ArevaEPRDCPEm Resource

From:	BRYAN Martin (EXT) [Martin.Bryan.ext@areva.com]
Sent:	Monday, March 22, 2010 4:16 PM
To:	Tesfaye, Getachew
Cc:	DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC); VANCE Brian (AREVA NP INC)
Subject:	Response to U.S. EPR Design Certification Application RAI No. 267, FSAR Ch. 12, Supplement 1
Attachments:	RAI 267 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 267 on February 19, 2010. The attached file, "RAI 267 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to the remaining question, 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 267 Question 12.03-12.04-16.

The following table indicates the respective pages in the response document, "RAI 267 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 267-12.03-12.04-16	2	4

This concludes the formal AREVA NP response to RAI 267, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.
Tel: (434) 832-3016
Martin.Bryan.ext@areva.com

From: DUNCAN Leslie E (AREVA NP INC)
Sent: Friday, February 19, 2010 1:38 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 267, FSAR Ch. 12

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 267 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the one question is not provided.

The following table indicates the respective pages in the response document, "RAI 267 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 267 — 12.03-12.04-16	2	2

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

Question #	Response Date
RAI 267 — 12.03-12.04-16	March 26, 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: Thursday, September 10, 2009 2:44 PM
To: ZZ-DL-A-USEPR-DL
Cc: Peng, Shie-Jeng; Jackson, Christopher; Snodderly, Michael; Jennings, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 267 (3234), FSARCh. 12

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 3, 2009, and discussed with your staff on August 19, 24, and September 10, 2009. No changes were made to the draft RAI question as a result of that discussion. The question in this RAI is considered potential open items for Phases 2 and 3 reviews. As such, the schedule we have established for your application assumes technically correct and complete responses prior to the start of Phase 4 review. If the RAI question cannot be answered prior to the start of Phase 4 review, it is expected that a date for receipt of this information will be provided 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: 1272

Mail Envelope Properties (BC417D9255991046A37DD56CF597DB71059FB164)

Subject: Response to U.S. EPR Design Certification Application RAI No. 267, FSAR Ch. 12, Supplement 1
Sent Date: 3/22/2010 4:15:30 PM
Received Date: 3/22/2010 4:15:42 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
"WILLIFORD Dennis C (AREVA NP INC)" <Dennis.Williford@areva.com>
Tracking Status: None
"VANCE Brian (AREVA NP INC)" <Brian.Vance@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	3653	3/22/2010 4:15:42 PM
RAI 267 Supplement 1 Response US EPR DC.pdf		149910

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

Response to

Request for Additional Information No. 267 (3234), Supplement 1

9/10/2009

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 9.4, 12.3.6

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

Question 12.03-12.04-16:

POTENTIAL OPEN ITEM

Supplemental RAI for EPR DC FSAR Section 12.3.6

1. Justify the HVAC System SSC as Described in EPR DC FSAR Section 9.4 Applicable to 10 CFR 20.1406.

   In DC FSAR Chapter 9, describe the design features provided to prevent or mitigate contamination of the environment; from the HVAC equipment drains for supply, recirculation or discharge air handing units, from the below grade HVAC Systems, Structures or Components (SSC), and due to pressure differentials in the ventilation system associated with normal or expected operation. If design features are not used, provide a description in DC FSAR Chapter 12 of procedures for operations to be used to prevent or mitigate contamination of the environment and provide the associated justification for not incorporating design features.

2. Justify the HVAC System Configuration as Described in EPR DC FSAR Section 9.4 Applicable to 10 CFR 20.1406.

   In DC FSAR Chapter 9, describe the design features provided to prevent or mitigate contamination of the environment resulting from equipment configurations such as; 1) the placement of HVAC inlets to prevent contamination by flooding, 2) the provision of moisture or resin traps on tank and vents prior to connection the HVAC system duct, 3) design configuration of system components to minimize the potential for contamination transport resulting from switching ventilation modes, and 4) contamination due to filter element failure. If design features are not used, provide a description in DC FSAR Chapter 12 of procedures for operations to be used to prevent or mitigate contamination of the environment and provide the associated justification for not incorporating design features.

