

ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Wednesday, December 08, 2010 8:19 AM
To: 'usepr@areva.com'
Cc: ODriscoll, James; Jackson, Christopher; McKirgan, John; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: Draft - U.S. EPR Design Certification Application RAI No. 462(5258_5259_5260), FSAR Ch. 6
Attachments: Draft RAI_462_SPCV_5258_5259_5260.doc

Attached please find draft RAI No. 462 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 2343

Mail Envelope Properties (0A64B42AAA8FD4418CE1EB5240A6FED1241743F695)

Subject: Draft - U.S. EPR Design Certification Application RAI No. 462(5258_5259_5260),
FSAR Ch. 6
Sent Date: 12/8/2010 8:18:33 AM
Received Date: 12/8/2010 8:18:33 AM
From: Tesfaye, Getachew

Created By: Getachew.Tesfaye@nrc.gov

Recipients:

"ODriscoll, James" <James.ODriscoll@nrc.gov>
Tracking Status: None
"Jackson, Christopher" <Christopher.Jackson@nrc.gov>
Tracking Status: None
"McKirgan, John" <John.McKirgan@nrc.gov>
Tracking Status: None
"Carneal, Jason" <Jason.Carneal@nrc.gov>
Tracking Status: None
"Colaccino, Joseph" <Joseph.Colaccino@nrc.gov>
Tracking Status: None
"ArevaEPRDCPEm Resource" <ArevaEPRDCPEm.Resource@nrc.gov>
Tracking Status: None
"usepr@areva.com" <usepr@areva.com>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

Files	Size	Date & Time
MESSAGE	727	12/8/2010 8:18:33 AM
Draft RAI_462_SPCV_5258_5259_5260.doc		65018

Options

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

Draft

Request for Additional Information No. 462 (5258, 5259, 5260), Revision 0

12/8/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 06.02.03 - Secondary Containment Functional Design

SRP Section: 06.04 - Control Room Habitability System

SRP Section: 06.05.01 - ESF Atmosphere Cleanup Systems

Application Section: 6.2.3

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

06.02.03-7

In RAI 1, Question 6.2.1-10, RAI 89, Questions 6.2.3-3 and 6.2.3-4, and RAI #378 Question 6.2.3-6, The staff asked for details of the analysis used to support the functional capability of the EPR secondary containment in response to a LOCA. The staff requires information to review the EPR secondary containment design against SRP 6.2.3 Acceptance Criteria 1A through 1 H. The staff awaits response to RAI #378 Question 6.2.3-6. In addition, the staff requests the following information:

1. Provide the GOTHIC input deck used in this analysis in order for the staff to perform confirmatory analyses.
2. Specifically address SRP 6.2.3 1E. Was any credit taken for secondary containment out leakage?

06.02.03-8

In RAI 89, Questions 6.2.3-5, the staff requested details of the Containment Leak-off system along with an explanation on how it will capture bypass leakage. The staff requires the information in the RAI response to In order for the staff to review the EPR secondary containment design against SRP 6.2.3 Acceptance Criterion 4 Therefore include the RAI response in FSAR section 6.2.3.2.3.

06.04-5

Follow-up to RAI 24, Question 13.03-03

In RAI 24, Question 13.03-03, the staff requested that the applicant identify details of the proposed TSC, located in the Control Room Envelope (CRE) Integrated Operations Area, sufficient to review criteria contained in NUREG-0696. Section 2.4, "TSC Size". The staff has reviewed the response to RAI 24, Question 13.03-03, dated June 27, 2008 that included a discussion on the proposed TSC size and FSAR revision 2 and the following information is required:

1. The content in the RAI response is need for the Staff to reach a finding on compliance with NUREG 0696. Therefore the following information, contained in the response should be added to FSAR Tier 2
 - a. A comprehensive statement that the proposed TSC area is designed in accordance with NUREG-0696
 - b. A statement that the TSC area that is within integrated operations area of at least 174.2 m² (1875ft²) is allocated to the TSC.
 - c. A statement that justifies the above size as it compares to NUREG guidance, similar to what was in your RAI response: "Thus the TSC is large enough to provide space for 25 personnel at 75 ft² per person. Additionally, the size of the TSC makes the center large enough to meet the acceptance criteria of section 2.4 of NUREG-0696."

