviewer's note in the Standard Technical Specifications for Westinghouse Plants Surveillance Requirement 3.8.1.13 indicates the mode restrictions may be deleted if it can be demonstrated to the staff that performing the surveillance requirement with the reactor in any of the restricted modes can satisfy the following criteria:

- Performance of the surveillance requirement will not render any safety system or component inoperable,

- Performance of the surveillance requirement will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems, and

- Performance of the surveillance, or failure of the surveillance requirement, will not cause, or result in, an anticipated operational occurrence (AOO) with attendant challenge to plant safety systems.

AREVA has evaluated this surveillance requirement against these criteria and concluded the following:

- Performance of Surveillance Requirement 3.8.1.13 requires verification that the noncritical automatic emergency diesel generator (EDG) trips are bypassed on an actual or simulated loss of offsite power (LOOP) signal on the emergency bus concurrent with an actual or simulated safety injection system (SIS) actuation signal. This test is a logic function test that is performed without the EDG operating. The logic test will simulate an EDG start from a SIS actuation signal concurrent with a bus loss of voltage signal from the respective division. A noncritical trip (e.g., crankcase pressure) is then initiated and an EDG and/or EDG output circuit breaker trip signal is verified not to initiate. Therefore, the test has no impact on the EDG or the emergency power supply system (EPSS) buses that the EDG connects to in a loss of power condition. No safety system or component will be rendered inoperable.

- During the period the EDG is under test, the remaining three EDGs are capable of mitigating a design basis accident (DBA) or providing for safe shutdown of the unit. Testing is limited to a single EDG at a time and is expected to take a limited time. Additionally, during the surveillance the EDG is available to respond to actual accident signals. Since the EDG is not connected to the EPSS buses during the performance of this surveillance requirement, this evolution has no impact on plant loads and no perturbations to any of the electrical distribution systems will be introduced.

- Performance of Surveillance Requirement 3.8.1.13 has no impact on the EPSS and does not challenge the system capability to mitigate a DBA. The testing is limited to a single EDG, and the performance or failure of the surveillance does not cause, or result in, an AOO or challenge plant safety systems. Failure of the surveillance is limited to the EDG under test becoming inoperable and any required actions would be taken as directed by plant technical specifications.

The proposed deviation from the WOG STS mode restriction is justified based on having no affect on the EPSS or plant loads, the capability to restore the EDG to being available within a short time, and that during testing three EDGs remain capable of mitigating a DBA and supporting safe shutdown of the nuclear power plant.

FSAR Impact:

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

Question 16-24:

Tech Spec 3.8.1 AC Sources - Operating

Explain the EPR uses of EDG Automatic Trips.

The EPR SR 3.8.1.13 Bases list of "Critical Protective Trips" that are NOT automatically bypassed, differs from the corresponding list in the WOG Bases (items d & e). Additionally, the WOG Bases specifically lists the "High Jacket Water Temperature Trip" as a Noncritical Automatic Trip which conflicts with the EPR classification.

Information required in order to validate the accuracy of the automatic trip information contained in EPR Bases Section SR 3.8.1.1.3.

Response to Question 16-24:

A response to this question will be provided by February 5, 2009.

FSAR Impact:

Question 16-25:

Tech Spec 3.8.1 AC Sources - Operating

Justify omission of Mode Restriction information from EPR Surveillance Requirement 3.8.1.14 and associated Bases.

EPR SR 3.8.1.14 omits NOTE 2 in WOG SR 3.8.1.14 which addresses Mode restrictions associated with performance of the surveillance. EPR Bases also omits the discussion which is included as part of the corresponding WOG Bases.

Reviewer's NOTE in the WOG SR 3.8.1.9 Bases states that the Mode Restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the Restricted Modes can satisfy a specific set of criteria.

Explanation required based on the fact that the omitted information appears to be both relevant and applicable to EPR. Explanation to address the specifics of the Reviewer's NOTE in the Bases of WOG SR 3.8.1.9 when justifying omission of the Mode Restriction information from EPR SR 3.8.1.14.

Response to Question 16-25:

The reviewer's note in the Standard Technical Specifications for Westinghouse Plants Surveillance Requirement 3.8.1.9 indicates the mode restrictions may be deleted if it can be demonstrated to the staff that performing the surveillance requirement with the reactor in any of the restricted modes can satisfy the following criteria:

- Performance of the surveillance requirement will not render any safety system or component inoperable,

- Performance of the surveillance requirement will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems, and

- Performance of the surveillance, or failure of the surveillance requirement, will not cause, or result in, an anticipated operational occurrence (AOO) with attendant challenge to plant safety systems.

AREVA has evaluated this surveillance requirement against these criteria and concluded the following:

- Performance of Surveillance Requirement 3.8.1.14 requires synchronizing, paralleling and loading the emergency diesel generator (EDG) with the offsite power source (via the associated emergency power supply system (EPSS) 6.9 kV bus) and then running it continuously while loaded to its full-load capability for not less than 24 hours. The electrical alignment for this test is similar to the monthly run of the EDG for Surveillance Requirement 3.8.1.3 for which there is no mode restriction.

- When considering performing this surveillance without mode restrictions, two types of electrical distribution system perturbations are considered. The first is the potential of grid

disturbances during the performance of the test. While the time required that the EDG is paralleled to offsite power for performance of the 24-hour endurance test is longer than the time an EDG is paralleled for the performance of other surveillance requirements requiring parallel operation, the required testing frequency is only once per 24 month cycle. Additionally, the endurance test will substitute for one of the required monthly tests, thus making the increased time only a fraction of the cumulative time incurred during the monthly testing time during the 24 month cycle. The occurrence of a grid disturbance is independent of testing performed as a result of this surveillance. The potential for the occurrence of a grid disturbance during the period that the EDG is in parallel with offsite power per this surveillance requirement is remote. Further, since there is only a remote probability that a grid disturbance will lead to EDG unavailability, the likelihood of an EDG being rendered unavailable as a result of a grid disturbance during testing is extremely remote. Although the EDG is potentially more susceptible to tripping due to the extra protection trip relays that are cut in during EDG testing, if an EDG protective trip were to occur in response to a disturbance in the offsite power system, operator action can be taken to manually reset the lockout relay of the EDG under test (assuming that the condition which caused the trip was promptly cleared or isolated) so that the EDG could be restarted and loaded if desired. If a design basis accident (DBA) were to occur during the period the EDG is paralleled with offsite power, a safety injection signal will separate the EDG under test from offsite power and return it to standby condition running at rated speed and voltage. Additionally, during the performance of the surveillance, the remaining three EDGs are capable of mitigating a design basis accident (DBA) or providing for a safe shutdown of the unit.

The second electrical distribution system perturbation considered is a perturbation to the EPSS as a result of performing the surveillance test. After the EDG is synchronized and loaded, the test is essentially a continuous run involving little or no dynamic effects. Bus voltage and power factor, including the effects of any changes in offsite power (such as the typical change in grid load that occurs in the course of a day) are monitored closely during the test because the surveillance requires the load and power factor to be maintained within a certain range. Electrical perturbations are thus minimized to the extent that they are monitored and can be controlled.

- Performance of Surveillance Requirement 3.8.1.14 has limited impact on the EPSS and does not challenge the system capability to mitigate a DBA. The testing is limited to a single EPSS division and EDG, and the performance or failure of the surveillance does not cause, or result in, an AOO or challenge plant safety systems. Failure of the surveillance is limited to the EDG under test becoming inoperable and any required actions taken as directed by plant technical specifications.

The proposed deviation from the WOG STS mode restriction is justified based on the acceptable small risk associated with paralleling an EDG to offsite power for surveillance testing when considering the robust design features of the electrical distribution system and that during testing three other EDGs remain capable of mitigating a DBA and supporting safe shutdown of the unit.

FSAR Impact:

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

Question 16-26:

Tech Spec 3.8.1 AC Sources - Operating

Justify omission of Mode Restriction information from EPR Surveillance Requirement 3.8.1.9 and associated Bases.

EPR SR 3.8.1.9 omits bracketed NOTE 1 in WOG SR 3.8.1.9 which addresses Mode restrictions associated with performance of the surveillance. EPR Bases also omits the discussion which is included as part of the corresponding WOG Bases.

Reviewer's NOTE in the WOG SR 3.8.1.9 Bases states that the Mode Restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the Restricted Modes can satisfy a specific set of criteria.

Explanation required based on the fact that the omitted information appears to be both relevant and applicable to EPR. Explanation to address the specifics of the Reviewer's NOTE in justifying omission of the Mode Restriction information.

Response to Question 16-26:

The reviewer's note in the Standard Technical Specifications for Westinghouse Plants Surveillance Requirement 3.8.1.9 indicates the mode restrictions may be deleted if it can be demonstrated to the staff that performing the surveillance requirement with the reactor in any of the restricted modes can satisfy the following criteria:

- Performance of the surveillance requirement will not render any safety system or component inoperable,

- Performance of the surveillance requirement will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems, and

- Performance of the surveillance, or failure of the surveillance requirement, will not cause, or result in, an anticipated operational occurrence (AOO) with attendant challenge to plant safety systems.

