ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Monday, December 29, 2008 1:53 PM
To: Getachew Tesfaye
Cc: John Rycyna; Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 83, FSAR Ch 10, Supplement 1
Attachments: RAI 83 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 12 of the 17 questions of RAI No. 83 on November 10, 2008. The attached file, "RAI 83 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to 2 of the remaining 5 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 83 Supplement 1 Questions 10.04.09-1 and 10.04.09-10.

The following table indicates the respective pages in the response document, "RAI 83 Supplement 1 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 83 — 10.04.09-1	2	3
RAI 83 — 10.04.09-10	4	4

The schedule for technically correct and complete responses to the remaining 3 questions is unchanged and is provided below:

Question #	Response Date
RAI 83 — 10.04.09-5	February 20, 2009
RAI 83 — 10.04.09-9	February 20, 2009
RAI 83 — 10.04.07-2	January 9, 2009

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
AREVA NP, Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
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From: WELLS Russell D (AREVA NP INC)
Sent: Monday, November 10, 2008 5:03 PM
To: 'Getachew Tesfaye'
Cc: 'John Rycyna'; Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V

(AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 83, FSAR Ch 10

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 83 Response US EPR DC.pdf" provides technically correct and complete responses to 12 of the 17 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 83 Questions 10.04.09-2, 10.04.09-3, 10.04.09-6, 10.04.09-7, 10.04.09-8, 10.04.09-11, 10.04.07-1, 10.04.07-3, 10.04.05-1, 10.04.02-1 and 10.04.01-1.

The following table indicates the respective pages in the response document, "RAI 83 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 83 — 10.04.09-1	2	2
RAI 83 — 10.04.09-2	3	3
RAI 83 — 10.04.09-3	4	5
RAI 83 — 10.04.09-4	6	8
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RAI 83 — 10.04.09-10	14	14
RAI 83 — 10.04.09-11	15	15
RAI 83 — 10.04.07-1	16	16
RAI 83 — 10.04.07-2	17	17
RAI 83 — 10.04.07-3	18	19
RAI 83 — 10.04.05-1	20	21
RAI 83 — 10.04.02-1	22	23
RAI 83 — 10.04.01-1	24	24

A complete answer is not provided for 5 of the 17 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 83 — 10.04.09-1	December 31, 2008
RAI 83 — 10.04.09-5	February 20, 2009
RAI 83 — 10.04.09-9	February 20, 2009
RAI 83 — 10.04.09-10	December 31, 2008
RAI 83 — 10.04.07-2	January 9, 2009

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
ronda.pederson@areva.com

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, October 09, 2008 3:36 PM
To: ZZ-DL-A-USEPR-DL
Cc: Angelo Stubbs; Devender Reddy; John Segala; Peter Hearn; Joseph Colaccino; John Rycyna
Subject: U.S. EPR Design Certification Application RAI No. 83(1230,1132,1233,1234,976), FSAR Ch 10

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 16, 2008, and on October 7, 2008, 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: 82

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD41E11396)

Subject: Response to U.S. EPR Design Certification Application RAI No. 83, FSAR Ch 10, Supplement 1
Sent Date: 12/29/2008 1:53:05 PM
Received Date: 12/29/2008 1:53:23 PM
From: WELLS Russell D (AREVA NP INC)

Created By: Russell.Wells@areva.com

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Tracking Status: None
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Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	5131	12/29/2008 1:53:23 PM
RAI 83 Supplement 1 Response US EPR DC.pdf	441615	

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

Response to

Request for Additional Information No. 83 Supplement 1
(1230,1132,1233,1234,976), Revision 0

10/9/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 10.04.09 - Auxiliary Feedwater System (PWR)
SRP Section: 10.04.07 - Condensate and Feedwater System
SRP Section: 10.04.05 - Circulating Water System
SRP Section: 10.04.02 - Main Condenser Evacuation System
SRP Section: 10.04.01 - Main Condensers
Application Section: FSAR Ch. 10
SBPA Branch

Question 10.04.09-1:

10 CFR 50, Appendix A, GDC-4, "Environmental and Dynamic Effects Design Bases," requires safety-related portions of the emergency feedwater systems to be protected against the adverse affects of events associated with pipe breaks. In Tier 1, Section 2.2.4 under arrangement, it is stated that physical separation exists between divisions of the EFWs. During review of the EFWS system, the staff noticed that suction piping from the EFWS storage pools is connected by normally open valves. Since the suction lines to all four storage pools are connected, a common-mode vulnerability may exist if a suction piping or pool leak develops.

