ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, May 25, 2011 9:41 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); HALLINGER Pat (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); WILLIFORD Dennis (AREVA); NOXON David (AREVA); SHARPE Robert (AREVA); WILLIAMSON Rick (AREVA); CORNELL Veronica (EXTERNAL AREVA)
Subject: Draft Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, Questions 03.02.01-12, 03.02.02-07, -08, -10, and -11
Attachments: RAI 420 Questions 03.02.01-12, 03.02.02-07, -08, -10, and -11 US EPR DC - DRAFT.pdf

Getachew,

Attached is a revised draft response for RAI 420 Questions 03.02.01-12, 03.02.02-07, -08, -10, and -11 in advance of the June 10, 2011 final response date. This revised draft response addresses comments received during the April 12, 2011 NRC phone call.

Let me know if the staff has questions or if this can be sent as a final response.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WELLS Russell (RS/NB)
Sent: Wednesday, April 13, 2011 3:45 PM
To: 'Tesfaye, Getachew'
Cc: NOXON David (RS/NB); GARDNER Darrell (RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, OPEN ITEM, Supplement 5

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 420 on August 25, 2010. RAI 420 Supplement 1 sent on November 22, 2010, Supplement 2 sent on January 7, 2011, Supplement 3 sent on February 9, 2011 and Supplement 4 sent on March 14, 2011 provided a revised schedule. The attached file, “RAI 420 Supplement 5 Response US EPR DC” provides a technically correct and complete final response to 6 of the 11 questions, as committed.

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 420 Question 03.02.02-9.

The following table indicates the respective pages in the response document, “RAI 420 Supplement 5 Response US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page

RAI 420 — 03.02.01-13	2	3
RAI 420 — 03.02.01-14	4	5
RAI 420 — 03.02.01-15	6	7
RAI 420 — 03.02.01-16	8	8
RAI 420 — 03.02.01-17	9	9
RAI 420 — 03.02.02-9	10	10

To allow additional time to interact with the NRC, the schedule for technically correct and complete responses to the remaining 5 questions has been changed and is provided below.

Question #	Response Date
RAI 420 — 03.02.01-12	June 10, 2011
RAI 420 — 03.02.02-7	June 10, 2011
RAI 420 — 03.02.02-8	June 10, 2011
RAI 420 — 03.02.02-10	June 10, 2011
RAI 420 — 03.02.02-11	June 10, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
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434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Monday, March 14, 2011 3:18 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); NOXON David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, OPEN ITEM, Supplement 4

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 420 on August 25, 2010. RAI 420 Supplement 1 sent on November 22, 2010, Supplement 2 to sent on January 7, 2011, and Supplement 3 sent on February 9, 2011 provided a revised schedule

Additional time is required to interact with the NRC staff.

The schedule for a technically correct and complete response to this question has been changed and is provided below.

Question #	Response Date
RAI 420 — 03.02.01-12	April 20, 2011
RAI 420 — 03.02.01-13	April 20, 2011
RAI 420 — 03.02.01-14	April 20, 2011

RAI 420 — 03.02.01-15	April 20, 2011
RAI 420 — 03.02.01-16	April 20, 2011
RAI 420 — 03.02.01-17	April 20, 2011
RAI 420 — 03.02.02-7	April 20, 2011
RAI 420 — 03.02.02-8	April 20, 2011
RAI 420 — 03.02.02-9	April 20, 2011
RAI 420 — 03.02.02-10	April 20, 2011
RAI 420 — 03.02.02-11	April 20, 2011

Sincerely,

Russ Wells
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From: BRYAN Martin (External RS/NB)
Sent: Wednesday, February 09, 2011 1:23 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); NOXON David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, OPEN ITEM, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 420 on August 25, 2010. RAI 420 Supplement 1 sent on November 22, 2010 and Supplement 2 sent on January 7, 2011 provided a revised schedule

Additional time is required to interact with the NRC staff.

The schedule for a technically correct and complete response to this question has been changed and is provided below.

Question #	Response Date
RAI 420 — 03.02.01-12	March 16, 2011
RAI 420 — 03.02.01-13	March 16, 2011
RAI 420 — 03.02.01-14	March 16, 2011
RAI 420 — 03.02.01-15	March 16, 2011
RAI 420 — 03.02.01-16	March 16, 2011
RAI 420 — 03.02.01-17	March 16, 2011
RAI 420 — 03.02.02-7	March 16, 2011
RAI 420 — 03.02.02-8	March 16, 2011
RAI 420 — 03.02.02-9	March 16, 2011
RAI 420 — 03.02.02-10	March 16, 2011

RAI 420 — 03.02.02-11	March 16, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
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Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Friday, January 07, 2011 3:59 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); NOXON David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, OPEN ITEM, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 420 on August 25, 2010. Supplement 1 to RAI 420 provided a revised schedule on November 22, 2010

Additional time is required to interact with the NRC staff.

The schedule for a technically correct and complete response to this question has been changed and is provided below.

Question #	Response Date
RAI 420 — 03.02.01-12	February 14, 2011
RAI 420 — 03.02.01-13	February 14, 2011
RAI 420 — 03.02.01-14	February 14, 2011
RAI 420 — 03.02.01-15	February 14, 2011
RAI 420 — 03.02.01-16	February 14, 2011
RAI 420 — 03.02.01-17	February 14, 2011
RAI 420 — 03.02.02-7	February 14, 2011
RAI 420 — 03.02.02-8	February 14, 2011
RAI 420 — 03.02.02-9	February 14, 2011
RAI 420 — 03.02.02-10	February 14, 2011
RAI 420 — 03.02.02-11	February 14, 2011

Sincerely,

Martin (Marty) C. Bryan
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From: BRYAN Martin (External RS/NB)
Sent: Monday, November 22, 2010 5:00 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); NOXON David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, OPEN ITEM, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 420 on August 25, 2010.

Additional time is required to interact with the NRC staff.

The schedule for a technically correct and complete response to this question has been changed and is provided below.

Question #	Response Date
RAI 420 — 03.02.01-12	January 10, 2011
RAI 420 — 03.02.01-13	January 10, 2011
RAI 420 — 03.02.01-14	January 10, 2011
RAI 420 — 03.02.01-15	January 10, 2011
RAI 420 — 03.02.01-16	January 10, 2011
RAI 420 — 03.02.01-17	January 10, 2011
RAI 420 — 03.02.02-7	January 10, 2011
RAI 420 — 03.02.02-8	January 10, 2011
RAI 420 — 03.02.02-9	January 10, 2011
RAI 420 — 03.02.02-10	January 10, 2011
RAI 420 — 03.02.02-11	January 10, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
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From: BRYAN Martin (External RS/NB)
Sent: Wednesday, August 25, 2010 8:20 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); NOXON David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, OPEN ITEM

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 420 Response US EPR DC.pdf," provides the schedule for technically correct and complete responses to these questions.

The following table indicates the respective pages in the response document, "RAI 420 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 420 — 03.02.01-12	2	2
RAI 420 — 03.02.01-13	3	3
RAI 420 — 03.02.01-14	4	4
RAI 420 — 03.02.01-15	5	5
RAI 420 — 03.02.01-16	6	6
RAI 420 — 03.02.01-17	7	7
RAI 420 — 03.02.02-7	8	8
RAI 420 — 03.02.02-8	9	9
RAI 420 — 03.02.02-9	10	10
RAI 420 — 03.02.02-10	11	11
RAI 420 — 03.02.02-11	12	12

The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 420 — 03.02.01-12	November 23, 2010
RAI 420 — 03.02.01-13	November 23, 2010
RAI 420 — 03.02.01-14	November 23, 2010
RAI 420 — 03.02.01-15	November 23, 2010
RAI 420 — 03.02.01-16	November 23, 2010
RAI 420 — 03.02.01-17	November 23, 2010
RAI 420 — 03.02.02-7	November 23, 2010
RAI 420 — 03.02.02-8	November 23, 2010
RAI 420 — 03.02.02-9	November 23, 2010
RAI 420 — 03.02.02-10	November 23, 2010
RAI 420 — 03.02.02-11	November 23, 2010

Sincerely,

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Martin.Bryan.ext@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Monday, July 26, 2010 7:20 AM
To: ZZ-DL-A-USEPR-DL
Cc: McNally, Richard; Dixon-Herrity, Jennifer; Patel, Jay; Miernicki, Michael; Colaccino, Joseph
Subject: U.S. EPR Design Certification Application RAI No. 420 (4687,4661), FSAR Ch. 3, OPEN ITEM

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on June 15, 2010, and on July 19, 2010, 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: 3027

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4727AD8)

Subject: Draft Response to U.S. EPR Design Certification Application RAI No. 420, FSAR Ch. 3, Questions 03.02.01-12, 03.02.02-07, -08, -10, and -11
Sent Date: 5/25/2011 9:40:51 AM
Received Date: 5/25/2011 9:41:35 AM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Files	**Size**	**Date & Time**
MESSAGE	12374	5/25/2011 9:41:35 AM
RAI 420 Questions 03.02.01-12, 03.02.02-07, -08, -10, and -11 US EPR DC - DRAFT.pdf	986569	

Options
Priority: Standard
Return Notification: No
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Sensitivity: Normal
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Recipients Received:

Response to

Request for Additional Information No. 420(4687, 4661), Revision 0, Questions 03.02.01-12, 03.02.02-07, -08, -10, and -11

7/26/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.02.01 - Seismic Classification
SRP Section: 03.02.02 - System Quality Group Classification

Application Section: 3.2.1

QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)

Question 03.02.01-12:

OPEN ITEM

FSAR Subsection 3.2.1.1 in combination with Subsection 3.1.1.2.1 identify that safety-related SSCs are designed either to withstand the effects of natural phenomena, including the SSE, without loss of capability to perform their safety-functions, or to fail in a safe condition. GDC 2 actually applies to all important to safety SSCs and not only SSCs that are considered safety related. In RAI 03.02.01-1, the staff requested the applicant to expand FSAR Subsections 3.2 and 3.1.1.2.1 to clarify how GDC 2 is satisfied relative to SSCs that are not identified as safety-related, but are considered important to safety and have augmented seismic requirements, such as the nonsafety-related fire protection system or any SSC that is classified as Seismic Category II. The RAI response gave several examples from earlier NRC documents that definitions of safety-related and important to safety are the same. The applicant also stated that U.S. EPR conforms to the RGs (1.29, 1.143, 1.151 and 1.189) listed in the SRP 3.2.1; therefore, the U.S. EPR SSCs are designed to the requirements of GDC 2.

Based on the applicant's RAI response, the applicant's process to apply the terms safety-related and important to safety to the classification of SSCs is considered unclear and unresolved such that additional information is needed to clarify how these terms are applied and to explain the process to develop supplemental quality requirements (special treatment) for nonsafety-related risk-significant SSCs considered important to safety to satisfy GDC 2. To comply with GDC 2 for seismic classification, further clarify how these terms are applied to satisfy GDC 2, revise the FSAR subsection 3.1.1.2.1 stated conformance to GDC 1 to replace the term "safety related" with the more comprehensive term "important to safety" and factor risk significance into quality group classification, based on the definition of the term important to safety in 10 CFR 50.

In regard to risk significance, the Staff is concerned that the applicant has not adequately identified risk-significant SSCs in the FSAR that may be important to safety or defined supplemental design and quality requirements to ensure their availability after an earthquake and reliability assumed in the PRA. Portions of nonsafety-related systems that are risk-significant may be important to safety and require special treatment and appropriate seismic classification so that they are designed to withstand earthquakes consistent with assumptions in the PRA. The complete list of risk-significant SSCs is developed in phases and SRP 17.4 indicates that, during the first phase, SSCs are identified for inclusion in the program. The response to RAI 17.4-1 includes a component list as PRA input to the RAP component identification process and the response to RAI 17.04-2 identifies that the full scope RAP will include passive components and the COL applicant is to provide the final list. The response to RAI 17.04-16 further identified that the FSAR will be revised to include a list of risk-significant SSCs. Since risk-significant SSCs are to be included in Section 17.4 of the DCD, the scope of risk-significant SSCs is to be evaluated in that subsection in combination with the Chapter 19 evaluation. The supplemental seismic requirements needed to satisfy GDC 2 for risk-significant SSCs are unclear and the applicant should either identify these specific requirements or explain the process, such as D-RAP and the NS-AQ classification process, used to develop and apply these requirements. For example, the basis for concluding that all risk-significant SSCs important to safety are designed to withstand earthquakes should be identified.

