

ArevaEPRDCPEm Resource

From: BRYAN Martin (EXT) [Martin.Bryan.ext@areva.com]
Sent: Thursday, April 15, 2010 1:56 PM
To: Tesfaye, Getachew
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 351, FSAR Ch. 9, Supplement 1
Attachments: RAI 351 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the 15 questions in RAI No. 351 on February 15, 2010. The attached file, "RAI 351 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to 1 of the 15 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 351 Question 09.05.01-75.

The following table indicates the respective pages in the response document, "RAI 351 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 351 — 09.05.01-75	2	5

Since responses to the remaining questions remain in process, a revised schedule is provided in this email.

The schedule for technically correct and complete responses to the remaining questions has been changed as provided below:

Question #	Response Date
RAI 351 — 09.02.05-22	July 1, 2010
RAI 351 — 09.02.05-23	July 1, 2010
RAI 351 — 09.02.05-24	July 1, 2010
RAI 351 — 09.02.05-25	July 1, 2010
RAI 351 — 09.02.05-26	July 1, 2010
RAI 351 — 09.02.05-27	July 1, 2010
RAI 351 — 09.02.05-28	July 1, 2010
RAI 351 — 09.02.05-29	July 1, 2010
RAI 351 — 09.02.05-30	July 1, 2010
RAI 351 — 09.02.05-31	July 1, 2010
RAI 351 — 09.02.05-32	July 1, 2010
RAI 351 — 09.02.05-33	July 1, 2010
RAI 351 — 09.02.05-34	July 1, 2010
RAI 351 — 09.02.05-35	July 1, 2010

Sincerely,

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.

From: DUNCAN Leslie E (AREVA NP INC)
Sent: Monday, February 15, 2010 2:39 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 351, FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 351 Response US EPR DC," provides a schedule since technically correct and complete responses to the fifteen questions are not provided.

The following table indicates the respective pages in the response document, "RAI 351 Response US EPR DC," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 351 — 09.02.05-22	2	2
RAI 351 — 09.02.05-23	3	4
RAI 351 — 09.02.05-24	5	6
RAI 351 — 09.02.05-25	7	8
RAI 351 — 09.02.05-26	9	10
RAI 351 — 09.02.05-27	11	12
RAI 351 — 09.02.05-28	13	13
RAI 351 — 09.02.05-29	14	14
RAI 351 — 09.02.05-30	15	16
RAI 351 — 09.02.05-31	17	19
RAI 351 — 09.02.05-32	20	21
RAI 351 — 09.02.05-33	22	23
RAI 351 — 09.02.05-34	24	24
RAI 351 — 09.02.05-35	25	25
RAI 351 — 09.05.01-75	26	27

Answers are not provided for fifteen of the fifteen questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 351 — 09.02.05-22	April 15, 2010
RAI 351 — 09.02.05-23	April 15, 2010
RAI 351 — 09.02.05-24	April 15, 2010
RAI 351 — 09.02.05-25	April 15, 2010
RAI 351 — 09.02.05-26	April 15, 2010
RAI 351 — 09.02.05-27	April 15, 2010
RAI 351 — 09.02.05-28	April 15, 2010
RAI 351 — 09.02.05-29	April 15, 2010
RAI 351 — 09.02.05-30	April 15, 2010
RAI 351 — 09.02.05-31	April 15, 2010
RAI 351 — 09.02.05-32	April 15, 2010
RAI 351 — 09.02.05-33	April 15, 2010

RAI 351 — 09.02.05-34	April 15, 2010
RAI 351 — 09.02.05-35	April 15, 2010
RAI 351 — 09.05.01-75	April 15, 2010

Sincerely,

Les Duncan
Licensing Engineer
AREVA NP Inc.
An AREVA and Siemens Company
Tel: (434) 832-2849
Leslie.Duncan@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, January 15, 2010 3:14 PM
To: ZZ-DL-A-USEPR-DL
Cc: Eul, Ryan; McCann, Edward; Segala, John; Lee, Samuel; Dreisbach, Jason; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 351 (4112, 4163),FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 19, 2009, and discussed with your staff on January 13, 2010. No changes were made to the draft RAI as a result of that discussion. 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: 1311

