ArevaEPRDCPEm Resource

From: RYAN Tom (AREVA) [Tom.Ryan@areva.com]
Sent: Monday, September 27, 2010 4:34 PM
To: Tesfaye, Getachew
Cc: BRYAN Martin (EXTERNAL AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); BENNETT Kathy (AREVA); KOWALSKI David (AREVA); HALLINGER Pat (EXTERNAL AREVA); HOTTLE Nathan (AREVA); GARDNER Darrell (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9, Supplement 5 - questions 09.01.04-15, 16, 17
Attachments: RAI 385 Response US EPR DC - DRAFT.pdf

This note is being sent in behalf of Marty Bryan:

Getachew,

To support a final response date of Oct 28, 2010, a draft response of RAI 385 Questions 09.01.04-15, 16, and 17 is provided in the attached file, "RAI 385 Response US EPR DC - DRAFT.pdf". Let me know if the staff has questions or if this response can be sent as final.

Thanks,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Wednesday, September 22, 2010 11:46 AM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9, Supplement 5

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the seven questions in RAI No. 385 on May 19, 2010. Supplement 1, Supplement 2, Supplement 3 and Supplement 4 responses to RAI No. 385 were sent on June 24, 2010, July 28, 2010, August 24, 2010 and September 15, 2010, respectively, to provide a revised schedule.

To provide additional time to interact with the NRC, a revised schedule is provided in this e-mail for the responses to Questions 09.01.05-20 and 09.01.05-22.

The schedule for technically correct and complete responses to the questions has been revised as provided below.

Question #	Response Date
RAI 385 — 09.01.04-15	October 28, 2010
RAI 385 — 09.01.04-16	October 28, 2010
RAI 385 — 09.01.04-17	October 28, 2010
RAI 385 — 09.01.05-20	October 22, 2010
RAI 385 — 09.01.05-21	October 28, 2010

RAI 385 — 09.01.05-22	October 22, 2010
RAI 385 — 09.01.05-23	October 28, 2010

Sincerely,

Martin (Marty) C. Bryan
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From: BRYAN Martin (External RS/NB)
Sent: Wednesday, September 15, 2010 4:06 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9, Supplement 4

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the seven questions in RAI No. 385 on May 19, 2010. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 385 were sent on June 24, 2010, July 28, 2010 and August 24, 2010, respectively, to provide a revised schedule.

Since the remaining responses are being processed, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the questions has been revised as provided below.

Question #	Response Date
RAI 385 — 09.01.04-15	October 28, 2010
RAI 385 — 09.01.04-16	October 28, 2010
RAI 385 — 09.01.04-17	October 28, 2010
RAI 385 — 09.01.05-20	September 22, 2010
RAI 385 — 09.01.05-21	October 28, 2010
RAI 385 — 09.01.05-22	September 22, 2010
RAI 385 — 09.01.05-23	October 28, 2010

Sincerely,

Martin (Marty) C. Bryan
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From: BRYAN Martin (External RS/NB)
Sent: Tuesday, August 24, 2010 9:49 AM

To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the seven questions in RAI No. 385 on May 19, 2010. Supplement 1 and Supplement 2 responses to RAI No. 385 were sent on June 24, 2010 and July 28, 2010, respectively, to provide a revised schedule.

On July 28, 2010, DRAFT responses to Questions 09.01.05-20 and 09.01.05-22 were submitted to the NRC staff. To allow additional time for interaction between AREVA and the NRC staff, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the questions has been revised and is provided below.

Question #	Response Date
RAI 385 — 09.01.04-15	September 15, 2010
RAI 385 — 09.01.04-16	September 15, 2010
RAI 385 — 09.01.04-17	September 15, 2010
RAI 385 — 09.01.05-20	**September 22, 2010**
RAI 385 — 09.01.05-21	September 15, 2010
RAI 385 — 09.01.05-22	**September 22, 2010**
RAI 385 — 09.01.05-23	September 15, 2010

Sincerely,

Martin (Marty) C. Bryan
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From: BRYAN Martin (EXT)
Sent: Wednesday, July 28, 2010 6:14 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the seven questions in RAI No. 385 on May 19, 2010. Supplement 1 response to RAI No. 385 was sent on June 24, 2010 to provide a revised schedule.

To allow time for interaction between AREVA and the NRC staff, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the questions has been revised and is provided below.

Question #	Response Date
RAI 385 — 09.01.04-15	September 15, 2010

RAI 385 — 09.01.04-16	September 15, 2010
RAI 385 — 09.01.04-17	September 15, 2010
RAI 385 — 09.01.05-20	August 25, 2010
RAI 385 — 09.01.05-21	September 15, 2010
RAI 385 — 09.01.05-22	August 25, 2010
RAI 385 — 09.01.05-23	September 15, 2010

Sincerely,

Martin (Marty) C. Bryan
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From: BRYAN Martin (EXT)
Sent: Thursday, June 24, 2010 4:52 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the seven questions in RAI No. 385 on May 19, 2010.

To allow time for interaction between AREVA and the NRC staff, a revised schedule is provided in this e-mail. With respect to Questions 09.01.04-15, 09.01.04-16, 09.01.04-17, and 09.01.04-22, AREVA anticipates having draft responses available during July to support interaction with the NRC staff to review the responses prior to the formal submittal.

The schedule for technically correct and complete responses to the questions identified above has been revised as provided below.

Question #	Response Date
RAI 385 — 09.01.04-15	August 13, 2010
RAI 385 — 09.01.04-16	August 13, 2010
RAI 385 — 09.01.04-17	August 13, 2010
RAI 385 — 09.01.05-20	July 28, 2010
RAI 385 — 09.01.05-21	July 28, 2010
RAI 385 — 09.01.05-22	August 12, 2010
RAI 385 — 09.01.05-23	July 28, 2010

Sincerely,

Martin (Marty) C. Bryan
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Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Wednesday, May 19, 2010 5:57 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 385 Response US EPR DC," provides a schedule since technically correct and complete responses to the seven questions are not provided. With respect to Questions 09.01.04-15, 09.01.04-16 and 09.01.04-17, AREVA anticipates having draft responses in late July to support interaction with the NRC staff to review the responses prior to the formal submittal. Additional time is included in the response date below to allow for these interactions.