Response to Question 03.02.01-12:

The U.S. EPR does not apply the term "important to safety" to the classification of systems structures and components (SSC). The term "important to safety" is only used in the context of quoting the requirements of the general design criteria (GDC). In the case of GDC 2, the guidance in Regulatory Guide 1.29 refers to 10 CFR 50 Appendix S for a definition of what SSC must remain functional if the safe-shutdown earthquake ground motion occurs. The criteria in 10 CFR 50 Appendix S is the same as the definition of “safety-related” in 10 CFR 50.2. Thus, there is no need to replace the term “safety-related” with “important to safety” in reference to GDC 2 in U.S. EPR FSAR Tier 2, Section 3.2.2.1. Replacing the term “safety-related” with “important to safety” would also be inconsistent with the NRC acceptance criteria in SRP 3.2.1 which states “To meet the requirements of GDC 2, 10 CFR Part 100, Appendix A, and 10 CFR Part 50, Appendix S regarding seismic design classification are met by using guidance provided in RG 1.29 “Seismic Design Classification.” The following U.S. EPR FSAR, Tier 2, sections and table will be revised to clarify the use of the terms “safety-related” and “important to safety”:

- Section 3.1.2.8.1
- Section 3.2
- Section 3.5
- Section 3.5.1.2
- Section 3.6.2.3
- Section 4.1.1
- Section 4.6.2
- Section 9.5.4.4
- Section 9.5.5.4
- Section 9.5.6.4
- Section 9.5.7.4
- Section 9.5.8.4
- Section 9A.1.2
- Section 9A.2.2
- Section 10.4.5.2.3
- Section 14.2
- Table 9A-2

Based on recent discussions with the NRC and on the clarification on the issues involved with this question (see RAI 435, Question 03.02.02-12) a more detailed discussion on the U.S EPR process for QA and seismic classification along with a discussion of the treatment of RAP related SSC is provided below.

U.S. EPR SSC QA and Seismic Classification Discussion

As described in U.S. EPR FSAR Tier 2, Section 3.2, the U.S. EPR safety classification methodology uses the following designations:

- Safety-related: S.
- Non-safety-related: NS.
- Supplemented Grade: NS-AQ.

Safety-related SSC are all treated as important to safety with respect to the applicable GDC. Safety-related SSC have a full 10 CFR 50 Appendix B quality assurance program applied along with the applicable GDC, such as the designation of Seismic Category I to meet the requirements of GDC 2. U.S EPR FSAR Tier 2, Section 17.5 references the AREVA NP Inc. Quality Assurance Plan for Design Certification of the U.S. EPR Topical Report (ANP-10266A) which describes the QA requirements applicable to all safety-related SSC.

In the case of assigning quality group classifications applied to SSC, compliance with GDC 1 is achieved through meeting the guidance in Regulatory Guide 1.26 as specified in SRP 3.2.2. As described in U.S EPR FSAR Tier 2, Section 3.2.2, the quality group classification of the U.S. EPR SSC conforms to the guidance of Regulatory Guide 1.26.

Some non-safety-related SSC are designated as supplemented grade (NS-AQ) as described in U.S. EPR FSAR Tier 2, Section 3.2. Supplemented grade (NS-AQ) is a classification applied to SSC for which a significant licensing requirement or commitment applies, but where the SSC functions do not meet the 10 CFR 50.2 definition of “safety-related.” Examples of SSC typically classified as supplemented grade include:

- Some post accident instrumentation (Regulatory Guide 1.97).
- Radwaste (Regulatory Guide 1.143).
- Some SSC required to respond to or mitigate the consequences of a station blackout (SBO) (Regulatory Guide 1.155).

A list of significant licensing requirements or commitments can be found in the following U.S. EPR FSAR Tier 2 Tables:

- Table 1.9-2 — "U.S. EPR Conformance with Regulatory Guides"
- Table 1.9-3 — "U.S. EPR Conformance with TMI Requirements (10 CFR 50.34(f)) and Generic Issues (NUREG-0933)"
- Table 1.9-4 — "U.S. EPR Conformance with Advanced and Evolutionary Light-Water Reactor Design Issues (SECY-93-087)"

For the U.S. EPR design, the application of additional quality assurance measures associated with non safety-related SSC is as follows:

- Supplemented grade SSC (NS-AQ) where the “significant licensing requirement or commitment” specifically invokes portions of 10 CFR 50 Appendix B Quality Assurance program requirements are designated as “Yes” for the 10 CFR 50 Appendix B column of the SSC classification table (U.S. EPR FSAR Tier 2, Table 3.2.2-1). A qualifying statement is provided that only pertinent sections of 10 CFR 50 Appendix B apply. For example, SSC that are classified as Seismic Category II are subject to the pertinent requirements of 10 CFR 50 Appendix B per Regulatory Guide 1.29.
- Supplemented Grade SSC (NS-AQ) where the “significant licensing requirement or commitment” does not specifically invoke 10 CFR 50 Appendix B Quality Assurance program requirements are designated as “No” for the 10 CFR 50 Appendix B column of the SSC classification table (U.S. EPR FSAR Tier 2 Table 3.2.2-1). For example, Regulatory Guide 1.143 notes that SSC in radioactive waste management systems have only a minimum impact on safety, so they need not be controlled according to 10 CFR 50 Appendix B Quality Assurance program requirements.
- Non-safety-related SSC (NS) are designated as “No” in the 10 CFR 50 Appendix B column of the SSC classification table (U.S. EPR FSAR Tier 2 Table 3.2.2-1).

For the U.S. EPR, seismic classification of SSC is described in U.S. EPR FSAR Tier 2, Section 3.2.1.

The U.S. EPR design is “deterministic” and does not invoke 10 CFR 50.69 to risk-classify SSC and does not implement risk-based programs (e.g., IST, ISI, Fire Protection). As noted in U.S. EPR FSAR Tier 2, Section 19.1.1.1, “The PRA is not used for any formal risk-informed applications, such as 10CFR50.69, Risk-Informed Categorization and Treatment of structures, systems and components (SSC) and 10CFR50.48, Fire Protection.” Risk significance is also not part of the SSC classification procedure for the U.S. EPR design. Since the classification process is deterministic, safety classifications, seismic classifications and quality group classifications are not selected on the basis of the risk significance of the SSC.

<u>U.S. EPR RAP SSC Treatment</u>

For the U.S. EPR design, a list of SSC determined to be risk-significant by the reliability assurance program (RAP) is provided in U.S.EPR FSAR Tier 2, Table 17.4-2 at the system and structure level. The SSC within an RAP designated system are therefore considered to be risk-significant under the RAP program. Further screening may be performed during detailed design by the COL applicant at a system function or individual component level.

Safety-related SSC that are also determined to be risk significant in the RAP have a full 10 CFR 50 Appendix B quality assurance program applied, along with the applicable GDC.

For non-safety-related SSC that have been determined to be “risk-significant” under the RAP in U.S. EPR FSAR Tier 2 Section 17.4, the U.S. EPR design applies additional quality assurance measures and design requirements. Consistent with the guidance in SRP 17.5, Part V, “Non-Safety Related SSC Quality Controls.” These additional quality assurance measures are described in the approved Topical Report ANP-10266A, Addendum A, and are applied to all risk-significant SSC during the design certification.

U.S. EPR FSAR Tier 2, Section 17.4.2 will be revised to describe the application of QA to SSC on the RAP list and to reflect the commitment to U.S. EPR QAPD, Addendum A parts A-1 through A-19 for all non-safety-related RAP SSC. U.S. EPR FSAR Tier 2, Section 3.2 will be revised to cross reference U.S. EPR FSAR Tier 2, Section 17.4.2 for a description of how quality assurance is applied to risk significant SSC.

The U.S. EPR RAP implementation process described in U.S. EPR FSAR Tier 2, Section 17.4 provides reasonable assurance that SSC related RAP information, such as risk-significant functions and failure modes, are reflected in the design and transmitted to the combined license (COL) applicant to support the procurement, fabrication, construction, and initial testing activities associated with the risk-significant SSC. This process provides reasonable assurance that both safety- and non-safety-related functions, including functions that are considered to be risk-significant are appropriately considered in the design of the SSC.

For seismic risk significance determination, the U.S. EPR design uses a PRA-based seismic margin assessment to determine seismic-related risk significance as part of an overall input to the reliability assurance program. The U.S. EPR PRA-based seismic margin assessment does not credit any non-seismic equipment to meet the commitment for a high confidence low probability of failure plant-level capacity of 1.67 times the safe shutdown earthquake (SSE). Therefore, no additional risk significant SSC currently classified as non-seismic are required to meet GDC 2 or any other licensing commitments related to seismic design.

Related to the RAP SSC, at a plant level, safety-significant features based on PRA insights and severe accident analyses are identified in U.S. EPR FSAR Tier 2, Table 14.3-6, which are verified by corresponding ITAAC. Significant PRA-related insights and assumptions are also documented in U.S. EPR FSAR Tier 2, Tables 19.1-108 and 19.1-109, respectively. U.S. EPR FSAR Tier 2, Section 19.1.2.2, COL item 19.1-9, confirm that the assumptions used in the PRA remain valid for the as-designed, as-built plant. PRA-related equipment reliability assumptions are also verified and maintained through the implementation of the maintenance rule by the COL applicant. Together these measures provide reasonable assurance that SSC reliability assumptions are confirmed and maintained throughout the life cycle of the plant. U.S. EPR FSAR Tier 2, Section 17.4.2 will be revised to reflect a commitment to the maintenance rule program for RAP related SSC.

To incorporate the broader definition of important to safety, U.S. EPR FSAR Tier 2, Sections 3.1.1.1.1, 3.1.1.2.1 and 3.2.1 will be revised to appropriately reference back to the PRA and RAP program for information on risk significant SSC.

FSAR Impact:

The following U.S. EPR FSAR Tier 2, sections and table will be revised as described in the response and indicated on the enclosed markup:

- Section 3.1.1.1.1
- Section 3.1.1.2.1
- Section 3.1.2.8.1
- Section 3.2
- Section 3.5

- Section 3.5.1.2
- Section 3.6.2.3
- Section 4.1.1
- Section 4.6.2
- Section 9.5.4.4
- Section 9.5.5.4
- Section 9.5.6.4
- Section 9.5.7.4
- Section 9.5.8.4
- Section 9A.1.2
- Section 9A.2.2
- Table 9A-2
- Section 10.4.5.2.3
- Section 14.2
- Section 17.4.2

Question 03.02.02-7:

OPEN ITEM

General Design Criterion 1 identifies, in part, that structures systems and components important to safety shall be designed, fabricated, erected and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. The QA Plan described in Topical Report ANP-10266A, Revision 1 applies to both safety-related and nonsafety-related SSCs, but this report does not identify a specific list of important to safety SSCs that require application of the 10 CFR 50 Appendix B QA Program or the list of nonsafety-related SSCs that apply the QA program that is not consistent with Appendix B. Table 3.2.2-1 of the DCD does include a list of safety-related and nonsafety-related SSCs defined as NS-AQ that require the application of an Appendix B Program, but the list of specific nonsafety-related SSCs that apply the quality assurance program that is not consistent with Appendix B is not clearly defined. In RAI 03.02.02-2, the applicant was requested to clarify which nonsafety-related SSCs apply the QA Program for nonsafety-related SSCs and identify if these SSCs have a unique quality classification.