Add the above information to FSAR Tier 2 Section 6.4, which discusses design requirements for the EPR CRE, or propose another location within Tier 2 for this information.

2. The EPR FSAR Tier 2 Revision 2 Section 6.4.1, CRE Design basis states the following: The CRE is protected from toxic gases released which include CO and CO₂ to permit access and occupancy of the MCR under accident conditions"
 - a. In regards to Occupancy and CO₂ production, please provide additional information for the staff to evaluate the performance of the CRE under accident conditions that include CRE isolation in conjunction with manning of the CRE TSC area at levels prescribed by NUREG-0696. (25 persons).
 - b. Note that as stated in Tier 2 Section 6.4.2.1, the CRE total free-air volume is approximately 200,000 ft³. The staff reviews this volume against guidance contained in SRP 6.4 Acceptance Criterion 2 as it relates to Control Room Personnel Capacity. Section III of SRP 6.4 states: "*A control room designed with complete isolation capability* from the outside air to provide radiation and toxic gas protection, is reviewed to determine if the buildup of carbon dioxide could present a problem. The air inside a 2830 m³ (100,000 cubic foot) control room would support five persons for at least six days. Thus, CO₂ buildup in an isolated emergency zone is not normally considered a limiting problem." Due to the co-location of the TSC and the MCR in the CRE, this may not be the case for the EPR CRE and CO₂ production by a large number of personnel during the accident period may adversely affect MCR operator performance.
 - c. Provide this additional information in the FSAR in order to allow the staff to review GDC 19 as it applies to CRE personnel capacity.

06.04-6

Follow-up to RAI 89, Question 06.04-3

The EPR FSAR revision 2 Tier 1 ITAAC 6.1 markup shows a new, separate CRE overpressure acceptance criteria for normal lineup. The new AC for CRE overpressure is significantly less than that specified in tier 2 as the normal overpressure design commitment. This design change varies from the response received in RAI 89, Supplement 1, Question 06.04-3

- a. Please provide reference to the staff request for additional information that prompted this change to Tier 2 9.4.1.1 of the FSAR revision 2.
- b. Clarify this change with respect to the existing Tier 2 CRACS design commitment described in 6.4.2.2 and 6.4.2.3: “The ventilation system maintains a positive pressure of 0.125 inches water gauge as a minimum within the CRE areas with respect to adjacent environmental zones to prevent uncontrolled, unfiltered in-leakage during normal and accident conditions.”
- c. Please clarify how the test to verify this very low positive pressure would be performed such that a determination can be made of the adequacy of the design.
- d. Revise Tier 1 and Tier 2 information as necessary.

06.04-7

Because toxic gas is site-specific, hardware associated with detection, measurement, and isolation are usually designated the responsibility of the COL and based on the specific toxic gas threat. The EPR design chooses to include some of the design information in the FSAR. Although this approach is not prohibited, addressing all possible toxic gas threat in the FSAR can be a challenge. In Tier 2 Section 6.4.2.4, the revised CRE design was changed to prescribe manual as opposed to automatic isolation of the CRE upon detection of toxic gas. If you choose to address toxic gas in the standard design FSAR, clarification of the following information in the FSAR is needed to make a regulatory finding.

