ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Wednesday, October 06, 2010 4:04 PM
To: Tesfaye, Getachew
Cc: Miernicki, Michael; RYAN Tom (AREVA); Hearn, Peter
Subject: FW: AREVA call on 10/7/10 - Draft Response to RAI 390 - Question 9.2.2-106
Attachments: RAI 390 Supplement 7 Response US EPR DC - DRAFT.PDF

Information for tomorrow's chapter 9 call.

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From: RYAN Tom (RS/NB)
Sent: Wednesday, October 06, 2010 3:57 PM
To: BRYAN Martin (External RS/NB)
Cc: GUSTAFSON Jeremy (EP/PE); GARDNER Darrell (RS/NB)
Subject: FW: AREVA call on 10/7/10 - Draft Response to RAI 390 - Question 9.2.2-106

Marty – attached is the updated draft for RAI 390, Question 106. It addresses the NRC second round of comments. To be discussed on the Chapter 9 NRC call tomorrow, 10/7. Please note that this is a consolidated response to all parts of Question 106 for convenience, we are not asking for any review except the final SAHARS issues that were the only open issues on that question (as noted below from the NRC reviewer).

Please let me know if you have any questions,
Thanks,
Tom Ryan

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, September 22, 2010 3:06 PM
To: BRYAN Martin (External RS/NB)
Cc: KOWALSKI David (RS/NB); Hearn, Peter
Subject: FW: AREVA call on 9/21/10

From: Wheeler, Larry
Sent: Wednesday, September 22, 2010 10:25 AM
To: Tesfaye, Getachew
Cc: Eul, Ryan; Lee, Samuel; Segala, John; Hearn, Peter
Subject: FW: AREVA call on 9/21/10

Getachew:

From the 9/21/10 call, thanks.

RAI 351

Q9.2.5-30: Consider adding "make up water sources" to the first paragraph of your response as a potential source of debris. Consider adding the last sentence of the second paragraph of your response "Both of these screens….flow cross section" to the FSAR Tier 2, Chapter 9.2.5. Then OK to submit.

RAI 390 - need to re-submit
Q9.2.2-106 (BOP comments – other branches are still reviewing this question):

In general (minor comment): In the response, make it clear the Tier 1 sections are associate with Section 2.3.3. For example, FSAR Tier 1, Section 2.0 should read also include– FSAR Tier 1 Section 2.3.3….. (several places)

GDC 2 - For the response - consider adding similar info from RAI 119, Q9.2.1-1 which states: non-seismic lines and associated equipment are routed, to the extent possible, outside of safety-related structures and areas to avoid potentially adverse interactions. In the event that this routing is not possible and non-seismic lines must be routed in safety-related areas, the non-seismic items are evaluated for seismic interactions as described in U.S. EPR FSAR Tier 2, Section 3.7.3.8, "Interaction of Other Systems with Seismic Category I Systems." Failure of the non-safety-related non-seismic portions of the SAHRS does not prevent or degrade the safety function of any safety-related Seismic Category I components.

Figure 19.2-22 - Boundary missing B to N
Figure 19.2-22 - consider adding note that the SAHR pump trips on low seal water tank pressure.
Figure 19.2-22 – mark number from the spray ring (BR004) is missing.

Larry Wheeler
US Nuclear Regulatory Commission (NRC)
Office of New Reactors (NRO)
Division of Safety Systems and Risk Assessment (DSRA)
Balance of Plant
Reactor Systems Engineer
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Subject: FW: AREVA call on 10/7/10 - Draft Response to RAI 390 - Question 9.2.2-106
Sent Date: 10/6/2010 4:04:04 PM
Received Date: 10/6/2010 4:06:02 PM
From: BRYAN Martin (EXTERNAL AREVA)

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Recipients:
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Response to

Request for Additional Information No. 390, Question 09.02.02-106
4/27/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.02 - New and Spent Fuel Storage
SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems
SRP Section: 09.05.04 - Emergency Diesel Engine Fuel Oil Storage and Transfer System
Application Section: 9.5.4

QUESTIONS for Balance of Plant Branch 1 (SBPA)
QUESTIONS for Health Physics Branch (CHPB)

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Question 09.02.02-106:

Follow-up to RAI No. 337, Supplement 2 responses addressing the seal water system (SEWSS), FSAR Section 9.2.7.

Question 9.2.2-79: In the applicant's response to item B.1, it was noted that check valves are installed on the upstream piping of each SEWSS user. Based on the staff's review of Figure 9.2.7-1, "Seal Water Supply System," all the users do not have check valves. Provide clarification in the RAI response that the check valves are located on the continuations of the FSAR figures and provide information on the figure numbers in the FSAR or add the required check valves to Figure 9.2.7-1 and associated FSAR tables.

Question 9.2.2-79: In the applicant's markup of Table 3.2.2-1, "Classification Summary," on sheet 110, valve 30GHW44 AA006 was added. The staff could not find this valve on any FSAR figures. Provide this valve on the FSAR figure.