The RAI response identifies that SSCs classified as supplemental grade (NS-AQ) are included in the 10 CFR 50 Appendix B QA Program, if inclusion is explicitly invoked by the relevant significant licensing requirement or commitment. The response references the response to RAI 03.02.01-1 for further discussion of the NS-AQ classification. The Staff is concerned that SSCs with a Safety Classification of NS-AQ that may be important to safety do not consistently invoke the 10 CFR 50 Appendix B program or elements of a similar program. For example, the Station Blackout Diesel Generator Set is considered risk-significant and is classified as NS-AQ, but there is no 10 CFR 50 Appendix B program or similar special treatment identified in the Classification Table 3.2.2-1. The applicant is requested to review classification Table 3.2.2-1 and identify those additional risk-significant SSCs that should apply the 10 CFR 50 Appendix B program or similar special treatment provisions.

Response to Question 03.02.02-7:

The NRC question states that the station blackout (SBO) diesel generator set is considered risk-significant and is classified as NS-AQ. The basis for the NS-AQ classification, or the non-safety-related supplemented grade, is that, as noted in U.S. EPR FSAR Tier 2, Section 3.2, a significant licensing requirement or commitment applies. ANSI/ANS 58-14 ANSI/ANS-58.14-1993, Section 5.6 states a “significant licensing requirement or commitment is one that is based on an NRC regulation or licensing guidance.” In the case of the SBO diesel generator set, the “significant licensing requirement or commitment” that applies is 10 CFR 50.63 along with the pertinent regulatory guidance.

As noted in U.S EPR FSAR Tier 2, Section 3.2, “Non-safety-related SSC are not included in the 10 CFR 50, Appendix B quality assurance program. However, the non-safety-related SSC that are classified as supplemented grade will be included in the 10 CFR 50, Appendix B quality assurance program if inclusion is explicitly invoked by the relevant ‘significant licensing requirement or commitment’.” For example, SSC that are classified as NS-AQ because they are Seismic Category II, have 10 CFR 50 Appendix B applied, consistent with the guidance in RG 1.29 Regulatory Position C.4. This is also consistent with the guidance of SRP 3.2.1 which states: “The requirements of 10 CFR Part 50, Appendix B apply to activities affecting the safety-related functions of those SSC, including those SSC defined by the guidance of RG 1.29 as Seismic Category I SSCs.”

AREVA NP also applies 10 CFR 50 Appendix B to components that are NS-AQ and non-seismic (NSC) if required by the “significant licensing requirement or commitment.” In the case of the SBO Diesel Generator Set, as noted in NRC approved AREVA NP Topical Report, ANP-10266A, Section A-19:

> “AREVA NP Inc. implements quality requirements to SBO equipment in accordance with Regulatory Position 3.5, “Quality Assurance and Specific Guidance for SBO Equipment that is not Safety-Related,” and Appendix A, “Quality Assurance Guidance for Non- Safety Systems and Equipment,” in Regulatory Guide 1.155, “Station Blackout.”

Neither Regulatory Position 3.5 of RG 1.155 nor the referenced Appendices A and B to RG 1.155 specifically impose Appendix B to 10 CFR Part 50. They provide QA guidance “to nonsafety systems and equipment used to meet the requirements of § 50.63 and not already explicitly covered by existing QA requirements in 10 CFR Part 50 in Appendix B or R.”

There is therefore no regulatory basis for imposing 10 CFR Part 50, Appendix B to the SBO diesel generator set. As noted in ANP-10266A and U.S EPR FSAR Tier 2, Section 8.4.1, AREVA conforms to the guidance of RG 1.155 for SBO.

The application of quality assurance controls to SSC identified as “risk-significant” under the Reliability Assurance Program (RAP) is addressed in the Response to Question 3.2.1-12 of this RAI.

FSAR Impact:

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

Question 03.02.02-8:

OPEN ITEM

FSAR Subsection 3.2 describes supplemented grade as those SSCs deemed to be important by NRC staff. Important to safety SSCs are not deemed important by NRC staff, but are identified as important to safety by the applicant's evaluation process such as the PRA, expert panel or other RTNSS process. FSAR Table 3.2.2-1 identifies those SSCs that are defined as NS-AQ. In RAI 03.02.02-3, the applicant was requested to revise the Subsection 3.2 wording to clarify the applicant's process to determine SSCs that are important to safety and, for those SSCs classified as NS-AQ, identify the supplemental design and quality requirements to ensure the reliability assumed in the PRA. If this information is not currently available and will be determined later, the applicant was requested to advise accordingly.

The RAI response stated that the FSAR will not be revised and refers to RAI questions 03.02.01-1 and 03.02.01-4 and FSAR Tier 2 Section 17.4 for a description of the reliability assurance program. The responses to the referenced RAIs and the description of the reliability assurance program in Chapter 17.4 do not currently identify the list of risk-significant SSCs or define the supplemental design and quality requirements for each nonsafety-related SSC classified in Table 3.2.2-1, such as NS-AQ, that may be important to safety. However, the response to RAI 17.04-16 identified that the FSAR will be revised to include a list of risk-significant SSCs. Identify or reference the list of nonsafety-related SSCs requiring special treatment in the FSAR, such as NS-AQ or other list of risk-significant SSCs and confirm that all nonsafety-related SSCs are or will be included in Table 3.2.2-1 with an appropriate classification based on its risk significance. Also identify the special treatment applied or, if not yet developed, revise FSAR subsection 3.2.2 to reference the D-RAP or other process to ensure the integrity and reliability assumed in the PRA and identify when the special treatment requirements are to be identified.

Response to Question 03.02.02-8:

As stated in the Response to Question 03.02.01-12 of this RAI, risk significance is not part of the equipment classification process. Since risk significance is not part of the SSC classification criteria, U.S. EPR FSAR Tier 2, Table 3.3.2-1, which specifically addresses SSC classification will not be revised. U.S.EPR FSAR Tier 2, Table 17.4-2 provides the list of SSC included within the RAP program at a structure and system level. Special treatment for risk-significant (RAP-related) SSC will be added to U.S. EPR FSAR Tier 2, Section 17.4 as described in the Response to Question 03.02.01-12.

The description of supplemented grade in U.S.EPR FSAR Tier 2, Section 3.2 will be revised as described in the Response to Question 03.02.01-12.

FSAR Impact:

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

Question 03.02.02-10:

OPEN ITEM

10 CFR Part 52.47 identifies that the Commission will require prior to design certification, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit. FSAR Tier 1 Chapter 2 includes system based design descriptions. This chapter identifies that specifications exist for components, piping and supports shown as ASME Section III. It is understood that this information is based on the information included in FSAR Tier 2 and design specifications are required for ASME Section III systems and components, but it is not clear if specifications exist for non-ASME systems and components. In RAI 03.02.02-6, the applicant was requested to clarify if the design information on quality group classification for all important to safety systems and components within the scope of the FSAR is included in specifications and if this information is now available for audit. The RAI response referenced the response to RAI 03.02.01-5. The response to RAI 03.02.01-5 identified that the design information on the seismic classification of SSCs within the scope of the FSAR, including structures, is included in design documents which are available for NRC inspection. The NRC Staff plans to audit this information to determine if the design is essentially complete in scope regarding quality group classifications of important to safety SSCs. Staff is concerned that P&IDs included in Tier 1 may not be consistent with P&IDs in Tier 2 concerning classification level of detail. The staff will schedule an audit based on availability of the documentation. The applicant is requested to correct any discrepancies between Tier 1 and Tier 2 and identify when the design information will be available.

Response to Question 03.02.02-10:

The Response to RAI 399, Question 14.03.03-47 provides revised U.S. EPR FSAR Tier 1 figures to indicate the ASME Code Section III Class 1, 2, and 3 boundaries. Other than differences in the level of detail shown with respect to ASME code class boundaries, no discrepancies have been identified between Tier 1 and Tier 2 figures.

The availability of design information on the seismic classification of SSCs within the scope of the FSAR is discussed in the response to Question 03.02.01-15.

FSAR Impact:

U.S. EPR FSAR, Tier 1, figures will be revised as described in the response and are provided in the response to RAI 399, Question 14.03.03-47.

Question 03.02.02-11:

OPEN ITEM

FSAR Tier 1 subsection 1.0 identifies that Tier 1 information is derived from Tier 2 and SRP 14.3 states that safety findings are based on Tier 2, not Tier 1, information because Tier 1 information is derived from Tier 2. SRP 14.3 further identifies that Tier 1 is to be clear and consistent with Tier 2 information. In regard to the FSAR Tier 1 ASME Code Class information included in the Chapter 2 system based design descriptions and ITAAC, update the figures included in Tier 1 to be consistent with Tier 2 figures in terms of level of detail for ASME classifications. FSAR Tier 1 subsection 1.0 identifies that Tier 1 information is derived from Tier 2 and SRP 14.3 states that safety findings are based on Tier 2, not Tier 1, information because Tier 1 information is derived from Tier 2. SRP 14.3 further identifies that Tier 1 is to be clear and consistent with Tier 2 information. In regard to the FSAR Tier 1 ASME Code Class information included in the Chapter 2 system based design descriptions and ITAAC, update the figures included in Tier 1 to be consistent with Tier 2 figures in terms of level of detail for ASME classifications.

Response to Question 03.02.02-11:

The Response to RAI 399, Question 14.03.03-47 provides revised U.S. EPR FSAR Tier 1 figures to indicate the ASME Code Section III Class 1, 2, and 3 boundaries. Other than differences in the level of detail shown with respect to ASME code class boundaries, no discrepancies have been identified between Tier 1 and Tier 2 figures.

FSAR Impact:

U.S. EPR FSAR, Tier 1, figures will be revised as described in the response and are provided in the response to RAI 399, Question 14.03.03-47.

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classification, relevant codes and standards, and applicable quality control program for each component is provided in Section 3.2.

03.02.01-12

To address the broader concept of important to safety in the context of GDC 1, non-safety-related, risk significant SSC identified by the reliability assurance program (RAP) will be subject to the additional QA measures, as described in Section 17.4.2.

3.1.1.2 Criterion 2 – Design Bases for Protection Against Natural Phenomena

"Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of the capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and (3) the importance of the safety functions to be performed."

3.1.1.2.1 U.S. EPR Compliance

The safety-related SSC are designed either to withstand the effects of natural phenomena without loss of the capability to perform their safety functions, or to fail in a safe condition. The nature and magnitude of the natural phenomena considered in the U.S. EPR design are described in Chapter 2. The U.S. EPR design criteria for wind, tornado, flood, and earthquakes are discussed in Section 3.3, Section 3.4, and Section 3.7, respectively.

The U.S. EPR design envelopes the natural phenomena of expected sites. The design bases for safety-related SSC reflect this envelope of natural phenomena, including appropriate combinations of the effects of normal and accident conditions. Seismic and ~~quality group~~other design classifications, as well as other pertinent standards and information, are provided in the sections that discuss individual SSC.

03.02.01-12

To address the broader concept of important to safety in the context of GDC 2, SSC credited in the PRA analysis of external events are qualified for natural phenomena, as described in Sections 19.1.5.1 and 19.1.5.4.

3.1.1.3 Criterion 3 – Fire Protection

"Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

The onsite electric power supplies, including the batteries, and the onsite electric distribution system shall have sufficient independence, redundancy, and testability to perform their safety functions, assuming a single failure.

Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights-of-way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in sufficient time, following a loss of onsite alternating current power supplies and other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained.

Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies."

3.1.2.8.1 U.S. EPR Compliance

The onsite AC power system is designed as two separate distribution systems, a Class 1E system and a non-Class 1E system. Safety-related loads as well as select non-safety-related loads ~~important to safety~~ are powered from the four-division Class 1E emergency power supply system (EPSS), while remaining non-safety-related plant loads are powered from the non-Class 1E normal power supply system (NPSS). The separation of the Class 1E and non-Class 1E buses limits the effect of non-safety-related equipment on safety-related equipment.