Response to Question 12.03-12.04-16:

To meet the requirements of 10 CFR 20.1406, a description of ventilation system design features for contamination control was added to U.S. EPR FSAR Tier 2, Section 12.3.6.5.6 in response to RAI 228, Question 12.03–12.04-9.

A cross-reference to Section U.S. EPR FSAR Tier 2, 12.3.6.5.6 and 10 CFR 20.1406 was also included in the following U.S. EPR FSAR Tier 2, HVAC sections as a result of the Response to RAI 228, Question 12.03–12.04-9:

- 9.4.2.2 (Fuel Building Ventilation System).
- 9.4.3.2.1 (Nuclear Auxiliary Building Ventilation System).
- 9.4.5.2.1(Safeguard Building Controlled-Area Ventilation System).
- 9.4.7.2.1 (Containment Building Ventilation System).
- 9.4.8.2.1 (Radioactive Waste Building Ventilation System).

Additional cross-references to U.S. EPR FSAR Tier 2, Section 12.3.6.5.6 and 10 CFR 20.1406 will be included in the following U.S. EPR FSAR Tier 2, HVAC sections that have a potential for radioactive contamination:

- 6.2.3.2.2 (Annulus Ventilation System).
- 9.4.1.2.1 (Main Control Room Air Conditioning System).
- 9.4.6.2.1 (Electrical Division of Safeguard Building Ventilation System).
- 9.4.14.2.1 (Access Building Ventilation System).

The following text will be added to U.S. EPR FSAR Tier 2, Section 12.3.6.5.6 to address additional design features of the HVAC systems to prevent or mitigate contamination of the environment:

> “The following design features are provided to prevent or mitigate contamination of the environment:
>
> - HVAC air handling equipment is provided with drain connections at the bottom of the equipment for gravity drainage. The drainage fluid flows through the hard piping to collection tanks for processing. Drainage may also be collected in trays that have connections to the hard piping which ultimately goes to the nuclear island vent and drain system.
> - Drainage from below-grade HVAC equipment is also collected in tanks and pumped to other collection tanks at a higher elevation for processing. Process piping is hard piping which ultimately goes to the nuclear island vent and drain system.
> - HVAC systems are designed so that the supply air flow path is directed from clean areas to areas of increasingly higher potential contamination under normal and accident modes of operation. Potentially contaminated areas are maintained at a lower negative pressure with respect to the adjoining areas. The air from the contaminated areas is sampled and monitored for airborne radiation levels.
> - Air intake connections for the HVAC systems are located on the roof or top floor of the building to prevent spread of contamination by flooding.
> - Radioactive waste collection tanks and other tanks that have vent connections to HVAC system ducts are designed to prevent migration of contaminated fluid or resin to the HVAC system. The fluid or resin levels in the tanks are monitored with high level alarms. Air that is vented from the top of the tanks into the HVAC ducting system is exhausted through iodine filtration trains which are equipped with prefilter, moisture separator, electric heaters, HEPA filters, and carbon adsorber. Moisture separators remove entrained moisture droplets. Heaters raise the temperature of the potentially saturated air to reduce the relative humidity to less than 70 percent in accordance with RG 1.52 or RG 1.140.
> - The HVAC system configuration is designed so that the supply air flow path is directed from clean areas to areas of increasingly higher potential contamination during switchover of the ventilation modes (e.g., switching from normal operation to accident mode operation, or switching between the air filtration trains). If the HVAC system design includes a bypass of the iodine filtration train, the radiation monitors are located upstream of the iodine filtration train. This allows the filtration trains to automatically

swap from bypass to iodine filtration train to prevent escape of radioactive airborne particulate to the environment. In cases where the design does not include a bypass of the iodine filtration train, the radiation monitor is located downstream of the iodine filtration train to provide an alarm in the event that the iodine filter unit fails to operate correctly.

