ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, March 13, 2013 4:53 PM
To: Snyder, Amy
Cc: Hearn, Peter; DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); TOLLEY Tracey (AREVA); VANCE Brian (AREVA); WELLS Russell (AREVA); WILLS Tiffany (AREVA); HARRINGTON James (AREVA)
Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9, Questions 09.01.02-40 & -41,and 09.01.03-14
Attachments: RAI 526 Advanced Response Q.09.01.02-40, Q.09.01.02-41 and Q.09.01.03-14 - US EPR DC.pdf

Importance: High

Amy,

Attached is an Advanced Response to RAI No.526, Questions 09.01.02-40, 09.01.02-41 and 09.01.03-14 in advance of the final response date of May 15, 2013.

To keep our commitment to send a final response to these questions by the commitment date, we need to receive all NRC staff feedback and comments no later than **May 1, 2013**.

Please let me know if NRC staff has any questions or if this response can be sent as final.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, February 22, 2013 8:09 AM
To: Amy.Snyder@nrc.gov
Cc: peter.hearn@nrc.gov; DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9, Supplement 4
Importance: High

Amy,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the four questions in RAI No. 526 on January 4, 2012. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 526 were sent on January 25, 2012, February 24, 2012, and January 9, 2013, respectively, to provide a revised schedule.

The attached file, "RAI 526 Supplement 4 Response US EPR DC.pdf," provides a technically correct and complete response to one question. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format, which support a final response to RAI 526 Question 09.01.03-15.

The following table indicates the respective pages in the response document, "RAI 526 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 526 — 09.01.03-15	2	2

The schedule for technically correct and complete responses to the remaining three questions has not changed as provided below.

Question #	Response Date
RAI 526 — 09.01.02-40	May 15, 2013
RAI 526 — 09.01.02-41	May 15, 2013
RAI 526 — 09.01.03-14	May 15, 2013

Sincerely,

Dennis Williford, P.E.
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From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, January 09, 2013 7:55 AM
To: Amy.Snyder@nrc.gov
Cc: peter.hearn@nrc.gov; DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9, Supplement 3

Amy,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the four questions in RAI No. 526 on January 4, 2012. Supplement 1 and Supplement 2 responses to RAI No. 526 were sent on January 25, 2012 and February 24, 2012, respectively, to provide a revised schedule.

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

Question #	Response Date
RAI 526 — 09.01.02-40	**May 15, 2013**
RAI 526 — 09.01.02-41	**May 15, 2013**
RAI 526 — 09.01.03-14	**May 15, 2013**

RAI 526 — 09.01.03-15	**February 28, 2013**

Sincerely,

Dennis Williford, P.E.
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Charlotte, NC 28262
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From: WILLIFORD Dennis (RS/NB)
Sent: Friday, February 24, 2012 5:25 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the four questions in RAI No. 526 on January 4, 2012. Supplement 1 response to RAI No. 526 was sent on January 25, 2012 to provide a revised schedule.

The schedule for technically correct and complete responses to the four questions has been changed as provided below. This schedule was transmitted to the NRC in AREVA NP letter NRC:12:008 dated February 21, 2012.

Question #	Response Date
RAI 526 — 09.01.02-40	**June 28, 2013**
RAI 526 — 09.01.02-41	**June 28, 2013**
RAI 526 — 09.01.03-14	**June 28, 2013**
RAI 526 — 09.01.03-15	**June 28, 2013**

Sincerely,

Dennis Williford, P.E.
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AREVA NP Inc.
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From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, January 25, 2012 12:15 PM

To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB); Michael.Miernicki@nrc.gov; peter.hearn@nrc.gov
Subject: Response to U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a preliminary schedule for responding to the four questions in RAI No. 526 on January 4, 2012.

The preliminary schedule for the response to these four questions has been changed as provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by February 21, 2012.