AREVA has evaluated this surveillance requirement against these criteria and concluded the following:

- Performance of Surveillance Requirement 3.8.1.9 requires tripping the emergency diesel generator (EDG) output circuit breaker with the EDG carrying greater than or equal to its associated single largest post-accident load while paralleled to offsite power, or while solely supplying the bus; or, tripping its associated single largest post-accident load with the EDG solely supplying the bus.

- If the method of test performance chosen is with operation of the EDG in parallel with the offsite power supply, the electrical alignment is similar to performance of the monthly Surveillance Requirement 3.8.1.3, which does not have any mode restrictions. Additionally, the amount of time required for the EDG to be paralleled to the offsite power source for

performance of Surveillance Requirement 3.8.1.9 is much less than the time the EDG is paralleled with offsite power when performing the monthly test required per Surveillance Requirement 3.8.1.3. Therefore, the performance of Surveillance Requirement 3.8.1.9 does not render any safety system or component inoperable beyond what is already allowed during monthly EDG surveillance testing.

- Two types of electrical distribution system perturbations are considered for performing surveillance requirement 3.8.1.9 without mode restrictions. The first is the potential of grid disturbances during the performance of the test. The potential for the occurrence of a grid disturbance during the relatively short period that the EDG is in parallel with offsite power per this surveillance requirement is remote. The occurrence of a grid disturbance is independent of testing performed as a result of this surveillance. Further, since there is only a remote probability that a grid disturbance will lead to EDG unavailability, the likelihood of an EDG being rendered unavailable as a result of a grid disturbance during testing is extremely remote. During the period the EDG is paralleled with offsite power, the remaining three EDGs are capable of mitigating a design basis accident (DBA) or providing for safe shutdown of the unit. Additionally, during a DBA a safety injection signal will separate the EDG under test from offsite power and return it to standby condition running at rated speed and voltage.

  The second electrical distribution system perturbation considered is a voltage or frequency transient in the electrical distribution system when the EDG has the single largest connected load rejected either by opening the EDG output circuit breaker or tripping the single largest load. Opening the EDG output circuit breaker during the performance of this surveillance separates the EDG from the emergency power supply system (EPSS) safety buses and allows offsite power to continue to supply the bus. This evolution has little impact on plant loads. The EPSS equipment ratings (e.g., transformers, switchgear and circuit breakers) are sized to handle this load under normal and accident conditions. Industry experience shows that there is no significant electrical distribution system effect on the associated bus during this type of load reject. Tripping the single largest post-accident load with the EDG solely supplying the bus will subject the bus to a momentary voltage and frequency transient. The voltage and frequency limits specified in the surveillance test are consistent with the design range of the equipment powered by the EDG.

- Performance of Surveillance Requirement 3.8.1.9 has limited impact on the EPSS and does not challenge the system capability to mitigate a DBA. The testing is limited to a single EPSS division and EDG, and the performance or failure of the surveillance does not cause, or result in, an AOO or challenge plant safety systems. Failure of the surveillance is limited to the EDG under test becoming inoperable and any required actions taken as directed by plant technical specifications.

The proposed deviation from the WOG STS mode restriction is justified based on the acceptable small risk associated with paralleling an EDG to offsite power for surveillance testing when considering the robust design features of the electrical distribution system and that during testing three EDGs remain capable of mitigating a DBA and supporting safe shutdown of the unit.

FSAR Impact:

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

Question 16-27:

Tech Spec 3.8.10 Distribution Systems - Shutdown

Explain omission of the verbiage "Engineered Safety Features Systems" from the EPR Bases "APPLICABLE SAFETY ANALYSES" section.

Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section states:

> "The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 and FSAR Chapter 15 assume the Protection System (PS) is OPERABLE.

Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria, states:

> "Plant systems such as the protection system (PS) and engineered safety features (ESF) are designed to mitigate the consequences of postulated upset conditions (transients and accidents)."

The Protection System is an integrated digital reactor protection system and ESF actuation system. The Protection System detects plant conditions that indicate the occurrence of AOOs and postulated accidents, and it actuates the safety-related process systems required to mitigate the event. The actual ESF systems are separate from the ESF actuation function performed by the Protection System. Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section should reference both the Protection System and the Engineered Safety Features System.

Explanation required in order to ensure the technical accuracy of the Bases and uniformity with the statement from Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria.

Response to Question 16-27:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications, Section B 3.8.10, *Applicable Safety Analyses* states:

> “The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 (Ref. 1) and FSAR Chapter 15 (Ref. 2), assume the Protection System (PS) is OPERABLE. The AC, DC, and AC vital electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.”

As described in U.S. EPR FSAR Tier 2, Section 7.2 and Section 7.3, the PS initiates reactor trip and ESF functions. The specific credited reactor trip and ESF functions that are initiated by the PS are specified in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Section 3.3.1, *Protection System (PS)*. Duplicating this information in the Bases for Section 3.8 increases the potential for subsequent errors. The systems that perform the ESF functions (e.g., emergency feedwater, control room air conditioning, and medium head safety injection, etc.) are considered to be separate systems and are not part of the PS. There is no "Engineered Safety Features System" in the U.S. EPR design. However, the Bases will be clarified to state that both the

Protection System and systems that perform Engineered Safety Features functions are operable.

The remaining references cited by the NRC were also reviewed and determined to be technically accurate as currently shown in the U.S. EPR FSAR.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.8.10 "Distribution Systems - Shutdown," will be revised as described in the response and as indicated on the enclosed markup.

Question 16-28:

Tech Spec 3.8.3 Diesel Fuel Oil, Lube Oil, and Starting Air

Clarify diesel lube oil inventory requirements. Revise below referenced EPR Bases and FSAR sections as required to ensure alignment.

Conflicting information and inconsistencies exist within the EPR STS Bases as well as between the Bases and the FSAR relative to the lube oil inventory requirement. Values for 3.5 days and 7 days of continuous operation are both referenced. Specific examples include:

> EPR STS "BACKGROUND" Bases section states: "Each engine oil sump contains an inventory capable of supporting a minimum of 3.5 days of operation. The onsite storage in addition to the engine oil sump is sufficient to ensure 7 days of continuous operation."
>
> EPR STS "LCO" Bases states: "Additionally, a sufficient lubricating oil supply must be available to ensure the capability to operate at full load for 3.5 days. This requirement, in conjunction with an ability to obtain replacement supplies within 3.5 days, supports the availability of EDGs required to shut down the reactor and to maintain it in a safe condition for an AOO or a postulated accident with loss of offsite power."
>
> EPR STS Bases B.1 states: "With lube oil inventory <750 gallons, sufficient lubricating oil to support 7 days of continuous EDG operation at full load conditions may not be available."
>
> EPR STS SR 3.8.3.2 Bases states: "This Surveillance ensures that sufficient lube oil inventory is available to support at least 7 days of full load operation for each EDG. The 750 gallon requirement ... when the EDG lube oil sump does not hold adequate inventory for 7 days of full load operation without the level reaching the manufacturer recommended minimum level."
>
> EPR FSAR Section 9.5.7.1 states: "The DGLS is designed to provide adequate lubrication and cooling for the various moving parts of the engine to permit it to be operated at continuous nameplate rating for a minimum of seven days without replenishing the system."
>
> EPR FSAR Section 9.5.7.2.2 under "Auxiliary Lube Oil Tank" states: "The non-safety-related auxiliary tank is located in the diesel room and contains an oil volume for oil consumption makeup during a seven day period of engine operation."
>
> EPR FSAR Section 9.5.7.4 states: "The DGLS components ... to permit operation at nameplate continuous rating for a minimum of seven days without oil replenishment from external sources."

Clarification required in order to resolve conflicting information and inconsistencies associated with EPR lube oil inventory requirements.

Response to Question 16-28:

A response to this question will be provided by February 5, 2009.

Question 16-29:

Tech Spec 3.8.3 Diesel Fuel Oil, Lube Oil, and Starting Air

Clarify stored diesel fuel oil inventory requirements. Revise below referenced EPR Bases and FSAR sections as required to ensure alignment.

> Conflicting information and inconsistencies exist between the EPR STS Bases and the EPR FSAR relative to stored diesel fuel oil storage requirements. EPR STS Bases specifies a storage capacity of 3.5 days of full load operation while the FSAR specifies 7 days. Specific examples include:
>
> EPR STS "BACKGROUND" Bases section states: "Each emergency diesel generator (EDG) is provided with a storage tank having a fuel oil capacity sufficient to operate that diesel for a period of 3.5 days while the EDG is supplying maximum post loss of coolant accident load demand discussed in FSAR Section 9.5.4.2."
>
> EPR STS "LCO" Bases states: "Stored diesel fuel oil is required to have sufficient supply for 3.5 days of full load operation."
>
> EPR STS Bases A.1 states: "In this Condition, the 3.5 day fuel oil supply for an EDG is not available. However, the Condition is restricted to fuel oil level reductions that maintain at least a 3 day supply."
>
> EPR STS SR 3.8.3.1 Bases states: "This SR provides verification that there is an adequate inventory of fuel oil in the storage tanks to support each EDG's operation for 3.5 days at full load. The 3.5 day period is sufficient time to place the unit in a safe shutdown condition and to bring in replenishment fuel from an onsite or offsite location."
>
> EPR FSAR Section 9.5.4 states: "The diesel generator fuel oil storage and transfer system (DGFOSTS) provides for the required storage capacity and transfer of fuel oil to each diesel engine as required for seven days of operation."
>
> EPR FSAR Section 9.5.4.1 states: "Following a LOOP, the system provides onsite storage and delivery of fuel oil for at least seven days of diesel generator operation at the continuous rating."
>
> EPR FSAR Section 9.5.4.2.1 states: "This allows for a 3.5 day fuel oil storage inventory in each fuel oil storage tank (plus 10 percent for surveillance testing) and still maintains a seven day fuel supply to the minimum required number of EDGs."
>
> EPR FSAR Section 9.5.4.2.2 states: "the capacity of each tank is based on the fuel consumption by one diesel engine for operation at the continuous rating for seven day, plus an additional ten percent for surveillance testing."