03.02.01-12

Each EPSS division has an emergency diesel generator (EDG) as a standby power source. A loss of power or a degraded voltage condition detected at the EPSS switchgear results in automatic disconnection from the preferred power source and connection of the respective EDG. EPSS loads are automatically sequenced on each EDG so that EDG output voltage and frequency are adequately maintained while providing power to the EPSS safety-related loads.

Four Class 1E uninterruptible power supply (EUPS) divisions consisting of batteries, battery chargers, inverters, and distribution equipment provide uninterruptible power

As a result, application of the U.S. EPR safety classification methodology logically allows both the identification of safety-related systems that include non-safety-related components, and the identification of non-safety-related systems that include safety-related components.

In addition to safety-related and non-safety-related, the U.S. EPR safety classification methodology has a third classification which includes SSC that are by definition non-safety-related, but to which a "significant licensing requirement or commitment" applies. A "significant licensing requirement or commitment" is a practice that is based on an NRC regulation or licensing guidance that applies to SSC that do not meet the 10 CFR 50.2 definition of safety-related~~, but which are deemed to be "important to safety" by NRC staff~~. These SSC are classified as supplemented grade.

03.02.01-12

The U.S. EPR safety classification methodology uses the following designations:

- Safety-related: S.
- Non-safety-related: NS.
- Supplemented Grade: NS-AQ.

U.S. EPR SSC that are classified as safety-related are subject to the quality assurance program requirements of 10 CFR 50, Appendix B. Non-safety-related SSC are not included in the 10 CFR 50, Appendix B quality assurance program. However, those non-safety-related SSC that are classified as supplemented grade will be included in the 10 CFR 50, Appendix B quality assurance program if inclusion is explicitly invoked by the relevant "significant licensing requirement or commitment." Also see Section 17.4.2 for a description of how quality assurance is applied to risk-significant SSC.

03.02.01-12

Table 3.2.2-1—Classification Summary lists the safety classification of U.S. EPR SSC.

Classification of fire protection systems in accordance with RG 1.189 is described in Section 9.5.1.

3.2.1 Seismic Classification

GDC 2 requires in part that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes…without loss of capability to perform their safety functions." In addition, 10 CFR 50.34(a)(12) requires that—in order to comply with the earthquake provisions of GDC 2—the U.S. EPR comply with the earthquake engineering criteria of 10 CFR 50, Appendix S. 10 CFR 50, Appendix S defines the safe shutdown earthquake (SSE) as the "vibratory ground motion for which certain structures, systems, and components must be designed to remain functional."

10 CFR 50, Appendix S states "the structures, systems, and components required to withstand the effects of the Safe Shutdown Earthquake Ground Motion or surface deformation are those necessary to assure:

1. The integrity of the reactor coolant pressure boundary;
2. The capability to shut down the reactor and maintain it in a safe shutdown condition; or
3. The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of §50.34(a)(1)."

To meet the requirements of both GDC 2 and 10 CFR 50, Appendix S with regard to the design for earthquakes, U.S. EPR SSC are seismically classified in accordance with RG 1.29.

Radioactive waste management SSC are explicitly excluded from the seismic classification requirements of RG 1.29. However, they meet the seismic design criteria specified in RG 1.143 (refer to Sections 11.2, 11.3, and 11.4) and GDC 61 as it relates to the design of radioactive waste systems and other systems that may contain radioactivity. Safety-related instrument sensing lines meet the seismic design requirements specified in RG 1.151.

The seismic classification of U.S. EPR SSC uses the following categories: Seismic Category I, Seismic Category II, radwaste seismic, conventional seismic, and non-seismic.

Table 3.2.2-1 lists the seismic classification of U.S. EPR SSC. A COL applicant that references the U.S. EPR design certification will identify the seismic classification of applicable site-specific SSC that are not identified in Table 3.2.2-1.

The piping and instrumentation diagrams (P&IDs) of U.S. EPR systems indicate the Seismic Category I boundaries when portions of a system are not Seismic Category I. A list of U.S. EPR piping and instrumentation diagrams is provided in Section 1.7.

03.02.01-12

To address the broader concept of important to safety in the context of seismic classification, only seismically designed SSC are credited in the probabilistic risk assessment-based seismic margin (refer to Section 19.1.5.1.2.4 and Table 19.1-106).

3.2.1.1 Seismic Category I

U.S. EPR SSC that are classified as safety-related are also designed to be capable of performing their safety functions during and following an SSE. Therefore, these safety-related SSC, including their foundations and supports, are classified as Seismic Category I. Additionally, certain SSC explicitly identified in RG 1.29, such as fuel

3.5 Missile Protection

In support of General Design Criteria 2 and 4 of Appendix A to 10 CFR 50, safety-related structures, systems and components (SSC) on the plant site and the containment are protected from externally and internally generated missiles. Safety-related SSC are designed and constructed so as not to fail or cause a failure in the event of a postulated credible missile impact. These SSC include some, which, if they fail, could cause the failure of the integrity of the reactor coolant system (RCS), the reduction to an unacceptable level of any plant feature required for safe shutdown of the reactor, or lead to offsite radiological consequences. The recommendations of RG 1.13, RG 1.27, RG 1.76, RG 1.115, and RG 1.117, as they pertain to internally and externally generated missiles, are met. Missile protection is provided by:

- Locating the system or component in a missile-proof structure.
- Separating redundant systems or components from the missile path or range.
- Providing local shields and barriers for systems and components.
- Designing the equipment to withstand the impact of the most damaging missile.
- Providing design features to prevent the generation of missiles.
- Orienting missile sources to prevent missiles from striking safety-related equipment ~~important to safety~~.

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Some missiles may be determined to be non-credible by demonstrating that the event is not statistically significant if the product of the probability of missile occurrence, probability of impact on a significant target, and probability of significant damage is less than 1×10^{-7} per year. To the extent practical, equipment required for safe shutdown of the U.S. EPR is located in areas of the plant separate from potential sources of missiles. Four redundant trains of safety-related components are provided, which are housed in the four separate Safeguard Buildings, the Emergency Power Generation Buildings (EPGB), and the Essential Service Water Buildings (ESWB) which houses the Essential Service Water Cooling Tower Structures (ESWCT) and the Essential Service Water Pump Buildings (ESWPB). In the case that missile creation cannot be prevented, missile barriers are provided to preclude damage to SSC required to achieve safe shutdown or to those SSC that are required to prevent the release of radioactivity producing offsite doses greater than prescribed limits. Missile barriers are composed of walls, partitions, component housings, and other items that enclose safety-related systems or separate redundant trains of safety-related systems.

Postulated missile impacts are assumed to occur in conjunction with single active failures of the SSC used to attain safe shutdown of the plant. A single active failure is the failure of an electrical or fluid system component as a result of mechanical, hydraulic, pneumatic or electrical malfunction, without the loss of the structural

Therefore, SSC inside containment are designed to withstand a postulated CRDM missile, even though this event is deemed non-credible.

03.02.01-12

A COL applicant that references the U.S. EPR design certification will describe controls to confirm that unsecured maintenance equipment, including that required for maintenance and that are undergoing maintenance, will be removed from containment prior to operation, moved to a location where it is not a potential hazard to safety-related SSC ~~important to safety~~, or seismically restrained to prevent it from becoming a missile.

3.5.1.3 Turbine Missiles

The plant layout, as shown in Figure 1.2-1 in Section 1.2, is a longitudinal arrangement for the turbine generators. The axis of the turbine rotor shafts is positioned such that safety-related structures, except for two of the four ESWBs and two of the four EPGBs, are located outside the turbine low-trajectory hazard zone, as defined by RG 1.115. Redundancy of the UHS and ESW systems and the EDGs provides adequate protection for U.S. EPR safety-related systems. Therefore, the turbine generator is favorably positioned, as defined by NUREG-0800 (Reference 10) SRP Section 3.5.1.3, because the containment and most of the safety-related SSC are located outside the low-trajectory hazard zone defined by RG 1.115.

Section 10.2 describes the design of the turbine generator. The probability of turbine failure resulting in ejection of the turbine rotor (or internal structure) fragments through the turbine casing, P_1, will be less than 1×10^{-4}. In accordance with guidance provided by Reference 10, SRP Section 3.5.1.3, Table 3.5.1.3-1, an overall turbine missile safety objective for the probability of unacceptable damage resulting from turbine missiles, P_4, of less than 1×10^{-7} is satisfied with P_1 less than 1×10^{-4} for favorably oriented turbine-generators. Therefore, given the redundancy and the low probability of a turbine missile being generated, the impact of turbine-generated missiles on safety-related SSC is not safety significant. A COL applicant that references the U.S. EPR design certification will confirm the evaluation of the probability of turbine missile generation for the selected turbine generator, P_1, is less than 1×10^{-4} for turbine-generators favorably oriented with respect to containment.

Section 10.2 describes requirements for disk and rotor integrity, rotor material fracture toughness, overspeed protection, inspection, testing, examination, startup procedures, operation procedures, and maintenance of the turbine generator equipment. A COL applicant that references the U.S. EPR design certification will assess the effect of potential turbine missiles from turbine generators within other nearby or co-located facilities.

3.6.2.3 Analytical Methods to Define Forcing Functions and Response Models

03.02.01-12

Movement of pipe, due to pipe breaks and cracks, is analyzed to show that the motion does not result in overstress of any safety-related structure, system, or component ~~important to safety~~. This section will address the criteria for dynamic or pseudo-dynamic analysis of piping systems, targets, and protection devices. Criteria for the dynamic analysis that will be followed are:

- For each postulated pipe break an analysis of the dynamic response of the broken pipe is performed.
- In the case of circumferential pipe breaks, the need for a pipe whip dynamic analysis is determined based on the driving energy of the fluid.
- Mass inertia and stiffness properties of the systems, elastic and inelastic deformation of piping systems, impact and rebound, and support boundary conditions are adequately accounted for when calculating the dynamic response of piping and restraints.
- Loading condition (pressure, temperature, and inertial effects) prior to rupture is used in the evaluation of postulated breaks. For piping pressurized during normal power operation, the initial conditions are the greater of system energy at hot standby or at 102 percent of rated power.
- Crushable material used to dissipate the energy of a moving pipe is limited to 80 percent of its rated energy dissipating capacity. A 10 percent increase of the design yield strength (S_Y) is used to account for strain rate effects.
- Unrestrained whipping pipe is considered to be capable of causing circumferential and longitudinal breaks, individually, in smaller NPS piping and leakage cracks in piping that is of equal or larger NPS with thinner wall thickness, except where analytical or experimental justification is provided that demonstrates that the impact does not cause rupture.

A representative mathematical model of a piping system and its restraints is shown in Figure 3.6.2-1—Representative Mathematical Model of a Piping System and its Restraints. The analytical methods used to predict the response of the piping and restraint system are presented in the sections below.

3.6.2.3.1 Rupture Response Models and Forcing Functions for LBB-Analyzed Piping

Since the LBB evaluation eliminates dynamic effects, there are no response models or forcing functions for the piping for which the LBB methodology is applied (see Sections 3.6.2.1 and 3.6.3).

- For the initial fuel loading, the MTC is negative for power operating conditions.
- Power oscillations that could result in conditions exceeding fuel design limits are not possible, or can be reliably and readily detected and suppressed.
- Instrumentation and controls (I&C) are provided to monitor variables and systems that can affect the fission process over anticipated ranges for normal operation, AOOs, and postulated accident (PA) conditions, and maintain the variables and systems within prescribed operating ranges.

03.02.01-12

- Reactivity control systems automatically initiate so that fuel design limits are not exceeded as a result of AOOs. This requires automatic operation of safety-related systems and components ~~important to safety~~ under accident conditions.
- No single malfunction of the reactivity control systems (excluding rod ejection) causes violation of the fuel design limits.
- Two independent reactivity control systems of different design are provided.
- Reactivity control systems have a combined capability, in conjunction with poison addition by the safety injection system (SIS), of reliably controlling reactivity changes under PA conditions, with appropriate margin for stuck rods.
- Fuel damage during PAs will not be severe enough to prevent control rod insertion when it is required.
- The effects of postulated reactivity accidents neither result in damage to the reactor coolant pressure boundary greater than limited local yielding, nor cause sufficient damage to significantly impair core coolability.
- Core coolability will be maintained, even after PAs.
- The reactor can be brought to a safe state, and the core can be kept sub-critical with acceptable heat transfer following a PA with only a small fraction of fuel rods damaged.
- Reactor materials are selected to be compatible with operating conditions.