The staff requests that the applicant:

1. Explain in the FSAR how there can be physical separation between divisions of EFWS if storage pools all connected by normally-open valves.
2. Discuss in the FSAR whether the valves are safety related and/or powered by class 1E sources and explain why the header isolation valves are not included in Tier 1, Table 2.2.4.1.
3. Explain in the FSAR the absence of pool or suction piping leaks in the failure modes and effects table for the EFWS.
4. Provide in the FSAR the methodology by which the system design, with the pool header isolation valve normally open, precludes the possibility of an internal hazard resulting from a EFWS pipe break in one of the EFWS supply lines adversely affecting the other trains.

Response to Question 10.04.09-1:

1. The open supply header isolation valves do not impact the capability to mitigate design basis events; however, the operator response to beyond design basis events (Refer to RAI 92, Supplement 1 Question 13.06-6) and the definition of Technical Specification requirements are affected by the open valves. The supply header isolation valves will be changed to normally closed valves. U.S. EPR FSAR Tier 2, Section 10.4.9.2 and Section 10.4.9.3 will be revised to reflect that the supply header valves are maintained in the closed position.

   Justification for operator action outside of the control room needed to open these valves includes:

   a. Separation between emergency feedwater system (EFWS) trains and Safeguard Buildings for design basis and applicable beyond design basis events is maintained.

   b. Short term operator actions are not required as a minimum of two storage pools will remain available to allow steam generator (SG) feed for all postulated events (assuming an EFW pump is out of service and a single active failure). The available inventory of two pools will support more than six hours of EFWS operation.

   c. Valve locations can be quickly and readily accessed from the control room.

   d. Local operator action can be taken to align the remaining EFW storage pools, if needed for design bases events.

e. Should a supply header break result from a beyond design basis event, the six hours provides adequate time so that operator actions outside of the control room to align additional EFWS water inventory can be safely performed and in an orderly manner. demineralized water, fire water or other on site water sources can be safely aligned at this time to provide make-up to the EFWS storage pools, as needed.

2. The supply header isolation valves are safety-related manual valves that may have to be opened to fulfill their safety function. U.S. EPR FSAR Tier 1, Figure 2.2.4-1, Sheets 1 through 4—Emergency Feedwater System Functional Arrangement will be revised to show the supply header isolation valves. U.S. EPR FSAR Tier 1, Table 2.2.4-1—EFWS Equipment Mechanical Design will be revised to list these valves.

3. Storage pool or supply header piping leakage was considered a passive failure in the FMEA. Passive failures are not required to be considered for the initial 24 hours for the events included in the FMEA.

4. The normally closed supply header isolation valves will preclude consideration of this concern.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 10.4.9.2 and Section 10.4.9.3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 1, Figure 2.2.4-1 and Table 2.2.4-1 will be revised as described in the response and indicated on the enclosed markup.

Question 10.04.09-10:

Surveillance requirements for the following parameters for the EFW storage pools are provided: (1) storage pool volume, and, (2) EFW SP supply cross-connect valves locked open. Because locking open the cross tie valves remove the train independence, the staff requests that the applicant provide justification in the FSAR for locking open the storage pool cross tie valves.