Question 9.2.2-80: In the applicant's response to item B.2, it was noted that a relief valve is provided for each buffer tank. Since these relief valves are for the nitrogen side of the buffer tanks, describe the vent path for the nitrogen and explain in the RAI if this release path affects the occupations of the main control room or affects plant operators from performing any duties related to safe shutdown.

Question 9.2.2-81: In the applicant's response to item B.1, it was noted that the severe accident heat removal system (SAHRS) did not have a statement added to the FSAR related to the SAHRS pump trip on low seal water pressure similar to the text added for the charging pump (Section 9.3.4.5). Provide clarification in the RAI response and add this information to the appropriate sections in the FSAR for the SAHRS.

The staff noted that SAHRS is described in FSAR Tier 1, Section 2.3.3, "Severe Accident Heat Removal System;" however, it is not described in detail in Tier 2. The information in Section 19.2.3.3.3.2, "Severe Accident Heat Removal System," does not include the design information to support Tier 1. The support systems for SAHRS (dedicated component cooling and dedicated essential cooling) are described in detail in Sections 9.2. Since SAHRS is described in Tier 1, and the design descriptions, interface requirements, and site parameters are derived from Tier 2 information, the applicant should provide this information in Tier 2. In addition, Tier 1 FSAR Section 1.0, "Introduction," states that the "information in the Tier 1 portion of the FSAR is extracted from the detailed information contained in Tier 2".

This information is needed in Tier 2 in order for the staff to complete its review as noted below;

- SARHS as it relates to the GDC 2. Tier 1, Table 2.3.3-1 indicates that all of the SAHRS components are not built to either seismic category I or II.
- SARHS as it related to 10 CRF20.1406 which needs to be evaluated for the minimization of the spread of contamination during system testing.

Question 9.2.2-81: In the applicant's response to item B.2, it was noted there was no basis for the 40 gallon buffer tanks. Provide the basis for the 40 gallon in the RAI response and add information to the FSAR as required.

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Response to Question 09.02.02-106:

Follow-up to Question 09.02.02-79:

Check valves were not added to the interfaces between the decontamination system for small machine components and the decontamination equipment for apparatus and vessels system users because these systems are not included in the U.S. EPR FSAR. Check valves are located on the continuation of the figures for the remaining seal water supply system (SEWSS) users. The U.S. EPR FSAR Tier 2 figures do not provide a level of detail that shows the interfaces between the SEWSS and the gaseous waste processing system, the operational chilled water system for gaseous waste processing system, and the liquid waste processing systems. Check valves are present in these systems. Their respective tag numbers are 30KPL20 AA201, 30QNB61 AA006, and 30KPF11 AA032.

Follow-up to Question 09.02.02-79:

Valve 30GHW44 AA006 was added to U.S. EPR FSAR Tier 2, Table 3.2.2-1—Classification Summary by RAI 337, Supplement 2. This valve was removed during the final consistency review before submittal of U.S. EPR FSAR, Revision 2.

Follow-up to Question 09.02.02-80:

The vent path for the nitrogen gas from the buffer tanks for the SAHRS and chemical and volume control system vents to the safeguard building controlled area ventilation system and fuel building ventilation system, respectively. These systems filter the gases before exhausting the gas through the vent stack. The operation of this vent path affects neither the occupants in the main control room (MCR) nor the plant operators performing duties related to safe shutdown.

Follow-up to Question 9.2.2-81 (B.1):

The severe accident heat removal system (SAHRS) is used to mitigate beyond design basis events (BDBEs). The system has been classified as non-safety, except for certain safety-related functions performed regarding containment and IRWST boundary isolation and protection. SAHRS descriptive information is provided in various sections of U.S. EPR FSAR Tier 2.

As related to GDC 2, SAHRS component seismic classifications are provided in FSAR Tier 1 Table 2.3.3-1, FSAR Tier 1 Figure 2.3.3-1, and FSAR Tier 2 Table 3.2.2-1. Inconsistencies have been noted and U.S. EPR FSAR Tier 1, Figure 2.3.3-1 and U.S. EPR FSAR Tier 2, Table 3.2.2-1, will be corrected show necessary changes to the U.S. EPR FSAR. U.S. EPR FSAR Tier 2, Figure 19.2-22 will be added as a new figure to show the simplified Piping and Instrumentation Diagram (P&ID) for SAHRS. U.S. EPR FSAR Tier 2, Section 19.2.3.3.3.2 will be revised to add a reference to this new figure.

For the seismic classification assignments, the criteria for seismic classification is predicated on conformance with GDC 2, as described in RG 1.29, “Seismic Design Classification” and NUREG-0800, Chapter 3, Section 3.2.1, “Seismic Classification”.