The following table indicates the respective pages in the response document, "RAI 385 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 385 — 09.01.04-15	2	3
RAI 385 — 09.01.04-16	4	5
RAI 385 — 09.01.04-17	6	6
RAI 385 — 09.01.05-20	7	7
RAI 385 — 09.01.05-21	8	8
RAI 385 — 09.01.05-22	9	10
RAI 385 — 09.01.05-23	11	11

The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 385 — 09.01.04-15	August 13, 2010
RAI 385 — 09.01.04-16	August 13, 2010
RAI 385 — 09.01.04-17	August 13, 2010
RAI 385 — 09.01.05-20	June 18, 2010
RAI 385 — 09.01.05-21	June 18, 2010
RAI 385 — 09.01.05-22	July 14, 2010
RAI 385 — 09.01.05-23	June 18, 2010

Sincerely,

Martin (Marty) C. Bryan
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Monday, April 19, 2010 9:46 AM
To: ZZ-DL-A-USEPR-DL
Cc: Curran, Gordon; Lee, Samuel; Segala, John; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 385 (4524, 4515),FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on March 31, 2010, and on April 15, 2010, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 2058

Mail Envelope Properties (8D609EE2F807714CBF5297D9BA8602FBC16319)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 385, FSAR Ch. 9, Supplement 5 - questions 09.01.04-15, 16, 17
Sent Date: 9/27/2010 4:34:09 PM
Received Date: 9/27/2010 4:34:37 PM
From: RYAN Tom (AREVA)

Created By: Tom.Ryan@areva.com

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Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	11484	9/27/2010 4:34:37 PM
RAI 385 Response US EPR DC - DRAFT.pdf		1125955

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

Response to

Request for Additional Information No. 385(4524, 4515), Supplement 7

4/19/2010

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: 09.01.05 - Overhead Heavy Load Handling Systems

Application Section: 9.1

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

Question 09.01.04-15:

Follow-up to RAI 131, Questions 09.01.04-5 and 09.01.04-7

In response to RAI 9.1.4-05 (RAI #131, Supplement 4) and RAI 9.1.4-07 (RAI #131, Supplement 5), the applicant proposed to remove the general description and details regarding operation of the spent fuel cask loading and spent fuel cask transfer facility from the FSAR and redefine the scope of U.S. EPR design certification to include only the cask loading pit penetration assembly (part of the spent fuel cask transfer facility) and covers. The response stated that U.S. EPR FSAR Tier 1, Section 2.2.8 and Table 2.2.8-1, and Tier 2, Section 9.1.4, and Section 14.2.12.3.16, will be revised accordingly, including deletion of Tier 2, Figure 9.1.4-7 that showed a simplified sketch of the spent fuel cask transfer facility. The RAI response also stated that the cask handling operations will be covered under a 10 CFR Part 72 license application once a cask design is selected.

The staff considers the applicant's response to RAI 9.1.4-05 and RAI 9.1.4-07 to be unacceptable. Spent fuel cask loading is considered a major portion of fuel handling system (FHS) to demonstrate the safe handling of spent fuel. The applicant has not provided sufficient details to verify that the light load handling system (LLHS), cask handling and pool design meets the guidance of SRP Section 9.1.2, 9.1.3, 9.1.4 and applicable portions of SRP Section 9.1.5. In accordance with SRP Section 9.1.4, the LLHS is acceptable if the integrated design of the structural, mechanical, and electrical elements, the manual and automatic operating controls, and the safety interlocks and devices provide adequate system control for the specific procedures of handling operations, if the redundancy and diversity needed to protect against malfunctions or failures are provided, and if the design complies with applicable regulations. As indicated in SRP Section 9.1.4, the area of review includes review of the LLHS from receipt of new fuel to loading of spent fuel into the shipping cask, for compliance with requirements of GDC 2, 5, 61 and 62.

The applicant's RAI responses stated that the cask handling operations will be covered under a 10 CFR Part 72 license application once a cask design is selected. However, the use of 10 CFR Part 72, applies to receipt, transfer, packaging and possession of power reactor spent fuel. Part 72 does not apply to the safe movement of spent fuel within the fuel building. Since the U.S. EPR's spent fuel cask transfer facility connects to the Part 52 cask loading pit and the improper operation/design of the spent fuel cask transfer facility could potentially adversely impact Part 52 structures, systems and components (SSCs), the staff concluded that the spent fuel cask transfer facility is included in the review scope of Part 52. Therefore, the staff requests the applicant to address all the questions that the staff previously asked in RAI 9.1.4-05 and RAI 9.1.4-07 and submit the revised RAI responses accordingly.

In accordance with 10 CFR 52.47 (a)(24), the applicant should either provide a full description of the spent fuel cask loading and spent fuel cask transfer facility in Chapter 9 of the FSAR or revise FSAR Section 1.8, "Interfaces with Standard Designs and Early Site Permits," to indicate that the spent fuel cask loading and spent fuel cask transfer facility is outside the scope of the EPR standard design and provide conceptual design information (CDI) of the spent fuel cask loading and spent fuel cask transfer facility in Chapter 9 of the FSAR.