Mail Envelope Properties (BC417D9255991046A37DD56CF597DB7105DA400D)

Subject: Response to U.S. EPR Design Certification Application RAI No. 351, FSAR Ch. 9, Supplement 1
Sent Date: 4/15/2010 1:56:02 PM
Received Date: 4/15/2010 1:56:05 PM
From: BRYAN Martin (EXT)

Created By: Martin.Bryan.ext@areva.com

Recipients:

"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>

Tracking Status: None

"ROMINE Judy (AREVA NP INC)" <Judy.Romine@areva.com>

Tracking Status: None

"BENNETT Kathy A (OFR) (AREVA NP INC)" <Kathy.Bennett@areva.com>

Tracking Status: None

"KOWALSKI David J (AREVA NP INC)" <David.Kowalski@areva.com>

Tracking Status: None

"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>

Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	Size	Date & Time
MESSAGE	5377	4/15/2010 1:56:05 PM
RAI 351 Supplement 1 Response US EPR DC.pdf		62224

Options

Priority: Standard

Return Notification: No

Reply Requested: No

Sensitivity: Normal

Expiration Date:

Recipients Received:

Response to

Request for Additional Information No. 351, Supplement 1

01/15/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 09.02.05 - Ultimate Heat Sink

SRP Section: 09.05.01 - Fire Protection Program

Application Section: FSAR Chapter 9

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

Question 09.05.01-75:**Follow-up to RAI 20, Question 09.05.01-35**

RAI Question 09.05.01-35 response added new FSAR Section 9.5.1.2.2, "Alternate Compliance with Regulatory Guide 1.189." Alternate compliance is provided due to lack of automatic fire suppression for electrical cable systems and electrical cabinets and a lack of detection for inside cabinets outside of the MCR. RAI Question 09.05.01-35 response stated that the basis for this is as follows:

The U.S. EPR is a four divisional design. Generally, each of the four divisions outside of the MCR and the Reactor Building are in divisional Safeguard Buildings separated from each other by 3 hour fire-rated barriers. Fire detection is provided in areas containing cables important to safety. Cable trays are accessible for manual fire fighting and manual hose stations and portable extinguishers are provided throughout the facility. Area smoke detection is provided where electrical cabinets are located and manual hose stations and portable extinguishers are provided throughout the facility. Spatial separation is provided between cabinets.

Having each safety division in fully separated buildings from redundant divisions and the fact that there are four safety divisions make it possible for the loss of any one division not to impact safe shutdown capability. There is a high probability that even with loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available.

As stated above the four divisional buildings design concept exception is generally valid. The MCR, Cable Floor, MCR Under Floor Area, RSS Area, and Reactor Building are identified exceptions to the above. The applicant needs to verify if other areas of the plant that are important to safety and that are also subdivided in four divisions such as the Essential Service Water Buildings and the Emergency Power Generating Buildings also follow the above suppression and detection design identified for the Safeguards Buildings.

For fire protection systems (FPSs) or features out of- service or impaired in areas such as the Safeguards Buildings one division out of four will be out of service. For this one division out of service the licensee would follow technical specifications (TS) which, for example, for one EDG or one ESW division out of service there is 120 days to restore to service. However, since 120 days is about one third of a year, compensatory actions should be in place when one or more divisions are out of service since a fire in one of the other functional divisions assuming 1 division is out of service would only leave the minimum of 2 functional divisions which would remove any defense in depth that the third functional division gave and remove the basis for this exception or alternate compliance to RG 1.189. FSAR Section 9.5.1.4 states "The FPP addresses the inspection, testing, and maintenance of FPSs and features. Disabled or impaired FPSs and features are controlled by a permit system. Procedures and practices also establish appropriate compensatory actions for FPSs or features out of service or impaired." The applicant needs to be more specific when compensatory actions are to be in place especially for areas where a third available train is being credited as defense in depth to justify an exception or alternate compliance to RG 1.189.

The applicant also needs to identify for areas of the plant that are not separated into four divisional buildings such as the Nuclear Auxiliary Building, and other areas important to safety not specifically identified in RG 1.189, such as the Turbine Building, Diesel Generator Rooms, Pump Rooms, etc, what suppression and detection criteria will be used for electrical cable systems and electrical cabinets since the four divisional buildings exception criteria is not applicable.