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As noted in SRP, Section 3.2.1:

> "Compliance with GDC 2 requires that nuclear power plant SSCs important to safety be designed to withstand the effects of natural phenomena, including earthquakes, without loss of capability to perform their safety functions. Also, compliance with 10 CFR Part 100, Appendix A and 10 CFR Part 50, Appendix S, requires that certain SSCs be designed to withstand the SSE and remain functional. The SSCs are those necessary to ensure: (1) the integrity of the reactor coolant pressure boundary; (2) the capability to shut down the reactor and maintain it in a safe shutdown condition; or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR Part 100. RG 1.29 describes an acceptable method of identification and classification of those SSCs that should be designed to withstand the SSE."

The introduction of RG 1.29 states:

> "In addition, Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," to 10 CFR Part 50, requires that all nuclear power plants must be designed so that certain SSCs remain functional if the safe-shutdown earthquake ground motion (SSE) occurs. These plant features are those necessary to ensure (1) the integrity of the reactor coolant pressure boundary, (2) the capability to shut down the reactor and maintain it in a safe shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR 50.34(a)(1) or 10 CFR 100.11.2."

The SAHRS equipment that is designated as seismic does not satisfy these NRC criteria since its purpose is to mitigate a beyond design basis accident, and it is not required to verify:

1. The integrity of the reactor coolant pressure boundary,
2. The capability to shut down the reactor and maintain it in a safe shutdown condition, or
3. The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR Part 100. Furthermore, this equipment is not identified in RG 1.29 as the type of equipment to be designed to withstand an SSE. The SAHRS equipment designated as seismic and safety-related are items related to the containment isolation system and IRWST boundary isolation and protection. These items function to confine radioactivity that may be released into the containment following a postulated design basis accident as part of the containment isolation system and/or provide IRWST inventory protection.

The U.S. EPR containment isolation system is discussed in U.S. EPR FSAR Tier 2, Section 6.2.4. The IRWST is discussed with the emergency core cooling system (ECCS) in U.S. EPR FSAR Tier 2, Section 6.3. Safety-related SAHRS components are discussed in the Response to RAI 249, Question 03.11-12 as they relate to the Environmental Qualification (EQ) program. Refer to the Response to RAI 212, Supplement 1, Questions 06.02.02-23 and 06.02.02-27 for details regarding the SAHRS passive flood line isolation valves (30JMQ42AA004 and 30JMQ42AA006) inside containment that support IRWST inventory protection.

Interactions of the non-Seismic Category 1 portions of the SAHRS will be evaluated as described in U.S. EPR FSAR Tier 2, Section 3.7.3.8. U.S. EPR FSAR Tier 1, Section 3.9,

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Subsection 1.0, Non-Seismic Category I subsystems will not impair the ability of Seismic Category I subsystems to perform their intended safety function. U.S. EPR FSAR Tier 1, Table 3.9-1 lists the seismic interaction analysis ITAAC. U.S. EPR FSAR Tier 1 information was added in response to RAI 370, Question 03.07.03-38.

Contamination control for systems is addressed in U.S. EPR FSAR Tier 2, Section 12.3.6.5 as it relates to 10CFR20.1406. Primary systems, such as dedicated CCW, which support the SAHRS are addressed. The SAHRS components are located in dedicated radiological compartments; refer to U.S. EPR FSAR Tier 2, Figure 12.3-27 and Figure 12.3-28. Spreading of contamination during testing is minimized by supporting system designs, cross contamination prevention and compartmentalization.

The low seal water pressure pump trip for to the SAHRS pump has been addressed in U.S. EPR FSAR Tier 2, Section 9.2.7.3.2 in response to RAI 337, Supplement 2, Question 09.02.02-81.

The overall presentation of SAHRS information differs between the FSAR Tier 1 and FSAR Tier 2. The FSAR Tier 1 content for SAHRS is presented in one consolidated section (Section 2.3.3, Severe Accident Heat Removal System). FSAR Tier 1, Section 2.3.3 specifically addresses the following SAHRS sections:

- Description.
- Arrangement.
- Mechanical Design Features.
- I&C Design Features, Displays, and Controls.
- Electrical Power Design Features.
- Environmental Qualification.
- Equipment and System Performance.
- Inspections, Tests, Analysis, and Acceptance Criteria.

The SAHRS content in U.S. EPR FSAR Tier 2 is not found in one specific section, but in multiple sections Tier 2 sections of the U.S EPR FSAR. A correlation of the Tier 1 U.S. EPR FSAR content to the Tier 2 U.S. EPR FSAR content is provided.

<u>Description</u>

For SAHRS description, U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 1.0 is supported by U.S. EPR FSAR Tier 2, Section 1.2.3.3.5 and U.S. EPR FSAR Tier 2, Section 19.2.3.3.2.

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Arrangement

U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 2.0 includes text that refers to U.S. EPR FSAR Tier 1, Figure 2.3.3-1—SAHRS Functional Arrangement and U.S. EPR FSAR Tier 1, Table 2.3.3-1—SAHRS Equipment Mechanical Design.