4.1.2 References

1. ANP-10285P, Revision 0, “U.S. EPR Fuel Assembly Mechanical Design Topical Report,” AREVA NP Inc., October 2007.
2. ANP-10263P-A, Revision 0, “Codes and Methods Applicability Report for the U.S. EPR,” AREVA NP Inc., August 2007.
3. BAW-2241P-A, Revision 2, “Fluence and Uncertainty Methodologies,” Worsham, J.R., et al., Lynchburg, Virginia, April 2006.
4. BAW-10231P-A, Revision 1, “COPERNIC Fuel Rod Design Computer Code,” Framatome ANP, January 2004.

Section 7.2 describes the PS, including I&C for CRDS trip functions.

4.6.2 Evaluation of the Control Rod Drive System

The safety-related function of the CRDS is to perform a rod drop and put the reactor in a subcritical condition. As described in Section 3.9.4, the CRDMs fail in an acceptable condition in accordance with GDC 23. When power is interrupted, the CRDMs insert the RCCA into the core by gravity. Therefore, the power supply to the operating coils of the CRDM is non-safety related. Additionally, the CRDS is part of the environmental qualification program as described in Section 3.11 and in Table 3.11-1, so that the CRDS remains functional and provides reactor shutdown capabilities under adverse environmental conditions. As noted in Section 3.1, in the event of a high or moderate energy pipe failure within the plant, adequate protection is provided so that essential structures, systems, and components are not impacted by the adverse effects of postulated piping failure. Within the support structure, the reactor vent lines and in-core instrumentation lines are high energy lines and are designed to comply with ASME Section III. These lines are less than or equal to one inch nominal pipe size (NPS) and as addressed in Section 3.6.2.1.3, are not postulated for line breaks or leakage cracks and therefore, do not represent a credible failure mode. As addressed in Section 3.5.1.2.2, a CRDM pressure housing failure, sufficient to create a missile from a piece of the housing or to allow a control rod to be ejected rapidly from the core, is non-credible. The U.S. EPR design also prevents the dynamic effects of postulated pipe ruptures based on the application of the leak before break approach.

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The CRDS design follows the guidance of IEEE 384-1992 (Reference 3) and RG 1.75 with respect to physical independence and electrical isolation between essential and non-essential components. Physical separation, or barriers utilized to achieve the physical separation, and approved electrical isolation devices are utilized to implement electrical isolation. As addressed in Section 7.1, the safety-related I&C systems and components ~~important to safety~~ are designed to accommodate the effects of, and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, which include loss-of-coolant accidents (LOCA) and from events and conditions outside the plant in accordance with GDC 4. Section 7.1 also addresses I&C architecture implementation of several design strategies such as defense-in-depth, functional diversity, priority, and redundancy that optimize plant safety.

The PS conforms to IEEE Std 603-1998 (Reference 2) as described in Sections 7.1, 7.2, and 7.3. To conform to this standard, the PS design was evaluated against numerous criteria, including but not limited to the following:

- Single failure criteria.
- Environmental and seismic qualification.

In the event that the fuel filters become fouled during engine operation, they are designed to be replaced on line without affecting engine operation.

On a LOOP, a time-delayed startup signal is transmitted from the plant protection system to the EDGs. The auxiliary fuel oil pump auto starts to begin flow from the day tank to the engine until fuel is supplied via the engine-driven pump.

9.5.4.4 Safety Evaluation

With the exception of the fill and vent connections, the DGFOSTS is located inside the EPGB.

- The external portions of the DGFOSTS are designed to withstand the effects of manmade and natural phenomena. Each fuel oil storage tank has two external fill locations. Each fuel oil storage and day tank has two external vent locations. The redundant locations are separated from each other by line of sight and distance. The exterior fill and vent SSC present a small target and it is improbable that a single event could disable more than one location on a single or multiple DGFOSTS. The design provides sufficient features and administrative controls on the storage tank outside fill and pump-out lines and tank vents to protect against damage from vehicle, tornado, hurricanes, missiles, floods, extreme cold, and accidental contamination.

- The EPGB is designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles, and other natural phenomena. Sections 3.3, 3.4, 3.5, 3.7(B), and 3.8 provide the bases for the adequacy of the structural design of this building. The buildings for the storage tanks are missile protected. The building design forms watertight barriers to prevent water entry into the tank rooms from ground water and flooding.

- The safety-related portions of the DGFOSTS are designed to remain functional after an SSE. Sections 3.7(B).2 and 3.9(B) provide the design loading conditions that were considered. There are no high- or moderate-energy lines in the EPGB whose failure could alter the function of more than one DGFOSTS. Sections 3.5, 3.6, and 9.5.1 provide the hazards analyses to verify that a safe shutdown, as outlined in Section 7.4, can be achieved and maintained.

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- The DGFOSTS for each diesel engine is independent of any other diesel engine's DGFOSTS. This precludes the sharing of any safety-related systems and components ~~important to safety~~ that could prevent those systems or components from performing required safety functions.

- The four-division design of the DGFOSTS provides complete redundancy; therefore, no single failure will compromise the EDG safety functions. Vital power can be supplied from either onsite or offsite power systems, as described in Chapter 8. This meets the recommendation of NUREG/CR-0660 (Reference 4).

- The DGFOSTS is initially tested with the program given in Chapter 14. Periodic inservice functional testing is done in accordance with Section 9.5.4.5.

system is equipped with isolation valves on all branch lines so that a leak in those lines is isolated without affecting the operability of the DGCWS. Normal makeup to the system is provided by the demineralized water distribution system. The expansion tank also has provisions for alternate fill. A leak in the DGCWS is made up from the system expansion tank. The leak results in a low level in the DGCWS expansion tank, which provides an expansion tank low level alarm and actuates the demineralized water system fill valve. In the event the demineralized water distribution system is unavailable or unable to maintain adequate makeup, the operator manually fills the system from an alternate source. If a leak is greater than that which can be maintained through normal or alternate fill provisions, the EDG is shut down by the operators or it will trip on very-high water temperature, once the water loss reduces the capability of the DGCWS to properly cool the engine. The very-high temperature trip shuts down the engine to prevent overheating and potentially catastrophic engine failure.

9.5.5.4 Safety Evaluation

- The cooling system is located in the EPGB and meets the same safety objectives as the diesel engine itself. The cooling water heat exchangers are installed in the EPGB and are structurally protected against environmental impacts.

- The EPGB is designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles, and other similar natural phenomena. Sections 3.3, 3.4, 3.5, 3.7(B), and 3.8 provide the bases for the adequacy of the structural design of the EPGBs.

- The safety-related portion of the DGCWS is designed to remain functional after an SSE. Sections 3.7(B).2 and 3.9(B) provide the design loading conditions that were considered. There are no high- or moderate-pressure lines in the EPGB whose failure can affect the function of more than one DGCWS. Sections 3.5, 3.6, and 9.5.1 provide the hazards analyses to make sure that a safe shutdown, as outlined in Section 7.4, can be achieved and maintained.

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- The DGCWS for each diesel engine is independent of any other diesel engine's DGCWS. This precludes the sharing of any safety-related systems and components ~~important to safety~~ that could prevent those systems or components from performing required safety functions.

- The four-division design of the DGCWS provides redundancy. No single failure will compromise the EDG safety functions. Vital power can be supplied from either onsite or offsite power systems, as described in Chapter 8. This meets the recommendation of NUREG/CR-0660 (Reference 1).

- The DGCWS is initially tested with the program described in Chapter 14. Periodic inservice functional testing is carried out in accordance with Section 9.5.5.5.

- Section 3.2 delineates the quality group classification, seismic category, and design and fabrication codes applicable to this system and supporting systems. The power

All other alarmed conditions will require operator evaluation to determine if continued operation is feasible. Operators can activate a manual trip at any time.

In case of abnormal operation during periodic start, an alarm signal is provided to the MCR. If the failure jeopardizes the equipment during a test or surveillance start, a trip signal is activated.

In case of abnormal conditions such as system leaks identified by operations and maintenance personnel during surveillance testing, routine operator rounds, and scheduled maintenance activities, the system has manual isolation valves on non-essential portions of the system, which are not required for engine operation.

9.5.6.4 Safety Evaluation

- The safety-related portion of the DGSAS is located in the EPGBs. The EPGB is designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles, and other similar natural phenomena. Sections 3.3, 3.4, 3.5, 3.7(B), and 3.8 provide the bases for the adequacy of the structural design of these buildings.

- The safety-related portion of the DGSAS is designed to remain functional after an SSE. Sections 3.7(B).2 and 3.9(B) provide the design loading conditions that were considered. There are no high- or moderate-energy lines in the EPGB whose failure could alter the function of more than one DGSAS. Sections 3.5, 3.6, and 9.5.1 provide the hazards analyses to make sure that a safe shutdown, as outlined in Section 7.4, can be achieved and maintained.

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- The DGSAS for each diesel engine is independent of any other diesel engine's DGSAS. This precludes the sharing of any safety-related systems and components ~~important to safety~~ that could prevent those systems or components from performing required safety functions.

- The four-division design of the EDGs provides complete redundancy. A single failure in one division of the DGSAS safety-related portion will not compromise the EDG safety function. All vital power can be supplied from either onsite or offsite power systems, as described in Chapter 8. This meets the recommendation of NUREG/CR-0660 (Reference 1).

- The DGSAS is initially tested using the program described in Chapter 14. Periodic inservice functional testing is carried out in accordance with Section 9.5.6.5.

- Section 3.2 delineates the quality group classification, seismic category, and design and fabrication codes applicable to the safety-related portion of this system and supporting systems. The power supplies and control functions necessary for safe function of the DGSAS are Class IE, as described in Chapters 7 and 8.

- The DGSAS is designed and fabricated to minimize the potential for system leaks. The system is monitored and alarms will indicate if the system parameters exceed predetermined limits. The starting air receivers have inlet check valves to isolate

- A failure in the prelube system, which results in a lowering of the sump oil temperature. As described in Section 8.3, this condition is monitored and alarmed locally and in the MCR.

- Crankcase pressure exceeding a maximum, which sounds an alarm to alert an increase in crankcase pressure and to shut down the engine automatically. This alarm is active in all modes but the trip function is disabled in emergency mode. See Section 8.3 for instrumentation details.

- Sudden pressure surges within the crankcase will be relieved by explosion relief doors which are designed to relieve the vapors from the crankcase and prevent the entry of outside air into the crankcase.

- Excessive leakage in the main oil system decreases the system pressure and, as described in Section 8.3, the engine automatically shuts down. This trip function is active in all engine operating modes.

- Low lube oil level in the engine lube oil sump is alarmed locally and generates a common MCR alarm.

- High oil temperature will result in an alarm in all engine operating modes. Very high temperature will trip the engine in normal engine operating mode, but the trip is bypassed in emergency engine operating mode.

9.5.7.4 Safety Evaluation

- The DGLS is located in the EPGB. This building is designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles, and other natural phenomena. Sections 3.3, 3.4, 3.5, 3.7(B), and 3.8 provide the bases for the adequacy of the structural design of this building.

- The DGLS remains functional after an SSE. Sections 3.7(B).2 and 3.9(B) provide the design loading conditions that were considered. There are no high energy lines in the EPGB. Sections 3.5, 3.6, and 9.5.1 provide the hazards analyses to provide reasonable assurance that a safe shutdown, as outlined in Section 7.4, can be achieved and maintained.