Additionally, for systems/components that are not physically separated into four separate divisions each in its own divisional building such as MSIVs, Feedwater, atmospheric dump valves (main steam to atmosphere), Emergency Feedwater, Letdown, Charging, and Reactor and Pressurizer Head relief valves and vent valves, the applicant needs to describe how safe-shutdown is achieved. Specifically, the applicant needs to identify how safe shutdown is achieved for a fire that leaves any of the safe-shutdown equipment associated with the above systems inoperable. As an example, the applicant should describe how safe shutdown is achieved for a fire in a MSIV room that leaves the applicable MSIV valve inoperable due to hot shorts that could prevent the MSIV from closing. The applicant also needs to relate how the buildings these systems are located in relate to the above issue of what suppression and detection criteria will be used for electrical cable systems and electrical cabinets since the four divisional buildings exception criteria is not applicable.

Response to Question 09.05.01-75:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.2 will be revised to address areas of the plant outside of the main control room (MCR), remote shutdown station (RSS) and the Reactor Building (RB), where cable systems and electrical cabinets important to safety are located.

The “Electrical Cable System Fire Detection and Suppression” subsection will be revised to include the following:

“The U.S. EPR is a four divisional design. Generally, the cable systems for each of the four divisions outside the MCR, RSS and RB are in divisional buildings (i.e., Safeguards and Emergency Diesel Generator Buildings and Essential Service Water Cooling Tower Structures). The buildings are separated from each other and other areas of the plant either by three-hour fire-rated barriers or the buildings are separated by sufficient distance to maintain adequate separation between divisions. Where a cable system for a safety division is located in a redundant divisional building such as the Division 2 main steam isolation valve cable systems in SB 1, or for redundant divisional cable systems in the FB, the redundant cable systems divisions are separated by three-hour fire-rated barriers. The RB annulus contains four safety divisions. Divisional separation is provided by three-hour fire-rated barriers or a combination of spatial separation and defense-in-depth fire protection features, such as fire barriers, fire-rated cable, fire detection, fire suppression and administrative controls to provide at least one success path of SSCs necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage. Fire detection is provided in areas containing cables important to safety. Cable trays are accessible for manual fire fighting and manual fire protection is provided by hand hose and portable extinguisher capability.

Separation of each safety division from redundant divisions and the four safety divisions make it so that the loss of any one division does not impact safe shutdown capability. At the onset of the postulated fire, all safe shutdown systems (including applicable redundant

trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operations, etc., in progress. The unit is assumed to be operating at full power under normal conditions and normal lineups. This is consistent with NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis" (Ref. 39). There is a high probability that even with a loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available."

The "Electrical Cabinets" subsection will be revised to include the following:

"The U.S. EPR is a four divisional design. Generally, electrical cabinets for each of the four divisions outside the MCR, RSS and RB are in divisional buildings (i.e., Safeguards and Emergency Diesel Generator Buildings and Essential Service Water Cooling Tower Structures). The buildings are separated from each other and other areas of the plant either by three-hour fire-rated barriers or the buildings are separated by sufficient distance to maintain adequate separation between divisions. Where electrical cabinets for a safety division are located in a redundant divisional building, such as the division 2 MSIV cabinets in the SB 1 or for redundant divisional electrical cabinets in the FB, the electrical cabinets are separated by three-hour fire-rated barriers. Area smoke detection is provided where safety-related electrical cabinets are located and manual fire protection is provided by hand hose and portable extinguisher capability.

Separation of each safety division from redundant cabinets and the four safety divisions make it so that the loss of any one safety division does not impact safe shutdown capability. At the onset of the postulated fire, all safe shutdown systems (including applicable redundant trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operations, etc., in progress. The unit is assumed to be operating at full power under normal conditions and normal lineups. This is consistent with NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis" (Ref. 39). There is a high probability that even with a loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available."

The AREVA position is consistent with accepted industry guidance. NEI 00-01, Rev. 2, "Guidance for Post Fire Safe Shutdown Circuit Analysis," Section 3.1.1.5 states:

"At the onset of the postulated fire, all safe shutdown systems (including applicable redundant trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operation, etc., in progress. The units are assumed to be operating at full power under normal conditions and normal lineups."