Question #	Response Date
RAI 526 — 09.01.02-40	**February 21, 2012**
RAI 526 — 09.01.02-41	**February 21, 2012**
RAI 526 — 09.01.03-14	**February 21, 2012**
RAI 526 — 09.01.03-15	**February 21, 2012**

Sincerely,

Dennis Williford, P.E.
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Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, January 04, 2012 4:17 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 526 Response US EPR DC.pdf," provides a schedule since technically correct and complete responses to the four questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 526 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 526 — 09.01.02-40	2	2
RAI 526 — 09.01.02-41	3	3

RAI 526 — 09.01.03-14	4	4
RAI 526 — 09.01.03-15	5	5

A preliminary schedule for technically correct and complete responses to these questions is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

Question #	Response Date
RAI 526 — 09.01.02-40	January 25, 2012
RAI 526 — 09.01.02-41	January 25, 2012
RAI 526 — 09.01.03-14	January 25, 2012
RAI 526 — 09.01.03-15	January 25, 2012

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, November 25, 2011 10:43 AM
To: ZZ-DL-A-USEPR-DL
Cc: Hernandez, Raul; Dreisbach, Jason; Segala, John; Hearn, Peter; Colaccino, Joseph
Subject: U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on November 11, 2011, and on November 21, 2011, 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: 4281

Mail Envelope Properties (554210743EFE354B8D5741BEB695E6560F156A)

Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 526 (6190, 6191), FSAR Ch. 9, Questions 09.01.02-40 & -41,and 09.01.03-14
Sent Date: 3/13/2013 4:53:14 PM
Received Date: 3/13/2013 4:53:18 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Tracking Status: None
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Tracking Status: None
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Tracking Status: None
"Snyder, Amy" <Amy.Snyder@nrc.gov>
Tracking Status: None

Post Office: FUSLYNCMX03.fdom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	9673	3/13/2013 4:53:18 PM
RAI 526 Advanced Response Q.09.01.02-40, Q.09.01.02-41 and Q.09.01.03-14 - US EPR DC.pdf	170873	

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

Advanced Response to

Request for Additional Information No. 526 (6190, 6191) Questions Q.09.01.02-40, Q.09.01.02-41 and Q.09.01.03-14

11/25/2011

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: 09.01.03 - Spent Fuel Pool Cooling and Cleanup System

Application Section: 09.01

QUESTIONS for Balance of Plant Branch 1 (SBPA)

Question 09.01.02-40:

OPEN ITEM

In response to RAI 385, Question 9.1.4-17 the applicant provided a description of the design features relied upon to ensure that the SFCTF will remain leak-tight following an SSE. The staff reviewed FSAR Tier 2 Sections 9.1.2.2.2, "Spent Fuel Storage," and 9.1.2.3, "Safety Evaluation," and identified that the system description in the FSAR does not address the impact of seismic event while the SFCTF is in operation (all the gates open).

The staff requests the applicant to update FSAR Tier 2 Section 9.1.2 to include the description and justification by which the design of the SFCTF and all the pressure retaining components prevent a SFP drain-down (seismic classification).

Response to Question 09.01.02-40:

U.S. EPR FSAR Tier 2, Section 9.1.2.3, will be revised to include the following statement:

> "The water level in the spent fuel pool can be affected by leaks in the cask loading pit (CLP) and spent fuel cask transfer facility (SFCTF). Refer to Section 9.1.4.3.4 for a discussion concerning the prevention, detection and mitigation of leaks in the CLP and SFCTF."

U.S. EPR FSAR Tier 2, Section 9.1.3.4, will be revised to include the following statement:

> "The water level in the spent fuel pool (SFP) can be affected by leaks in the cask loading pit (CLP) and spent fuel cask transfer facility (SFCTF). The FPPS can be used to provide makeup water to the SFP. Refer to Section 9.1.4.3.4 for a discussion concerning the prevention, detection and mitigation of leaks in the CLP and SFCTF."