Response to Question 10.04.09-10:

As described in the response to Question 10.04.09-1, the storage pool cross tie valves will be changed to normally closed manual valves. U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Surveillance Requirement (SR) 3.7.5, Bases 3.7.5, SR 3.7.6 and Bases 3.7.6 will be revised to reflect this new valve alignment.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications SR 3.7.5, Bases 3.7.5, SR 3.7.6 and Bases 3.7.6 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

10.04.09-1

Table 2.2.4-1 - EFWS Equipment Mechanical Design (2 Sheets)

Equipment Description	Equipment Tag Number(1)	Equipment Location	ASME Code Section III	Function	Seismic Category
(Division 2, Division 3, Division 4)	(30LAR31 AA007) (30LAR41 AA007)			Isolation)	
EFW Supply Header Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30LAR13 AA001 (30LAR23 AA001) (30LAR33 AA001) (30LAR43 AA001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	yes	open , close	I
EFW Discharge Header Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30LAR14 AA001 (30LAR24 AA001) (30LAR34 AA001) (30LAR44 AA001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	yes	open , close	I
EFW Pump Flow Division 1 (Division 2, Division 3, Division 4)	30LAR11 CF801 (30LAR21 CF801) (30LAR31 CF801) (30LAR41 CF801)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	yes	indication , control	I
EFW Flow to SG Division 1 (Division 2, Division 3, Division 4)	30LAR11 CF002 (30LAR21 CF002) (30LAR31 CF002) (30LAR41 CF002)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	yes	indication	I
Demineralized Water Distribution System Isolation Valve	30LAR04 AA001	Safeguard Building 4	yes	close	I