The FSAR should specifically include as a minimum:

a. design and operational information of: (1) the cask loading pit, (2) the cask loading pit seals, (3) the penetration connection equipment, (4) the procedures and process to connect the transfer cask to the cask loading pit and (5) the cask loading procedures and process, in order for the staff to complete its evaluation of the spent fuel pool, the cask loading pit, and the fuel handling machine,

b. a description of the capability of the spent fuel cask loading and spent fuel cask transfer facility to comply with the applicable portions of NUREG-0800 Standard Review Plan (SRP) Sections 9.1.4, "Light Load Handling System (Related to Refueling)", SRP 9.1.2, "New and Spent Fuel Storage," SRP 9.1.3, "Spent Fuel Pool Cooling and Cleanup System," and 9.1.5, "Overhead Heavy Load Handling Systems." This includes design features to meet General Design Criterion (GDC) 2, 4, 5, 61, 62 and 63,

c. the appropriate Inspection, Testing, Analyses and Acceptance (ITAAC) requirements. For a spent fuel cask loading and spent fuel cask transfer facility that is outside the scope of the EPR standard design, in accordance with 10 CFR 52.47 (a)(25), the FSAR Tier 1 should include the necessary interface requirements for the CDI portions. The CDI should be sufficiently detailed to allow the staff to reach a safety conclusion,

d. a description of capability of the cask handling integrated design of the structural, mechanical, and electrical elements, the manual and automatic operating controls, and the safety interlocks and devices to provide: (1) adequate system control for fuel handling operations, (2) redundancy and diversity to protect against malfunctions or failures, and (3) compliance with applicable regulations, and

e. a detailed description of the (1) design, maintenance and operation for the cask handling components, including the gates (slot gate and swivel gate) used to isolate cask loading pit from the SFP, (2) penetration at the base of the cask pit (including lower and upper cover), (3) penetration seals (including details such as seals and bellows materials), and (4) cask transfer machine and other components needed to safely perform the cask loading process.

f. a detailed description of operator training, guidance on rigging and lifting devices, crane inspection and well defined procedures. Historically, deficiencies in these elements have been principal causes of historical crane load drop or handling accidents.

g. an evaluation, in accordance with 10 CFR 52.47(a)(22), of relevant international operating experience insights and an explanation of how the spent fuel cask loading and spent fuel cask transfer facility is designed and/or operating to prevent design deficiencies and/or undesirable operating events.

The applicant is requested to address in the FSAR all the information discussed above, as well as the information requested in RAI 9.1.4-05 and 9.1.4-07 and submit a revised response.

Response to Question 09.01.04-15:

The U.S. EPR Fuel Building (FB) is designed so that spent fuel can be removed from the spent fuel pool (SFP) and loaded into a cask for transfer out of the building. The loading pit adjacent to the SFP is used for underwater transfer of the spent fuel assemblies into the cask, which is connected to the penetration at the bottom of the loading pit. This configuration is used in the P'4 and N4 series pressurized water reactors (PWRs) in France. The configuration eliminates overhead cask handling in the FB and avoids contamination of the cask exterior from immersion in the SFP water.

The spent fuel cask transfer facility will support cask loading operations based on the specific requirements of a cask certified in accordance with 10 CFR Part 72. Process requirements, such as filling, draining, cooling, and drying, lid handling and sealing requirements, cask dimensions, and shielding requirements depend upon the specific cask design. Prior to use of a 10 CFR Part 72 general license, the 10 CFR Part 52 licensee will determine whether a change in the facility Technical Specifications or a license amendment is required pursuant to 10 CFR 50.59(c)(2), as required by 10 CFR 72.212(b)(4). U.S. EPR FSAR Tier 2, Section 9.1.4.3.1 will be revised to remove the statement regarding the single failure criterion related to the spent fuel cask transfer facility.

For 10 CFR Part 52 design certification, standard review plan (SRP) 9.1.4 addresses the light load handling system from the receiving station to loading spent fuel into the shipping cask. The spent fuel machine (SFM) handles the fuel assemblies during cask loading operations. The safety provisions of the SFM are described in U.S. EPR FSAR Tier 2, Section 9.1.4.3.1.

SRP 9.1.2 addresses the spent fuel storage facility (SFSF), including the SFP and adjacent pits, pool liners, fuel racks, and the structures that house these components. The loading pit penetration upper cover serves as a portion of the loading pit fluid boundary and is subject to review under SRP 9.1.2. The penetration upper cover will be maintained closed under administrative control until the plant license is amended to allow cask loading. The fluid boundary during cask loading operations will be extended beyond the upper cover and will depend on the cask design.

The loading pit penetration upper cover maintains leak-tightness under postulated conditions in accordance with Regulatory Guide (RG) 1.13. The metallic parts of the penetration in contact with water and which provide fluid boundary, including the upper cover, are made from stainless steel. The supporting structure of the penetration is equipped with two ethylene propylene diene monomer (EPDM) seals that provide the leak-tightness of the upper cover. The space between the seals is monitored for leakage. A water leak sensor, which is connected to the plant main control room (MCR), monitors a potential leak caused by seal failure. A seismic locking device holds the upper cover in closed position during an earthquake. The FB protects the penetration from extreme winds and turbine missiles.

Two stainless steel gates, a slot gate handled by the auxiliary crane and a swivel gate that pivots manually on hinges to open, separate the SFP from the adjacent loading pit. Both gates are designed to Seismic Category I requirements and support the full height of water in the SFP when the loading pit is empty. The gates do not depend on active components, such as inflatable seals, to maintain leak-tightness. The gate seal material is radiation resistant. A conceptual view of the two gates is shown in Figure 09.01.04-7-1. U.S. EPR FSAR Tier 1, Table 2.2.8-1 and U.S. EPR FSAR Tier 2, Table 3.2.2-1, Table 3.10-1, and Section 9.1.2.2.2 will be revised to include design information regarding the pool gates.

The loading pit liner is equipped with a leak chase system similar to the SFP as described in U.S. EPR FSAR Tier 2, Section 9.1.2.2.2.