- HVAC filters, heaters, and cooling coils are located inside a housing which is designed for a minimal amount of air in-leakage to control airborne contamination. During operation, a negative pressure with respect to the adjoining environment is created in the housing. This prevents radioactive material from reaching the environment as a result of filter element failure. The housing and filters are designed, fabricated, and tested in accordance with ASME AG-1."

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 6.2.3.2.2, 9.4.1.2.1, 9.4.6.2.1, 9.4.14.2.1 and 12.3.6.5.6 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

uncontrolled release of radioactivity to the environment. The design description and performance criteria of the RSB are presented in Section 3.8.4.

The annulus ventilation system collects and filters airborne radioactive material that may leak from the primary containment by maintaining a subatmospheric pressure in the annulus.

6.2.3.2.2 Annulus Ventilation System

The AVS is designed to contain leakage from the primary containment by maintaining a subatmospheric pressure in the annulus. The AVS consists of three trains: one train is used during normal plant operation; two trains are used to mitigate potential accidents. AVS design and performance parameters are presented in Table 6.2.3-1.

12.03-12.04-16

Refer to Section 3.2 for the seismic and system quality group classification of the AVS.

Refer to Section 12.3.6.5.6 for ventilation system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

6.2.3.2.2.1 AVS Normal Operation Train

The normal operation filtration train is shown in Figure 6.2.3-1. The full capacity normal operation filtration train is designed to maintain a subatmospheric pressure in the annulus, to maintain the annulus temperature above 45°F to prevent boron precipitation in the extra borating system piping, and to provide conditioned air in the annulus for personnel accessibility.

During normal operation, the conditioned air is drawn from the Nuclear Auxiliary Building ventilation supply shaft (See Section 9.4.3) through a fire damper, a motor-operated control damper, and two motor-operated isolation dampers. The supply air is distributed in the bottom of the annulus to four different locations. A subatmospheric pressure of less than or equal to -0.8 inches water gauge is maintained in the annulus during normal operation by regulating the control damper with two redundant pressure sensors located in the annulus.

The exhaust air is drawn from the top of annulus by the Nuclear Auxiliary Building ventilation system exhaust fans through two motor-operated isolation dampers and a fire damper. The exhaust air is filtered by the Nuclear Auxiliary Building filtration trains and discharged through the vent stack.

The normal operation filtration train is in service during normal plant operation and plant shutdown conditions. The two accident trains are available as backup if the normal operation train is not able to maintain the subatmospheric pressure in the annulus.

The CRACS is capable of isolating all non-safety-related system penetrations of the CRE boundary so that occupation and habitability of the control room is not compromised.

- The CRACS maintains the following temperature ranges for the areas serviced:
  - Main Control Room: 65°F to 76°F
  - Other areas of CRE: 68°F to 79°F.

The relative humidity within the MCR and the CRE I&C/Computer Rooms at or above 20 percent and less than or equal to 70 percent is maintained.

9.4.1.2 System Description

9.4.1.2.1 General Description

The CRACS is designed to maintain acceptable ambient conditions inside the CRE areas to provide for proper operation of equipment and for personnel access to conduct inspection, testing and maintenance. The CRE area is shown in Figures 6.4-1 through 6.4-3.

The CRACS consists of following subsystems:

- Air intake.
- Iodine filtration train.
- Recirculation air handling.
- Air supply and recirculation.
- Kitchen and sanitary rooms exhaust.

12.03-12.04-16

Refer to Section 12.3.6.5.6 for ventilation system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

Air Intake Subsystem

The air intake subsystem is illustrated in Figure 9.4.1-1—Control Room Air Intake and Iodine Filtration Train Subsystems.

