ArevaEPRDCPEm Resource

From: RYAN Tom (AREVA) [Tom.Ryan@areva.com]
Sent: Tuesday, September 11, 2012 4:09 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); TOLLEY Tracey (AREVA); VANCE Brian (AREVA); KOWALSKI David (AREVA); WILLIFORD Dennis (AREVA); BALLARD Bob (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 550 (6501), FSAR Ch. 9 - NEW PHASE 4 RAI - Fukushima - Question 09.01.03-16
Attachments: RAI 550 Question 09.01.03-16 DRAFT Response - US EPR DC.pdf

Getachew,

Attached is a DRAFT response for RAI 550, Question 09.01.03-16 in advance of the final response date of October 31, 2012 shown below.

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 **October 24th**.

Please let me know if the staff has questions or if the response to these questions can be sent as final.

Sincerely,

Tom Ryan for
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: Monday, June 25, 2012 11:33 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 550 (6501), FSAR Ch. 9 - NEW PHASE 4 RAI - Fukushima

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 550 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the single question cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 550 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 550 — 09.01.03-16	2	2

The schedule for a technically correct and complete response to this question is provided below.

Question #	Response Date
RAI 550 — 09.01.03-16	**October 31, 2012**

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: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, May 25, 2012 7:22 AM
To: ZZ-DL-A-USEPR-DL
Cc: Hernandez, Raul; McKenna, Eileen; Hearn, Peter; Segala, John; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 550 (6501), FSAR Ch. 9 - NEW PHASE 4 RAI - Fukushima

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on May 18, 2012, and on May 24, 2012, 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/LB1
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4037

Mail Envelope Properties (68A588D0DDE96547855C97AF83A8CAFDB1A46D)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 550 (6501), FSAR Ch. 9 - NEW PHASE 4 RAI - Fukushima - Question 09.01.03-16
Sent Date: 9/11/2012 4:09:00 PM
Received Date: 9/11/2012 4:09:52 PM
From: RYAN Tom (AREVA)

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Files	**Size**	**Date & Time**	
MESSAGE	3256	9/11/2012 4:09:52 PM	
RAI 550 Question 09.01.03-16 DRAFT Response - US EPR DC.pdf			797294

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

Response to

Request for Additional Information No. 550 (6501), Revision 0
Question 09.01.03-16

5/25/2012

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.03 – Spent Fuel Pool Cooling and Cleanup System
Application Section: 9.1.3

QUESTIONS for Balance of Plant & Fire Protection Branch (BPFP)

Question 09.01.03-16:

Open Item

New Phase 4 RAI - Fukushima

Implementation of Fukushima Task Force Recommendation 7.1

Provide sufficient reliable instrumentation, able to withstand design-basis natural phenomena, and monitor spent fuel pool water level, as described in Attachment 3 to Order EA-12-051 (ML12054A679).

Response to Question 09.01.03-16:

The following paragraphs and sections of Attachment 3 to Order EA-12-051 for Part 52 applicants were considered applicable for this response. The AREVA response to each item is provided below.

Attachment 2 to this Order for Part 50 Licensees requires reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) "level that is adequate to support operation of the normal fuel pool cooling system," (2) "level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck," and (3) "level where fuel remains covered and actions to implement make-up water addition should no longer be deferred."

1. The spent fuel pool level instrumentation shall include the following design features:

    1.1. Arrangement: The spent fuel pool level instrument channels shall be arranged in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the spent fuel pool. This protection may be provided by locating the safety-related instruments to maintain instrument channel separation within the spent fuel pool area, and to utilize inherent shielding from missiles provided by existing recesses and corners in the spent fuel pool structure.

    1.2. Qualification: The level instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool water at saturation conditions for an extended period.

    1.3. Power Supplies: Instrumentation channels shall provide for power connections from sources independent of the plant alternating current (AC) and direct current (DC) power distribution systems, such as portable generators or replaceable batteries. Power supply designs should provide for quick and accessible connection of sources independent of the plant AC and DC power distribution systems. Onsite generators used as an alternate power source and replaceable batteries used for instrument channel power shall have sufficient capacity to maintain the level indication function until offsite resource availability is reasonably assured.

