ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Thursday, February 19, 2009 6:53 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 131, Supplement 1
Attachments: RAI 131 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 21 questions of RAI No.131 on January 14, 2009. The attached file, "RAI 131 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to 1 of the remaining 16 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 131 Question 09.02.01-25.

The following table indicates the respective pages in the response document, "RAI 131 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 131 — 9.02.01-25	2	3

The schedule for technically correct and complete responses to the remaining 15 questions is unchanged and provided below:

Question #	Response Date
RAI 131 — 9.01.04-1	March 20, 2009
RAI 131 — 9.01.04-3	March 20, 2009
RAI 131 — 9.01.04-4	March 20, 2009
RAI 131 — 9.01.04-5	March 20, 2009
RAI 131 — 9.01.04-6	March 20, 2009
RAI 131 — 9.01.04-7	March 20, 2009
RAI 131 — 9.01.04-8	March 20, 2009
RAI 131 — 9.01.04-9	March 20, 2009
RAI 131 — 9.01.04-11	March 20, 2009
RAI 131 — 9.01.04-13	March 20, 2009
RAI 131 — 9.05.06-1	March 20, 2009
RAI 131 — 9.05.06-2	March 20, 2009
RAI 131 — 9.05.06-5	March 20, 2009
RAI 131 — 9.05.06-7	March 20, 2009
RAI 131 — 9.05.06-8	March 20, 2009

Sincerely,

Ronda Pederson

ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
AREVA NP Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935

Phone: 434-832-3694
Cell: 434-841-8788

From: Pederson Ronda M (AREVA NP INC)
Sent: Wednesday, January 14, 2009 2:48 PM
To: 'Getachew Tesfaye'
Cc: WILLIFORD Dennis C (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 131(1537,1510,1560), FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 131 Response US EPR DC.pdf" provides technically correct and complete responses to 5 of the 21 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 131, Questions 9.01.04-2, 9.01.04-12, 9.05.06-3, and 9.05.06-6.

The following table indicates the respective page(s) in the response document, "RAI 131 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 131 — 9.01.04-1	2	2
RAI 131 — 9.01.04-2	3	3
RAI 131 — 9.01.04-3	4	4
RAI 131 — 9.01.04-4	5	5
RAI 131 — 9.01.04-5	6	6
RAI 131 — 9.01.04-6	7	7
RAI 131 — 9.01.04-7	8	8
RAI 131 — 9.01.04-8	9	9
RAI 131 — 9.01.04-9	10	10
RAI 131 — 9.01.04-11	11	11
RAI 131 — 9.01.04-12	12	12
RAI 131 — 9.01.04-13	13	13
RAI 131 — 9.02.01-25	14	14
RAI 131 — 9.05.06-1	15	15
RAI 131 — 9.05.06-2	16	16
RAI 131 — 9.05.06-3	17	17
RAI 131 — 9.05.06-4	18	18
RAI 131 — 9.05.06-5	19	19
RAI 131 — 9.05.06-6	20	20
RAI 131 — 9.05.06-7	21	21
RAI 131 — 9.05.06-8	22	22

A complete answer is not provided for 16 of the 21 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 131 — 9.01.04-1	March 20, 2009
RAI 131 — 9.01.04-3	March 20, 2009

RAI 131 — 9.01.04-4	March 20, 2009
RAI 131 — 9.01.04-5	March 20, 2009
RAI 131 — 9.01.04-6	March 20, 2009
RAI 131 — 9.01.04-7	March 20, 2009
RAI 131 — 9.01.04-8	March 20, 2009
RAI 131 — 9.01.04-9	March 20, 2009
RAI 131 — 9.01.04-11	March 20, 2009
RAI 131 — 9.01.04-13	March 20, 2009
RAI 131 — 9.02.01-25	February 27, 2009
RAI 131 — 9.05.06-1	March 20, 2009
RAI 131 — 9.05.06-2	March 20, 2009
RAI 131 — 9.05.06-5	March 20, 2009
RAI 131 — 9.05.06-7	March 20, 2009
RAI 131 — 9.05.06-8	March 20, 2009

Sincerely,

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
AREVA NP Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, December 02, 2008 3:01 PM
To: ZZ-DL-A-USEPR-DL
Cc: Larry Wheeler; Gerard Purciarello; Stephen Campbell; John Segala; Peter Hearn; Joseph Colaccino; John Rycyna
Subject: U.S. EPR Design Certification Application RAI No. 131(1537,1510,1560), FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 29, 2008, and discussed with your staff on November 19, 2008. Draft RAI Question 09.01.04-10 was deleted 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, excluding the time period of **December 20, 2008 thru January 1, 2009, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 45 days**, it is expected that a date for receipt of this information will be provided to the staff within the 45-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: 231