The control room air conditioning system has two outside air intakes. The train 1 intake is located in Safeguard Building 2 and the train 4 intake is located in Safeguard Building 3. Outside air is supplied by each outside air intake through a wire mesh grille. Each outside air intake is equipped with an electrically heated, weather protected grille to prevent ice formation. A sensor is installed in each outside air

- The second exhaust ductwork is used for the rooms which could accumulate specific gas (hydrogen in the battery rooms and refrigerant gas in the rooms of the SCWS) and for the non-controlled mechanical area. The air is directly exhausted outside using one of two exhaust fans (one safety-related fan, or one non-safety-related maintenance fan). For the battery rooms, a bypass connection to the recirculation/exhaust air path is provided with an isolation damper.

- A single air outlet equipped with dampers and air intake grilles (common for the entire exhaust air of all non-controlled HVAC systems of the same division, except toilet exhaust air of divisions 1 and 4).
- One independent exhaust duct used for toilets, the air being exhausted outside using one non-safety-related exhaust fan via a separate air outlet (divisions 1 and 4 only).
- One safety-related recirculation cooling unit (equipped with a cooling coil, droplet separator, and recirculation fan) for the emergency feedwater pump room.
- One safety-related recirculation cooling unit (equipped with a cooling coil, droplet separator, and recirculation fan) for the CCWS components rooms.

12.03-12.04-16

Refer to Section 12.3.6.5.6 for ventilation system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

9.4.6.2.2 Component Description

The major components of the SBVSE are described in the following paragraphs. Refer to Section 3.2 for the seismic and system quality group classification of these components.

Supply Air System – Safety-Related Train

The supply air units are located in divisions 1 and 4 at elevation +39 ft and in divisions 2 and 3 at elevation +69 ft (also elevation +96 ft for air intake components). The components are installed in a concrete chamber structure.

Each air conditioning train includes:

- Weather protection grilles, electrically heated to prevent ice formation.
- Dampers.
- Insect protection screens.
- Isolation damper, manually operated.
- Set of control dampers with electrical actuator.

9.4.14 Access Building Ventilation System

The access building ventilation system (ABVS) maintains room ambient conditions inside the Access Building to permit personnel access to the Nuclear Island (NI), and to control the concentration of airborne radioactive material in the controlled areas of the building during normal operation, including maintenance and refueling shutdowns, and during anticipated operational occurrences. The ABVS is composed of the following three subdivisions:

- The supply of fresh air to all areas of the Access Building and the prestressing gallery underneath the Reactor Building (RB).
- The controlled area exhaust with radiation classification.
- The supervised areas exhaust with no radiation classification.

9.4.14.1 Design Bases

The ABVS performs no safety-related functions and is not required to operate during a design basis accident (DBA).

The ABVS monitors the controlled area exhaust air for potential radioactivity upstream of the prefilter and high efficiency particulate air (HEPA) filters by the sampling activity monitoring system (SAMS) prior to discharge into the plant vent stack. This complies with the requirements of GDC-60.

The ABVS environmental operating conditions are specified in Table 9.4.14-1—ABVS Environmental Conditions.

9.4.14.2 System Description

9.4.14.2.1 General Description

Two of the three ABVS subdivisions are located in the Access Building:

- The supervised areas (i.e., non-controlled areas with no radiation classification).
- The controlled areas (i.e., areas with radiation classification).

The ABVS also provides supply and exhaust air to the prestressing gallery, located in the RB at elevation -50 ft. The ventilation system is designed for fresh supply air and exhaust air operation; there is no air recirculation.

12.03-12.04-16

Refer to Section 12.3.6.5.6 for ventilation system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

These filtration systems are also designed to permit periodic inspection and periodic pressure and functional testing per ASME AG-1-2003 (Reference 13). The filters are contained in housings and a dedicated, ventilated room to minimize the potential for facility and environmental contamination. For some units, lighting is also available inside filter banks between the rows of filters and inspection portholes in the filter housing doors to enable viewing while in operation.

There are certain containment penetrations that introduce the potential for primary containment leakage to bypass the filtered annulus and escape directly to the environment. These potential bypass leakage paths exist through the double seals of the equipment hatch, personnel airlocks, fuel transfer tube, and containment ventilation system isolation valves. The negative pressure difference between the annulus and the environment provides a driving force to route these bypass leakage paths to the annulus, thereby providing an additional barrier against a release to the environment.