1.4. Accuracy: The instrument shall maintain its designed accuracy following a power interruption or change in power source without recalibration.

1.5. Display: The display shall provide on-demand or continuous indication of the spent fuel pool water level.

2. The spent fuel pool instrumentation shall be maintained available and reliable through appropriate development and implementation of a training program. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels.

Consistent with the information in Attachment 3 to Order EA-12-051, the U.S. EPR design addresses requirements in Attachment 2 to Order EA-12-051 by providing two physically separate and independent divisions of safety-related spent fuel pool (SFP) level sensing with two redundant wide-range level sensor channels in each division. The instruments measure the level from the top of the spent fuel pool normal operating range to below the top of the fuel racks. This span ensures indication of: (1) a level that is adequate to support operation of the normal fuel pool cooling system, (2) a level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and (3) a level where fuel remains covered and actions to implement make-up water addition should no longer be deferred. The spent fuel pool level instrumentation is safety-related and has the following design features:

- Seismic and environmental qualification of the instruments.
- Independent power supplies.
- Electrical isolation and physical separation between instrument divisions.
- Continuous display in the Control Room.
- Routine calibration and testing.

In addition, the following requirements that are specified in Attachment 3 to Order EA-12-051 are addressed as follows in a manner consistent with JLD-ISG-2012-03, Order EA-12-051 and NEI 12-02, Revision 1, as endorsed by JLD-ISG-2012-03.

Arrangement

The safety-related wide-range level sensors from each division are Seismic Category 1 components. The level sensors are located in separate corners, or recesses, of the SFP to provide reasonable protection against missiles and debris.

U.S. EPR FSAR Tier 2, Table 3.2.2-1 and Section 9.1.3.6, will be revised to reflect this information.

Qualification

The sensors and cabling for the wide-range level instrument channels are qualified to operate for a minimum period of seven days under the following conditions:

- Radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water where fuel remains covered.

- Temperature of 212 degrees F and 100% relative humidity.
- Boiling water and/or steam environment.
- Concentrated borated water environment.

U.S. EPR FSAR Tier 1, Table 2.2.5-2; and Tier 2, Table 3.11-1, will be revised to reflect this information.

Power Supplies

The primary instrument channels normally receive power from plant vital AC power.

Each of the two divisions of wide-range level sensors includes the capability to connect a sensor directly to a battery-operated portable indication device. The two portable indication devices provide on demand push-button-activated indication of spent fuel pool level with no dependence on other station power sources. Each portable indication device is located in the associated division I&C room, which is protected and accessible during normal operation, event, and post-event conditions. The portable indication device batteries are maintained in a charged state during normal operation with a minimum battery capacity of seven days of on demand operation.

U.S. EPR FSAR Tier 2, Sections 9.1.3.1 and 9.1.3.3.2, will be revised to reflect this information. Additionally, U.S. EPR FSAR Tier 2, Section 14.2.12.1.1, will be revised to test the functionality of the portable indication device.

Accuracy

The accuracy of the wide-range level instrument channels is less than ±1 ft. This configuration assures that the instrument channel indication demonstrates that the stored fuel is covered with water. Accuracy is maintained following a power interruption, change in power source, or connection of a battery-powered indication device.

U.S. EPR FSAR Tier 2, Section 9.1.3.6, will be revised to reflect this information.

Display

Continuous display of the spent fuel pool level is available in the Main Control Room. On-demand indication of the spent fuel pool level is available in the Division 1 and 4 I&C rooms of the associated instrument channel. On-demand display is provided by portable battery-powered indication devices that can be operated independently of normal and emergency station power sources.

Training

As discussed in U.S. EPR FSAR Tier 2, Section 13.2, a COL applicant that references the U.S. EPR design certification will provide site-specific information for training programs for plant personnel. A COL item will be added to U.S. EPR FSAR Tier 2, Section 13.2; and U.S. EPR FSAR Tier 2, Table 1.8-2, to require the COL applicant to assess their training program to demonstrate that the spent fuel pool instrumentation will be maintained available and reliable in

an extended loss of all AC power. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels.