- a. Please clarify if or how the standard design, as described in FSAR Revision 2, conforms to RG 6.4 guidance for a “Type iii” (SRP 6.4 Section III.3.E.iii) system. Add a paragraph to FSAR section 6.4 that details this conformance in FSAR section 6.4. Also See #7 below.
- b. Note that RG 1.78 Section 4.2 says the following with respect to a MCR isolation system:

“Upon detection of a toxic chemical, a detector should initiate complete closure of isolation dampers to the control room with minimal delay. The isolation time is a function of the control room design, in particular, the inleakage characteristics. If the detectors are upstream from the isolation dampers, credit will be allowed for the travel time between the detectors and the dampers.”

Please clarify the inconsistency between this RG 1.78 guidance and the design of the CRE as described in FSAR Revision 2.
- c. Clarify this change with respect to Tier 1 Table 2.6.1-3 Main Control Room ITAAC number 6.3 which tests automatic isolation of the CRE upon detection of toxic gas from a toxic gas sensor.
- d. Clarify this FSAR change with respect to the description of the response of the CRE to an external or internal smoke event as described in FSAR section 9.5.1.2.1
- e. Clarify this FSAR change with respect to FSAR Tier 2 Section 14.2 (test abstract #082), Section 3.4.2
- f. Clarify this FSAR change with respect to FSAR Tier 2 Chapter 16. B 3.7.10, which state that a toxic gas signal switches CREF to an isolation alignment.
- g. FSAR section 6.4 does not define or discuss zone isolation as covered in SRP 6.4 Section III.3.E.i, ii, iii, and iv. Provide a discussion in FSAR section 6.4 on how the EPR

CRE addresses this guidance as it relates to the ventilation system types iii and iv and the method of operation for radiological and toxic gas events.

06.04-8

In Tier 2 Section 6.4.2.3, "Leak-tightness", the following sentence is unclear "The CRE boundary limits leakage from adjacent environmental zones to a maximum of 50 cfm unfiltered-inleakage." RG 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," Regulatory Position 2.5, states that any analysis to demonstrate compliance with GDC 19 should include a value for leakage that is due to ingress to and egress from the control room envelope, which is combined with the leakage test value. Consequently, the ASTM E-741 test acceptance criteria for CRE unfiltered leakage should be a that assumed in the accident dose analysis minus an amount allocated for access and ingress to the CRE.

- a. The FSAR in Section 6.4 should clearly state either: 1) The CRE design limit for boundary leakage, or 2) The CRE unfiltered leakage ASTM E-741 test acceptance criteria. Clarify the referenced sentence in Section 6.4.2.3 to state the actual CRE envelope leak tightness test acceptance criteria value: This value should be 40 cfm plus 10 cfm allocated for CRE ingress and egress, which would correspond to FSAR Table 15.0-18; which states that the pre and post isolation unfiltered leakage from areas surrounding the MCR pressure envelope, including ingress and egress is 50 cfm total. The corresponding note in that table states that 10 cfm allocation for CRE access and ingress is incorporated in the 50 cfm total value. Alternatively, revise the sentence to state the CRE design limit for boundary leakage. This value should be 40 cfm.
- b. This last paragraph in FSAR section 6.4.2.3 also states that CRE testing requirements will be specified in the control room envelope habitability program in Technical Specification Section 5.5.17. If the applicant intends to propose an ingress egress allocation for unfiltered CRE leakage that is less than the 10 cfm value stated in the guidance, this FSAR section should be revised to state what that value is. In addition supporting justifying design information would need to be included in 6.4.2.3 of the FSAR to support staff review of lower access/ingress leakage allocation values. The current CRE design information in the FSAR is insufficient to support values less than 10 cfm. For example the staff noted that two door vestibules are provided in some but not all of the CRE access points. (see figure 6.4-2) In addition more design information on vestibule door seals, expected vestibule pressures, and necessary features to enable doors to interlock to function as air locks would need to be provided. Additionally, if a smaller value than 10 cfm is assumed for CRE ingress/egress and justified, conforming changes should be noted in the DBA dose calculations described in FSAR Chapter 15.0.3.
- c. Clarify Tier 1 Table 2.6.1-3 Main Control Room Air Conditioning System ITAAC item 6.4 Acceptance Criteria to state that the Test confirms that the unfiltered air in-leakage inside the CRE area boundary is less than or equal to 40 cfm total. Alternatively, clarify this to state that the Test confirms that the unfiltered air in-leakage inside CRE area boundary is less than or equal to 50 cfm total, which includes 10 cfm allocated for unfiltered in-leakage due to CRE access/egress.