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- The DGLS for each diesel engine is independent of any other diesel engine's DGLS. This precludes the sharing of any safety-related systems and components ~~important to safety~~ that could prevent those systems or components from performing required safety functions.

- The four-division design of the EDGs provides complete redundancy; therefore a single failure of the DGLS portion will not compromise the EDG safety function. Vital power can be supplied from either the onsite or offsite power systems, as described in Chapter 8. This meets the recommendation of NUREG/CR-0660 (Reference 1).

- The U.S. EPR has four independent divisions of essential service water (ESW) that provide cooling to the EDG of their respective division. Each EDG is cooled by a

The temperature of the engine exhaust gas is monitored to verify that the engine is operating as designed. An alarm is sounded if the exhaust temperature exceeds established parameters which could damage internal components of the engine or prevent the engine from meeting its design power requirements. Heat generated by the engine combustion is maintained in a defined range to allow the engine, turbocharger, and emissions equipment to function as designed.

The exhaust system is equipped with a bypass valve and a bypass stack which provides a safety-related exhaust path in the event that a system failure downstream restricts the exhaust flow.

9.5.8.4 Safety Evaluation

- The safety-related portion of the combustion air system is located inside the EPGB and meets the same safety objectives as the diesel engine itself. This building is designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles, and other natural phenomena. Sections 3.3, 3.4, 3.5, 3.7(B), and 3.8 provide the bases for the adequacy of the structural design of these buildings.
- The safety-related portion of the DGAIES is designed to remain functional after an SSE. Sections 3.7(B).2 and 3.9(B) provide the design loading conditions that were considered. There are no high- or moderate-pressure lines in the EPGB whose failure can affect the function of more than one DGAIES. Sections 3.5, 3.6 and 9.5.1 provide the hazards analyses to establish that a safe shutdown, as outlined in Section 7.4, can be achieved and maintained.

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- The DGAIES for each diesel engine is independent of any other diesel engine's DGAIES. This precludes the sharing of any safety-related systems and components ~~important to safety~~ that could prevent those systems or components from performing required safety functions.
- The four-division design of the EDG air system provides complete redundancy; therefore no single failure compromises the EDG system safety functions. Vital power can be supplied from either onsite or offsite power systems, as described in Chapter 8. This meets the recommendation of NUREG/CR-0660 (Reference 1).
- Section 3.2 delineates the quality group classification, seismic category, and design and fabrication codes applicable to the safety-related portion of this system and supporting systems. All the power supplies and control functions necessary for safe function of the air handling system are Class IE, as described in Chapters 7 and 8.

9.5.8.5 Inspection and Testing Requirements

The DGAIES is initially tested using the program detailed in Chapter 14 and Section 14.2, tests #104, 105, and 106.

Additionally, 10 CFR 50.34(h) requires new reactor license applications to include an evaluation of the facility against the current Standard Review Plan (SRP) guidance. The applicable SRP guidance is specified in Section 9.5.1 of NUREG-0800 (Reference 1). Reference 1 describes the areas of review, acceptance criteria, and review procedure for NRC review of nuclear power plant fire protection programs. Reference 1 in turn invokes RG 1.189 for methods acceptable to the NRC to demonstrate compliance with the SRP review criteria. In addition to the guidance specified in RG 1.189, Section 9.5.1 of Reference 1 also invokes SECY-90-016 (Reference 2) for additional NRC fire protection requirements applicable to evolutionary reactor designs.

9A.1.2 Defense-In-Depth

The objective of the overall Fire Protection Program is to implement a defense-in-depth strategy to achieve and maintain a high degree of plant safety. This strategy is accomplished by achieving and maintaining a balance between the following:

- Preventing fires from occurring.
- The capability to rapidly detect, control, and promptly extinguish those fires that do occur.

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- Adequate protection for safety-related structures, systems, and components (SSC) ~~important to safety~~ so that a fire that is not promptly extinguished by fire suppression activities will not prevent safe shutdown of the plant or result in release of radioactive materials to the environment.

The programmatic elements used by the FPA to implement the defense-in-depth strategy are:

- Document and assess the impact of in situ and transient fire hazards on a fire area basis throughout the facility, including potential effects on safe shutdown capability, effects of fire suppression activities, and applicable risk insights from the fire probabilistic fire risk assessment.
- Specify measures for fire prevention, fire detection, fire suppression, and fire confinement.
- Minimize the potential for a fire or fire-related event to place the plant in an unrecoverable condition, cause a release of radioactive materials, or result in radiological exposure to onsite and offsite personnel.
- Specify measures that will provide reasonable assurance that one success path of safe shutdown capability will be available under credible postfire conditions.

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4. The in situ plant equipment and components, including electrical cables, housed within each fire area are considered. Any <u>safety-related</u> SSC ~~important to safety~~ located within the fire area are considered.

5. In situ fire and explosion hazards associated with plant operations, maintenance, and refueling activities within the fire area are identified (e.g., cables, lube oil, diesel fuel oil, flammable gases, chemicals, building materials, and interior finish). In developing postulated fire scenarios for each fire area, the FPA considers the quantity and continuity of combustible materials, susceptibility of the materials to ignition, heat of combustion, heat release rates (HRR), and potential for fire spread.

   In the event that a fire area could be subject to potentially explosive environments from flammable gases or other potentially energetic sources (e.g., chemical treatment systems, ion exchange columns), explosion-prevention features and measures are provided.

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   External exposure hazards are identified (e.g., flammable and combustible liquid or gas storage, auxiliary boiler units, natural vegetation) that could potentially expose <u>safety-related</u> SSC ~~important to safety~~ to fire effects (i.e., heat, flame, smoke). Wildfire hazards are addressed if the potential for damage to <u>safety-related</u> SSC ~~important to safety~~ exists.

6. The credible in situ ignition sources within the fire area are identified. The FPA classifies ignition sources as common or atypical and assign potential fire severity levels on a generic basis using predefined guidance. Most in situ ignition sources are of the common type, which include electrical switchgear cabinets, general electrical and control cabinets, electric motors, pumps (i.e., reactor coolant pumps, feedwater pumps, and other pumps), diesel generators, air compressors, battery banks, boiler heating units, electric dryers, heating, ventilation, air conditioning (HVAC) subsystem components, and others.

   Atypical sources of ignition include arcing electrical faults, hydrogen storage tanks, hydrogen piping, turbine generator exciter hydrogen, outdoor oil-filled transformers, and liquid fuels (i.e., spills). Because of their nature, fires associated with atypical ignition sources are not assigned a generic intensity level.

   Most anticipated fires will involve the common in situ ignition sources as represented by the equipment and components typically found in nuclear power plants. Such fires can be assessed using a fixed fire intensity (i.e., HRR) level for the given fire ignition source. However, consideration of a fixed fire intensity level for a given ignition source may not adequately consider the potential for low-likelihood, high intensity fires. NUREG/CR-6850, (Reference 4) addressed this concern by assigning a ranking of two HRR values. The first value assigned is the 75th percentile fire intensity. This means that 75 percent of the fires involving a given ignition source would reach an intensity no greater than the cited fire intensity (absent the fire propagating to any secondary combustibles). The second HRR value is the 98th percentile value, which is intended to represent a high-confidence fire intensity value, which based on the industry guidance cited, is expected to bound the vast majority of fires involving a given ignition source.

of in situ hazards within the area and its FPA hazard classification, a THL-2 determination may or may not reflect the need for detailed assessment of transient fire hazards. A THL-3 determination generally reflects the need for detailed assessment of transient fire hazards within the area analysis. In such cases, the material type, quantity, and associated thermal properties comprising the transient hazard package is evaluated. More than one type of transient hazard source may apply to a given fire area. Section 9A.2.3.3 provides additional information regarding the transient fire hazard determination process.

Based on compartmentation of the plant by three hour rated structural fire barriers, additional fire protection features (e.g., fire detection system capability, fixed fire suppression system capability, electrical raceway fire barrier systems) are generally not required in order to provide adequate separation of redundant trains of safe shutdown systems, components, and cables. However, for provision of fire protection features, regulatory requirements and regulatory guidance take precedence. Risk-informed, performance-based methods, or other quantitative/computational methods or tools are not utilized to determine where fire detection and suppression systems will or will not be installed. However, where fire detection and suppression systems are provided in accordance with regulatory guidance, recognized fire protection engineering practices, methods and analytical tools, such as those promulgated by NUREG-1805 and NUREG-1824 may be used to assess the performance capability of such systems.

8. Based on the previously mentioned considerations, suitable fire protection defense-in-depth features are specified for all plant fire areas.

   The fire protection features provided (e.g., fire barriers and closure devices, fire detection systems, fire suppression systems and equipment) are designed and installed in accordance with applicable regulatory guidance, codes and NFPA standards. Deviations from the above requirements are justified. See Section 9.5.1 for further information regarding fire protection features.

9. Appropriate manual fire suppression capability (i.e., hydrants, standpipe and hose systems, and portable fire extinguishers) are specified and described for each plant fire area.

10. Pursuant to GDC 3, the potentially disabling effects of fire suppression systems, due to normal or inadvertent operation, on SSC important to safety are described for each fire area.

11. The FPA describes the means provided to ventilate, exhaust, or isolate each fire area. Additionally, in accordance with Reference 2, the ventilation system design provides reasonable assurance that smoke, hot gases, and fire suppressants do not migrate into other fire areas to the extent that they could adversely affect safe shutdown capabilities, including operator manual actions. See Section 9.5.1 for further information regarding the ventilation system design.

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12. For each fire area, the capability to protect safety-related SSC ~~important to safety~~ from flooding associated with automatic and manual fire suppression activities,

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Column	1	2	3	4	5
Fire Area	FA-UJA-01	FA-1UJH-01	FA-1UJH-02	FA-1UJH-03	FA-1UJH-04
Building	UJA/UJB	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-40 thru 09.APP.9A-51	09.APP.9A-6 thru 09.APP.9A-16	09.APP.9A-6 thru 09.APP.9A-16	09.APP.9A-6 thru 09.APP.9A-16	09.APP.9A-6 thru 09.APP.9A-16, 09.APP9A-22, and 09.APP.9A-27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	Yes	None	Yes	Yes
SCC: post-fire safe shutdown	Yes	None	None	Yes	Yes
In situ Loading (Note 1)	a, b, c, d, e, g	a, b, c	a, b, c, d	a, b, c, d, e, g, r, o	a, b, c, e, g
Transient Fire Loading	THL-1	THL-1	THL-1	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, c, d, m, o	b, n	b, c, n	a, b, c, d, o	b, n
Atypical Ignition Sources (Note 2b)	aa	None	None	aa	aa
Hazard Classification (Note 12)	OH Group-2	Light Hazard	Light Hazard	OH Group-1	OH Group-1
Automatic Fire Detection (Note 13)	Partial	None	Area Wide	Area Wide	Area Wide
Manual Fire Alarms	Yes	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	Partial	None	None	None	None