References:

1. NRC Order EA-12-051, dated March 12, 2012, Subject: "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation."
2. NRC ISG JLD-ISG-2012-03, Revision 0, dated 8/29/2012, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation."
3. NEI 12-02, Revision 1, Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation."

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.2.5-2; U.S. EPR FSAR Tier 2, Sections 9.1.3.1, 9.1.3.3.2, 9.1.3.6, 13.2, and 14.2.12.1.1; Tables 1.8-2, 3.2.2-1, and 3.11-1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 2.2.5-2—FPCPS Equipment I&C and Electrical Design (~~2~~ 3 Sheets)

Description	Tag Number (1)	Location	IEEE Class 1E Source (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
RBP CI Valve (outside)	30FAL15AA002	Fuel Building (UFA)	Div. 1[N] Div. 2[A]	yes	yes	Position / Position	Open-Close / Open-Close
RBP CI Valve (inside)	30FAL12AA001	Reactor Building (UJA)	Div. 4[N] Div. 3[A]	yes	yes	Position / Position	Open-Close / Open-Close
SFP Makeup Pump	30FAL02AP001	Fuel Building (UFA)	Div. 1	N/A	yes	On-Off / N/A	Start-Stop / N/A
SFP WR Level Sensor	30FAK31CL003	Fuel Building (UFA)	Div. 1[N] / Div. 2[A]	Note 3	N/A	Level / N/A	NA / N/A
SFP WR Level Sensor	30FAK31CL004	Fuel Building (UFA)	Div. 4[N] / Div. 3[A]	Note 3	N/A	Level / N/A	NA / N/A
SFP WR Level Sensor	30FAK31CL005	Fuel Building (UFA)	Div. 1[N] / Div. 2[A]	Note 3	N/A	Level / N/A	N/A / N/A
SFP WR Level Sensor	30FAK31CL006	Fuel Building (UFA)	Div. 4[N] / Div. 3[A]	Note 3	N/A	Level / N/A	N/A / N/A

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; [A] denotes the division the component is powered from when alternate feed is implemented.

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Table 2.2.5-2—FPCPS Equipment I&C and Electrical Design (3 Sheets)

3) The SFP WR level sensors will be qualified to operate for a minimum of seven days under the following conditions:

- Radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water where fuel remains covered.
- Temperature of 212 degrees F and 100% relative humidity.
- Boiling water and/or steam environment.
- Concentrated borated water environment.

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Table 1.8-2—U.S. EPR Combined License Information Items
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Item No.	Description	Section
12.3-3	A COL applicant that references the U.S. EPR design certification will describe the use of portable instruments, and the associated training and procedures, to accurately determine the airborne iodine concentration within the facility where plant personnel may be present during an accident, in accordance with requirements of 10 CFR 50.34(f)(2)(xxvii) and the criteria in Item III.D.3.3 of NUREG-0737. The procedures for locating suspected high-activity areas will be described.	12.3.4.5
12.3-4	A COL applicant that references the U.S. EPR design certification will maintain dose rates below the administrative limits shown in Table or revise nearby or adjacent radiation zone designations as necessary based on site-specific dose analysis for the areas listed in Table .	12.3.2.3
12.5-1	A COL applicant that references the U.S. EPR design certification will fully describe, at the functional level, elements of the Radiation Protection Program. The purpose of the Radiation Protection Program is to maintain occupational and public doses ALARA. The program description will identify how the program is developed, documented, and implemented through plant procedures that address quality requirements commensurate with the scope and extent of licensed activities. This program will comply with the provisions of 10 CFR Parts 19, 20, 50, 52, and 71 and be consistent with the guidance in RGs 1.206, 1.8, 8.2, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.13, 8.15, 8.27, 8.28, 8.29, 8.34, 8.35, 8.36, 8.38, and the consolidated guidance in NUREG-1736.	12.5
13.1-1	A COL applicant that references the U.S. EPR design certification will provide site-specific information for management, technical support, and operating organizations.	13.1
13.2-1	A COL applicant that references the U.S. EPR design certification will provide site-specific information for training programs for plant personnel.	13.2
13.2-2	A COL applicant that references the U.S. EPR design certification will assess their training program to demonstrate that the spent fuel pool instrumentation will be maintained available and reliable in an extended loss of AC power. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels.	13.2
13.3-1	A COL applicant that references the U.S. EPR design certification will provide a site-specific emergency plan in accordance with 10 CFR 50.47 and 10 CFR 50 Appendix E.	13.3