06.05.01-2

Follow-up to RAI 233, Question 06.05.01-1

In RAI 233 Question 06.05.01-1, the staff requested additional information on the design, inspection and testing of the EPR ESF filter systems in order for the staff to determine if the

US EPR design complies with the guidance of Regulatory Guide 1.52. The staff is using the guidance of NUREG-0800 Section 6.5.1 in order to perform this review and determine the necessary detail of design information to be reviewed. The previous RAI requested specific design information along with any supporting justifying information.

The staff has reviewed the RAI response (The July 10, 2009 and the September 1, 2009, response to RAI 233, Question 06.05.01-1, Supplement 1) and the following information is requested:

The staff considers this information design-basis information that that must be incorporated into the FSAR Tier 2 because this information will be used to justify staff determinations on the adequacy of the EPR ESF filter system design. Therefore:

- a. Incorporate your response to Question 06.05.01-1 parts 1 through 5 in the Carbon Adsorber Section of the FSAR. Section 6.5.1.2.2
- b. Incorporate your response to Question 06.05.01-1 (Additional Information Question) in the HEPA Filter Section of the FSAR Section 6.5.1.2.2

06.05.01-3

Follow-up to RAI 135, Question 09.04.05-1.13

The February 27, 2009, response to RAI 135, Question 09.04.05-1.13, addressed moisture removal for the SBVS during other operational events. The staff requested the applicant clarify the ESF filter system design as it relates to RG 1.52 position C.3; paragraph C3.1, which recommends installation of a moisture separator prior to the heater to remove entrained water droplets from the inlet air stream, thereby protecting downstream HEPA filters and iodine absorbers. In a February 27, 2009, response to RAI 135, Question 09.04.05-1.13, you clarified the FSAR to include a description of the moisture separator in the design of the ESF filter systems. You clarified that the SBVS Iodine Filtration Trains incorporate Moisture Separators in the Prefilter design, and the applicant clarified that the SBVS moisture separator meets the requirements of RG 1.52, ASME N509 and ASME AG-1.

- a. The staff notes that the response and the FSAR revisions seem specific to the design of the SBVS ESF filter train. The RAI on compliance with guidance on the incorporation of a moisture separator in a ESF filter system design is general. Please clarify the FSAR description of the moisture separator for the other systems that contain ESF filtration systems (AVS, CRACS and Containment Building Low Flow Purge Exhaust filtration trains). Revise FSAR drawings and descriptions of these systems as required, to clearly show an ESF filter system moisture separator and associated drain, or justify taking exception to RG 1.52 position C.3; paragraph C3.1 guidance.
- b. NUREG-0800 Section 6.5.1 contains specific guidance on demister water drain design. Section IIIG of this guidance states the following: "Water drain design and the accessibility of components and ease of maintenance are in accordance with the recommendations of ERDA 76-21 and ASME N509-1989. In addition RG 1.52 regulatory position C4.8 specifies ERDA 76-21 and Section HA of ASME AG-1a2000. Revise the FSAR description of the moisture separator to specifically address compliance with ERDA 76-21 "Nuclear Air Cleaning Handbook", and Section HA of

ASME AG-1a2000 as these references apply to Moisture Separator water drain design, accessibility of components and ease of maintenance.

- c. The discussion in FSAR Section 12 on ventilation system design features which demonstrate compliance with requirements of 10 CFR 20.1406 is related to the design of the ESF filter system moisture separator drains. The discussion on HVAC air handling equipment drainage is general in nature. Revise this section of the FSAR to clarify that drains from ESF moisture separators are routed to a drain system that will handle potentially contaminated liquid. Revise the paragraph as needed to address the above design provisions to ensure that any drainage is properly collected.