A general illustration is provided in U.S EPR FSAR Tier 2, Figure 19.2-2. U.S. EPR FSAR Tier 2, Figure 19.2-22 will be added to provide a more detailed SAHRS Functional Arrangement drawing.

For arrangement purposes, U.S. EPR FSAR Tier 1, Table 2.3.3-1 provides detail for equipment description, equipment tag number, and equipment location. The comparable U.S. EPR FSAR Tier 2 information is found in U.S. EPR FSAR Tier 2, Table 3.2.2-1.

U.S. EPR FSAR Tier 1, Table 2.3.3-1 and U.S. EPR FSAR Tier 2, Table 3.2.2-1 will be corrected to resolve the inconsistencies noted between these tables for Quality Groups and Seismic Classifications.

Mechanical Design Features

U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 3.0 content includes text that references Table 2.3.3-1—SAHRS Equipment Mechanical Design. U.S. EPR FSAR Tier 1, Table 2.3.3-1 provides detail for equipment description, equipment tag number, equipment location, ASME Code Section III, Function, and Seismic Category.

With the exception of a "Function" column, the content in U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 3.0 and Table 2.3.3-1, is supported by U.S. EPR FSAR Tier 2, Table 3.2.2-1 for the safety-related valves identified (containment isolation valves (CIVs) - 30JMQ40 AA001, 30JMQ41 AA001, 30JMQ42 AA001, 30JMQ43 AA001 and Check Valves - 30JMQ41 AA002, 30JMQ42 AA002, and 30JMQ43 AA002). The "Function," as it relates to the safety-related valves in the SAHRS is provided in U.S. EPR FSAR Tier 2, Table 6.2.4-1—Containment Penetration, Isolation Valve, and Actuator Data. These valves have a dual function of supporting both the applicable DBEs and the beyond DBEs of SAHRS. The safety functions are not associated with beyond DBE functions of SAHRS.

The spring-loaded non-safety supplemented grade passive flooding valves (30JMQ42 AA003 and 30JMQ42 AA005) are addressed at the end of U.S. EPR FSAR Tier 1, Table 2.3.3-1. In U.S. EPR FSAR Tier 2, Table 3.2.2-1, these components are depicted with component code 30JMQ42, description "Piping and associated equipment inside Containment (except Passive Flooding Line)." They are also shown in the new figure, U.S. EPR FSAR Tier 2, Figure 19.2-22. Operating function is discussed with the spreading area and cooling structure information in U.S. EPR FSAR Tier 2, Section 19.2.3.3.3.1.

I&C Design Features, Displays, and Controls

U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 4.0 content includes text that references U.S. EPR FSAR Tier 1, Table 2.3.3-2, specifically,

- "4.1 The SAHRS equipment controls are provided in the MCR as listed in Table 2.3.3-2—SAHRS Equipment I&C and Electrical Design."

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- "4.2 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.3.3-2 responds to the state requested by a test signal."

U.S. EPR FSAR Tier 1, Table 2.3.3-2 addresses equipment description, equipment tag number, equipment location, IEEE Class 1E, EQ Harsh Environment, PACS, MCR Displays, and MCR controls for the SAHRS pump and the motor-operated containment isolation valves. The SAHRS pump information for Environmental Qualification (EQ) harsh environment in FSAR Tier 1, Table 2.3.3-2 is being changed as discussed with in "Environmental Qualification".

Containment Isolation instrumentation and control (I&C) design features are addressed in U.S. EPR FSAR Tier 2, Section 7.3.1.2.9. U.S. EPR FSAR Tier 2, Figure 7.1-2 shows the U.S. EPR I&C architecture. U.S. EPR FSAR Tier 2, Section 7.3.1.1 describes that actuation orders are sent from the protection system (PS) to the priority and actuator control system (PACS). Details associated with IEEE Class 1E, EQ, and equipment are also addressed in the Response to this RAI.

Electrical Power Design Features

Electrical power supply and design features are described in U.S. EPR FSAR Tier 2, Chapter 8. The safety-related electrical components in the SAHRS and non-safety-related SAHRS electrical components considered critical for mitigation of a BDBE, such as the SAHRS pump are powered by the Class 1E electrical distribution system with electrical separation and isolation provided as described in U.S. EPR FSAR Tier 2, Section 8.3.1.1.9. The components can receive power supplied from the offsite power source, emergency diesel generator or the station blackout (SBO) diesel generator. Dual function motorized isolation valves, such as those supporting both applicable DBEs and the beyond DBEs of SAHRS, are backed by 12-hour uninterruptible power supply (12UPS) batteries during a severe accident with a loss of offsite power and of emergency diesel generators. U.S. EPR FSAR Tier 2, Figure 8.3-2 — Emergency Power Supply System Single Line Drawing illustrates the connection of the 6.9 kV SAHRS pump to the Class 1E electrical distribution system with electrical separation and isolation provided, as described in U.S. EPR FSAR Tier 2, Section 8.3.1.1.9. The dual function SAHRS motor-operated valves are supplied by 480 V motor control centers 31/34BNB03. As shown in the U.S. EPR FSAR Tier 2, Chapter 8 single line drawings, the BNB03 MCCs are capable of being supplied from offsite power, the respective division emergency diesel generator or SBO diesel generator, and are also capable of connection with the 12UPS system. Identification of the SAHRS dual function motor-operated valve power supply was provided in the Response to RAI 11, Supplement 2, Question 08.03.01-2.