Clarification required in order to resolve conflicting information and inconsistencies associated with EPR fuel oil inventory requirements.

Response to Question 16-29:

A response to this question will be provided by December 17, 2008.

Question 16-30:

Tech Spec 3.8.3 Diesel Fuel Oil, Lube Oil, and Starting Air

Justify the 92-day Surveillance Requirement Frequency for EPR GTS SR 3.8.3.5. Provide rational for why it is acceptable to remove water accumulation from the fuel oil storage tanks quarterly as opposed to monthly in EPR GTS SR 3.8.3.5 Bases.

EPR GTS SR 3.8.3.5 specifies a Frequency of 92 days. WOG STS SR 3.8.3.5 specifies a 31-day Frequency. Both the EPR and WOG Bases state:

> "Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel storage tanks eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, and contaminated fuel oil, and from breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequencies are established by Regulatory Guide 1.137. This SR is for preventive maintenance. The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during performance of the surveillance."

Reg Guide 1.137, Fuel-Oil Systems For Standby Diesel Generators, states: "Accumulated condensate should be removed from storage tanks on a quarterly basis or on a monthly basis when it is suspected or known that the groundwater table is equal to or higher than the bottom of buried storage tanks."

Information required in order to justify why it is permissible to extend the surveillance frequency from monthly to quarterly, when the basis for the extension depends upon the relationship between the groundwater table and the bottom of buried storage tanks. The required information is site-specific. No justification provided in the EPR GTS Bases for extending the Frequency from 31 to 92 days.

Response to Question 16-30:

As discussed in U.S. EPR FSAR Tier 2, Section 9.5.4.2.2, the fuel oil storage tanks are located inside the Class I Emergency Power Generating Building. The fuel oil day tank is located with the fuel oil storage tank in a separate room located at a building level above the diesel room. Locating the fuel oil storage tanks indoors, instead of using underground burial, eliminates the potential for groundwater contamination and justifies the 92 day surveillance frequency.

FSAR Impact:

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

Question 16-31:

Tech Spec 3.8.3 Diesel Fuel Oil, Lube Oil, and Starting Air

Evaluate the range of values specified for diesel fuel oil storage tank level in EPR STS LCO Condition "A". Specify a level range supported by Reg Guide 1.137.

EPR STS LCO Condition "A" fuel oil storage tank values appear to support a 3.5 day fuel oil supply. Regulatory Position "1.c" of Reg Guide 1.137 (Fuel-Oil Systems For Standby Diesel Generators) states that the calculation of fuel oil storage requirements are "based on the assumption that the diesel generator operates continuously for 7 days at its rated capacity." EPR STS Bases A.1 references 3.5 days as well. Corresponding WOG STS and associated Bases both specify a 7-day fuel oil supply.

Information required in order to ensure that the diesels have sufficient fuel oil storage capacity to ensure the availability of necessary power to ESF systems so that fuel, Reactor Coolant System, and containment design limits are not exceeded.

Response to Question 16-31:

A response to this question will be provided by December 17, 2008.

Question 16-32:

Tech Spec 3.8.5 DC Sources - Shutdown

Explain omission of qualifying verbiage in Condition B of EPR GTS 3.8.5.

The statement "for reasons other than Condition A OR Required Actions and associated Completion Time of Condition A not met" is bracketed text in the WOG STS. This qualifying verbiage appears to be applicable based on guidance in the WOG STS REVIEWER'S NOTE that states "The first option above is adopted for plants that have a CTS requiring the same level of DC electrical power subsystem support as is required for power operating conditions."

Explanation required in order to remove potential ambiguity from between entry conditions and also to provide directional guidance in the event that Condition "A" Required Action Completion Times are exceeded.

Response to Question 16-32:

The inadvertently omitted verbage will be added to Condition B of GTS 3.8.5.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.5 "DC Sources - Shutdown," will be revised as described in the response and as indicated on the enclosed markup.

No changes to the U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases are required.

Question 16-33:

Tech Spec 3.8.5 DC Sources - Shutdown

Explain the position in the EPR Bases "LCO" section that Two DC subsystems are required to be Operable to support Two divisions of the Distribution systems required Operable by LCO 3.8.10 "Distribution Systems - Shutdown."

LCO 3.8.10 (Distribution Systems - Shutdown) states:

> "The necessary portions of the AC, DC, and AC vital electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE." There is no specific requirement within LCO 3.8.10 for the Operability of Two divisions as stated in EPR Bases LCO section of 3.8.5.

Additionally, there is no reference within the actual text of LCO 3.8.5 itself that specifies Two DC subsystems. LCO 3.8.5 (DC Sources - Shutdown) states:

> "Class 1E DC subsystem(s) shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."

Explanation required in order to ensure the technical accuracy of the Base and to clarify what the minimum DC subsystem Operability requirements are for Shutdown conditions.

Response to Question 16-33:

The format of U.S. EPR FSAR Tier 2, Chapter 16 LCOs 3.8.5 and 3.8.10 were developed based on those contained in the Standard Technical Specifications for Westinghouse Plants (NUREG-1431). A side-by-side comparison of each is provided below:

	Westinghouse Standard Technical Specifications	**U.S. EPR Technical Specification**
LCO 3.8.5	DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."	Class 1E DC subsystem(s) shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown.
LCO 3.8.10	The necessary portions of AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE.	The necessary portions of the AC, DC, and AC vital electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE.

Only changes necessary to reflect the U.S. EPR specific design considerations were made to the U.S. EPR limiting conditions for operation (LCO).

With regards to the requirement for two divisions to be OPERABLE in shutdown conditions, two divisions of Class 1E power are required to mitigate the consequences of an accident or an

Anticipated Operational Occurrence (AOO) in cold shutdown or refueling modes. As stated in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.8.5:

> "The DC electrical power system provides normal and emergency DC electrical power for the EDGs, emergency auxiliaries, and control and switching during all MODES of operation."

Therefore, two subsystems (divisions) of DC power are required to ensure the operability of the emergency diesel generators (EDG) to mitigate the consequences of postulated accidents and AOOs that can occur during shutdown when coupled with a loss of offsite power (LOOP).

The necessity for two divisions is derived from the analysis of postulated accidents and AOOs that can occur during shutdown. The fuel handling accident is described in U.S.EPR FSAR Tier 2, Section 15.0.3.10. Control room air conditioning is required to maintain temperature and humidity within required limits. As stated in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases 3.7.11, *Control Room Air Conditioning System (CRACS)*, there are four 75% capacity trains. Two out of four 75% CRACS air conditioning trains operating in the recirculation mode with fresh outside makeup air will provide the required temperature in the main control room. These trains are not powered by an alternate feed. Therefore, two divisions are required to be operable during shutdown.

Additionally, an inadvertent boron dilution event is described in U.S. EPR FSAR Tier 2, Section 15.4.6. The chemical and volume control system (CVCS) charging line isolation on anti-dilution mitigation (ADM) at shutdown conditions (reactor coolant pump (RCP) not operating) engineered safety feature (ESF) function is shown on U.S. EPR FSAR Tier 2, Figure 7.3-22. The actuation for this function is only accomplished through Divisions 1 and 4. Therefore, one of these two divisions is required to be operable during shutdown.

Various combinations of electrical power divisions/subsystems can be used to satisfy electrical power requirements during shutdown conditions. However, U.S. EPR FSAR Tier 2, Chapter 16, LCO 3.8.2 specifies that two EDGs in one divisional pair shall be operable during shutdown conditions.

FSAR Impact:

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

Question 16-34:

Tech Spec 3.8.5 DC Sources - Shutdown

List the Surveillance Requirements of Specification 3.8.4, DC Sources - OPERABLE, in EPR SR 3.8.5.1.

The list of Surveillance Requirements associated with Specification 3.8.4, DC Sources - OPERABLE, have been omitted from EPR SR 3.8.5.1. Surveillance requirements 3.8.4.1, 3.8.4.2, and 3.8.4.3 are applicable to EPR SR 3.8.5.1 and need to be listed.

Response to Question 16-34:

The wording of U.S. EPR FSAR Tier 2, Chapter 16, Surveillance Requirement 3.8.5.1 will be revised to more closely reflect the format and content of the Standard Technical Specifications for Westinghouse Plants (NUREG-1431).

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.5 “DC Sources - Shutdown,” will be revised as described in the response and as indicated on the enclosed markup.

No changes to the U.S. EPR FSAR Tier 2, Chapter 16 Technical Specification Bases are required.