U.S. EPR FSAR Tier 2, Section 9.1.4.3.4, will be revised to include additional information that describes design features which prevent, detect, and mitigate leaks from the cask loading pit (CLP) and spent fuel cask transfer facility (SFCTF). This additional information will also emphasize that all CLP and SFCTF fluid boundary components and their supporting structures, which are required for maintaining the SFP water inventory, are classified safety-related and Seismic Category I.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 9.1.2.3, 9.1.3.4 and 9.1.4.3.4, will be revised as described in the response and indicated on the enclosed markup.

Question 09.01.02-41:

OPEN ITEM

In its response to RAI 385, Question 9.1.4-17, the applicant stated that the swivel gate between the CLP and the SFP, and the SFCTF upper cover are prevented from opening simultaneously, without having a cask connected to the SFCTF by an interlock. The staff evaluated the applicant's design for the SFCTF and determined that the applicant has not proposed any regulatory control over the gates SFP gates or the SFCTF cover to prevent inadvertent opening of these gates while the SFCTF is not in operation, which would result in draining of the SFP below the minimum water level. The staff also identified that the applicant design relies on interlock to prevent the inadvertent opening of gates before the cask is secured and docked in the SFCTF, but the applicant has not specify which of the interlocks are safety related, which are procedural controlled or which are controlled by electronic switches.

The staff requests the applicant to

a. justify not having a Technical Specification or a license condition that would require at least two of the seismic barriers to be in place while there is no cask attached to the SFCTF;

b. describe in the FSAR the prevention of the inadvertent draining of the SFP by the interlocks (safety related and non-safety related), by providing which alarms are associated with the interlocks, which interlocks are automatically cleared once the conditions are met, and which interlock are manually cleared by operator actions.

Response to Question 09.01.02-41:

a. The spent fuel pool (SFP) and cask loading pit (CLP) barriers that maintain the fluid boundary and leak tightness are classified safety-related and Seismic Category I.

   The CLP is equipped with two safety-related, Seismic Category I gates (i.e., one slot gate and one swivel gate). When connected to the CLP, the penetration assembly is equipped with two safety-related, Seismic Category I, covers. The postulated event, involving a failure of two safety-related Seismic Category I components, is not a design basis accident event and does not meet the criteria in 10 CFR 50.36 for creating a new Technical Specification or License Condition.

   When the spent fuel cask transfer facility (SFCTF) is not operational, the CLP is normally empty and isolated from the SFP by a safety-related, Seismic Category I slot and swivel gate. The SFP gates are designed to support the full height of water in the SFP when the other side (i.e., CLP) is completely empty. In order to access the CLP, the slot gate must be removed by the Fuel Building auxiliary crane and the swivel gate opened. The swivel gate is hinged and manually opened using an actuation tool. The volume of the CLP pit is such that if the seals of both gates fail, the SFP coolant inventory will not be reduced to a level less than 10 feet above the top of the fuel assemblies (this meets the requirements of RG 1.13).

   A safety-related, Seismic Category I, penetration assembly is used to connect the CLP to the internal cavity of the cask. The penetration assembly consists of an upper cover at the bottom of the CLP and a lower cover at the lower end of the penetration. The

penetration upper and lower covers are designed to support the weight of the water in the CLP while maintaining leak tightness. The lower cover is bolted to the leak-tight flange of the penetration assembly, and is manually unbolted and removed by the operators.

U.S. EPR FSAR Tier 2, Section 9.1.4.2.1, will be revised to include the requirement that a minimum of two safety-related, Seismic Category I, barriers are closed while there is no cask attached to the SFCTF.

b. The Response to RAI 526, Question 09.01.02-40, describes the design features which prevent, detect, and mitigate potential leakage during operation of the SFCTF.

The Response to RAI 525, Question 09.01.04-22, provides a discussion of interlocks and alarms.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.1.4.2.1, will be revised as described in the response and indicated on the enclosed markup.