06.05.01-4

FSAR Revision 2, Tier 2, Section 6.5.2.5 "Instrumentation Requirements" State that instrumentation and controls related to the ESF filters are described with the associated ventilation systems in the corresponding sections of the FSAR. It specifically states that Instrumentation and controls for ESF Filter Systems are provided in Table 9.4.1-1- Minimum Instrumentation, Indication and Alarm Features for CREF (Iodine Filtration) Train Subsystem ESF Filter Systems" The staff has reviewed this information and requests the following information:

- a. The above cited information is unclear. As shown in revision 2 of the FSAR The title of Table 9.4.1-1 is "Minimum Instrumentation, Indication and Alarm Features from CREF (Iodine Filtration)Train Subsystem" The referenced table (Table 9.4.1-1) is specific to the CREF (iodine Filtration) Train subsystem. However there are three other ESF filter systems that is covered in FSAR section 6.5.1 (AVS Accident filtration Trains, SBVS Accident Iodine Exhaust filtration trains, and Containment building ventilation system: Low-Flow Purge Exhaust subsystem). Contrary to the information in this paragraph, there is no information or table showing the minimum inventory of alarms displays and controls for the ESF filter system portion of the AVS, SBVS or CBVS in the respective FSAR sections. Therefore it is unclear what instrumentation, is supplied for these systems. Revise this paragraph to clarify this. Revise the "Instrument Requirements" paragraphs in the respective FSAR sections to clearly indicate the minimum inventory of alarms displays and controls such that instrument requirements for all ESF filter systems are clearly addressed., such list should address NUREG-0800 guidance for ESF filter systems as addressed below:
- b. NUREG-0800 Section 6.5.1 contains specific guidance on what should be the minimum inventory of alarms, displays and controls for ESF filter systems. Section IIID of this guidance states the following: " Design of instrumentation for ESF atmosphere cleanup systems conforms to the guidelines of RG 1.52 and to the recommendations of ASME N509-1989. Instrumentation, readout, recording, and alarm provisions for ESF atmosphere cleanup systems meet the minimum guidance given in Table 6.5.1-1 of this SRP section"
- c. For each respective ESF filter system, address Table 6.5.1-1.
- d. For each respective ESF filter system, revise the FSAR to clearly specify design requirements for instrumentation for ESF filter systems as it relates to this guidance.

- e. Include a table of the Minimum instrumentation, readout, recording and alarm provisions for the ESF filter system.
- f. Revise Tier 1 ITAAC tables to list the the minimum inventory of alarms, displays and controls for ESF filter system instrumentation associated with the SBVS, AVS and the CBVS.

06.05.01-5

Follow-up to RAI 312, Question 09.04.02-3

In RAI 312, Question 09.04.02-3 the staff requested that you justify the use of ASME AG-1-2003, Referenced in FSAR Tier 2 Section 6.5.4, in lieu of ASME AG-1-1997, which is the version of this code endorsed by RG 1.52. The staff also requested you justify the use of ASME N509 (2002), Referenced in FSAR Tier 2 Section 6.5.4 in lieu of ASME N509 (1989), which is the version of this code endorsed by RG 1.52. In an October 21, 2009 response the applicant provided a reconciliation of the two versions of the code as they relate to the US EPR design. The applicant also provided marked up correction to FSAR Tier 2 Table 1.9.-2, which notes that The EPR standard design takes exception to RG 1.52 and 1.140 as noted above.

Based on a review of your response and proposed FSAR corrections the following information is requested.