Environmental Qualification

U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 6.0 content includes text that references Table 2.3.3-2. U.S. EPR FSAR Tier 1, Table 2.3.3-2 includes the containment isolation valves, which are classified safety-related and Seismic Class I. As stated in the Response to RAI 249, Question 3.11-12:

> "U.S. EPR FSAR, Tier 2, Table 3.10-1 and Table 3.11-1 both have entries for the SAHRS. These entries consist of various equipment items (e.g., valves, actuators, sensors) that are associated with normal plant operation, and have safety-related functions applicable to DBEs, for which qualification is required (i.e., containment isolation and single failure protection of the in-containment refueling water storage tank (IRWST)). These SAHRS

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system entries in U.S.EPR FSAR, Tier 2, Table 3.10-1 and Table 3.11-1 are equipment that have a dual function of supporting both applicable DBEs and the beyond DBE of SAHRS. These dual function components within the SAHRS system are, therefore, qualified to the higher required DBE conditions. They are not qualified for the beyond DBE SAHRS conditions."

The Response to RAI 249, Question 03.11-12, noted that 10 CFR 50.49, environmental qualification (EQ) applies to equipment relied upon to remain functional during and following a design basis event (DBE). The SAHRS is a dedicated system to support mitigation of BDBEs and is classified as a non-safety system. SAHRS is not required to be environmentally qualified per 10 CFR 50.49.

U.S. EPR FSAR Tier 1, Table 2.3.3-2 will be corrected to denote that the SAHRS pump is "N/A" in the harsh environmental column. The SAHRS pump does not fall within the EQ program.

Equipment and System Performance

U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 7.0 content references U.S. EPR FSAR Tier 1, Table 2.3.3-1. The following subsections are also included:

- "7.2 Class 1E valves listed in Table 2.3.3-2 perform the functions listed in Table 2.3.3-1 under system design conditions."
- "7.3 Containment isolation valves listed in Table 2.3.3-1 close within the containment isolation response time following initiation of a containment isolation signal."

The content associated with U.S. EPR FSAR Tier 1, Table 2.3.3-1 was previously addressed in this response. EQ relationships, functions, and containment isolation valve links were also perviously addressed in this response.

Inspections, Tests, Analysis, and Acceptance Criteria

U.S. EPR FSAR Tier 1, Section 2.3.3, Subsection 8.0 content references U.S. EPR FSAR Tier 1, Table 2.3.3-3. U.S. EPR FSAR Tier 2 ITAACs associated with the SAHRS are listed in U.S. EPR FSAR, Section 14.2.12.2.6.

Follow-up to Question 9.2.2-81 (B.2):

The sizing of the SEWSS buffer tanks is based on a straightforward calculation. The required volume is obtained by multiplying the required total flow rate by the required total duration of time for the availability of seal water at each user. The 40-gallon amount is based on the total required flow rate of 0.00264 gpm in the duration required of 250 hours for GHW45 BB001, while total required flow of 9.25E-5 gpm in the duration required of 7,000 hours for GHW 44 BB001. The total required flow rate and duration time values are based on a reference plant design. Since the buffer tanks are not safety-related tanks, this level of detail is not reflected in the U.S. EPR FSAR.

FSAR Impact:

U.S. EPR FSAR, Tier 1, Section 2.3.3, Table 2.3.3-1, Table 2.3.3-2 will be revised as described in the response and indicated on the enclosed markup.

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U.S. EPR FSAR Tier 2, Table 3.2.2-1, and Section 19.2.3.3.3.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 2, Figure 19.2-22 will be added as described in the response and indicated on the enclosed markup.