Question 16-35:

Tech Spec 3.8.6 Battery Parameters

Explain how the initial assumptions of the accident analyses support the position in the EPR Bases "APPLICABLE SAFETY ANALYSES" section, that "at least two divisions of DC sources are required to be OPERABLE during accident conditions."

Paragraph 2 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section states:

> "The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least two divisions of DC sources OPERABLE during accident conditions".

LCO 3.8.10 (Distribution Systems - Shutdown) states:

> "The necessary portions of the AC, DC, and AC vital electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE." There is no specific requirement within LCO 3.8.10 or its Bases for the Operability of at least Two Divisions of DC sources.

Additionally, there is no reference within the actual text of LCO 3.8.5 itself that specifies Two DC subsystems. LCO 3.8.5 (DC Sources - Shutdown) states:

> "Class 1E DC subsystem(s) shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."

Explanation required in order to ensure the technical accuracy of the Bases.

Response to Question 16-35:

See the response to Question 16-33 for the explanation of why a minimum of two DC subsystems are required to be operable while in Modes 5 and 6 and the justification for the wording of LCOs 3.8.5 and 3.8.10.

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications LCO 3.8.9, Distribution Systems - Operating, would require four AC, DC, and AC vital electrical power distribution systems be operable in Modes 1, 2, 3, and 4. If they can not be restored to operable status within the specified completion time, the unit would be required to be in Mode 3 in six hours and Mode 5 in 36 hours.

FSAR Impact:

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

Question 16-36:

Tech Spec 3.8.6 Battery Parameters

Explain omission of the verbiage "Engineered Safety Features Systems" from the EPR Bases "APPLICABLE SAFETY ANALYSES" section.

Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section states:

> "The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 and FSAR Chapter 15 assume the Protection System (PS) is OPERABLE.

Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria, states:

> "Plant systems such as the protection system (PS) and engineered safety features (ESF) are designed to mitigate the consequences of postulated upset conditions (transients and accidents)."

The Protection System is an integrated digital reactor protection system and ESF actuation system. The Protection System detects plant conditions that indicate the occurrence of AOOs and postulated accidents, and it actuates the safety-related process systems required to mitigate the event. The actual ESF systems are separate from the ESF actuation function performed by the Protection System. Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section should reference both the Protection System and the Engineered Safety Features System.

Explanation required in order to ensure the technical accuracy of the Bases and establish uniformity with the statement from Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria.

Response to Question 16-36:

See the response to Question 16-27.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.8.6 "Battery Parameters," will be revised as described in the response and as indicated on the enclosed markup.

Question 16-37:

Tech Spec 3.8.6 Battery Parameters

Correct cell voltage value specified in paragraph 2 of the EPR Bases "BACKGROUND" section.

Paragraph 2 of the EPR Bases "BACKGROUND" section specifies a cell voltage of 2.065 volts per cell (Vpc) for a 120 cell battery with an open circuit voltage of approximately 250 volts. Calculated cell voltage should be 2.083 Vpc.

Correction required in order to ensure the technical accuracy of the Bases.

Response to Question 16-37:

The open circuit voltage per cell of 2.065 volts is consistent with the Standard Technical Specifications for Westinghouse Plants (NUREG-1431). Additionally, this value has been confirmed with potential battery suppliers as the typical open circuit voltage for batteries used in nuclear power plant applications. The Bases uses the phrase “approximately 250 volts” which implies the open circuit voltage does not need to exactly equal the individual cell voltage times the number of battery cells in the string.

FSAR Impact:

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

Question 16-38:

Tech Spec 3.8.7 Inverters - Operating

Explain omission of information from EPR LCO and Bases section associated with removal of an inverter from service during a battery equalizing charge.

WOG STS 3.8.7 "LCO" NOTE and accompanying Bases information associated with "disconnecting an inverter from its DC bus during performance of a battery equalizing charge," has been omitted from the EPR STS 3.8.7 LCO and Bases section. WOG LCO Bases states: If the inverters were not disconnected, the resulting voltage condition might damage the inverter. These provisions minimize the loss of equipment that would occur in the event of a loss of offsite power.

Explanation required in order to understand why information associated with the potential for inverter damage during a battery equalizing charge would be excluded from EPR Tech Specs.

Response to Question 16-38:

The inverters for the U.S. EPR will operate at a nominal voltage of 250 v DC. However, they will be designed for a maximum input voltage of 280 v DC, specifically to allow the inverter to remain in service during battery equalizing charge. Battery charger equalizing voltage will be less than 280 v DC. Therefore, there is no need to disconnect the inverter during battery equalizing.

FSAR Impact:

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

Question 16-39:

Tech Spec 3.8.7 Inverters - Operating

Explain omission of the verbiage "Engineered Safety Features Systems" from the EPR Bases "APPLICABLE SAFETY ANALYSES" section.

Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section states:

> "The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 and FSAR Chapter 15 assume the Protection System (PS) is OPERABLE.

Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria, states:

> "Plant systems such as the protection system (PS) and engineered safety features (ESF) are designed to mitigate the consequences of postulated upset conditions (transients and accidents)."

The Protection System is an integrated digital reactor protection system and ESF actuation system. The Protection System detects plant conditions that indicate the occurrence of AOOs and postulated accidents, and it actuates the safety-related process systems required to mitigate the event. The actual ESF systems are separate from the ESF actuation function performed by the Protection System. Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section should reference both the Protection System and the Engineered Safety Features System.

Explanation required in order to ensure the technical accuracy of the Bases and uniformity with the statement from Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria.

Response to Question 16-39:

See the response to Question 16-27.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.8.7 "Inverters - Operating," will be revised as described in the response and as indicated on the enclosed markup.

Question 16-40:

Tech Spec 3.8.8 Inverters - Shutdown

Explain the reference to "two divisions" in the first sentence of the EPR GTS 3.8.8 Bases "ACTIONS" section "A" that states "If two divisions are required by LCO 3.8.10, Distribution Systems - Shutdown ..."

EPR LCO 3.8.10 (Distribution Systems - Shutdown) states:

> "The necessary portions of the AC, DC, and AC vital electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE."

There is no specific requirement within LCO 3.8.10 for the Operability of two divisions as stated in EPR Bases "ACTIONS" section "A" of 3.8.8.

Additionally, there is no reference within the actual text of LCO 3.8.8 itself that specifies Two Divisions of Inverters. LCO 3.8.8 (Inverters - Shutdown) states:

> "Inverters shall be OPERABLE to support the onsite Class 1E AC vital bus electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."

Explanation required in order to ensure the technical accuracy of the Base and to clarify what the minimum Inverter Operability requirements are for Shutdown conditions.

Response to Question 16-40:

Two divisions of Class 1E power are required to mitigate the consequences of an accident or an anticipated operational occurrence (AOO) in cold shutdown or refueling modes. As stated in U.S. EPR FSAR, Tier 2, Chapter 16, Technical Specifications Bases 3.8.5:

> “The DC electrical power system provides normal and emergency DC electrical power for the EDGs, emergency auxiliaries, and control and switching during all MODES of operation.”

Therefore, two subsystems (divisions) of DC power are required to ensure the operability of the emergency diesel generators (EDG) to mitigate the consequences of postulated accidents and AOOs that can occur during shutdown when coupled with a loss of offsite power (LOOP).

The necessity for two divisions is derived from the analysis of postulated accidents and AOOs that can occur during shutdown. The fuel handling accident is described in U.S.EPR FSAR Tier 2, Section 15.0.3.10. Control room air conditioning is required to maintain temperature and humidity within required limits. As stated in U.S. EPR FSAR, Tier 2, Chapter 16, Technical Specifications Bases 3.7.11, *Control Room Air Conditioning System (CRACS)*, there are four 75% capacity trains. Two out of four 75% CRACS air conditioning trains operating in the recirculation mode with fresh outside makeup air will provide the required temperature in the main control room. These trains are not powered by an alternate feed. Therefore, two divisions are required to be operable during shutdown.

Additionally, an inadvertent boron dilution event is described in U.S. EPR FSAR Tier 2, Section 15.4.6. The chemical and volume control system (CVCS) charging line isolation on anti-dilution mitigation (ADM) at shutdown conditions (reactor coolant pump (RCP) not operating) engineered safety feature (ESF) function is shown on U.S. EPR FSAR Tier 2, Figure 7.3-22. The actuation for this function is only accomplished through Divisions 1 and 4. Therefore, one of these two divisions is required to be operable during shutdown.

The wording of the U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification LCOs 3.8.8 and 3.8.10 and associated Bases is consistent with the wording of the Standard Technical Specifications for Westinghouse Plants (NUREG-1431).

FSAR Impact:

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

Question 16-41:

Tech Spec 3.8.8 Inverters - Shutdown

Revise statement in paragraph #4 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section to insert the word "postulated" so that it reads "many postulated accidents" instead of "many accidents".

Use of the word "postulated" in this application maintains the consistency previously established throughout the entire Section 3.8 Bases of the EPR. The phrase "Postulated Accidents" in the EPR Bases correlates to the acronym "DBA."

Response to Question 16-41:

The word "postulated" will be added to two locations in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.8.8.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications B 3.8.8 “Inverters - Shutdown,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-42:

Tech Spec 3.8.8 Inverters - Shutdown

Explain omission of the verbiage "Engineered Safety Features Systems" from the EPR Bases "APPLICABLE SAFETY ANALYSES" section.

Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section states:

> "The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 and FSAR Chapter 15 assume the Protection System (PS) is OPERABLE.

Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria, states:

> "Plant systems such as the protection system (PS) and engineered safety features (ESF) are designed to mitigate the consequences of postulated upset conditions (transients and accidents)."

The Protection System is an integrated digital reactor protection system and ESF actuation system. The Protection System detects plant conditions that indicate the occurrence of AOOs and postulated accidents, and it actuates the safety-related process systems required to mitigate the event. The actual ESF systems are separate from the ESF actuation function performed by the Protection System. Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section should reference both the Protection System and the Engineered Safety Features System.

Explanation required in order to ensure the technical accuracy of the Bases and uniformity with the statement from Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria.

Response to Question 16-42:

See the response to Question 16-27.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.8.8 "Inverters - Shutdown," will be revised as described in the response and as indicated on the enclosed markup.

Question 16-43:

Tech Spec 3.8.9 Distribution Systems - Operating

Explain omission of the verbiage "Engineered Safety Features Systems" from the EPR Bases "APPLICABLE SAFETY ANALYSES" section.

Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section states:

> "The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 and FSAR Chapter 15 assume the Protection System (PS) is OPERABLE.

Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria, states:

> "Plant systems such as the protection system (PS) and engineered safety features (ESF) are designed to mitigate the consequences of postulated upset conditions (transients and accidents)."

The Protection System is an integrated digital reactor protection system and ESF actuation system. The Protection System detects plant conditions that indicate the occurrence of AOOs and postulated accidents, and it actuates the safety-related process systems required to mitigate the event. The actual ESF systems are separate from the ESF actuation function performed by the Protection System. Paragraph 1 of the EPR Bases "APPLICABLE SAFETY ANALYSES" section should reference both the Protection System and the Engineered Safety Features System.

Explanation required in order to ensure the technical accuracy of the Bases and uniformity with the statement from Section 15.0.0.2 (EPR Chapter 15), Accident Analysis Acceptance Criteria.

Response to Question 16-43:

See the response to Question 16-27.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification Bases 3.8.9 "Distribution Systems - Operating," will be revised as described in the response and as indicated on the enclosed markup.

Question 16-44:

Tech Spec 3.8.9 Distribution Systems - Operating

Revise verbiage in EPR Bases "ACTIONS" section B.1 from "inverter using internal AC source" to "inverter using an AC source".

EPR 3.8.9 Bases "ACTIONS" section B.1 states:

> "The required AC vital bus must be restored to OPERABLE status within two hours by powering the bus from the associated inverter via inverted DC, inverter using internal AC source, or Class 1E voltage regulated bus."

EPR inverters do not use an internal AC source but instead utilize a static bypass switch to transfer power from the inverter to an EDG backed bypass source. This is accurately reflected in Paragraph #3 of the EPR Bases "LCO" section which uses the phrase "inverter using an AC source" in a similar statement associated with vital bus Operability.

Revision required in order to ensure verbiage contained in EPR Bases "ACTIONS" section B.1 is technically correct with respect to inverter specifics.

Response to Question 16-44:

The word "internal" will be replaced with the word "an" in the cited location in U.S. EPR FSAR Tier 2, Technical Specification Bases 3.8.9.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications B 3.8.9 “Distribution Systems - Operating,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-45:

Tech Spec 3.8.2 AC Sources - Shutdown

Explain the 15-second diesel sequence time requirement for the EPR.

EPR GTS LCO 3.8.2 Bases states that the EDG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage within 15-seconds.

Chapter 15 Table 15.0-8, Engineered Safety Features Functions Used in the Accident Analysis (Sheet 1 of 3), does not unequivocally specify the 15 second time requirement. The time delays listed in Table 15.0-8 for SIS Actuation Functions are 40 seconds for SIS delivery concurrent with a LOOP. EDG loading time is included in the 40 seconds.

Information required to:

1) Conclusively determine whether or not the 15 second start requirement supports the assumptions of the design basis LOCA analysis.
2) Conclusively validate the 15 second time requirement for achieving required voltage and frequency from the information provided in Chapter 15.

Response to Question 16-45:

See the response to Question 16-12.

FSAR Impact:

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

Question 16-46:

Tech Spec 3.8.2 AC Sources - Shutdown

Explain why the two Operable EDGs are required to reside within the same divisional pair as opposed to one Operable EDG residing in each of two separate divisional pairs.

EPR STS LCO 3.8.2.b specifies that two emergency diesel generators (EDGs) in one divisional pair capable of supplying the onsite Class 1E power distribution subsystem(s) required by LCO 3.8.10 shall be Operable. Associated LCO Bases merely states: "to ensure a diverse power source is available to provide electrical power support, assuming a loss of the offsite circuit." Bases does not address the inability of two emergency diesels in separate divisional pairs to supply the necessary electrical power for the various combinations of subsystems, equipment, and components required Operable by LCO 3.8.10.

Information required in order to determine why two emergency diesels in separate divisional pairs would not be capable of supplying the onsite Class 1E power distribution subsystem(s) required by LCO 3.8.10.

Response to Question 16-46:

As stated in U.S. EPR FSAR Tier 2, Section 8.3:

> "The Emergency Power Supply System (EPSS) is designed in accordance with RG 1.6 to provide independence between the redundant standby power sources that supply the safety-related loads. The EPSS has four divisions, normally powered from the preferred power source, each with an independent and redundant EDG assigned to their respective switchgear 31BDA, 32BDA, 33BDA, and 34BDA. The EPSS divisions combine to make two divisional pairs. Division 1 and 2 constitute the first divisional pair while Divisions 3 and 4 constitute the second divisional pair. The EPSS safety-related loads are separated between the divisional pairs and a loss of one divisional pair will not prevent the minimum safety-related functions from being performed."

The philosophy in the development of the U.S. EPR FSAR Tier 2, Chapter 16 Electrical Power System Technical Specifications (Section 3.8) was to refer to divisional pairs and not to introduce the complexity associated with other combinations of operable EDGs. For example, U.S. EPR FSAR Tier 2, Technical Specification 3.8.1, *AC Sources - Operating*, Condition C, refers to two EDGs inoperable. Separate Conditions, with separate actions, were not specified for the various possible combinations of EDGs being inoperable.

The U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications 3.8.2, AC Sources – Shutdown, also reflect the operational philosophy for the U.S. EPR, which is to maintain a divisional pair operable during outages.

FSAR Impact:

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

Question 16-47:

Tech Spec 3.8.2 AC Sources - Shutdown

Correct surveillance requirement reference in EPR SR 3.8.2.1 Bases.

EPR SR 3.8.2.1 Bases incorrectly references SR 3.8.1.20 in the first paragraph. SR 3.8.1.20 does not exist in the EPR STS. SR 3.8.2.1 correctly references SR 3.8.1.19.

Change required to ensure technical accuracy of SR 3.8.2.1 Bases.

Response to Question 16-47:

The reference to SR 3.8.1.20 will be replaced with a reference to SR 3.8.1.19 in U.S. EPR FSAR Tier 2, Chapter 16 Technical Specification Bases 3.8.2.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications B 3.8.2 “AC Sources - Shutdown,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-48:

Tech Spec 3.8.2 AC Sources - Shutdown

Evaluate the need to reference an additional Surveillance Requirement in the NOTE associated with EPR SR 3.8.2.1.

The Automatic Load Sequencer was omitted from LCO 3.8.1, AC Sources - Operating. An RAI was submitted under Tech Spec 3.8.1 to evaluate and justify omission of the Load Sequencer. A subsequent RAI was submitted under LCO 3.8.1 requesting an explaination for the omission of the surveillance requirement for verifying the interval between each sequenced load block (for the Load Sequencer function) from the EPR SRs. It will be necessary to include a reference to the surveillance requirement for "verifying the interval between each sequenced load block" in the NOTE associated with EPR SR 3.8.2.1, if the Automatic Load Sequencer becomes part of the EPR Tech Specs.

RAI submitted to ensure that the NOTE associated with SR 3.8.2.1 references all applicable surveillance requirements.

Response to Question 16-48:

As discussed in the response to Question 16-1, no individual periodic Technical Specification surveillance tests are required for the load sequencing function.

FSAR Impact:

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

Question 16-49:

Tech Spec 3.8.2 AC Sources - Shutdown

Justify omission of automatic load sequencing statements from EPR GTS LCO Bases.

EPR GTS 3.8.2 LCO Bases section omits the following WOG STS LCO Bases statements associated with automatic load sequencing:

> "Proper sequencing of loads, including tripping of nonessential loads, is a required function for DG OPERABILITY.
>
> "In addition, proper sequencer operation is an integral part of offsite circuit OPERABILITY since its inoperability impacts on the ability to start and maintain energized loads required OPERABLE by LCO 3.8.10."