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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
30FAL12 AA001	Reactor Building Purification Containment Isolation Valve (Inner)	S	B	I	Yes	UJA	ASME Class 2[2]
30FAL12/15 AA002	Reactor Building Purification Containment Isolation Valves (Outer)	S	B	I	Yes	UFA	ASME Class 2[2]
30FAL12 AP001	Reactor Building Purification Pump	NS	D	NSC	No	UFA	ASME VIII[8]
30FAL11 AP001	Reactor Building Skimming Pump	NS	D	NSC	No	UJA	ASME VIII[8]
30FAL02 AP001	Spent Fuel Pool Makeup Pump	S	C	I	Yes	UFA	ASME Class 3[3]
FAL	Spent Fuel Pool Makeup Pump Piping	S	C	I	Yes	UFA	ASME Class 3[3]
30FAK31CL003, CL004, CL005, CL006	Spent Fuel Pool Wide Range Level Sensors	S	N/A	I	Yes	UFA	IEEE 323 IEEE 344
KBA, KBD	**Chemical & Volume Control System**						
30KBA20 AA104	3-Way Control Valve to KBB	NS-AQ	D	NSC	Yes	UFA	ANSI/ASME B31.1[6]

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment
Sheet 78 of 136

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)
Letdown Line Flow Transmitter	30KBA14CF752	30UFA01084	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
LP Reducing Station Control Valve Positi	30KBA14CG106	30UFA06095	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
VCT Level Transmitter	30KBA20CL750	30UFA10084	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
VCT Level Transmitter	30KBA20CL751	30UFA06084	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
VCT Level Transmitter	30KBA20CL752	30UFA10084	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Flow Transmitter	30KBA34CF851A	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Flow Transmitter	30KBA34CF851B	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Flow Transmitter	30KBA34CF852A	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Flow Transmitter	30KBA34CF852B	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Boron Concentration Measurement Transmit	30KBA34CQ857A	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Boron Concentration Measurement Transmit	30KBA34CQ857B	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Boron Concentration Measurement Transmit	30KBA34CQ858A	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Boron Concentration Measurement Transmit	30KBA34CQ858B	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Temperature Tran	30KBA34CT857A	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Temperature Tran	30KBA34CT857B	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Temperature Tran	30KBA34CT858A	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Charging Pump Discharge Temperature Tran	30KBA34CT858B	30UFA01033	M	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
JEW							
RCP Seal Water Injection Outside Cont. I	30JEW01AA005	30UFA06045	M	H	ES PAM SI	S 1E EMC	Y (2) Y (5) Y (6)
RCP Seal Water Leakoff Inside Containmen	30JEW50AA001	30UJA07016	H	H	ES PAM SI	S 1E EMC	Y (1) Y (5)
RCP Seal Water Leakoff Outside Containme	30JEW50AA002	30UFA06045	M	H	ES PAM SI	S 1E EMC	Y (2) Y (5) Y (6)
Spent Fuel Pool Wide Range Level Sensor	30FAK31CL003	30UFA29015	Note 6	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Spent Fuel Pool Wide Range Level Sensor	30FAK31CL004	30UFA29015	Note 6	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Spent Fuel Pool Wide Range Level Sensor	30FAK31CL005	30UFA29015	Note 6	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
Spent Fuel Pool Wide Range Level Sensor	30FAK31CL006	30UFA29015	Note 6	H	SI	S 1E EMC	Y (2) Y (5) Y (6)
AUXILIARY SYSTEMS							
Nuclear Sampling System (NSS)							
RCS HL1 Iso Vlv Actuator	30KUA10AA002	30UJA18003	H	H	SI	S 1E EMC	Y (1) Y (5)
RCS HL1 Inner Cont Iso Vlv Actuator	30KUA10AA003	30UJA07016	H	H	ES PAM SI	S 1E EMC	Y (1) Y (5)
RCS HL1 Outer Iso Cont Vlv Actuator	30KUA10AA004	30UFA06045	M	H	ES PAM SI	S 1E EMC	Y (2) Y (5) Y (6)
Pressurizer Sample Vlv Actuator	30KUA20AA001	30UJB05003	M	M	SI	S 1E EMC	Y (5) Y (6)
Pressurizer Inner Cont Iso Vlv Actuator	30KUA20AA002	30UJB05003	M	M	ES PAM SI	S 1E EMC	Y (5) Y (6)