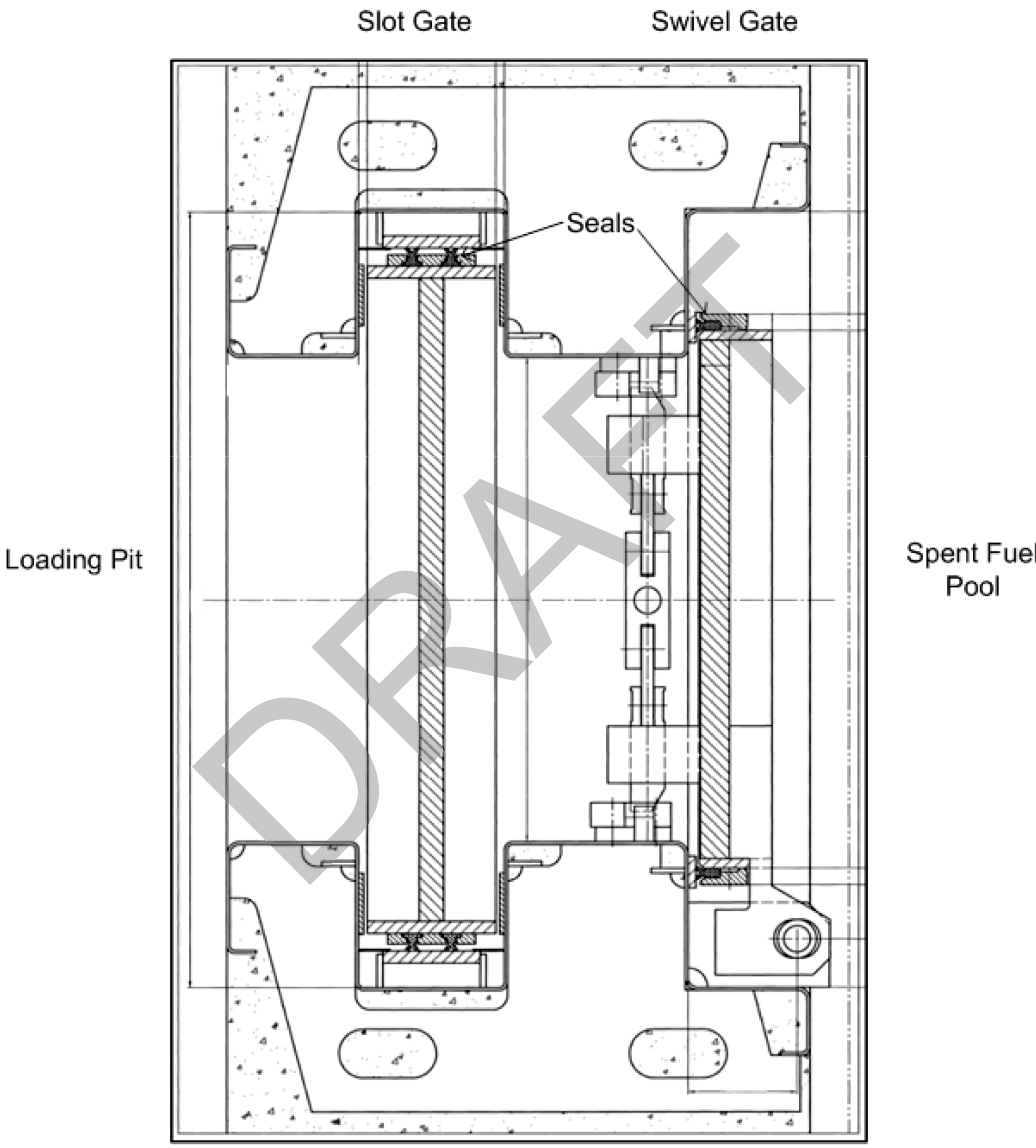
SRP 9.1.5 addresses overhead heavy load handling systems. The U.S. EPR spent fuel cask transfer facility eliminates overhead handling of a spent fuel cask. The biological lid handling station, which removes the biological lid, or shield plug, from the cask prior to loading, only performs lifts during cask loading operations. The biological lid handling station is classified as Seismic Category II. The spent fuel cask transfer machine, which will be used to transfer the cask in the FB loading hall during loading operations, will not be stored in the FB and thus can not impact the operation of any safety-related equipment in the FB.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.2.8-1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Table 3.2.2-1, Table 3.10-1, and Section 9.1 will be revised as described in the response and indicated on the enclosed markup.

Figure 09.01.04-7-1—Loading Pit Gates



Question 09.01.04-16:

Follow-up to RAI 131, Question 09.01.04-7

In RAI 9.1.4-7, the staff asked the applicant to provide the methodology for preventing draining of the SFP, when the shipping cask is connected to the bottom of the cask loading pit, assuming a single failure. The response to RAI 9.1.4-7 proposed a markup indicating that the gates and weirs are arranged so that the bottoms of the gates are higher than the top of the stored fuel assemblies.

Based on the information provided in the FSAR and the RAI responses, the staff finds that the applicant has not provided sufficient information to complete the evaluation for movement of spent fuel in accordance with 10CFR52.47, GDC 61, GDC 62 and GDC 63. SRP Section 9.1.4 states that the objective of the review is to confirm that the LLHS design precludes system malfunctions or failures that could cause criticality accidents, a release of radioactivity, or excessive personnel radiation exposures. For the entire cask handling operation, failure of any component that could have an adverse impact on the spent fuel, SSCs and operating personnel should be addressed. The applicant has not provided sufficient information to assess all potential failure scenarios of the cask loading pit gates, the penetration connection between the cask and the cask loading pit, the seals relied upon to maintain leak tightness and SFP water inventory, and any other failure that could potentially impact the SSCs, SFP integrity or personnel.