Question 09.01.03-14:

OPEN ITEM

The staff also identified that the applicant's response to RAI 9.1.4-17 proposes to update FSAR Tier 2 Section 9.1.4 to address the design and safety evaluation of the SFCTF. The SFCTF relies on the FPCS for makeup water in order to prevent a SFP drain-down.

The staff requests the applicant to update FSAR Section 9.1.3 to reflect the new safety function of the FPCS (make up to the CLP if the SFCTF leaks). Furthermore, include the safety analysis discussion that addresses the impact of a seismic event while the SFCTF is in operation and the design features relied upon to minimize potential leakage and handle the event.

Response to Question 09.01.03-14:

The fuel pool cooling system (FPCS) does not supply makeup water to the cask loading pit (CLP). Using the spent fuel pool purification pump, the fuel pool purification system (FPPS) supplies makeup water to the CLP from the in-containment refueling water storage tank. Refer to U.S. EPR FSAR Tier 2, Sections 9.1.3.2.5 and 9.1.4.3.4, for a further discussion.

The demineralized water distribution system supplies normal makeup water to the spent fuel pool (SFP). As described in U.S. EPR FSAR Tier 2, Section 9.1.3.2.4, the FPPS supplies emergency makeup water to the SFP through the SFP makeup pump.

The impact of a seismic event while the SFCTF is in operation, and the design features relied upon to minimize potential leakage, are described in the response to Question 09.01.02-40.

FSAR Impact:

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

U.S. EPR
Final Safety Analysis Report

MARKUPS

6. Containment and confinement are provided in the SFSF by the spent fuel pool liner and by the ventilation system for the Fuel Building (see Section 9.4.2). The joint welds that require initial testing and subsequent monitoring of weld integrity are provided with a leak chase system. A monitoring system is provided for the leak chase system. Any water collected is directed to the floor and equipment drain system and transferred to the liquid radwaste system for processing. Filtering of the spent fuel pool water is provided by the FPCPS (see Section 9.1.3). For the NFSF, appropriate confinement of the new fuel assemblies is provided by the new fuel storage racks located inside the concrete structure of the new fuel room.

7. The design and density storage arrangement of the spent fuel racks provide adequate natural coolant circulation to remove the residual heat from spent fuel stored in the spent fuel rack, in combination with the FPCPS. The FPCPS maintains the spent fuel pool water temperature and water level within prescribed limits by removing decay heat generated by the stored spent fuel assemblies (see Section 9.1.3).

8. Instrumentation is provided to monitor the pool water level and water temperature (see Section 9.1.3) to provide indication of the loss of decay heat removal and to warn personnel of potentially unsafe conditions. In addition, area radiation monitors are provided near the SFP which will provide a distinct audible and visual alarm to alert personnel in the vicinity of the need to take appropriate action. Refer to Section 12.3.4 for further details on the area radiation monitors.

9. The new and spent fuel racks are Seismic Category I structures and are designed to withstand normal and postulated dead loads, live loads, loads resulting from thermal effects, and loads caused by an SSE event. See Section 9.1.2.2.3 for information on structural and stress analyses for new and spent fuel racks.

10. The spent fuel is stored within a stainless steel lined concrete pool which has no penetrations that can result in an unacceptable loss of water. As described in Section 9.1.3, the FPCPS provides makeup water for the SFP. The concrete structures for the SFP and fuel transfer canal are designed to maintain leak-tight integrity to prevent the loss of cooling water from the pool. 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.

11. The design of the new and spent fuel racks confirms that only one fuel assembly can be inserted into a single storage cell.

RAI 526, Q. 09.01.02-40

12. The spent fuel pool and cooling systems are designed so that in the event of failure of inlets, outlets, piping, or drains, the pool level will not be inadvertently drained below a level approximately 3 meters (10 feet) above the top of the active fuel. The spent fuel pool does not include piping that extends below this elevation. The water level in the spent fuel pool can be affected by leaks in the cask loading pit (CLP) and spent fuel cask transfer facility (SFCTF). Refer to Section 9.1.4.3.4 for a discussion concerning the prevention, detection, and mitigation of leaks in the CLP and SFCTF.

leakage. In addition to SFP level instrumentation, SFP leakage detection, Fuel Building sump alarms and radiation monitors will provide timely detection and MCR notification of SFP or system component leakage to allow initiation of appropriate actions.