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment
Sheet 136 of 136

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)
Electrical Containment Penetration JML40GD447	JML40GE447	30UJB18F0447B	H	H	RT ES PAM SI	S 1E	Y(1) Y(5)
Electrical Containment Penetration JML40GD448	JML40GP448	30UJB18F0448B	H	H	RT ES PAM SI	S 1E	Y(1) Y(5)
For a List of Components Requiring Seismic Qualification see Table 3.10-1							

NOTES

1. EQ Environment: M (Mild), H (Harsh)
2. Radiation Environment Zone: M (Mild), H (Harsh)
3. EQ Designated Function: RT (Reactor Trip), ES (Engineered Safeguards), PAM (Post Accident Monitoring), SI (Seismic I), SII (Seismic II)
4. Safety Class: S (Safety Related), NS-AQ (Supplemental Grade Non-Safety), 1E (Class 1E), EMC (Electromagnetic Compatibility), C/NM (Consumables/Non Metallics)
5. EQ Program Designation: Yes (1) = Full EQ Electrical, Yes (2) = EQ Radiation Harsh-Electrical, Yes (3) = EQ Radiation Harsh-Consumables, Yes (4) = EQ for Consumables, Yes (5) = EQ Seismic, Yes (6) = EQ EMC.
6 SFP WR level sensors will be qualified to operate for a minimum of seven days under the following conditions:
   - Radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water where fuel remains covered.
   - Temperature of 212 degrees F and 100% relative humidity environment.
   - Boiling water and/or steam environment.
   - Concentrated borated water environment.

RAI 550,
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section C.2 with regard to provisions for decontamination is provided in Section 12.3.1.

12. The safety-related components and systems of the FPCPS are not shared among nuclear power units (GDC 5).

13. Designed to provide acceptable performance for the environments anticipated under normal, testing, and design basis conditions in compliance with the requirements of 10 CFR 50.49.

14. Monitoring capability provides on-demand indication of SFP level independent of AC and DC normal and emergency power sources.

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9.1.3.2 System Description

9.1.3.2.1 General Description

The FPCPS system is described in following four sections:

- Fuel Building and Reactor Building pools.
- Fuel pool cooling system.
- SFP makeup capability.
- Fuel pool purification system.

9.1.3.2.2 Fuel Building and Reactor Building Pools

The Fuel Building pool (see also the description of the Fuel Building in Section 3.8.4 and the Spent Fuel Storage Facility in Section 9.1.2.2.2) includes the following three compartments:

- The Fuel Building Transfer Compartment is used for transfer of used or new fuel between the Fuel Building and the Reactor Building. This compartment is filled from the in-containment refueling water storage tank (IRWST) before refueling.
- The Cask Loading Pit is filled with water when spent fuel transfer from the pool is required. The water needed to fill this compartment is stored in the Fuel Building Transfer Compartment.
- The SFP is dedicated to the storage and cooling of the spent fuel.

The Reactor Building pool (see also the description of the Reactor Building in Section 1.2 and Section 3.8) includes the following four compartments:

- The Reactor Building transfer compartment is connected to the Fuel Building Transfer Compartment by a transfer tube (see Section 9.1.4), and is used for transfer of used or new fuel between the Fuel Building and the Reactor Building.