The applicant's evaluation in the FSAR should address all potential failure scenarios such as, but not limited to (1) the drop of a fuel assembly on the cask loading pit penetration, the cask loading pit cover, or into the cask, (2) the drop or tipping of the cask, (3) the improper connection/alignment of the cask and the penetration, (4) operator error at any point in the cask loading operation (such as, improper operation, derailment, load or crane collision, track condition, etc…), (5) the failure of the penetration seals, (6) the failure of the cask handling machine, and (7) the effect of a seismic event at any stage of the cask loading process. The scenarios described above are some of the possible failure scenarios of the cask loading system. The applicant should also discuss any other potential failure scenario.

The applicant's evaluation of all the failure scenarios in the FSAR needs to address how these failures impact:

a. the SFP water inventory,
b. the cooling of stored spent fuel assemblies and casks,
c. the cooling of a suspended fuel assembly (when the scenario occurs while a fuel assembly is in movement),
d. the radiation dosage from a suspended fuel assembly (when the scenario occurs while a fuel assembly is in movement),
e. the radiation dosage from the fuel stored in the pool, and the fuel stored in the cask,
f. steps necessary to restore cask loading pool integrity, the time required to complete these actions, the capability to implement these actions during and/or following situations that cause the cask loading pit to drain, and controls that will be established to ensure that cask loading pool integrity can be restored as described (after a seismic event only seismic Category I SSCs can be credited to remain operational),

g. the flooding considerations,

h. the operator actions that are credited, including indication and alarms that are available to alert operators of the problem, and the time needed for operators to complete the required actions,

i. cask handling pit and loading hall ventilation, and

j. the effects on SSCs important to safety as a result of dropped or tipped cask during movement from all applicable events (i.e. seismic event, machine malfunction, etc…).

The applicant's evaluation should take into consideration that the gates between the SFP and the cask loading pit are not Seismic Category I and therefore cannot be credited to maintain operational after a seismic event. The cover and penetration at the bottom of the cask loading pit are seismic Category I, and are credited to prevent draining of the SFP, only when they are closed. The spent fuel machine is not seismic Category I and therefore cannot be credited to remain operational after a seismic event.

The cask loading pit should include a system for detecting and containing pool liner leaks. Segmented leak channels, proper drainage, and sumps for collecting and containing such leakage should be used. Provide, in the FSAR, the details of the system to be used to detect and collect leakage from the cask loading pit and the penetration at base of the cask loading pit. Provide, in the FSAR, the details of system to be used to detect and collect leakage while the cask loading pit penetration is closed and during cask loading operation.

Response to Question 09.01.04-16:

Refer to the Response to Question 09.01.04-15. Cask loading operations will be evaluated prior to use of a 10 CFR Part 72 general license as required by 10 CFR 72.212(b)(4). The penetration upper cover will be maintained closed under administrative control until the plant license is amended to allow cask loading.

The loading pit penetration upper cover maintains leak-tightness under postulated conditions. A water leak sensor connected to the plant main control room monitors for leakage caused by seal failure and prompts the operator to take action. Water in the loading pit can be pumped to the transfer pit to allow seal replacement. Flooding from the loading pit is addressed in U.S. EPR FSAR Tier 2, Section 3.4.3.5.

A seismic locking device holds the upper cover in closed position during an earthquake. The gates separating the loading pit from the spent fuel pool are designed to remain leak-tight under postulated conditions, including the safe shutdown earthquake, so that spent fuel pool water inventory is not reduced below acceptable levels.

The loading pit liner is equipped with a leak chase system similar to the spent fuel pool (SFP) liner as described in U.S. EPR FSAR Tier 2, Section 9.1.2.2.2.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 09.01.04-17:

Follow-up to RAI 131, Question 09.01.02-13

In RAI 9.1.2-13, the staff requested the applicant to determine the reduction in SFP water level if leakage into the adjacent fuel-handling areas were to occur. In the RAI response dated October 27, 2008, the applicant stated that 29,000 gal (111,000 L) of water will be maintained in the transfer compartment and/or the cask loading pit, therefore a seismic induced failure of both gates separating the SFP and transfer compartment and both gates between the SFP and the cask loading pit would reduce the SFP water level to 57.2 ft (17.4 m), which is 24 ft (7.3 m) above the active fuel and two feet above the top of the fuel pool cooling suction pipes, in order to prevent the SFP cooling pumps from tripping at low-low level setpoint.

The staff evaluated the applicant's response and noted that the applicant credits the adjacent pools to the SFP will be maintained flooded with a minimum of 29,000 gal (111,000 L) of water. The applicant has not proposed a technical specification (TS) that will ensure that the adjacent pools maintain the minimum water inventory credited to prevent the SFP water level to drop to an unacceptable level. This TS should also prevent the fuel movement in the SFP if the combine water inventory of the adjacent pools do not have the required water inventory.

Additionally, the applicant has stated that the cask loading pit penetration cover is a seismic Category 1 that will remain leak tight during and after a seismic event. However, the applicant has not address the consequences of a seismic event while this cover is open. The applicant should evaluate in the FSAR this situation during normal operations, maintenance, and inspections.

The staff requests the applicant to:

a. include in the FSAR a technical specification (TS) that will ensure that the adjacent pools maintain the minimum water inventory credited to prevent the SFP water level to drop to an unacceptable level,
b. address, in the FSAR, consequences of a seismic event while the cask loading pit penetration cover is open, describe the actions that are required to close the cover, provide the time required to close it, the amount of water lost through the open penetration and the plans that the applicant proposes to recover from the event.

Response to Question 09.01.04-17:

a) The gates separating the spent fuel pool (SFP) from the adjacent loading pit and transfer compartment are designed to Seismic Category I criteria. U.S. EPR FSAR Tier 2, Table 3.2.2-1 will be revised to include the seismic classification of the gates.

   According to Standard Review Plan (SRP) Section 9.1.2, "the volume of adjacent fuel-handling areas should be limited so that leakage into these areas while drained would not reduce the coolant inventory to less than 3 meters (10 feet) above the top of the fuel assemblies." If the cask loading pit and transfer compartment are initially empty, the equilibrium level of the three pool compartments is 53.3 feet, assuming the SFP is initially at its normal water level of 62.3 feet. This equilibrium level provides approximately 20.0 feet of water over the tops of the stored fuel assemblies. The SRP criterion is met without taking credit for water initially in the adjacent pits, so the proposed technical specification is not required.