10. GDC 61 as related to the system design:

    – The FPCPS is designed to permit appropriate periodic functional testing to confirm component integrity, operability of active components, and operational performance of the system, as described in Section 9.1.3.5.

    – Safety-related and Seismic Category I piping and valves are provided to allow isolation of the purification piping exiting the bottom of the Fuel Building Cask Loading Pit & Fuel Transfer Compartment and Reactor Building pools to provide containment of radioactive water in case of failure of non-safety portions of the system. Piping and valves that connect to the SFP at or below an elevation of 55 feet 6 inches are designed to Seismic Category 1 and any non-seismic pipe that extends below that elevation is provided with an anti-siphon device. The purification piping that enters the top of the SFP is classified non-seismic and is provided with siphon breaker devices to preclude drainage below the elevation of 55 feet 6 inches.

    – The FPCPS decay heat removal capability is addressed by item 5.

    – The capability to prevent reduction in SFP inventory is addressed by item 7, item 8, and item 9.

    – The FPPS removes corrosion products, radioactive materials and impurities from the pool water and surface. The ion exchangers and filters are designed to maintain safe operating conditions in the area and to reduce occupational exposure to radiation. Strainers are provided in pipes that exit the bottom of a pool to prevent radioactive particles from being spread throughout the piping system. Instrumentation is provided to monitor ion exchanger performance and filter loading to detect conditions that could result in excessive radiation levels.

11. ALARA principles have been incorporated into the FPCPS design with respect to providing adequate shielding, provisions for decontamination, and the use of remote methods for filter replacement.

    – The capability for decontamination and flushing with demineralized water is provided for the FPCPS pumps, heat exchangers, filters, ion exchanger, and resin traps.

RAI 526, Q. 09.01.02-40

12. The components and systems relied on for the performance of FPCPS safety functions are not shared with other nuclear units since this is a single unit plant.

13. The water level in the spent fuel pool (SFP) can be affected by leaks in the cask loading pit (CLP) and spent fuel cask transfer facility (SFCTF). The FPPS can be used to provide makeup water to the SFP. Refer to Section 9.1.4.3.4 for a

discussion concerning the prevention, detection and mitigation of leaks in the CLP and SFCTF.

9.1.3.5 Inspection and Testing Requirements

Preoperational testing of the FPCPS and components is performed in accordance with the initial plant test program. Refer to Section 14.2 (test abstract # 001) for initial plant startup test program. The testing includes system pressure test, verification of actuation signals, proper operation of valves, verification of control logic, instrument calibrations and validation of measurements.

9.1.3.6 Instrumentation Requirements

The FPCPS includes the following instrumentation and controls for performance of safety-related functions:

- Class 1E SFP wide-range level instruments are provided to alert the operators in the MCR of leakage. The level sensors are located in separate corners or recesses of the SFP to provide reasonable protection against missiles and debris. The range of each of the SFP wide-range level sensors spans from the top of the normal operating range to below the top of the spent fuel racks with an accuracy of less than ± 1 ft.
- The FPCS pumps are tripped on low-low SFP level to preclude unacceptable loss of water or damage to the pumps.
- The FPCS isolation motor operated valves are opened or closed automatically.

The FPCPS includes the following instrumentation and controls for performance of non-safety-related functions:

- A battery-powered portable level indication device for monitoring spent fuel pool level is located in the Division 1 and 4 I&C Room and stored in a protective enclosure. In the event that no station power sources are available, the portable level indication devices can be connected to the SFP wide-range level instrument channels to power the instrument loop and provide on-demand indication of SFP level.