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Subject: Response to U.S. EPR Design Certification Application RAI No. 131, Supplement 1
Sent Date: 2/19/2009 6:53:21 PM
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From: Pederson Ronda M (AREVA NP INC)

Created By: Ronda.Pederson@areva.com

Recipients:
"BENNETT Kathy A (OFR) (AREVA NP INC)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>
Tracking Status: None
"WILLIFORD Dennis C (AREVA NP INC)" <Dennis.Williford@areva.com>
Tracking Status: None
"Getachew Tesfaye" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

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Options
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Response to

Request for Additional Information No. 131, Supplement 1

12/2/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.04 - Light Load Handling System (Related to Refueling)
SRP Section: 09.02.01 - Station Service Water System
SRP Section: 09.05.06 - Emergency Diesel Engine Starting System
Application Section: FSAR Ch. 9

QUESTIONS for Balance of Plant Branch 2 (ESBWR/ABWR) (SBPB)
QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

Question 09.02.01-25:

Flooding isolation of the Essential Service Water System (ESWS) pumps is discussed in two sections of the Final Safety Analysis Report (FSAR) (see below); however, Tier 2, Section 9.2.1 makes no mention of this important feature to mitigate a flood in the Safeguard Building (SB) or Fuel Building (FB). Provide a detailed discussion in the appropriate sections of 9.2.1 related to the flood signals and ESWS isolation. Clarify how the logic will isolate each division of ESWS pumps (or all ESWS pumps) and clarify if any pump receives a lockout from starting. Provide schematic diagrams showing all inputs (i.e., logic inputs , sensor inputs, all variables, actuation logic, binary limitation signals), with input types (i.e., hardwired, fiber, type of isolation used), ESWS circuit components, and all ESWS control signal outputs of the ESWS control system. The schematic provided should be of the type provided by Figure RAI 19-1, page 5, and Figure RAI 19-2, page 6, in “Response to Second Request for Additional information”, Attachment A, ANP-10284Q2P, dated June 13, 2008. In addition, describe operator actions that are required and justify the non-safety-related classification for the ESWS flooding isolation logic.

From Tier 2 FSAR 19.1.5.2.2.5

“Floods caused by a break in a system with very large flooding potential (ESWS or DWS) are assumed to be contained below ground level of the affected buildings (SB or FB). This is a reasonable assumption since those systems are automatically isolated if the building sump detects a large flooding event. Moreover, expansive time is needed to flood a building up to ground level, so operator isolation is likely to succeed if automatic isolation failed.”

From Tier 2 FSAR 3.4.3.4

“Relevant component and system piping failures considered in the analysis for this elevation include failures in the essential service water system (ESWS) and component cooling water system (CCWS) heat exchangers, leaks in the emergency feedwater system, leaks in the CCWS, and pipe failure in the fire water distribution system.

A postulated pipe break or erroneous valve alignment in the ESWS has the potential to impact more than one division. The ESWS piping penetrates the SBs at elevation -14 feet, 9-1/4 inches and is routed to the CCWS heat exchangers at elevation +0 feet. The worst case scenario assumed in the analysis is an erroneous valve alignment where the CCW heat exchanger is left open after plant maintenance, resulting in the entire cross section of the associated ESW line releasing water at elevation +0 feet. To cope with nonclosure of the heat exchanger or a large break in the ESWS piping, the pump must be stopped and the isolation valve in the discharge line of the affected ESWS train must be closed to limit the flooding volume in the affected SB.

Non safety-related detection and isolation signals are provided in the nuclear island drain and vent system in each SB to isolate the ESWS. The alarm that actuates the isolation is above the floor level so only large flooding events can activate the alarm. Two level sensors in a one-out-of-two logic activate the alarm. If a level instrument fails, that sensor is not considered for the voting, and the signal is activated when one sensor alarms.”

Response to Question 09.02.01-25:

In case of significant leakage from an ESWS train in a Safeguard Building, the associated motor driven ESWS pump discharge isolation valve is automatically closed and the ESWS pump is tripped. Another ESWS train is also put into operation. The isolation valve in the discharge line of the affected ESWS train is automatically closed and pump is stopped in order to restrict the released flood water volume in the affected SB, thus preventing the resulting internal water level from rising above the maximum allowed elevation of +0 feet. The detection and isolation signaling is performed by safety-related means. Nuclear island drain/vent system (NIDVS) sump level instruments in the non-controlled areas of the SBs (see U.S. EPR FSAR Tier 2, Figure 9.3.3-1) are supplied by Class 1E power and are Seismic Category I. Each sump is equipped with two level instruments located above floor level. If a large flooding event occurs, a signal (1 out of 2 logic) will provide a MAX alarm in the main control room and isolate the affected train. No operator action is required to isolate the ESWS in a large flooding event. Other large flooding events could isolate the ESWS in the affected SB; however, this is acceptable since it is assumed the entire affected division is lost due to the flooding event.