U.S. EPR FSAR Tier 2, Section 9.1.3.2.4 states that approximately 29,000 gallons of SFP makeup water is maintained in the cask loading pit or the transfer compartment (or both). The Fuel Building (FB) design has been revised so that approximately 50,000 gallons of makeup water will be maintained in the adjacent pits. U.S. EPR FSAR Tier 2, Section 9.1.3.2.4 will be revised to reflect this design change.

b) As explained in the Response to Question 09.01.04-15, the penetration upper cover is maintained closed under administrative control until the plant license is amended to allow cask loading. The safety evaluation of the cask loading configuration will be performed at that time.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 3.2.2-1 and Section 9.1.3.2.4 will be revised as described in the response and indicated on the enclosed markup.

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Table 2.2.8-1—FHS Equipment Mechanical Design

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
New Fuel Elevator	FCD10	Fuel Building (UFA)	N/A	N/A	N/A
Spent Fuel Machine	FCD01	Fuel Building (UFA)	N/A	N/A	N/A
Transfer Tube and Blind Flange (Fuel Transfer Tube Facility)	FCJ05	Fuel Building (UFA) and Reactor Building (UJA)	Yes	Containment isolation	I
Transfer Tube gate valve and expansion joints	FCJ05	Fuel Building (UFA) and Reactor Building (UJA)	Yes	Leak tightness	I
Mechanism (Fuel Transfer Tube Facility)	FCJ01	Fuel Building (UFA) and Reactor Building (UJA)	N/A	N/A	N/A
Refueling Machine	FCB01	Reactor Building (UJA)	N/A	N/A	N/A
Spent Fuel Cask Transfer Facility penetration including loading pit bottom cover.	FCJ12	Fuel Building (UFA)	N/A	Leak tightness	I
New Fuel Storage Racks	FAA01	Fuel Building (UFA)	N/A	Fuel storage	I
Spent Fuel Storage Racks	FAB02	Fuel Building (UFA)	N/A	Fuel storage	I
Transfer Pit Slot Gate	30FAB11 KB001	Fuel Building (UFA)	N/A	Leak tightness	I
Transfer Pit Swivel Gate	30FAB11 KB002	Fuel Building (UFA)	N/A	Leak tightness	I
Loading Pit Slot Gate	30FAB12 KB001	Fuel Building (UFA)	N/A	Leak tightness	I
Loading Pit Swivel Gate	30FAB12 KB002	Fuel Building (UFA)	N/A	Leak tightness	I

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Table 3.2.2-1—Classification Summary
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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
FCD06	SFM Tower & Rotation Device	NS-AQ	D	II	Yes	UFA	ANS 57.1-1992; Located in close proximity to safety-related equipment
FCD03	SFM Trolley	NS-AQ	D	II	Yes	UFA	ANS 57.1-1992; Located in close proximity to safety-related equipment
FCJ05	Fuel Transfer Tube - Tube and Blind Flange	S	B	I	Yes	UJA, UFA	ASME Class MC[23]
FCJ05	Fuel Transfer Tube - FB Gate Valve and Expansion Joints	S	C	I	Yes	UJA, UJB, UFA	ASME Class 3[3]
FAB02	Underwater Fuel Racks	S	C	I	Yes	UFA	ANS 57.2-1983
30FAB11 KB001	Transfer Pit Slot Gate	S	N/A	I	Yes	UFA	Manufacturer's standard
30FAB11 KB002	Transfer Pit Swivel Gate	S	N/A	I	Yes	UFA	Manufacturer's standard
30FAB12 KB001	Loading Pit Slot Gate	S	N/A	I	Yes	UFA	Manufacturer's standard
30FAB12 KB002	Loading Pit Swivel Gate	S	N/A	I	Yes	UFA	Manufacturer's standard

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Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment (Sheet 134 of 195)