9.1.3.6.1 Indications and Alarms

The FPCPS includes the following minimum indications and alarms:

- SFP water level and temperature.
- Pump on/off indications.
- Filter differential pressure.
- Mixed bed ion exchanger differential pressure, flow, and temperature.

RAI 526, Q. 09.01.02-41

Administrative controls for fuel handling operations include the following:

1. Movement of the fuel assemblies from the core shall be started only after allowing for sufficient decay after the reactor shutdown.

2. ~~The spent fuel cask loading pit gate shall be retained closed during refueling operations.~~ At least two of the following safety-related, Seismic Category I, barriers will be retained closed while there is no cask attached to the SFCTF:

   – Cask loading pit slot gate.

   – Cask loading pit swivel gate.

   – Penetration assembly upper cover.

   – Penetration assembly lower cover.

3. Manual control of the handling equipment, such as, Refueling Machine, Spent Fuel Machine, New Fuel Elevator, and Auxiliary Crane shall be put under administrative control.

9.1.4.2.2 Component Description

The major components of the FHS are described in the following paragraphs. Table 3.2.2-1 provides the seismic and other design classifications for the components in the FHS. The FHS is designed in accordance with ANS 57.1 (Reference 1), ANS 57.2 (Reference 2), and ANS 57.3 (Reference 3). The transfer tube components are designed per ASME Boiler and Pressure Vessel Code, III (Reference 4).

Refueling Machine

The refueling machine (RM) moves fuel assemblies both within the reactor vessel and between the reactor vessel and the fuel transfer tube facility during outages. The RM is primarily designed for the underwater handling of fuel assemblies between the FTTF and the core during outages. The RM also provides access to fuel assemblies for detecting fuel cladding ruptures, visual core mapping, an operational platform for handling control rod drive shafts and instrumentation, and access to the upper internals of the reactor vessel.

The main components of the RM are shown in Figure 9.1.4-1—Refueling Machine.

A conceptual drawing of the fuel assembly hoisting mechanism is shown in Figure 9.1.4-2—Fuel Assemblies Hoisting Mechanism.

Fuel Transfer Tube Facility

The main purpose of the FTTF is to transfer fuel between the SFP and the refueling cavity. The fuel transfer tube is fitted with a blind flange on the RB side to provide

- Isolate system that is confirmed to be cause of inadvertent draining of refueling cavity.

- Identify and confirm availability of system(s) to make up water from the IRWST, if the cause of leakage is the reactor cavity ring or other leakage in the Reactor Building.~~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 if an acceptable location is available or in the fuel transfer facility, where it can be positioned horizontally to increase shielding depth or can be transferred to the FB. Weirs in the RB and FB pools limit the loss of water in pool areas separated from the drain path by the weirs.

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9.1.4.3.4 Cask Loading Pit Draindown Events

All cask loading pit (CLP) and SFCTF fluid boundary components and their supporting structures, which are required for maintaining the SFP water inventory, are classified safety-related and Seismic Category I. In addition, pressure retaining components, which are part of the fluid boundary, are classified Quality Group C and are constructed to ASME Section III Class 3 standards. Consequently, except for operator error, there are no design basis events that can result in draining the SFP, including seismic events.

The CLP and SFCTF operate in the following three basic configurations:

- CLP dry, with CLP slot and swivel gates closed, and the penetration assembly upper and lower cover closed.

- CLP flooded, with no cask attached to the penetration assembly; with the CLP slot and swivel gates open, and the penetration assembly upper and lower cover closed.

- CLP flooded, with a cask attached to the penetration assembly; with the CLP slot and swivel gates open, and the penetration assembly upper and lower cover open.

In all configurations the fluid retaining components and their supports are classified safety-related and Seismic Category I and are designed against a single active failure. In addition, portions of the fluid boundary are designed against a single passive failure, such as the penetration assembly seals and bellows.