Information required in order to fully understand the automatic load sequencing function as it relates to EDG operability, Offsite Circuit OPERABILITY, and the Protection System. Although the auto load sequencing function is actually performed by the Protection System, there are no surveillance requirements in TS 3.3.1 to verify operability of the load sequencer. The load sequencing function is apparently verified under SR 3.8.1.11. If the load sequencer failed, the associated EDG would be rendered inoperable due to inability to successfully complete the SR, and offsite circuit OPERABILITY could be adversely affected. The fact that operability of the load sequencing function is neither included in or surveilled under Protection System LCO 3.3.1, as well as being excluded from AC Sources - Operating LCO 3.8.1, requires justification in order to clearly understand the operability issues as they relate to both LCOs and the reason for omission of the automatic load sequencing statements from EPR STS 3.8.2 LCO Bases.

Response to Question 16-49:

As discussed in the response to Question 16-1, no individual periodic Technical Specification surveillance tests are required for the load sequencing function.

FSAR Impact:

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

Question 16-50:

Tech Spec 3.8.4 DC Sources - Operating

Correct the cell voltage value specified in paragraph 10 of the EPR Bases.

Paragraph 10 of the EPR STS 3.8.4 BACKGROUND Bases specifies a cell voltage of 2.065 volts per cell (Vpc) for a 120 cell battery with an open circuit voltage of approximately 250 volts. Calculated cell voltage should be 2.083 Vpc.

Correction required in order to ensure the technical accuracy of the Bases.

Response to Question 16-50:

Refer to the response to Question 16-37.

FSAR Impact:

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

Question 16-51:

Tech Spec 3.8.9 Distribution Systems - Operating

Enhance EPR Bases "LCO" Section 3.8.9 discussion to describe how redundant electrical power distribution subsystem equipment within a divisional pair is considered Operable and capable of performing its safety-related functions when Alternate Feed Cross Tie Breakers are closed.

Paragraph #4 of the EPR Bases "LCO" Section 3.8.9 states:

> "The alternate feed is interlocked to prevent sources from two divisions supplying a bus at the same time. In addition, interlocks prevent inadvertently paralleling two EDGs together. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, that could cause the failure of a redundant subsystem and a loss of essential safety function(s).

This statement is not completely supported by the following excerpts from Chapter 8 of the EPR FSAR.

EPR FSAR Tier 2 section 8.3.1.1.9, Independence of Redundant Systems (pg 8.3-20) states:

> "The occurrence of an internal hazard will not result in a common mode failure of the redundant equipment except during alternate feed."

EPR FSAR Tier 2 section 8.3.1.2.4, Compliance with GDC 17 (pg 8.3-26) states:

> "Alternate feed protection and coordination prevents a fault on one division from degrading the other division below an acceptable level."

EPR FSAR Tier 2 section 8.3.1.1.3, Electric Circuit Protection and Coordination (pg 8.3-7) states:

> "The inter-divisional alternate feeds have a protection and coordination scheme to provide protection so that a fault on one division does not degrade the other division below an acceptable level. The alternate feed circuit protection scheme uses circuit breakers so that a malfunction of the components being alternately fed does not result in unacceptable influences in the division that supplies the power."

Ability of redundant equipment within divisional pairs to maintain safety-related functional capabilities when Alternate Power Feed Cross Tie Breakers are closed is questionable considering select verbiage from Chapter 8 of the EPR FSAR such as: "except during alternate feed"; "below an acceptable level"; and "does not result in unacceptable influences."

Response to Question 16-51:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases, "LCO" Section of B 3.8.9 will be revised to describe how redundant electrical power distribution subsystem equipment within a divisional pair is considered Operable and capable of performing its safety-related functions when the alternate feed cross tie breakers are closed.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications B 3.8.9 “Distribution Systems - Operating,” will be revised as described in the response and as indicated on the enclosed markup.

Question 16-52:

Tech Spec 0.0 General Comment

Revise all EPR application references from "U.S. EPR Standard Technical Specification or STS" to "U.S. EPR generic Technical Specifications or GTS".

10CFR 50.36 Technical Specifications, states that each applicant for a design certification under part 52 shall include in its application, proposed Generic Technical Specifications - not standard Technical Specifications. Standard Technical Specifications are developed and issued by the NRC as a guide for the development of generic or plant-specific Technical Specifications by applicants.

Response to Question 16-52:

AREVA will revise all U.S. EPR application references from "U.S. EPR Standard Technical Specification or STS" to "U.S. EPR Generic Technical Specifications or GTS". As this will require changing the footer on all pages of the Technical Specifications from "U.S. EPR STS" to "U.S. EPR GTS," AREVA will incorporate this change as part of the issuance of Revision 1 of the U.S. EPR FSAR.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16 will be revised as described in the response.

Question 16-53:

Tech Spec 3.8.1 AC Sources - Operating

Enhance 3.8.1 Bases B.5 discussion associated with the 120-day EDG Completion Time.

Condition B.5 of the EPR STS specifies a 120-day Completion Time for restoration of a single inoperable Diesel. Associated EPR Bases justifies this duration as reasonable by crediting the alignment of alternate feed and the fact that operation of the Diesel is not assumed in the safety analysis to mitigate the consequences of a postulated accident or AOO.

AC Sources Operating Bases B.5 discussion requires additional detail/enhancement with regard to the safety analysis specifics, key assumptions, and risk insights.

Response to Question 16-53:

The details regarding the safety analysis and assumptions regarding U.S. EPR operation with three operable emergency diesel generators (EDG) and the alternate feed aligned are provided in U.S. EPR FSAR Tier 2, Chapter 15 and Chapter 8.

With regards to the safety analysis, the assumptions regarding EDG availability are included, as appropriate, with each event. For example, U.S. EPR FSAR Tier 2, Section 15.6 addresses decrease in reactor coolant inventory events. U.S. EPR FSAR Tier 2, Section 15.6.1.2, *Methods of Analysis and Assumptions*, states:

> "The most reactive control rod is assumed not to insert at reactor trip (RT). A Loss of Offsite Power (LOOP) is assumed to occur with RT. Subsequent to an RT, the limiting single failure is taken as the failure of one emergency diesel generator (EDG), resulting in the unavailability of one train of pumped SIS (MHSI, LHSI, and EFWS). A second EDG is assumed to be under maintenance and therefore unavailable, causing a second train of pumped SIS to be unavailable."

The electrical aspects are described in U.S. EPR FSAR Tier 2, Chapter 8. For example, U.S. EPR FSAR Tier 2, Section 8.1.2, *Onsite Power System Description*, states:

> "An alternate feed is provided from EPSS division 2 to EPSS division 1 to supply a standby source of power to required safety related systems, safety-related support systems, or components that do not have four 100 percent redundant trains when the EPSS division 1 EDG or certain portions of the EPSS division 1 electrical distribution system are not available. A similar alternate feed provides standby power to EPSS division 2, from EPSS division 1 when the EPSS division 2 EDG or certain portions of the EPSS division 2 electrical distribution system are not available. Similar alternate feeds are used between EPSS division 3 and EPSS division 4. Implementation of the alternate feed is completed manually to satisfy single failure criteria when certain electrical components, including EDGs, are out of service.
>
> Each EDG automatically starts and connects to its EPSS 6.9 kV switchgear when a loss of power or a degraded voltage condition is detected at the respective division supply bus. An automatic start will also occur if a safety injection signal (SIS) is initiated from the protection system. The required safety-related loads are automatically sequenced onto the EDG when

the generator has obtained nominal speed and voltage, and a loss of voltage or a degraded voltage signal is received. Each EDG has the capacity and capability to power the required safety-related loads when an alternate feed is implemented between divisions."

U.S. EPR FSAR Tier 2, Section 8.3.1.1.1, *Emergency Power Supply System*, states:

"EPSS divisions are functionally independent and physically separated from the others during normal bus alignments. An alternate feed is provided between EPSS divisions 1 and 2 (first divisional pair) to provide the normal and standby source of power to required safety-related systems, safety-related support systems, or components that do not have the required redundancy when certain electrical components, including the division 1 emergency diesel generator (EDG), are out of service. A similar alternate feed provides standby power to EPSS division 2, from division 1 when certain electrical components, including the division 2 EDG are out of service. Similar alternate feeds are used between divisions 3 and 4 (second divisional pair)."

U.S. EPR FSAR Tier 2, Section 8.3.1.2.4, *Compliance with GDC 17*, states:

"The EPSS has four divisions, normally powered from the preferred power source, each with an independent and redundant EDG assigned to their respective switchgear 31BDA, 32BDA, 33BDA, and 34BDA. The EPSS divisions combine to make two divisional pairs. Division 1 and 2 constitute the first divisional pair while divisions 3 and 4 constitute the second divisional pair. The EPSS safety-related loads are separated between the divisional pairs and a loss of one divisional pair will not prevent the minimum safety-related functions from being performed.

The four EPSS divisions are normally functionally independent and physically separated from each other. During periods a standby power source is out of service, or other similar maintenance activities, alternate feeds are provided between Division 1 and Division 2 or between Divisions 3 and Division 4 as appropriate for the out-of-service EDG. The alternate feed configuration, consistent with separating the safety related loads between divisional pairs, maintains the plant capability to complete safety-related functions coincident with a single failure."