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U.S. EPR Final Safety Analysis Report Markups

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09.02.02-106

Table 2.3.3-2—SAHRS Equipment I&C and Electrical Design

Description	Tag Number (1)	Location	IEEE Class 1E (2) (3)	EQ – Harsh Env.	PACS	MCR Displays	MCR Controls
SAHRS Suction Side Containment Isolation Valve	30JMQ40AA001	Safeguard Building 4	$1^N,2^A$	Yes	Yes	Yes	Open-Close
SAHRS Pump	30JMQ40AP001	Safeguard Building 4	4^N	~~No~~N/A	Yes	N/A	Start-Stop
Spray Function Outside Containment Isolation Valve	30JMQ41AA001	Safeguard Building 4	$4^N,3^A$	Yes	Yes	Yes	Open-Close
Active Cooling Function Outside Containment Isolation Valve	30JMQ42AA001	Safeguard Building 4	$4^N,3^A$	Yes	Yes	Yes	Open-Close
IRWST Backflush Function Outside Containment Isolation Valve	30JMQ43AA001	Safeguard Building 4	$4^N,3^A$	Yes	Yes	Yes	Open-Close

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) ^{N} denotes the division the component is normally powered from, while ^{A} denotes the division the component is powered from when alternate feed is implemented.

3) Safety electrical components in the SAHRS are being qualified for DBEs, not beyond DBEs.

09.02.02-106

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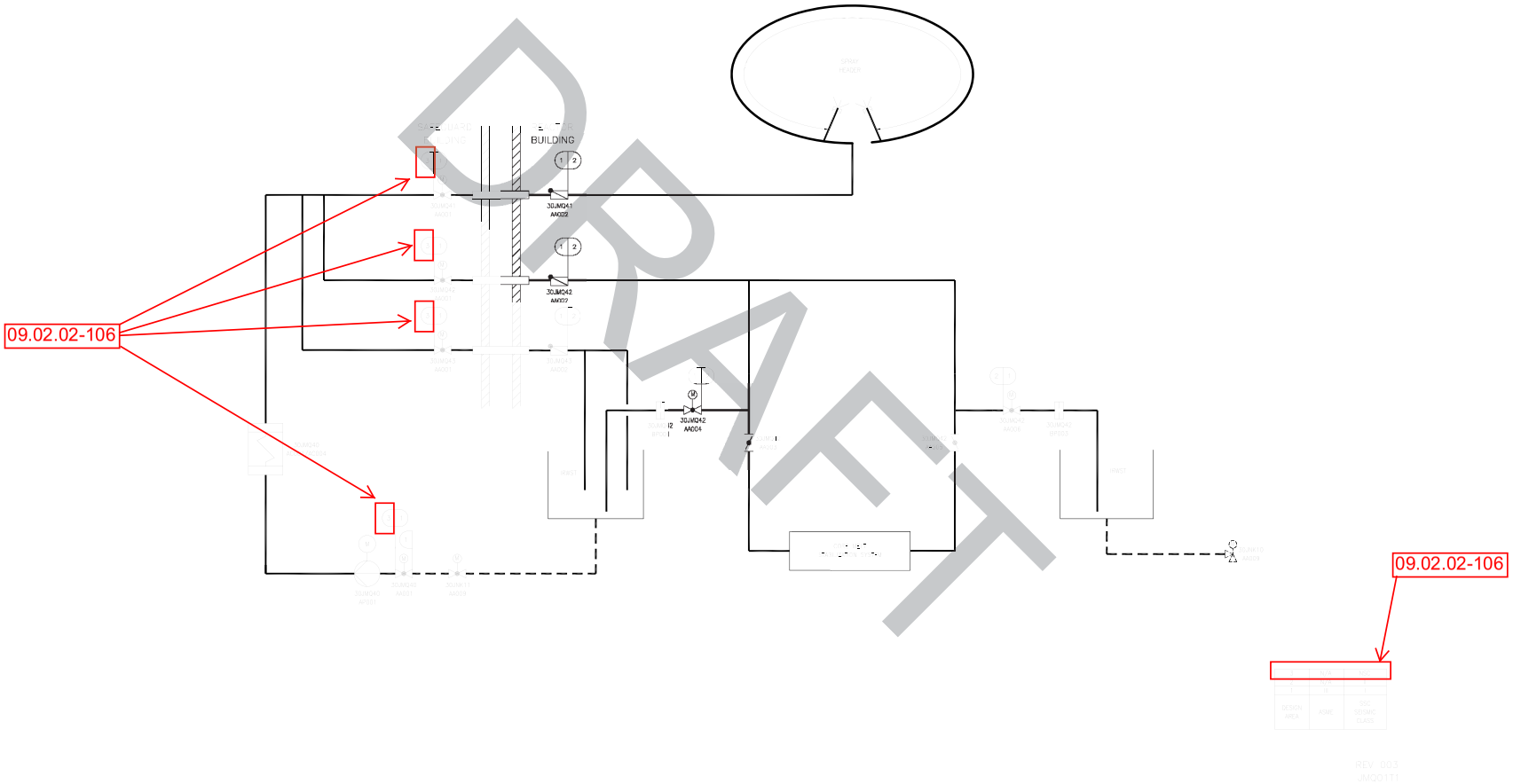
Figure 2.3.3-1—Severe Accident Heat Removal System Functional Arrangement