In addition to the spent fuel level indication in the MCR, the water level can be checked locally. The affected part of the FPCS or FPPS then can be isolated and repaired.

Failure of FPCS Train

In the case of failure of the operating FPCS pump, the train can be restarted and realigned by starting the parallel FPCS pump. Alternatively, the other FPCS train can be put into operation.

The FPCS has the capability to maintain the SFP temperature below 140°F during refueling operations, including a full core offload, following the complete loss of one train.

Instrumentation is available to detect a reduction in FPCS flow or heat exchanger performance that could impact SFP decay heat removal capability.

Loss of Offsite Power

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The FPCPS components that perform safety functions are fed from both offsite and onsite power. The power supply to both trains of FPCS components that perform safety functions and FPPS containment isolation valves is backed by the emergency diesel generators (See Section 8.3).

Loss of Normal and Emergency AC and DC Power

The FPCPS instrumentation includes provisions for monitoring of SFP level independently of station AC and DC normal and emergency power sources. Battery powered portable indication devices can be connected to the Division 1 and 4 instrument channels to power the instrument loop and provide on-demand indication in the Division 1 and 4 instrumentation and control (I&C) rooms.

9.1.3.4 Safety Evaluation

1. The FPPS provides containment isolation for the reactor pool purification supply and return piping.

   The containment isolation valves are qualified for accident environment conditions (i.e., radiation, temperature, pressure and humidity). The motor-operated isolation valves are provided with Class 1E emergency power to automatically close upon receipt of a containment isolation signal. See Section 6.2.4 for further details on the containment isolation system.

2. The safety-related components of the FPCPS, including the SFP makeup capability components, are located inside the Fuel Building and Reactor Building, which are Seismic Category I structures that are designed to withstand effects of natural

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.

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- 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.
- FPCS heat exchanger SFP water and CCWS inlet and outlet temperature indication.
- FPCS heat exchanger fuel pool cooling and CCWS flow.
- Containment isolation valve position.
- Fuel Building area radiation monitors (see Section 12.3.4).

13.2 Training

A COL applicant that references the U.S. EPR design certification will provide site-specific information for training programs for plant personnel. Additional information on training is provided in Section 18.9.

A COL applicant that references the U.S. EPR design certification will assess their training program to demonstrate that the spent fuel pool instrumentation will be maintained available and reliable in an extended loss of all AC power. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels.

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3.10 Measure differential pressure across the FPP ion exchanger, pre-filter, and post filter.

3.11 Measure the performance characteristics of power-operated valves (e.g., thrust, stroke time, fail position upon loss of motive power) as designed.

3.12 Operate control valves remotely while:

a. Observing each valve operation and position indication.

b. Measuring valve performance data (e.g., thrust, opening and closing times).

3.13 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

3.14 Connect and check the on-demand level indication functionality of the battery-powered SFP portable indication devices.

4.0 DATA REQUIRED

4.1 Pump head versus flow and operating data for each pump.

4.2 FPC pump flows for tested alignments.

4.3 FPC isolation valve performance results.

4.4 FPC heat exchanger pressure drop results.

4.5 FPP pump flows for tested alignments.

4.6 FPP ion exchanger, pre-filter, and post filter pressure drop results.

4.7 Setpoints of alarms interlocks and controls.

4.8 Anti-siphon device inspection report.

4.9 Spent fuel pool gate leakage data.

4.10 Valve performance data.

4.11 Control valve operation and position.

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5.0 ACCEPTANCE CRITERIA

5.1 The FPCPS meets design requirements (refer to Sections 9.1.2 and 9.1.3):

5.1.1 FPC pump performance within limits.

5.1.2 FPC instrument and controls, interlocks, and alarms function as designed.

5.1.3 Design flows are achieved for both one FPC pump and two FPC pump system operation.

5.1.4 FPC isolation valves operate as designed (valve open on pump start and close on pump stop).