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Column	6	7	8	9	10
Fire Area	FA-1UJH-05	FA-1UJH-06	FA-1UJH-07	FA-1UJH-08	FA-2UJH-01
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-6 thru 09.APP.9A-16	09.APP.9A-6 thru 09.APP.9A-16	09.APP.9A-24	09.APP.9A-24 and 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	None	None	Yes
In situ Loading (Note 1)	a, b, f, m	a, b, c, e, g	a, b, c	a, b, c, d, e, g, h	a, b, c, e, g
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	THL-1
Common Ignition Source (Note 2a)	j, n	b, g	n	b, m, n, o	b, n
Atypical Ignition Sources (Note 2b)	aa	aa	None	aa	None
Hazard Classification (Note 12)	OH Group-2	OH Group-1	OH Group-1	OH Group-1	Light Hazard
Automatic Fire Detection (Note 13)	Area Wide	Area Wide	Area Wide	Partial	None
Manual Fire Alarms	None	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Column	11	12	13	14	15
Fire Area	FA-2UJH-02	FA-2UJH-03	FA-2UJH-04	FA-2UJH-05	FA-2UJH-06
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, g, h, r	a, b, c, e, g	a, b, c, e, g	a, b, f, m
Transient Fire Loading	THL-1	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	c, n	a, b, c, d, g, m, o	b, g, n	a, b, g, m	j, n
Atypical Ignition Sources (Note 2b)	None	aa	aa	aa	aa
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-1	OH Group-2
Automatic Fire Detection (Note 13)	Area Wide	None	Area Wide	Area Wide	Area Wide
Manual Fire Alarms	Yes	Yes	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Column	21	22	23	24	25
Fire Area	FA-3UJH-02	FA-3UJH-03	FA-3UJH-04	FA-3UJH-05	FA-3UJH-06
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, g, h, r	a, b, c, e, g	a, b, c, e, g	a, b, c, g, f, m
Transient Fire Loading	THL-1	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	c, n	b, c, d, m, n, o	b, g, n	a, b, g, m	j, n
Atypical Ignition Sources (Note 2b)	None	None	aa	aa	aa
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-1	OH Group-2
Automatic Fire Detection (Note 13)	Area Wide	None	Area Wide	Area Wide	Area Wide
Manual Fire Alarms	Yes	Yes	Yes	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	26	27	28	29	30
Fire Area	FA-3UJH-07	FA-3UJH-08	FA-3UJH-09	FA-3UJH-10	FA-4UJH-01
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-17 thru 09.APP.9A-27	09.APP.9A-34 thru 09.APP.9A-36, 09.APP.9A-38	09.APP.9A-28 thru 09.APP.9A-38
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~ safety-related	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	Yes	Yes	None
In situ Loading (Note 1)	a, b, c, e, g, r, s	a, b, c, g, s	a, b, g, m	a, b, d	a, b, c, g
Transient Fire Loading	THL-2	THL-2	THL-3	THL-1	THL-1
Common Ignition Source (Note 2a)	b, m, n	m, n	n	n	b, n
Atypical Ignition Sources (Note 2b)	aa	None	aa	None	None
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	Area Wide	Area Wide	Area Wide	Partial	None
Manual Fire Alarms	None	Yes	None	None	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	31	32	33	34	35
Fire Area	FA-4UJH-02	FA-4UJH-03	FA-4UJH-04	FA-4UJH-05	FA-4UJH-06
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-28thru 09.APP.9A-38	09.APP.9A-28 thru 09.APP.9A-38	09.APP.9A-22, 09.APP.9A-27, and 09.APP.9A-28 thru 09.APP.9A-38	09.APP.9A-28 thru 09.APP.9A-38	09.APP.9A-28thru 09.APP.9A-38
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, f, g, h, j, t	a, b, c, e, g	a, b, f, g, m	a, b, c, e, g
Transient Fire Loading	THL-1	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	c, n	a, b, c, d, o	b, n	j, n	a, b, g
Atypical Ignition Sources (Note 2b)	None	aa	aa	aa	aa
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-2	OH Group-1
Automatic Fire Detection (Note 13)	Area Wide	None	Partial	Area Wide	Area Wide
Manual Fire Alarms	Yes	Yes	Yes	None	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None

Table 9A-2—Fire Area Parameters
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Column	36	37	38	39	40
Fire Area	FA-4UJH-07	FA-4UJH-08	FA-UFA-01	FA-UFA-02	FA-UFA-03
Building	UJH/UJK	UJH/UJK	UFA	UFA	UFA
Figures	09.APP.9A-24	09.APP.9A-24	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	Yes	None	None	None
SCC: post-fire safe shutdown	None	Yes	None	None	None
In situ Loading (Note 1)	a, b, c	a, b, c, d, e, g, h	a, b	a, b, c, d	a, b, c, d
Transient Fire Loading	THL-2	THL-2	THL-1	THL-1	THL-1
Common Ignition Source (Note 2a)	n	b, m, n, o	n	n	c, n
Atypical Ignition Sources (Note 2b)	None	aa	None	None	None
Hazard Classification (Note 12)	OH Group-1	OH Group-1	Light Hazard	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	Area Wide	Partial	None	None	Area Wide
Manual Fire Alarms	Yes	Yes	Yes	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	41	42	43	44	45
Fire Area	FA-UFA-04	FA-UFA-05	FA-UFA-06	FA-UFA-07	FA-UFA-08
Building 03.02.01-12	UFA	UFA	UFA	UFA	UFA
Figures	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	Yes	Yes	Yes	None
SCC: post-fire safe shutdown	None	Yes	None	Yes	None
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, g, o, p, q, r	a, g	a, b, c, d, e, g, o, p, q, r	a
Transient Fire Loading	THL-1	THL-2	THL-1	THL-2	THL-1
Common Ignition Source (Note 2a)	c, n	a, b, c, d, m, o	n	a, b, c, d, m, o	n
Atypical Ignition Sources (Note 2b)	None	None	aa	aa	None
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-1	Light Hazard
Automatic Fire Detection (Note 13)	Area Wide	None	Area Wide	Area Wide	None
Manual Fire Alarms	None	Yes	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	46	47	48	49	50
Fire Area	FA-UFA-09	FA-UFA-10	FA-UFA-11	FA-UFA-12	FA-UFA-13
Building	UFA	UFA	UFA	UFA	UFA
Figures	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-84 thru 09.APP.9A-97
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	None	None	Yes	Yes
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, g	a	a, b, c, d, p, q, r	a, b, c, h	a, b, c, h
Transient Fire Loading	THL-1	THL-1	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	n	n	c, n,	c, m, n	a, c, m
Atypical Ignition Sources (Note 2b)	aa	None	None	None	None
Hazard Classification (Note 12)	OH Group-1	Light Hazard	OH Group-1	OH Group-1	OH Group-1
Automatic Fire Detection (Note 13)	Area Wide	Area Wide	None	None	Area Wide
Manual Fire Alarms	None	None	Yes	None	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	51	52	53	54	55
Fire Area	FA-UFA-14	FA-UKA-01	FA-UKA-02	FA-UKA-03	FA-UKA-04
Building	UFA	UKA	UKA	UKA	UKA
Figures	09.APP.9A-84 thru 09.APP.9A-97	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, g	a, b	a, b, c, d	a, b, c, d, e, g, o, q	a, b, c, d, e, g
Transient Fire Loading	THL-1	THL-1	THL-1	THL-2	THL-2
Common Ignition Source (Note 2a)	n	n	c, n	a, b, c, d, g, l	a, b, c, d, m
Atypical Ignition Sources (Note 2b)	aa	None	None	aa	None
Hazard Classification (Note 12)	OH Group-1	Light Hazard	Light Hazard	OH Group-1	OH Group-1
Automatic Fire Detection (Note 13)	Area Wide	None	Area Wide	None	None
Manual Fire Alarms	None	Yes	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	56	57	58	59	60
Fire Area	FA-UKA-05	FA-UKA-06	FA-UKA-07	FA-UKA-08	FA-UKA-09
Building	UKA	UKA	UKA	UKA	UKA
Figures	09.APP.9A-52 thru 09.APP.9A-65, 09.APP.9A-93 thru 09.APP.9A-94	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	Yes	Yes	Yes	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, b, c, d, e, g, h	a, b, g	a, b, g	b, g	a, b
Transient Fire Loading	THL-2	THL-1	THL-1	THL-1	THL-1
Common Ignition Source (Note 2a)	b, c, d, m, n	a	a	a	n
Atypical Ignition Sources (Note 2b)	None	aa	aa	aa	None
Hazard Classification (Note 12)	OH Group-1	OH Group-1	OH Group-1	OH Group-1	Light Hazard
Automatic Fire Detection (Note 13)	None	Area Wide	Area Wide	Area Wide	None
Manual Fire Alarms	Yes	None	None	None	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	61	62	63	64	65
Fire Area	FA-UKA-10	FA-UKA-11	FA-UKA-12	FA-UKA-13	FA-UKS-01
Building	UKA	UKA	UKA	UKA	UKS
Figures	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-66 thru 09.APP.9A-75
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, b	a, b, d, o	a	a, b	a, b
Transient Fire Loading	THL-2	THL-2	THL-1	THL-1	THL-1
Common Ignition Source (Note 2a)	m, n	c, n	a, c	n	n
Atypical Ignition Sources (Note 2b)	None	None	None	None	None
Hazard Classification (Note 12)	OH Group-1	OH Group-1	Light Hazard	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	None	Partial	None	None	None
Manual Fire Alarms	None	Yes	None	None	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	66	67	68	69	70
Fire Area	FA-UKS-02	FA-UKS-03	FA-UKS-04	FA-UKS-05	FA-UKS-06
Building	UKS	UKS	UKS	UKS	UKS
Figures	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-66 thru 09.APP.9A-75
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, f, g, o, p, q, s	a, b, c, d, e, g, h, o	a, b, e, g	a, b, g
Transient Fire Loading	THL-1	THL-3	THL-2	THL-2	THL-1
Common Ignition Source (Note 2a)	c, n	a, b, c, d, l	a, b, c, d, m	a, b	b
Atypical Ignition Sources (Note 2b)	None	aa, ee	None	aa	aa
Hazard Classification (Note 12)	Light Hazard	OH Group-2	OH Group-1	OH Group-1	OH Group-1
Automatic Fire Detection (Note 13)	Area Wide	None	None	Area Wide	Area Wide
Manual Fire Alarms	None	None	None	None	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	71	72	73	74	75
Fire Area	FA-UKS-07	FA-UKS-08	FA-1UBP-01	FA-1UBP-02	FA-1UBP-03
Building	UKS	UKS	UBP	UBP	UBP
Figures	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	None	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	None	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d, r, s	a, b, h	n	a, b, c, e, g	a, b, c, d, e, g, n
Transient Fire Loading	THL-2	THL-1	THL-1	THL-1	THL-3
Common Ignition Source (Note 2a)	c, n, o	m, n	m, n	b, n	a, b, c, i, m
Atypical Ignition Sources (Note 2b)	None	None	ee	aa	aa, ee
Hazard Classification (Note 12)	OH Group-1	OH Group-1	EH Group-2	OH Group-1	EH Group-2
Automatic Fire Detection (Note 13)	None	None	Area Wide	Area Wide	Area Wide
Manual Fire Alarms	None	None	None	Yes	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	Area Wide	None	Area Wide
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	76	77	78	79	80
Fire Area	FA-2UBP-01	FA-2UBP-02	FA-2UBP-03	FA-3UBP-01	FA-3UBP-02
Building 03.02.01-12	UBP	UBP	UBP	UBP	UBP
Figures	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	n	a, b, c, e, g	a, b, c, d, e, g, n	n	a, b, c, e, g
Transient Fire Loading	THL-1	THL-1	THL-3	THL-1	THL-1
Common Ignition Source (Note 2a)	m, n	b, n	a, b, c, i, m	m, n	b, n
Atypical Ignition Sources (Note 2b)	ee	aa	aa, ee	ee	aa
Hazard Classification (Note 12)	EH Group-2	OH Group-1	EH Group-2	EH Group-2	OH Group-1
Automatic Fire Detection (Note 13)	Area Wide	Area Wide	Area Wide	Area Wide	Area Wide
Manual Fire Alarms	None	Yes	Yes	None	Yes
Automatic Fixed Fire Suppression (Note 14)	Area Wide	None	Area Wide	Area Wide	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	81	82	83	84	85
Fire Area	FA-3UBP-03	FA-4UBP-01	FA-4UBP-02	FA-4UBP-03	FA-1URB-01
Building	UBP	UBP	UBP	UBP	UQB/URB
Figures	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-1 thru 09.APP.9A-5	09.APP.9A-76 thru 09.APP.9A-83
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d, e, g, n	n	a, b, c, e, g	a, b, c, d, e, g, n	a, b, c, d, e
Transient Fire Loading	THL-3	THL-1	THL-1	THL-3	THL-2
Common Ignition Source (Note 2a)	a, b, c, i, m	m, n	b, n	a, b, c, i, m	a, b, c, d, g, p
Atypical Ignition Sources (Note 2b)	aa, ee	ee	aa	aa, ee	None
Hazard Classification (Note 12)	EH Group-2	EH Group-2	OH Group-1	EH Group-2	Light Hazard
Automatic Fire Detection (Note 13)	Area Wide	Area Wide	Area Wide	Area Wide	Partial
Manual Fire Alarms	Yes	None	Yes	Yes	None
Automatic Fixed Fire Suppression (Note 14)	Area Wide	Area Wide	None	Area Wide	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	Yes-Yard area
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	No