For these ventilation systems, there are no buried pipes handling potentially contaminated exhaust gases and therefore, no means to contaminate the environment from a leaking pipe. Gases that may potentially leak from these ventilation systems upstream of the HEPA filters are collected and subsequently filtered by one of these ventilation systems, which are providing a sub-atmospheric pressure in the room where the leak may occur.

The registers of the ventilation systems are placed in each area to deliver the supply air high in the room or corridor, and to draw the air into the exhaust register high in the room or area served by the HVAC system. As a general design rule, the HVAC register placement is high above the flood plain.

12.03-12.04-16

The following design features are provided to prevent or mitigate contamination of the environment:

- HVAC air handling equipment is provided with drain connections at the bottom of the equipment for gravity drainage. The drainage fluid flows through the hard piping to collection tanks for processing. Drainage may also be collected in trays that have connections to the hard piping which ultimately goes to the nuclear island vent and drain system.

- Drainage from below-grade HVAC equipment is also collected in tanks and pumped to other collection tanks at a higher elevation for processing. Process piping is hard piping which ultimately goes to the nuclear island vent and drain system.

- HVAC systems are designed so that the supply air flow path is directed from clean areas to areas of increasingly higher potential contamination under normal and accident modes of operation. Potentially contaminated areas are maintained at a

12.03-12.04-16

lower negative pressure with respect to the adjoining areas. The air from the contaminated areas is sampled and monitored for airborne radiation levels.

- Air intake connections for the HVAC systems are located on the roof or top floor of the building to prevent spread of contamination by flooding.
- Radioactive waste collection tanks and other tanks that have vent connections to HVAC system ducts are designed to prevent migration of contaminated fluid or resin to the HVAC system. The fluid or resin levels in the tanks are monitored with high level alarms. Air that is vented from the top of the tanks into the HVAC ducting system is exhausted through iodine filtration trains which are equipped with prefilter, moisture separator, electric heaters, HEPA filters and carbon adsorber. Moisture separators remove entrained moisture droplets. Heaters raise the temperature of the potentially saturated air to reduce the relative humidity to less than 70 percent in accordance with RG 1.52 or RG 1.140.
- The HVAC system configuration is designed so that the supply air flow path is directed from clean areas to areas of increasingly higher potential contamination during switchover of the ventilation modes (e.g., switching from normal operation to accident mode operation, or switching between the air filtration trains). If the HVAC system design includes a bypass of the iodine filtration train, the radiation monitors are located upstream of the iodine filtration train. This allows the filtration trains to automatically swap from bypass to iodine filtration train to prevent escape of radioactive airborne particulate to the environment. In cases where the design does not include a bypass of the iodine filtration train, the radiation monitor is located downstream of the iodine filtration train to provide an alarm in the event that the iodine filter unit fails to operate correctly.
- HVAC filters, heaters and cooling coils are located inside a housing which is designed for a minimal amount of air in-leakage to control airborne contamination. During operation, a negative pressure with respect to the adjoining environment is created in the housing. This prevents radioactive material from reaching the environment as a result of filter element failure. The housing and filters are designed, fabricated and tested in accordance with ASME AG-1.

12.3.6.5.7 Essential Service Water System

The essential service water system (ESWS) is designed to minimize contamination of the facility and the environment as described in the general protective design features listed in Sections 12.3.6.1 and 12.3.6.2.

The ESWS is free of radioactivity resulting from plant operation. The ESWS design is consistent with the U.S. EPR contaminant management philosophy in compliance with 10 CFR 20.1406. Migration of radioactive material from potentially radioactive systems is prevented with a minimum of two barriers. The ESWS supplies water to the CCWS heat exchangers (HX) and returns the water to the ultimate heat sink (UHS) cooling tower basins. The CCWS is between the ESWS and RHRS. In addition to the CCWS/ESWS HX, there is a second HX barrier between the CCWS and RHRS. Radiation monitors in the CCWS detect radioactive contaminants migrating through