Next File

Table 3.2.2-1—Classification Summary
Sheet 47 of 183

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
JDH10/40	Test Line Piping, Valves, & Flow Restrictor	S	B	I	Yes	UFA	ASME Class 2[2]
30JDH10 BR051	VCT Suction Line	NS	E	NSC	No	UFA	ANSI/ASME B31.1[6]
30JDH10 AA051	VCT Suction Line Isolation Valve	NS-AQ	D	NSC	Yes	UFA	ANSI/ASME B31.1[6]
JMT	**Combustible Gas Control System**						
JMT20	Convection Foils	S	B	I	Yes	UJA	ASME AG-1[14], ASME Section VIII[8]
JMT20	Hydrogen Mixing Damper	S	B	I	Yes	UJA	AG-1[14]
JMT10	Passive Autocatalytic Recombiner	NS-AQ	B	II	Yes	UJA	AG-1[14]
JMT20	Rupture Foils	S	B	I	Yes	UJA	ASME AG-1[14], ASME Section VIII[8]
JMQ	**Severe Accident Heat Removal System**						
30JMQ40AA001 and 30JMQ~~40/~~41/42/43 AA001/002	Containment Isolation Valves (including penetrations and associated piping)	S	B	I	Yes	UJH	ASME Class 2[2]

09.02.02-106

DRAFT

Table 3.2.2-1—Classification Summary
Sheet 48 of 183

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30JMQ42 BR005/007	Passive Flooding line up to and including MOV (JMQ42 AA004/006)	S	B	I	Yes	UJA	ASME Class 2[2]
30JMQ41 BR004	Piping - Spray Header and Nozzles	NS-AQ	D	II	Yes	UJA	ANSI/ASME B31.1[6]; Located above safety-related piping and equipment
30JMQ40/41/42/43	Piping and associated equipment in Safeguards Building (excluding piping from containment isolation valve to penetration)	NS	D	NSC	No	UJH	ANSI/ASME B31.1[6]
30JMQ41/43	Piping and associated equipment inside Containment	NS-AQ	D	II	Yes	UJA	ANSI/ASME B31.1[6]; Located in close proximity to safety-related piping and equipment
30JMQ42	Piping and associated equipment inside Containment (except Passive Flooding Line)	NS-AQ	D	II	Yes	UJA	ANSI/ASME B31.1[6]; Located in close proximity to safety-related piping and equipment

09.02.02-106

DRAFT

09.02.02-106

Table 3.2.2-1—Classification Summary
Sheet 49 of 183

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
~~30JMQ41/42/43~~	~~Piping in Safeguards Building~~	~~NS-AQ~~	~~D~~	~~II~~	~~Yes~~	~~UJH~~	~~ANSI/ASME B31.16; Located in close proximity to safety related piping and equipment~~
30JMQ40 AC001	SAHRS Heat Exchanger	NS	D	NSC	No	UJH	ASME VIII[8]
30JMQ40 AP001	SAHRS Pump	NS	D	NSC	No	UJH	Manufacturer Standards
JMB	**Core Melt Stabilization System**						
JMB40 AC	Cooling Structure	NS	E	NSC	No	UJA	
JMB20 AB001	Gate	NS	E	NSC	No	UJA	
JMB30	Melt Discharge Channel	NS-AQ	E	II	Yes	UJA	Helps support the structural integrity of reactor pit
JMB30 BU001	Melt Discharge Channel - Refractory Layer	NS	E	NSC	No	UJA	
JMB20	Melt Plug – Sacrificial Concrete	NS	E	NSC	No	UJA	
JMB10	Reactor Cavity – Sacrificial Concrete	NS	E	NSC	No	UJA	
JMB10 BU001	Refractory Layer: Reactor Cavity, Melt Discharge Channel	NS	E	NSC	No	UJA	

DRAFT

- Active backflush of the SAHRS pump suction strainer.

The SAHRS equipment is located in Safeguard Building 4, and includes:

- A suction line from the IRWST.
- Containment isolation valves.
- A recirculation pump.
- A heat exchanger for containment heat rejection.
- Discharge line to a containment spray header, the spreading room, and sump screen.
- Support from a dedicated cooling chain via plant auxiliary systems.

The SAHRS heat exchangers transfer the residual heat from the containment to the ultimate heat sink via dedicated portions of component cooling water system (CCWS) and essential service water system (ESWS) trains. During operation, the three possible flow paths downstream of the pump and the heat exchanger are:

- To a containment spray system with a ring header and spray nozzles.
- To the spreading area of the CMSS.
- To a sump screen flushing device which is used to remove accumulated debris.

09.02.02-106

The general configuration of the SAHRS is shown in Figure 19.2-2, with key design parameters provided in Table 19.2-2—SAHRS Design and Operating Parameters. The SAHRS simplified Piping and Instrumantation Diagram is shown in Figure 19.2-22.