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Table 9A-2—Fire Area Parameters
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Column	86	87	88	89	90
Fire Area	FA-2URB-01	FA-3URB-01	FA-4URB-01	FA-UKE-01	FA-UKE-02
Building	UQB/URB	UQB/URB	UQB/URB	UKE	UKE
Figures	09.APP.9A-76 thru 09.APP.9A-83	09.APP.9A-76 thru 09.APP.9A-83	09.APP.9A-76 thru 09.APP.9A-83	09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	Yes	Yes	Yes	None	None
SCC: post-fire safe shutdown	Yes	Yes	Yes	None	None
In situ Loading (Note 1)	a, b, c, d, e	a, b, c, d, e	a, b, c, d, e	a, b	a, b, d
Transient Fire Loading	THL-2	THL-2	THL-2	THL-1	THL-1
Common Ignition Source (Note 2a)	a, b, c, d, g, p	a, b, c, d, g, p	a, b, c, d, g, p	n	c, n
Atypical Ignition Sources (Note 2b)	None	None	None	None	None
Hazard Classification (Note 12)	Light Hazard	Light Hazard	Light Hazard	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	Partial	Partial	Partial	None	Area Wide
Manual Fire Alarms	None	None	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	None	None	None	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	91	92	93	94	95
Fire Area	FA-UKE-03	FA-UKE-04	FA-UKE-05	FA-UKE-06	FA-UKE-07
Building	UKE	UKE	UKE	UKE	UKE
Figures	09.APP.9A-39 and 09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: ~~important to safety~~safety-related	None	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, b, c, d, e, g	a, b, c, d	a, b, g	a, b, c, e, g, o, p, q, r, s	a, b, c, e, g
Transient Fire Loading	THL-2	THL-2	THL-1	THL-3	THL-2
Common Ignition Source (Note 2a)	a, b, c	a, c, m	n	a, c	n
Atypical Ignition Sources (Note 2b)	None	None	None	ee	None
Hazard Classification (Note 12)	OH Group-1	OH Group-1	OH Group-1	OH Group-2	OH Group-1
Automatic Fire Detection (Note 13)	Partial	None	Area Wide	Partial	None
Manual Fire Alarms	Yes	None	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

Table 9A-2—Fire Area Parameters
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Column	96	97	98	99	100
Fire Area	FA-UKE-08	FA-UKE-09	FA-UKE-10	FA-UKE-11	
Building 03.02.01-12	UKE	UKE	UKE	UKE	
Figures	09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106	09.APP.9A-98 thru 09.APP.9A-106	
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	
SSC: ~~important to safety~~safety-related	None	None	None	None	
SCC: post-fire safe shutdown	None	None	None	None	
In situ Loading (Note 1)	a, b, c, e, g	a, b, c	a, b, c, e, g	a, b, c, e, g	
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	
Common Ignition Source (Note 2a)	n	n	n	n	
Atypical Ignition Sources (Note 2b)	None	None	None	None	
Hazard Classification (Note 12)	OH Group-1	OH Group-1	OH Group-1	OH Group-1	
Automatic Fire Detection (Note 13)	None	None	None	None	
Manual Fire Alarms	None	None	None	None	
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	

i. Section 9.4.13 - Smoke Confinement System.

j. Section 9.4.14 - Access Building Ventilation System.

k. Section 9.4.12 - Main Steam and Feedwater Valve Room Ventilation System.

l. Section 9.4.11 - Essential Service Water Pump Building Ventilation System.

10. Emergency Lighting:

aa. Self-contained, battery backed fixtures installed throughout the fire area which provide minimum illumination for a 90 minute period to make sure that a safe access and egress path in the event of a loss of the normal plant lighting system.

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bb. Is provided by the emergency lighting subsystem. This lighting consists of interruptible EDG-backed lighting provided for operation of ~~important to safety~~ safety-related equipment in the event of a loss of the normal plant lighting system (TBV).

cc. Is provided by the emergency lighting subsystem. This lighting consists of interruptible EDG-backed lighting provided for operation of ~~important to safety~~safety-related equipment in the event of a loss of the normal plant lighting system (TBV). Emergency lighting is also provided for the egress route between the MCR and the RSS.

dd. Is provided by the special emergency lighting subsystem. This lighting consists of uninterruptible UPS-backed lighting provided for operation of ~~important to safety~~safety-related equipment.

11. Communication:

One or more of the following methods of communication are available: plant-wide public address and paging system, in-plant telephone system, external communication links to the outside world, and portable radio communications.

12. Hazard Classification:

See Section 9A.2.2 for definition of hazard classifications.

- Light Hazard.
- Ordinary Hazard (OH Group-1).

discharge the circulating water into a common header, and from there into separate supply lines to the condenser water boxes. Downstream of the condenser water boxes in the outdoor area, the circulating water is routed back to the cooling towers through two separate return lines.

As unit load is decreased, and at lower-than-design wet bulb temperatures, individual cooling tower fans can be switched off. Individual circulating water pumps can be turned off and their associated butterfly valve closed. One circulating water pump and cooling tower must remain in operation as long as there is demand for heat removal capability from the condensers.

Abnormal Operation

If there is a loss of one circulating water pump the total flow of cooling water is reduced, resulting in an increased temperature rise across the condenser. The turbine backpressure will also increase, resulting in a decrease in power output. If more than one circulating water pump fails, these effects on performance increase. If all circulating water pumps fail, heat removal is provided by the main steam relief trains described in Section 10.3.

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Flooding protection is included in the design so that large leaks from circulating water piping do not result in the loss of all circulating water pumps. The layout of the CWS design is such that a malfunction of any component or piping does not adversely affect the safe operation of the plant or any safety-related system ~~that is important to safety~~.

In the case of loss of one cooling tower, the temperature drop across the circulating water in the cooling tower will increase. This will increase the outlet temperature from the condenser halves. The turbine backpressure will also increase, resulting in a decrease in power output. If more than one cooling tower fails, these effects on performance increase. If all cooling towers fail, heat removal is provided by the main steam relief trains described in Section 10.3.

Loss of offsite power results in the loss of the non-emergency AC power supply. The effect is the same as the loss of all circulating water pumps.

If one condenser path is closed due to leakage in the condenser, the affected line is isolated. The circulating water flow rate is reduced, resulting in a decrease in power output.

If both condenser paths are closed due to leakage in the condenser, the effect is the same as the loss of all circulating water pumps.

4.0 DATA REQUIRED

4.1 Pipe response data to include piping drawings, vibration measurements and operating conditions.

5.0 ACCEPTANCE CRITERIA

5.1 Steady state vibration testing based on limits established by the piping designers.

5.1.1 Acceptance criteria are based on conservatively estimated stresses which are derived from measured velocities and conservatively assumed mode shapes.

5.2 Transient vibration testing based on limits established by the piping designers.

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5.2.1 No permanent deformation or damage in any safety-related system, structure or component ~~important to nuclear safety~~ is observed.

5.2.2 All suppressors and restraints respond within their allowable ranges, between stops or with indicators on scale.

14.2.12.3.13 Control Rod Drive Mechanism Control (Test #036)

1.0 OBJECTIVE

1.1 To demonstrate proper input signals and proper sequencing of input signals to CRDM coils.

1.2 To demonstrate proper operation of the CRDM control system in functional modes.

1.3 To verify proper operation of the CRDM control system interlocks and alarms.

1.4 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the CRDM control system have been completed and system software is installed.

2.2 Cable continuity tests have been completed.

2.3 Special test instrumentation has been calibrated and is functional.

2.4 Special test equipment is functional.

2.5 RCCAs are installed in dummy or actual fuel assemblies, to allow movement of the RCCAs.

2.6 RCCAs are latched by lifting the drive shaft and observing the weight corresponding to a latched RCCA, prior to installing the reactor head.

5.0 ACCEPTANCE CRITERIA

5.1 The safety injection system meets design requirements (refer to Section 6.3).

14.2.12.13.18 Pre-Core Loss of Instrument Air (Test #178)

1.0 OBJECTIVES

1.1 To demonstrate that a reduction and loss of instrument air pressure causes no adverse operation of active safety-related equipment.

2.0 PREREQUISITES

2.1 Construction activities on items to be tested have been completed.

2.2 Individual valves and equipment are functional.

2.3 The instrument air system is in service at rated pressure with support systems functional to the extent necessary to conduct the test. Pneumatic loads are cut-in to the extent possible at the time test begins.

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2.4 A listing of the air-operated active safety-related equipment ~~important to safety~~ which includes the loss of air failed position and the fail safe position of each component has been compiled.

2.5 This test satisfies the requirements of RG 1.68.3, regulatory positions C.1-C.11.

2.6 Loss-of-air supply tests shall be conducted on branches of the instrument air system simultaneously, if practicable, or on the largest number of branches of the system that can be adequately managed.

3.0 TEST METHOD

3.1 Place the valves in the normal operating position, and maintain plant in as close to normal conditions as it practicable and verify proper operation of the following components:

3.1.1 Compressors.

3.1.2 Aftercoolers.

3.1.3 Oil separator units, if applicable.

3.1.4 Air receivers.

3.1.5 Dryers including a full regeneration cycle, if applicable.

3.1.6 Pressure controls and compressor unloaders.

3.1.7 Pressure reducing stations.

3.1.8 Automatic and manual start / stop circuits of standby compressors.

3.1.9 Controls to change operating sequence of units (spread operating time and starting duty).

17.4.2 Reliability Assurance Program Implementation

The RAP for the design stage is implemented in several phases. The first phase is the design certification phase, which defines the overall structure of the RAP, including guidance for procedures and other activities which will be implemented in future phases. A design-specific PRA model is used to develop a list of SSC and insights. The risk-significant SSC are identified in this phase for inclusion in the program using the probabilistic, deterministic, or other methods previously indicated.

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The second phase is the site-specific phase, which introduces the plant site-specific design information to the RAP process. A COL applicant that references the U.S. EPR design certification will identify the site-specific SSC within the scope of the RAP. Also in this phase, the RAP is modified or appended based on consideration specific to the site.

Risk-significant SSC are subject to the appropriate quality requirements through the implementation of the RAP. Safety-related SSC that are also determined to be risk-significant in the RAP have a full 10 CFR 50 Appendix B quality assurance program applied along with the applicable GDC.

For non-safety-related SSC that have been determined to be "risk-significant" under the RAP in Section 17.4, the U.S. EPR design applies additional quality assurance measures and design requirements consistent with the guidance in SRP 17.5, Part V, "Non-Safety Related SSC Quality Controls." These additional quality assurance measures are described in the approved topical report ANP-10266A, Revision 1, "AREVA NP Inc. Quality Assurance

Plan (QAP) for Design Certification of the U.S. EPR Topical Report," Addendum A, and are applied to all risk-significant SSC during the design certification phase.

All risk-significant SSC will be included in the scope of the COL applicant's Maintenance Rule program in accordance with 10 CFR 50.65(b) in the high safety significance category. This is done so that the risk-significant SSC are subject to performance monitoring criteria which are established consistent with the reliability and availability assumptions used in the PRA.

Tier 1 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) provide confirmation that as the SSC design progresses, the procurement and construction information for risk-significant SSC is consistent with the RAP related key assumptions and insights. This confirmation occurs by verifying that appropriate quality requirements are specified in the documents approved for the procurement and construction of risk-significant SSC.

Beyond the writing of design specifications, consistency with RAP related key assumptions and insights during the construction and initial testing phases are verified