Details of the control system logic, including schematic diagrams, will be developed later in the design process and will be consistent with the description provided.

U.S. EPR FSAR Tier 2, Section 3.4.3.3 will be revised to state that safety-related detection and isolation signals are provided in the NIDVS in each SB to isolate the ESWS, and to clarify that the level sensors actuate the isolation.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 3.4.3.3, 9.2.1.3.5 and 9.3.3.3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

09.02.01-25

nonclosure of the heat exchanger or a large break in the ESWS piping, the pump must be stopped and the isolation valve in the discharge line of the affected ESWS train must be closed to limit the flooding volume in the affected SB.

Non sSafety-related detection and isolation signals are provided in the nuclear island drain and vent system in each SB to isolate the ESWS. The alarmlevel sensors that actuates the isolation isare above the floor level so only large flooding events can initiate an isolationactivate the alarm. Two level sensors in a one-out-of-two logic actuate the isolationactivate the alarm. If a level sensorinstrument fails that sensor is not considered for the voting, and the signal is activated when one sensor detectsalarms.

Flooding protection measures mitigate consequences resulting from a postulated failure in the fire water distribution system. A watertight physical protection door prevents water ingress into neighboring divisions through the interconnecting passageway between SB-1 and SB-2. This door is provided with position indication and monitoring of the locking and bolting status for control of the closed position. In the event of flooding, the door is considered closed. A flooding pit with a burst panel below the interconnecting passageway allows water to flow to lower building levels. This arrangement also exists for the passageways between SB-3 and SB-4 and between SB-2 and SB-3.

Elevation +15 Feet and Above

Physical separation for flooding is not provided for elevations +15 feet and above. Therefore, protection measures restrict flooding to the SB where the flooding event was initiated. Sufficient openings and thresholds direct water flow to the lower building levels.

Potential sources of flooding located on these building levels include the demineralized water distribution system, safety chilled water system (SCWS), fire water distribution system, CCWS including surge tank, and the potable and sanitary water disposal system. These systems have been reviewed for possible effects on the MCR and remote shutdown station (RSS) because they are located above the MCR, and measures are provided to protect the MCR and RSS from flooding. No water-carrying piping systems are located in the MCR or RSS. Thresholds are provided for doors entering the MCR and water resistant doors are provided for entry doors to the RSS. For the fire water distribution system, demineralized water distribution system, and the CCWS, multiple openings and flow paths direct flood water from pipe breaks to lower building levels. Surge tank water tightness is provided by a steel liner and leak detection system.

Each division of the SCWS contains a limited volume of water that can either be stored in the area where it was released or drained to the building sump or to the lowest

9.2.1.3.5 Piping, Valves, and Fittings

System materials must be selected that are suitable to the site location, ESW fluid properties and site installation. System materials that come into contact with one another must be chosen so as to minimize galvanic corrosion. All safety-related piping, valves, and fittings are in accordance with ASME Code Section III, Class 3 (Reference 1).

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The general protection concept in case of pipe failures in the ESWS with regard to flooding is based on the principle of restricting the consequences to the affected division. In case of significant leakage from an ESWS train in a Safeguard Building (SB), the associated motor-driven ESWS pump discharge isolation valve is automatically closed and the ESWS pump is tripped. Another ESWS train is also put into operation. The detection and isolation signaling is done by safety-related means. One-out-of-two logic from two nuclear island drain and vent system (NIDVS) sump level instruments in the non-controlled areas of the SBs provide a MAX alarm in the MCR and isolate the affected ESWS train. No operator action is required to isolate the ESWS in a large flooding event.~~In case of pipe failure in one Safeguard Building above elevation +0.00 feet, the water is directly led to the lower levels via sufficient openings in the floor.~~

Primary overpressure protection on the ESWS side of the CCWS HXs is provided by thermal relief valves.

Secondary overpressure protection on the ESWS side of the CCWS HXs is provided by manual opening of the valve (located upstream of the relief valve) before isolation of the particular HX.

To make sure the performance of the safety-related functions, all manually operated valves in the main lines of the safety-related ESWS divisions are mechanically locked in the proper position.