With regard to risk insights, the 120 day allowed outage time (AOT) is not a risk-informed value. Since the U.S. EPR safety analysis assumptions are satisfied with three operable EDGs and the alternate feed aligned, an indefinite AOT is justifiable from a deterministic standpoint. The proposed AOT does not constitute a temporary relaxation of the requirement for a postulated single failure concurrent with a postulated accident or anticipated operational occurrence (AOO). Therefore, the proposed 120 day AOT does not constitute a deviation from the Standard Technical Specifications. Rather, it is an additional conservative restriction that maximizes the availability of the EDGs. In general, a licensee would not be expected to submit risk information in support of a position that is consistent with currently approved staff positions. These licensee positions are normally evaluated by the staff using traditional engineering analyses.

The level of detail contained in the Bases for this completion time is consistent with the level of detail provided for completion times throughout the Bases, both within the U.S. EPR Technical Specifications and the Standard Technical Specifications for Westinghouse Plants (NUREG-1431).

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

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One EDG inoperable.	B.1 Perform SR 3.8.1.1 for the offsite circuits.	1 hour AND Once per 8 hours thereafter
	AND	
	B.2 Declare required feature(s) supported by the inoperable EDG inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	AND	
	B.3.1 Determine OPERABLE EDGs are not inoperable due to common cause failure.	24 hours
	OR	
	B.3.2 Perform SR 3.8.1.2 for OPERABLE EDGs.	24 hours
	AND	
	B.4 ----------NOTE---------- Required Action B.4 is not applicable if both EDGs in the same divisional pair are inoperable and Condition C is entered. ---------- Align the alternate feed from the remaining OPERABLE EDG in the divisional pair.	72 hours

DELETED MATERIAL
----------NOTE----------
Required Action B.4 is not applicable if both EDGs in the same divisional pair are inoperable and Condition C is entered.

Question 16-6

16-6

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	AND	
	B.5 Restore EDG to OPERABLE status.	120 days
C. Two EDGs inoperable.	C.1 ----------NOTE---------- Required Action C.1 is not applicable if both EDGs in the same divisional pair are inoperable. ---------- Align the alternate feed from the remaining OPERABLE EDG in one divisional pair.	2 hours
	AND	
	C.2 Restore one EDG to OPERABLE status.	72 hours
D. Two offsite circuits inoperable.	D.1 Declare required feature(s) inoperable when its redundant feature(s) is inoperable.	12 hours from discovery of Condition ~~C~~ D concurrent with inoperability of redundant features
	AND	
	D.2 Restore one offsite circuit to OPERABLE status.	24 hours

16-19

16-17

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ 1350 gal of fuel oil.	31 days
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	31 days
SR 3.8.1.6	Verify each fuel oil transfer system operates to automatically transfer fuel oil from storage tank to the day tank.	~~92~~ 31 days
SR 3.8.1.7	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify each EDG starts from standby condition and achieves: a. In ≤ 15 seconds, voltage ≥ 6210 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 6210 V and ≤ 7260 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	184 days
SR 3.8.1.8	----------NOTE---------- This Surveillance shall not normally be performed in MODE 1 or 2. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify automatic and manual transfer of AC power sources from the normal offsite circuit to the alternate offsite circuit.	24 months

16-14

16-8

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	----------NOTE---------- If performed with the EDG synchronized with offsite power, it shall be performed at a power factor ≤ 0.9. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable. ---------- Verify each EDG rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ ~~64.5~~63 Hz; 16-7 b. Within 3 seconds following load rejection, the voltage is ≥ 6210 V and ≤ 7260 V; and c. Within 3 seconds following load rejection, the frequency is ≥ 58.8 Hz and ≤ 61.2 Hz.	24 months
SR 3.8.1.10	----------NOTE---------- If performed with EDG synchronized with offsite power, it shall be performed at a power factor ≤ 0.9. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable. ---------- Verify each EDG does not trip and voltage is maintained ≤ 8280 V during and following a load rejection of ≥ 8550 kW and ≤ 9500 kW.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	----------NOTE---------- All EDG starts may be preceded by prelube period. ---------- Verify on an actual or simulated Safety Injection System actuation signal each EDG auto-starts from standby condition and: a. In ≤ 15 seconds after auto-start and during tests, achieves voltage ≥ 6210 V and frequency ≥ 58.8 Hz; b. Achieves steady state voltage ≥ 6210 V and ≤ 7260 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz; c. Operates for ≥ 5 minutes; and d. Permanently connected loads remain energized from the offsite power system. e. Emergency loads are energized from the offsite power system.	24 months 16-9
SR 3.8.1.13	Verify each EDG's noncritical automatic trips are bypassed on an actual or simulated Loss of Offsite Power signal on the emergency bus concurrent with an actual or simulated Safety Injection System actuation signal.	24 months

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 Class 1E DC subsystem(s) shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

----------NOTE----------
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required battery charger inoperable.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. AND A.2 Verify battery float current ≤ 2 amps. AND A.3 Restore required battery charger to OPERABLE status.	2 hours Once per 12 hours 72 hours
B. One or more required DC electrical power subsystems inoperable for reasons other than Condition A.	B.1 Declare affected required feature(s) inoperable. OR	Immediately

16-32

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
OR Required Actions and associated Completion Time of Condition A not met.	B.2.1 Suspend movement of irradiated fuel assemblies. AND B.2.2 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration. AND B.2.3 Initiate action to restore required DC subsystem(s) to OPERABLE status.	Immediately Immediately Immediately

16-32

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	----------NOTE---------- The following SRs are not required to be performed: SR 3.8.4.2 and SR 3.8.4.3. ----------	
	For DC subsystems required to be OPERABLE, the following SRs ~~of Specification 3.8.4, "DC Sources - Operating",~~ are applicable: SR 3.8.4.1 SR 3.8.4.2 SR 3.8.4.3	In accordance with applicable SRs

16-34

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank is at or above the level at which fuel oil is automatically added. The level is expressed as an equivalent volume in gallons, and is selected to ensure adequate fuel oil for a minimum of 1 hour of EDG operation at full load plus 10%.

The 31 day Frequency is adequate to assure that a sufficient supply of fuel oil is available, since low level alarms are provided and facility operators would be aware of any large uses of fuel oil during this period.

SR 3.8.1.5

Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel oil day tanks once every 31 days eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during EDG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequencies are established by Regulatory Guide 1.137 (Ref. 9). This SR is for preventative maintenance. The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during the performance of this Surveillance.

SR 3.8.1.6

This Surveillance demonstrates that each required fuel oil transfer pump operates and transfers fuel oil from its associated storage tank to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for automatic fuel transfer systems are OPERABLE.

16-14

The ~~92~~31 day Frequency is appropriate considering the reliability and redundancies of the system.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.7

See SR 3.8.1.2.

SR 3.8.1.8

Transfer of each 6.9 kV ESF bus power supply from the normal offsite circuit to the alternate offsite circuit demonstrates the OPERABILITY of the alternate circuit distribution network to power the shutdown loads. The 24 month Frequency of the Surveillance is based on engineering judgment and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

16-8

This SR is modified by a Note. The reason for the Note is that, during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.9

Each EDG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the EDG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. For this unit, the

BASES

SURVEILLANCE REQUIREMENTS (continued)

associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they

are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights
or deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.12

16-9

This Surveillance demonstrates that the EDG automatically starts and achieves the required voltage and frequency within the specified time (15 seconds) from an actual or simulated Safety Injection System actuation signal and operates for ≥ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability. SR 3.8.1.12.d and SR 3.8.1.12.e ensures that permanently connected loads and emergency loads are energized from the offsite electrical power system on a SIS actuation without loss of offsite power.

The requirement to verify the connection of permanent and autoconnected loads is intended to satisfactorily show the relationship of these loads to the offsite power loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded with undue hardship or potential for undesired operation. For instance, ECCS injection valves are not desired to be stroked open, or high pressure injection systems are not capable of being operated at full flow, or RHR systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the EDG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The Frequency of 24 months is intended to be consistent with the expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by a Note. The reason for the Note is to minimize wear and tear on the EDGs during testing. For the purpose of this testing, the EDGs must be started from standby conditions, that is, with

BASES

ACTIONS (continued)

Pursuant to LCO 3.0.6, the Distribution System's ACTIONS would not be entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A are modified by a Note to indicate that when Condition A is entered with no AC power to any required ESF bus, the ACTIONS for LCO 3.8.10 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit, whether or not a division is de-energized. LCO 3.8.10 would provide the appropriate restrictions for the situation involving a de-energized division.

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires the SRs from LCO 3.8.1 that are necessary for ensuring the OPERABILITY of the AC sources in other than MODES 1, 2, 3, and 4. SR 3.8.1.8 is not required to be met since only one offsite circuit is required to be OPERABLE. SR 3.8.1.12 and SR 3.8.1.18 are not required to be met because the Safety Injection System actuation signal is not required to be OPERABLE. SR 3.8.1.17 is not required to be met because the required OPERABLE EDG(s) is not required to undergo periods of being synchronized to the offsite circuit. SR 3.8.1.~~20~~19 is excepted because starting independence is not required with the DG(s) that is not required to be operable.

16-47

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE EDG(s) from being paralleled with the offsite power network or otherwise rendered inoperable during performance of SRs, and to preclude deenergizing a required 6.9 kV ESF bus or disconnecting a required offsite circuit during performance of SRs. With limited AC sources available, a single event could compromise both the required circuit and the EDG. It is the intent that these SRs must still be capable of being met, but actual performance is not required during periods when the EDG and offsite circuit is required to be OPERABLE. Refer to the corresponding Bases for LCO 3.8.1 for a discussion of each SR.