DRAFT

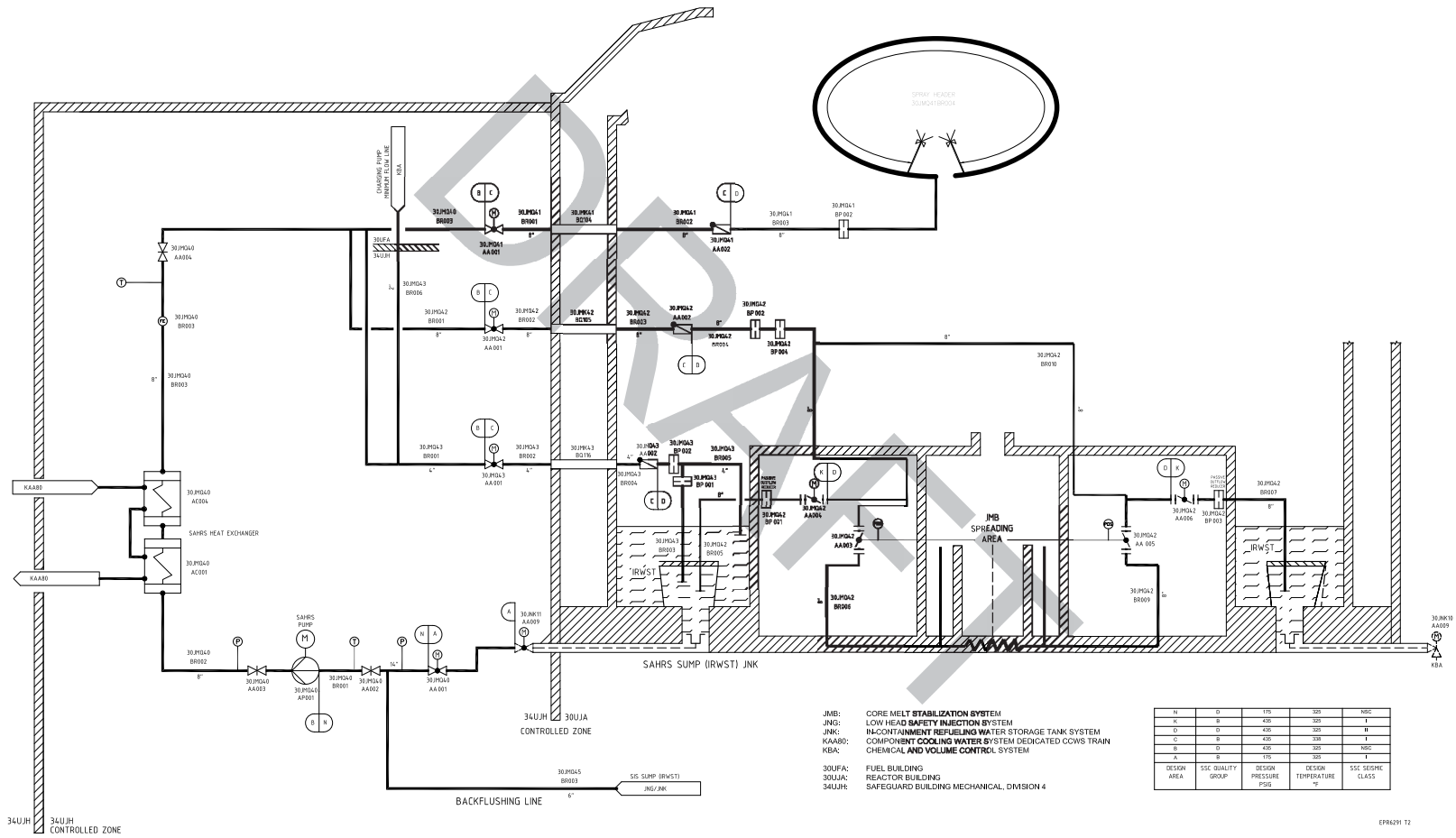
Passive Cooling of Molten Debris

In this mode the SAHRS provides water to the cooling structure surrounding the spreading compartment. Once molten debris is within the spreading compartment, water from the IRWST passively starts to fill the cooling structure. This dedicated flooding line is equipped with a flow limiter downstream of the IRWST outlet, which limits the flow such that its subsequent complete vaporization does not present a containment overpressurization challenge. This passive flow of water fills the cooling structure within five minutes. Water then overflows into the spreading compartment until it is hydrostatically balanced with water from the IRWST. This flooding submerges the spreading area and transfer channel, as well as a portion of the reactor cavity, thereby cooling any residual debris in those areas.

Operating in this passive mode, IRWST water supplied by the SAHRS boils off and is released into the free volume of the containment through the steam chimney directly above the spreading compartment (see Figure 19.2-1). As this process continues, the

09.02.02-106

Figure 19.2-22—Severe Accident Heat Removal System



N	D	175	325	NSC
K	B	435	325	I
D	D	435	325	II
C	B	435	325	I
B	D	435	325	NSC
A	B	175	325	I
DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS

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