Special compensatory actions are not required during Technical Specification out of service times.

The concern associated with defense-in-depth of post-fire shutdown systems is addressed in RG 1.189, Section 5, which states:

"When considering the consequences of a fire in a given fire area during the evaluation of the safe-shutdown capabilities of the plant, licensees should demonstrate that one success

path of SSCs that can be used to bring the reactor to hot-shutdown or hot-standby conditions remain free of fire damage.”

RG 1.189 defines success path as:

“The minimum set of structures, systems (including power, instrument, and control circuits and instrument sensing lines), and components that must remain free of fire damage to achieve and maintain safe shutdown in the event of a fire.”

The Response to RAI 20, Question 09.05.01-21 states that the plant design is required to provide at least one success path to achieve post-fire shutdown.

The post-fire safe shutdown analysis for the U.S. EPR plant will utilize the deterministic guidance of NEI 00-01 in addressing the regulatory positions of RG 1.189, Rev. 2. Fire damage will be presumed to result in equipment failing to pre-determined modes (fail open/fail closed) or spuriously operating depending upon the cables or controls affected by the fire. For components where the failure mode or position matches the desired shutdown mode or position, certain design features are employed to prevent spurious actuations, such as segregating control wiring to preclude hot shorts. For components that are required to operate, but are presumed disabled, the U.S. EPR design provides sufficient redundancy of function separate from the fire area under consideration. Not all shutdown system redundant paths are located in divisional buildings. For those cases, the U.S. EPR design provides separation per RG 1.189.

Assessment of the fire effect on individual components and cables requires detailed design information to be developed later in the design process. However, as an example, a postulated fire in an MSIV room can be addressed by noting that fire area separation is provided for each MSIV. The MSIV controls are designed as de-energize to close. Therefore, if measures are taken to segregate sensitive cables in conduit, it can be concluded that the valve fails to its preferred shutdown position by preventing the possibility of a fire-induced hot short spuriously opening the valve. Another example is the Extra Borating System, which has major components contained in the FB, with redundant required-to-operate valves located in separate fire areas.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

2. The gaseous fire suppression system being manually actuated via a local hand switch actuation by MCR operators, in lieu of automatic activation of the fire detection system for the sub-floor in the MCR. This is to preclude concerns regarding inadvertent activation of this fire extinguishing system.

The lack of automatic water suppression systems for the peripheral rooms in the control room complex is acceptable due to the control room complex being constantly manned and area wide automatic smoke detection being provided throughout, including within cabinets and consoles. Manual fire suppression is provided by standpipe and hose and portable extinguishers. Combustible materials and ignition sources are controlled and limited in the MCR complex by administrative procedures to those required for operation.

Having the suppression system for the MCR sub-floor being manually actuated instead of automatically actuated is acceptable based on the MCR being manned at all times the plant is operating, and the relatively small volume of the sub-floor area, which provides reasonable assurance that the quantity and location of ionization type fire detectors in the sub-floor area will provide early warning for timely response by MCR personnel.

Electrical Cable System Fire Detection and Suppression

09.05.01-75

Generally, electrical cable systems comply with RG 1.189, Regulatory Position 4.1.3.3. Alternative compliance is provided due to the lack of a fixed fire suppression system.

The U.S. EPR is a four divisional design. Generally, the cable systems for each of the four divisions outside the MCR, RSS and RB are in divisional buildings (i.e., Safeguards and Emergency Diesel Generator Buildings and Essential Service Water Cooling Tower Structures). The buildings are separated from each other and other areas of the plant either by three-hour fire-rated barriers or the buildings are separated by sufficient distance to maintain adequate separation between divisions. Where a cable system for a safety division is located in a redundant divisional building such as the Division 2 main steam isolation valve cable systems in SB 1, or for redundant divisional cable systems in the FB, the redundant cable systems divisions are separated by three-hour fire-rated barriers. The RB annulus contains four safety divisions. Divisional separation is provided by three-hour fire-rated barriers or a combination of spatial separation and defense-in-depth fire protection features, such as fire barriers, fire-rated cable, fire detection, fire suppression and administrative controls to provide at least one success path of SSCs necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage. Fire detection is provided in areas containing cables important to safety. Cable trays are accessible for manual fire fighting and manual fire protection is provided by hand hose and portable extinguisher capability.