9.2.1.4 Operation

9.2.1.4.1 Normal Operating Conditions

Safety-Related Divisions

The ESWS supply is vital for all phases of plant operation and is designed to provide cooling water both during power operation and shutdown of the plant. During normal plant operation, two of four pumps are in operation with the remaining divisions in standby. The pumps are switched over periodically, thus changing the operational divisions.

The four divisions are filled and vented prior to operation. Under normal system operating conditions on a per division basis, the ESWS pump is in operation, the debris

- NAB non-controlled area floor drains.

9.3.3.2.3 System Operation

During normal plant operation, the NIDVS collects different categories of liquid and gaseous effluents. Liquid leakages or discharges drain by gravity to sumps. Sump pumps automatically or manually transfer their contents to storage tanks.

Boron-containing reactor coolant leakage from primary vents, drains, pump seal and valve stem leakage, and safety valve discharges, is collected and stored for further processing to recover the boron by the coolant supply and storage system, coolant purification system and coolant treatment system. Liquid effluents produced by the decontamination facilities are collected and stored by the NIVDS for routing to the liquid waste storage system and then for processing in the liquid waste processing system. Recovered gaseous wastes are routed to the gaseous waste processing system or appropriate ventilation system for treatment.

9.3.3.3 Safety Evaluation

Safety-related components and equipment in the NIDVS include containment isolation valves (CIV), connecting piping and penetrations. CIVs are located in portions of the following subsystems:

- Drains/vents and safety valve discharges system - primary effluents inside RB.
- Type 1 floor drains system - RB floor drains.
- Type 2 floor drains system - low contamination RB drains.

The design of safety-related portions of the NIDVS satisfies GDC 2 regarding the effects of natural phenomena.

- Safety-related portions of the NIDVS are located in the RB and FB. These buildings are designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, tsunami and seiches. Section 3.3, Section 3.4, Section 3.5, Section 3.7 and Section 3.8 provide the bases for the adequacy of the structural design of the buildings.
- Safety-related portions of the NIDVS are designated Seismic Category I and are designed to remain functional during and following a safe shutdown earthquake (SSE). Section 3.7 provides the design loading conditions that are considered.
- Safety-related portions of the NIDVS are protected against the effects of flooding by consideration of the following design features: redundancy, location and physical separation.

09.02.01-25

- To cope with a large flooding event, the NIDVS sump located in the lowest level of the non-controlled areas of each SB is equipped with redundant safety-related level instrumentation to automatically trip the ESWS pump and close the associated discharge isolation valve. This instrumentation is located above floor level, provided with Class 1E power, and is classified as Seismic Category I.

09.02.01-25

The design of safety-related portions of the NIDVS satisfies GDC 4 regarding the capability to withstand the effects of and to be compatible with the environmental conditions (e.g., flooding) associated with normal operation, maintenance, testing and postulated accidents (e.g., pipe breaks, tank ruptures).

- Safety-related portions of the NIDVS inside the RB are located at sufficient elevation to be protected from flooding events inside this building.
- Sump pumps inside the SBs and FB are equipped with a double level measurement. The corresponding set point level in each sump is above floor level. In case of flooding inside these buildings, the dedicated level measurement systems are capable of detecting flooding at the lowest level.
- The NIDVS contains instrumentation that detects water accumulation that can adversely affect the operation of safety-related equipment. This includes monitoring the RCS leak tightness and reactor coolant inventory using leak detection and measurement means in the RB.
- The NIDVS is designed to prevent backflow of water through the drain systems into areas of the plant containing safety-related equipment by the use of check valves.
- Safety-related portions of the NIDVS are protected against the effects of internal missiles by consideration of the following design features: redundancy, location and physical separation.
- The NIDVS design considers: (1) actuation of installed fire suppression systems (e.g., gas and water), (2) accumulation of fire fighting water, and (3) prevention of backflow of combustible liquids into safety-related areas.
- Redundancy and physical separation of CIVs provide assurance that the containment isolation function is protected against fire-related events. The inner and outer CIVs are located in separate fire zones.

The design of the safety-related portions of the NIDVS satisfies GDC 60 concerning the suitable control of the release of radioactive materials in gaseous and liquid effluents, including AOOs.

- The NIDVS is designed to prevent the inadvertent transfer of contaminated fluids to non-contaminated drainage systems.
- Portions of the NIDVS that are located in areas that may contain radioactive effluents are physically separated from the plant areas that do not contain radioactive effluents. System design and operational controls monitor the transfer of effluents to the appropriate treatment systems.