REFERENCES None.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Parameters

BASES

BACKGROUND

This LCO delineates the limits on battery float current as well as electrolyte temperature, level, and float voltage for the DC batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources – Operating" and LCO 3.8.5, "DC Sources - Shutdown." In addition to the limitations of this Specification, the licensee controlled program also implements a program specified in Specification 5.5.16 for monitoring various battery parameters that is based on the recommendations of IEEE Standard 450-2002, "IEEE Recommended Practice For Maintenance, Testing, And Replacement Of Vented Lead-Acid Batteries For Stationary Applications" (Ref. 1).

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 250 V for 120 cell battery (i.e., cell voltage of 2.065 volts per cell (Vpc)). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with its open circuit voltage ≥ 2.065 Vpc, the battery cell will maintain its capacity for 30 days without further charging per manufacturer's instructions. Optimal long term performance however, is obtained by maintaining a float voltage 2.20 to 2.25 Vpc. This provides adequate over-potential which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.22 Vpc corresponds to a total float voltage output of 266.4 V for a 120 cell battery as discussed in FSAR Chapter 8 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 (Ref. 1) and FSAR Chapter 15 (Ref. 2), assume the Protection System (PS) and systems that perform Engineered Safety Features functions are~~is~~ OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the EDGs, emergency auxiliaries, Instrumentation and Control, and control and switching during all MODES of operation.

16-36

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least two divisions of DC sources OPERABLE during accident conditions, in the event of:

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst-case single failure.

Battery parameters satisfy Criterion 3 of 10 CFR 50.36(d)(2)(ii).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters - Operating

BASES

BACKGROUND

The inverters are the preferred source of power for the AC vital buses because of the stability and reliability they achieve. The function of the inverter is to provide AC electrical power to the vital buses. The Uninterruptible Power Supply (UPS) loads can be powered from an AC source or from the station battery. The station battery provides an uninterruptible power source for the Instrumentation and Control (I&C) system power, which includes the Protection System (PS) and Emergency Diesel Generator (EDG) starting logic. Specific details on inverters and their operating characteristics are found in FSAR Chapter 8 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The initial conditions for postulated accidents and anticipated operational occurrences in FSAR Chapter 6 (Ref. 2) and FSAR Chapter 15 (Ref. 3), assume the PS and systems that perform Engineered Safety Features functions are~~is~~ OPERABLE. The inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of normal and emergency power for 480 VAC loads requiring uninterruptible power and the AC/DC converters that provide power to the I&C system, which includes the PS, during all MODES of operation. This ensures that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

16-39

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes maintaining required AC vital buses OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC electrical power or all onsite AC electrical power; and

b. A worst case single failure.

Inverters are a part of the distribution system and, as such, satisfy Criterion 3 of 10 CFR 50.36(d)(2)(ii).

LCO

The inverters ensure the availability of AC electrical power for the instrumentation required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated accident. The inverters also supply motive power to certain ESF components (e.g., containment isolation valves).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Inverters - Shutdown

BASES

BACKGROUND

A description of the inverters is provided in the Bases for LCO 3.8.7, "Inverters - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 (Ref. 1) and FSAR Chapter 15 (Ref. 2), assume the Protection System (PS) and systems that perform Engineered Safety Features functions areis OPERABLE. The DC to AC inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of required power to the Instrumentation and Control (I&C) system, which includes the PS and Emergency Diesel Generator starting logic so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

16-42

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the inverter to each AC vital bus during MODES 5 and 6 ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is available to mitigate events postulated during shutdown, such as a fuel handling accident.

16-41

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many postulated accidents that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

BASES

APPLICABLE SAFETY ANALYSES (continued)

16-41

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case postulated accidents which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, has found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The inverters were previously identified as part of the distribution system and, as such, satisfy Criterion 3 of 10 CFR 50.36(d)(2)(ii).

LCO

The inverter ensures the availability of electrical power for the instrumentation for systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated accident. The battery powered inverters provide uninterruptible supply of AC electrical power to the AC vital buses even if the 6.9 kV safety buses are de-energized. OPERABILITY of the inverter requires that the AC vital bus be powered by the inverter. This ensures the availability of sufficient inverter power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

APPLICABILITY

The inverter required to be OPERABLE in MODES 5 and 6 and during movement of irradiated fuel assemblies provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core;

b. Systems needed to mitigate a fuel handling accident are available;

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

BASES

APPLICABLE SAFETY ANALYSES

The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 (Ref. 1) and FSAR Chapter 15 (Ref. 2), assume the Protection System (PS) and systems that perform Engineered Safety Features functions are~~is~~ OPERABLE. The AC, DC, and AC vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

16-43

The OPERABILITY of the AC, DC, and AC vital bus electrical power distribution systems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining power distribution systems OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power or all onsite AC electrical power; and

b. A worst case single failure.

The distribution systems satisfy Criterion 3 of 10 CFR 50.36(d)(2)(ii).

LCO

The required power distribution subsystems listed in Table 3.8.9-1 ensure the availability of AC, DC, and AC vital bus electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated accident. The designated AC, DC, and AC vital electrical power distribution subsystems are required to be OPERABLE.

Maintaining the Divisions 1, 2, 3, and 4 AC, DC, and AC vital bus electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single failure within any system or within the electrical power distribution subsystems will not prevent safe shutdown of the reactor.

OPERABLE AC electrical power distribution subsystems require the associated buses, load centers, motor control centers, and distribution panels to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses and distribution panels to be energized to their proper voltage from the associated battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated inverter via inverted DC voltage, inverter using an AC source, or Class 1E voltage regulated bus.

BASES

LCO (continued)

16-51

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open unless they are being utilized to power an alternate feed. The alternate feed is interlocked to prevent sources from two divisions supplying a bus at the same time. In addition, interlocks prevent inadvertently paralleling two EDGs together. Open tie breakers ~~This~~ prevent~~s~~ any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, that could cause the failure of a redundant subsystem and a loss of essential safety function(s). With a tie breaker closed to implement alternate feed, a fault within the alternate fed divisional pair may affect two redundant subsystems within the divisional pair. During alternate feed, this is acceptable since the other divisional pair power distribution subsystems are available to support redundant subsystems. This applies to the onsite, safety related redundant electrical power distribution subsystems. It does not, however, preclude redundant Class 1E 6.9 kV buses from being powered from the same offsite circuit.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated accident.

Electrical power distribution subsystem requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems - Shutdown."

ACTIONS

A.1

With one or more of the required AC electrical power distribution subsystems inoperable and a loss of function has not occurred, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in one of the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC electrical power distribution subsystem must be restored to OPERABLE status within 8 hours.

BASES

ACTIONS (continued)

Condition A worst scenario is one 6.9 kV AC electrical power distribution subsystem out for maintenance and another in the same divisional pair (Divisions 1 and 2 or Divisions 3 and 4) without AC power (i.e., no offsite power to the division and the associated EDG inoperable). In this Condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operator's attention be focused on minimizing the potential for loss of power to the remaining divisions by stabilizing the unit, and on restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because of:

a. The potential for decreased safety if the unit operator's attention is diverted from the evaluations and actions necessary to restore power to the affected division, to the actions associated with taking the unit to shutdown within this time limit; and

b. The potential for an event in conjunction with a single failure of a redundant component in the remaining divisions with AC power.

Required Action A.1 is modified by a Note that requires the applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources - Operating," to be entered for DC division made inoperable by inoperable power distribution subsystems. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. Inoperability of a distribution system can result in loss of charging power to batteries and eventual loss of DC power. This Note ensures that the appropriate attention is given to restoring charging power to batteries, if necessary, after loss of distribution systems.

B.1

With one or more AC vital subsystems inoperable, and a loss of function has not yet occurred, the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum ESF functions not being supported. Therefore, the required AC vital bus must be restored to OPERABLE status within 2 hours by powering the bus from the associated inverter via inverted DC, inverter using an ~~internal~~ AC source, or Class 1E voltage regulated bus.

16-44

Condition B represents one or more AC vital buses without power; potentially both the DC source and the associated AC source are nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all noninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit,

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.10 Distribution Systems - Shutdown

BASES

BACKGROUND

A description of the AC, DC, and vital AC electrical power distribution systems is provided in the Bases for LCO 3.8.9, "Distribution Systems - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of postulated accidents and anticipated operational occurrences in FSAR Chapter 6 (Ref. 1) and FSAR Chapter 15 (Ref. 2), assume the Protection System (PS) and systems that perform Engineered Safety Features functions are~~is~~ OPERABLE. The AC, DC, and AC vital electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

16-27

The OPERABILITY of the AC, DC, and AC vital electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum AC, DC, and AC vital electrical power distribution subsystems during MODES 5 and 6, and during movement of irradiated fuel assemblies ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is provided to mitigate events postulated during shutdown, such as a fuel handling accident.

The AC, DC, and AC vital electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(d)(2)(ii).

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support required features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of required systems, equipment, and components - all specifically addressed in each LCO and implicitly required via the definition of OPERABILITY.