1. Significantly more information is needed in order to justify the use of the newer version of the above codes for the US EPR design. The proposed revisions to the FSAR that describe the departure leaves it unclear what regulatory positions of RG 1.52 are being departed from. In order to review and document this deviation from guidance for the EPR design, this detail must be captured in the FSAR and reviewed. This process is expected to take a significant amount of resources. Therefore the staff recommends that you cite the previously approved versions of these codes, and do not depart from guidance of Regulatory Guide 1.52.
2. Alternatively, provide more specific justification for compliance and departure from RG 1.52 in the FSAR. This justification should address each paragraph of RG 1.52 with a separate discussion on why the later version of ASME N509 or ASME AG-1 guidance is equivalent or improved over that cited in each individual paragraph of the RG as specified below.
 - a. Include this discussion in FSAR as noted below. The discussion should be, clearly linked to RG 1.52 for the respective regulatory position as noted below. Compliance with applicable guidance should be discussed in the existing FSAR paragraphs specifically for the following system Environmental design criteria in the following area:
 - i. Regulatory Position C2.2: Describe how this position is addressed, specifically the need for shielding for nearby equipment In paragraph 6.5.1.2.1, or the respective HVAC sections of the FSAR
 - b. Include this discussion in FSAR as noted below. The discussion should be clearly linked to RG 1.52 for the respective regulatory position as noted below. Compliance with applicable guidance should be discussed in the existing

FSAR paragraphs specifically for the following system design criteria in the following areas:

- i. Regulatory Position C3.1: The staff notes that a moisture separator is still not mentioned in FSAR paragraph 6.5.1.2.1. Include this component in the description of the General System Design of EPR ESF filter systems, or justify why a moisture separator is not supplied for some ESF trains (see related RAI)
 - ii. C3.2: Specify if this position is or is not met for the SBVS: Accident Iodine Exhaust filtration trains and the Containment Building low flow purge exhaust subsystem. In paragraph 6.5.1.2.1, or the respective HVAC sections of the FSAR.
 - iii. C3.3: Specify/justify if this position applies to any ESF filter system in paragraph 6.5.1.2.1 of the FSAR.
 - iv. C3.6: Include the information you previously provided the staff in your response to RAI 6.5.1-1. (See related RAI)
 - v. C3.7: Include information on supplied ESF filter system instrumentation as described in the related RAI on ESF instrumentation.
 - vi. C3.10 Specify and discuss ESF filter system design features that address this regulatory position in paragraph 6.5.1.2.1 of the FSAR
- c. Include this discussion in FSAR section 6.5.1 under the appropriate section. A discussion should be added, clearly linked to RG 1.52 for the respective regulatory position (noted below). Compliance with applicable guidance should be discussed in the existing FSAR paragraphs specifically for the following components:
- i. Moisture separator (Regulatory position 4.1)
 - ii. Filter Air heaters (4.2)
 - iii. Prefilters (4.3)
 - iv. HEPA filters (4.4)
 - v. Dampers (4.13)
 - vi. System fan, fan mounting and ductwork connection(4.14)
 - vii. Carbon Adsorbers (Design, Construction and Testing 4.10;see related RAI on details of Carbon Adsorber design to be included in FSAR)
- d. The staff notes that additional sections on other ESF filter system components should be added for a clear discussion, clearly linked to RG 1.52 for the respective regulatory position (noted below). Compliance or departure from RG 1.52 guidance should be discussed with new sections or paragraphs specifically for the following components:
- i. Mounting frames for the HEPA filter and Type II adsorber cells (Regulatory position C4.5)
 - ii. Filter and adsorber Bank Arrangement (4.6)
 - iii. System filter housings including floors and doors (4.7)
 - iv. Water drains (4.8; see related RAI on Moisture Separator Water drains)

- v. Ducts and filter housings (4.12)
- e. Specifically address departures and compliance from Maintainability Criteria as described in RG 1.52 in the FSAR. Compliance with applicable guidance should be discussed with new sections or paragraphs specifically in the following areas:
 - i. Accessibility of components for maintenance (Regulatory position C5.1)
 - ii. Removal of cleanup components (5.2)