Beyond design basis events have been analyzed. In all cases, the SFP water level remains at least 10 feet above the active fuel in the spent fuel racks, except for the hypothetical worst case where both the CLP slot and gate valves are open and the penetration assembly upper and lower covers are open and the cask is not docked to the penetration assembly. In this hypothetical event, the SFP water level remains at least 2 feet above the top of the active fuel in the spent fuel racks.

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The following U.S. EPR design features are available for the prevention, detection, and mitigation of leakage in the CLP and SFCTF:

Prevention Features

- Fluid boundary components and their supports are designated safety-related and Seismic Category I.
- Fluid boundary components, which are also pressure retaining, are designated Quality Group C
- Leak tightness is tested prior to using the penetration assembly.
- Interlocks are provided that:
  - Prevent spurious movement of SFCTM during loading operations (Interlock CF12).
  - Prevent undocking of cask when penetration upper cover is open and water level in cask is outside the required range (Interlock CF15).
  - Confirm correct docking of cask to penetration. The anti-seismic devices on the SFCTM are locked and the seals between the penetration and cask are leak-tight prior to filling the penetration (Interlock CF16).
- Penetration assembly is designed to maintain leak-tight integrity following the drop of a fuel assembly.
- Redundant active components:
  - CLP slot/swivel gate.
  - Penetration assembly top and bottom cover.
  - Normally-open valves in series.

Detection Features

- Monitor leak tightness of penetration assembly upper cover (Interlock CF18).
- Monitors baffle leakage.
- Monitors seal leakage.
- Monitors CLP level.

Mitigation Features

- Nuclear Island Drain/Vent System (NIVDS) is sized to accommodate volume of leakage.

- NIVDS diverts flow of leakage away from mitigation equipment.
- Available makeup water includes:
  - 25 gpm from safety-related, emergency-powered purification pump.
  - 400 gpm from purification pump suction from in-containment refueling water storage tank.

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Draindown Events During Non-Cask Loading Operations

The two gates separating the SFP from the cask loading pit are described in Section 9.1.2.2.2. The gates do not rely on active equipment, such as inflatable seals, to maintain leak-tightness. The slot gate seals are compressed by the weight of the gate to create a leak tight barrier. The swivel gate has a locking mechanism which equally distributes pressure on the seal to create a leak tight barrier. The swivel gate is locked in both the open and closed positions. The gates are shown in Figure 9.1.2-9—Cask Loading Pit Gates. Unless spent fuel is being moved to the cask loading pit, both gates are closed. Failure of a single gate does not impact the water inventory in the spent fuel pool. During cask loading operations, the slot gate is removed, and the swivel gate is open to allow fuel movement into the cask loading pit.

The penetration assembly between the cask loading pit and the loading hall beneath the pit remains closed when cask handling operations are not occurring. The penetration assembly is closed by an upper cover at the bottom of the cask loading pit and a lower cover below the leak-tightness flange. The upper cover is a thick plate with a pressurization mechanism that pressurizes the cover uniformly and locks it closed for maintaining a leak tight seal. Two seals are provided to maintain leak-tightness between the upper cover and the supporting structure and compressed air is supplied between the two seals to monitor leak-tightness. A seismic locking device holds the upper cover in the closed position during an SSE. The lower cover is a thick disk bolted to the leak-tightness flange of the penetration assembly with two seals providing leak-tightness. It is designed to support the weight of the water in the cask loading pit without the upper cover, which is an abnormal condition. In this condition, mechanical stops on the spring mounted devices shown in Figure 9.1.4-8—Cask Loading Pit Penetration Assembly, limit the displacement of the bottom cover.

Draindown Events During Cask Loading Operations

During cask loading operations, the cask loading pit is flooded, the slot gate is removed and the swivel gate is open to allow fuel movement into the cask loading pit. In this case, the spent fuel pool and cask loading pit are connected volumes. The cask loading pit is filled prior to opening the penetration assembly upper cover. The upper cover is prevented, by design, from opening if there is a pressure difference across the cover, thus preventing inadvertent opening before the penetration is filled. The docking system uses an irreversible screw design that prevents undocking on a loss of power.