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)			Safety Class (Note 4)			EQ Program Designation (Note 5)		
Transfer Pit Slot Gate	30FAB11 KB001	30UFA16023	M	H			SI	S		C/NM	Y(3)		Y(5)
Transfer Pit Swivel Gate	30FAB11 KB002	30UFA16023	M	H			SI	S		C/NM	Y(3)		Y(5)
Loading Pit Slot Gate	30FAB12 KB001	30UFA19021	M	H			SI	S		C/NM	Y(3)		Y(5)
Loading Pit Swivel Gate	30FAB12 KB002	30UFA19021	M	H			SI	S		C/NM	Y(3)		Y(5)
RM (Entire Assembly)	FCB01	30UJA29	H	H			SII	NS-AQ	SII				Y (5)
CCU (RB)	FCB30	30UJA29	H	H			SII	NS-AQ	SII				Y (5)
SFM (Entire Assembly)	FCD01	30UFA29015	M	H			SII	NS-AQ	SII				Y (5)
NFE (Entire Assembly)	FCD10	30UFA15022	M	H			SII	NS-AQ	SII				Y (5)
CCU (SFPB)	FCD30	30UFA29	M	H			SII	NS-AQ	SII				Y (5)
FTTF	FCJ01	30UFA16023 / 30UJA15021	H	H			SII	NS-AQ	SII				Y (5)
Transfer Tube and Expansion Joints (Compensators)	FCJ05	30UFA16023 / 30UJA15021	H	H			SI	S	SI	C/NM		Y (4)	Y (5)
Penetration including Loading Pit Bottom Cover	FCJ12	30UFA10015	M	H			SI	S	SI	C/NM	Y (3)		Y (5)
Auxiliary Crane	SMF01	30UFA29015	M	H			SII	NS-AQ	SII				Y (5)
Nuclear Sampling System (NSS)													
RCS HL1 Iso Valve	30KUA10AA001	30UJA18003	M	M			SI	S		C/NM			Y (5)
RCS HL1 Mov Iso Vlv (HP Boundary)	30KUA10AA002	30UJA18003	H	H			SI	S		C/NM		Y (4)	Y (5)
RCS HL1 Inner Cont Iso Vlv	30KUA10AA003	30UJA07016	H	H	ES	PAM	SI	S		C/NM		Y (4)	Y (5)
RCS HL1 Outer Cont Iso Vlv	30KUA10AA004	30UFA06045	M	H	ES	PAM	SI	S		C/NM	Y (3)		Y (5)
RCS HL1 Iso Cont Pressure Relief Vlv	30KUA10AA090	30UJA18003	M	M			SI	S					Y (5)
RCS HL1 Inner Cont Iso Relief Vlv	30KUA10AA091	30UJA07016	M	M			SI	S					Y (5)
RCS HL1 Cont Iso Test Vlv 1	30KUA10AA092	30UJA07016	M	M			SI	S		C/NM			Y (5)
RCS HL1 Cont Iso Test Vlv 2	30KUA10AA093	30UJA07016	M	M			SI	S		C/NM			Y (5)
RCS HL1 Cont Iso Test Vlv 3	30KUA10AA094	30UJA07016	M	M			SI	S		C/NM			Y (5)
RCS HL1 Cont Iso Test Vlv 4	30KUA10AA095	30UJA07016	M	M			SI	S		C/NM			Y (5)
RCS HL1 High Point Vent Vlv 1	30KUA10AA501	30UJA18003	M	M			SI	S		C/NM			Y (5)
RCS HL1 High Point Vent Vlv 2	30KUA10AA502	30UJA18003	M	M			SI	S		C/NM			Y (5)
Pressurizer Mov Sample Vlv	30KUA20AA001	30UJA18019	M	M			SI	S		C/NM			Y (5)
Pressurizer Inner Iso Cont Vlv	30KUA20AA002	30UJA07016	M	M	ES	PAM	SI	S		C/NM			Y (5)
Pressurizer Outer Iso Cont Vlv	30KUA20AA003	30UFA06095	M	H	ES	PAM	SI	S		C/NM	Y (3)		Y (5)
Prz Sample Relief Ckv Vlv	30KUA20AA090	30UJA18019	M	M			SI	S					Y (5)
Prz Test Ckv Vlv	30KUA20AA091	30UJA07016	M	M			SI	S					Y (5)

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checkerboard or other pattern that confirms that adequate cooling can be maintained consistent with Technical Specification restrictions.

Figure 9.1.2-6 provides an illustration of a typical spent fuel rack array with the spent fuel storage rack layout as shown in Figure 9.1.2-7. The spent fuel storage rack modules are composed of a rectangular grid of connected cells, each cell designed to store a single fuel assembly. Center-to-center spacing of the assemblies in the spent fuel racks is provided in Reference 3. Section 9.1.1.1 provides the design basis quantities of fuel to be stored.

The design of the SFP is such that inadvertent draining of water from the pool is prevented (see Section 9.1.3). The concrete structures for the SFP, SFP liner, and fuel transfer canal are designed in accordance with the criteria for Seismic Category I structures contained in Section 3.7 and Section 3.8. As such, they are designed to maintain leak-tight integrity to prevent the loss of cooling water from the pool. In addition, all piping penetrations into the pool are designed to preclude draining the pool down to an unacceptable limit, as described in Section 9.1.3.

The spent fuel pool liner leak chase system consists of half pipes, structural steel or concrete channels, or similar configurations embedded in the concrete, segregated into sectors, and interconnected to the exterior side of the pool liner. Leakage, if any, from the stainless steel pool liner is monitored and routed to collection areas to determine the amount of leakage, its leakage channel location, and proper disposal. The design of the system is such that it provides accessibility for inspections, removal of blockages, and testing. The stainless steel liner plate welds are inspected during fabrication and tested for leak-tightness after erection.

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Borated demineralized reactor makeup water is used to fill and to supplement water inventory in the spent fuel pool.

Adjacent to the SFP is a separate spent fuel cask loading pit. This pit is used when the spent fuel is to be shipped offsite. Also adjacent to the SFP is a transfer compartment. The transfer compartment is used to transfer fuel assemblies between the Fuel Building and the Reactor Building. The fuel transfer tube is fitted with a blind flange on the Reactor Building side and a gate valve on the Fuel Building side.

Two stainless steel gates separate the cask loading pit from the SFP and two stainless steel gates separate the transfer compartment from the SFP. The gates allow isolation of the adjacent pits from the SFP so that they can be drained. The gates are designed to Seismic Category I criteria and are designed to maintain leak-tight integrity to prevent the loss of cooling water from the SFP. The gates are equipped with radiation resistant seals. The gates and the weirs, shown in Figure 3.8-52, are arranged so that the bottoms of the gates are higher than the top of the stored fuel assemblies. The combined volume of the adjacent pits is limited so that leakage into these areas while drained will not reduce the SFP inventory to less than 10 feet above the top of the fuel assemblies.

Adjacent to the SFP is a separate spent fuel cask loading pit. This pit is used when the spent fuel is to be shipped offsite. Two gates separate the cask loading pit from the spent fuel storage area and are only opened for cask loading operations. The gates allow isolation of the cask loading pit from the spent fuel storage area so that the cask loading pit can be drained. Both gates are designed to maintain leak-tight integrity to prevent the loss of cooling water from the spent fuel storage area. The gates and the weir, shown in Figure 3.8-52, are arranged so that the bottoms of the gates are higher than the top of the stored fuel assemblies.

The Reactor Building and the Fuel Building are connected by a fuel transfer tube. This tube is fitted with a blind flange on the Reactor Building side and a gate valve on the Fuel Building side.