Separation of each safety division from redundant divisions and the four safety divisions make it so that the loss of any one division does not impact safe shutdown capability. At the onset of the postulated fire, all safe shutdown systems (including applicable redundant trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operations, etc., in progress. The unit is assumed to be operating at full power under normal conditions and normal lineups. This is consistent with NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis" (Ref. 39). There is a high probability that even with a loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available.

~~The U.S. EPR is a four divisional design. Generally, each of the four divisions outside of the MCR and the Reactor Building are in divisional Safeguard Buildings separated from each other by 3 hour fire-rated barriers. Fire detection is provided in areas containing cables important to safety. Cable trays are accessible for manual fire-fighting and manual hose stations and portable extinguishers are provided throughout the facility.~~

~~Having each safety division in fully separated buildings from redundant divisions and the fact that there are four safety divisions make it possible for the loss of any one division not to impact safe shutdown capability. There is a high probability that even with loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available.~~

The U.S. EPR design utilizes electrical cable construction that has met the acceptance criteria of the IEEE 1202 (Reference 34) test standard (or an equivalent standard) for prevention of flame propagation. IEEE 1202 is a vertical flame propagation test protocol. It is widely recognized that a vertical cable orientation represents a more severe fire test exposure than a horizontal cable orientation. Moreover, the NRC RES Fire Research Branch has stated, "The FT-4 / Vertical Flame Test, included in standard(s) IEEE 1202-1991...is the most rigorous of the 20kW (70000 BTU/hr) tests...What makes this test the most difficult to pass of the 20kW (70000 BTU/hr) tests is its low acceptable damage length of 4.9 ft (1.5m)." Therefore, the ability of cables qualified to the IEEE 1202 test standard (or an equivalent standard) to prevent fire propagation of fire along the length of cables routed in trays located within a given fire area or zone.

Electrical Cabinets

Generally, fire areas comply with RG 1.189, Regulatory Position 4.1.3.6. Alternative compliance is provided due to the lack of a fixed fire suppression system in rooms containing electrical cabinets important to safety and the lack of detection inside cabinets except in the MCR.

The U.S. EPR is a four divisional design. Generally, electrical cabinets for each of the four divisions outside the MCR, RSS and RB are in divisional buildings (i.e., Safeguards and Emergency Diesel Generator Buildings and Essential Service Water Cooling Tower Structures). The buildings are separated from each other and other areas of the plant either by three-hour fire-rated barriers or the buildings are separated by sufficient distance to maintain adequate separation between divisions. Where electrical cabinets for a safety division are located in a redundant divisional building, such as the division 2 MSIV cabinets in the SB 1 or for redundant divisional electrical cabinets in the FB, the electrical cabinets are separated by three-hour fire-rated barriers. Area smoke detection is provided where safety-related electrical cabinets are located and manual fire protection is provided by hand hose and portable extinguisher capability.

Separation of each safety division from redundant cabinets and the four safety divisions make it so that the loss of any one safety division does not impact safe shutdown capability. At the onset of the postulated fire, all safe shutdown systems (including applicable redundant trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operations, etc., in progress. The unit is assumed to be operating at full power under normal conditions and normal lineups. This is consistent with NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis" (Ref. 39). There is a high probability that even with a loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available.

~~The U.S. EPR is a four division design. Generally, electrical cabinets for a given safety division are located in separate divisional Safeguard Buildings which are separated from each other and other areas of the plant by three hour rated fire barriers. Area smoke detection is provided where electrical cabinets are located and manual hose stations and portable extinguishers are provided throughout the facility. Spatial separation is provided between cabinets.~~

~~Having each safety division in separate buildings from redundant cabinets, and the fact that there are four safety divisions, provides reasonable assurance that the loss of any one safety division does not to impact safe shutdown capability. There is a high probability that even with loss of one division from fire, an extra division beyond the minimum required for safe shutdown would be available.~~

Cable Spreading Room

Generally, the cable floor where all four safety divisions are routed to the MCR and the RSS complies with RG 1.189, Regulatory Position 6.1.3. Alternative compliance is provided due to the lack of a fixed fire suppression system for the cable floor rooms.