The Fuel Pool Cooling and Purification System (FPCPS) functions to limit the spent fuel storage pool temperature to 140°F during non-refueling plant conditions, and to remove impurities from the water to improve visual clarity. A description of the FPCPS is provided in Section 9.1.3.

During fuel handling operations, a controlled and monitored ventilation system removes gaseous radioactivity from the atmosphere above the spent fuel pool and processes it through high efficiency particulate air (HEPA) filters and charcoal adsorber units to the unit vent. Refer to Section 9.4.2 for a description of the spent fuel pool area ventilation system operation and to Section 11.5 for the process ventilation monitors.

Refer to Section 3.2 for the seismic and system quality group classification of the spent fuel racks. Non-safety-related equipment or structures not designed to Seismic Category I criteria that are located in the vicinity of the SFSF will be evaluated to confirm that their failure could not cause an increase in the k_{eff} value beyond the maximum allowable k_{eff}.

Refer to Section 12.3.6.5.1 for fuel handling and storage system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

9.1.2.2.3 New Fuel Rack and Spent Fuel Storage Rack Design

Structural design and stress analysis of the new and spent fuel storage racks are evaluated in accordance with Seismic Category I requirements of RG 1.29. The dynamic and stress analyses are performed and described in Reference 3. Loads and load combinations considered in the structural design and stress analysis are provided in Table 9.1.2-1 based on SRP Section 3.8.4, Appendix D. Uplift force analysis is also performed for new and spent fuel racks design, and described in Reference 3. Each

- The reactor cavity is filled with water from the IRWST during refueling operation.

The initial filling, makeup, and refilling of the Fuel Building and Reactor Building pools is performed by the reactor boron and makeup water system. Demineralized water is normally used to compensate for normal evaporation in the pools. The boron concentration of the pool water is maintained the same as the water in the IRWST.

9.1.3.2.3 Fuel Pool Cooling System

The FPCS, shown in Figure 9.1.3-1—Fuel Pool Cooling System, consists of two separate cooling trains located on opposite sides of the SFP for removal of decay heat generated by irradiated fuel stored in the SFP. Each train consists of two pumps in parallel, one heat exchanger, supply and return piping, and associated valves. The pumps can be operated individually or simultaneously, as needed. The heat exchanger is cooled by the component cooling water system (CCWS). The cooling water flow to the heat exchanger can be adjusted from the main control room by CCWS motor operated control valves. Each FPCS train includes a motor-operated isolation valve downstream of the heat exchanger.

The FPCS is designed to maintain the SFP temperature below 120°F during refueling periods to facilitate operations in the SFP area, with a maximum temperature of 140°F if a single failure occurs.

9.1.3.2.4 SFP Makeup Capability

Normal makeup water to the SFP is supplied by the demineralized water distribution system. The safety-related and Seismic Category I SFP makeup capability is provided with sufficient inventory and capacity to compensate for normal evaporation losses from the SFP for up to 7 days with the FPCS in operation and maintaining SFP temperature at 140°F. SFP leakage associated with a dropped fuel assembly has not been considered, as an assembly drop will not result in perforation of the SFP liner.

09.01.04-1

The SFP makeup water, approximately ~~29,000~~50,000 gallons, is maintained in the cask loading pit or the transfer compartment (or both) which are both Seismic Category I structures adjacent to the SFP. A Quality Group C and Seismic Category I pump and piping to the SFP is provided. The SFP makeup pump is shown in Figure 9.1.3-2—Fuel Pool Purification System. The SFP makeup pump is provided with emergency power and is operated from the main control room (MCR).

Other independent on-site Seismic Category I water supplies are available to provide the back-up SFP makeup capability, including the IRWST with at least 500,000 gallons available during plant operation. The piping and pump used to deliver the back-up water to the SFP are not designed to Seismic Category I.

Spent Fuel Cask Transfer Facility

When the Spent Fuel Cask Transfer Facility is not operated, the loading pit is isolated from the SFP by two gates. The loading pit may be empty or contain water for SFP makeup, as described in Section 9.1.3. The leak tightness of the SFP loading pit penetration is monitored and an alarm is transmitted to the main control room.

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~~The single failure criterion is applied to the components of the facility performing safety functions, failure of which may lead to abnormal levels of occupational radiation exposure. The safe position is assured by the mechanical components in case of electrical failure.~~

9.1.4.3.2 Refueling Cavity Draindown Events

Rapid draindown of the refueling cavity resulting in fuel uncovery during refueling is not a credible event. The reactor vessel cavity ring is a permanently installed stainless steel assembly welded to the reactor vessel and the refueling cavity liner to prevent water leakage from the refueling cavity. The passive cavity ring design does not rely on active components such as pneumatic seals and is not susceptible to gross failure. Seals for openings in the refueling cavity liner do not rely on active components and do not pose a risk for rapid cavity draining.

Inadvertent draining of the refueling cavity is addressed by plant procedures. Refer to Section 13.5 for plant procedure information.

Any credible drainage from the refueling cavity will be detected visually or by installed instrumentation in adequate time to place a handled fuel assembly, if necessary, in a safe storage location. The safe storage location is either in the reactor core or in the fuel transfer facility, where it can be positioned horizontally to increase shielding depth or can be transferred to the Fuel Building. Weirs in the Reactor Building and Fuel Building pools limit the loss of water in pool areas separated from the drain path by the weirs.

9.1.4.4 Inspection and Testing Requirements

The safety-related components are located to permit preservice and inservice inspections. The FHS containment isolation function is testable. Refer to Section 14.2 (test abstracts #038 and #039) for initial plant testing of the FHS components. The performance and structural integrity of system components is demonstrated by continuous operation.

9.1.4.5 Instrumentation Requirements

In general, mechanical or electrical interlocks are provided, when required, to provide reasonable assurance of the proper and safe operation of the fuel handling equipment. The intent is to prevent a situation which could endanger the operator or damage the