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

Figure 2.2.4-1—Emergency Feedwater System Functional Arrangement
Sheet 1 of 4

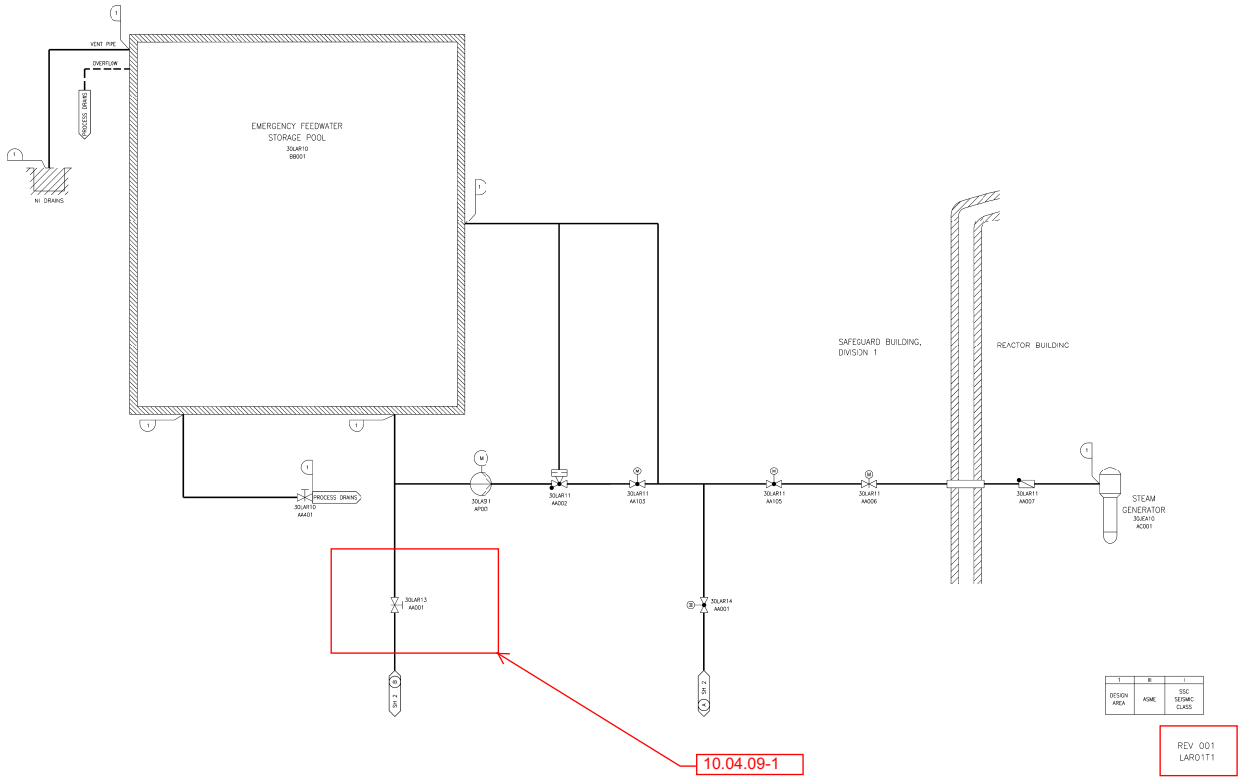


Figure 2.2.4-1—Emergency Feedwater System Functional Arrangement
Sheet 2 of 4

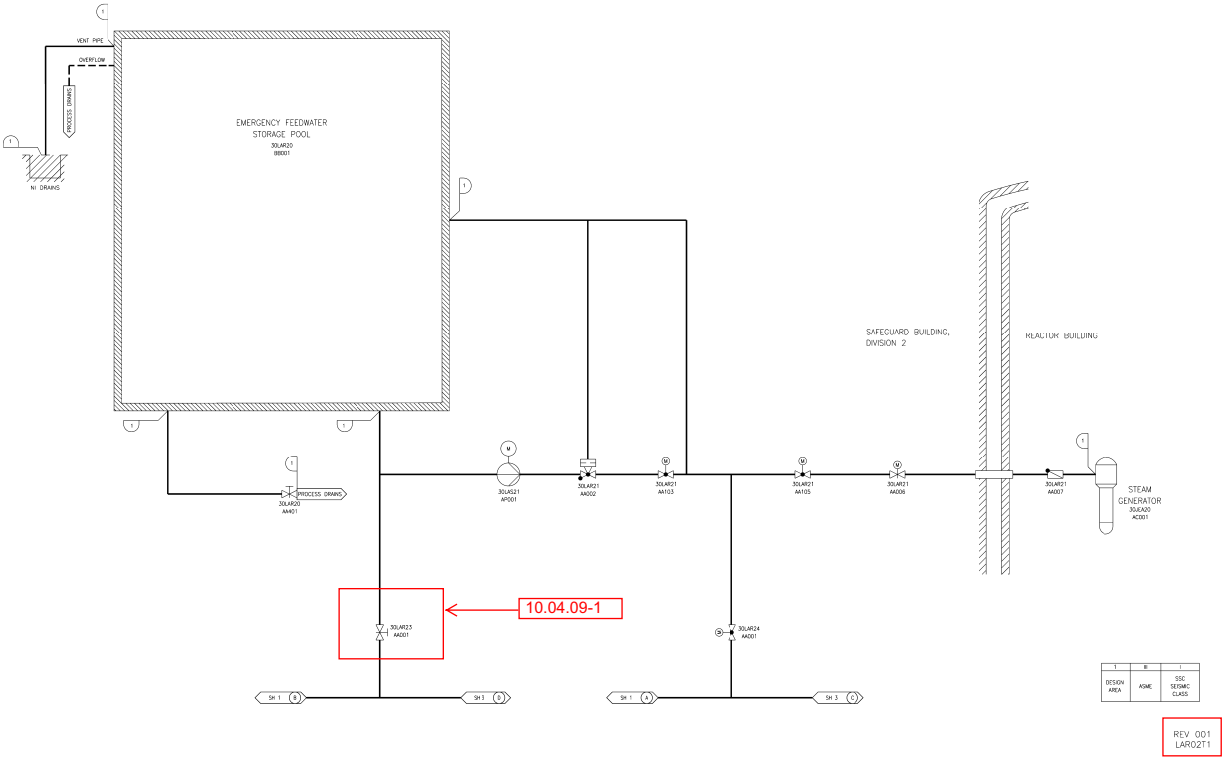


Figure 2.2.4-1—Emergency Feedwater System Functional Arrangement
Sheet 3 of 4

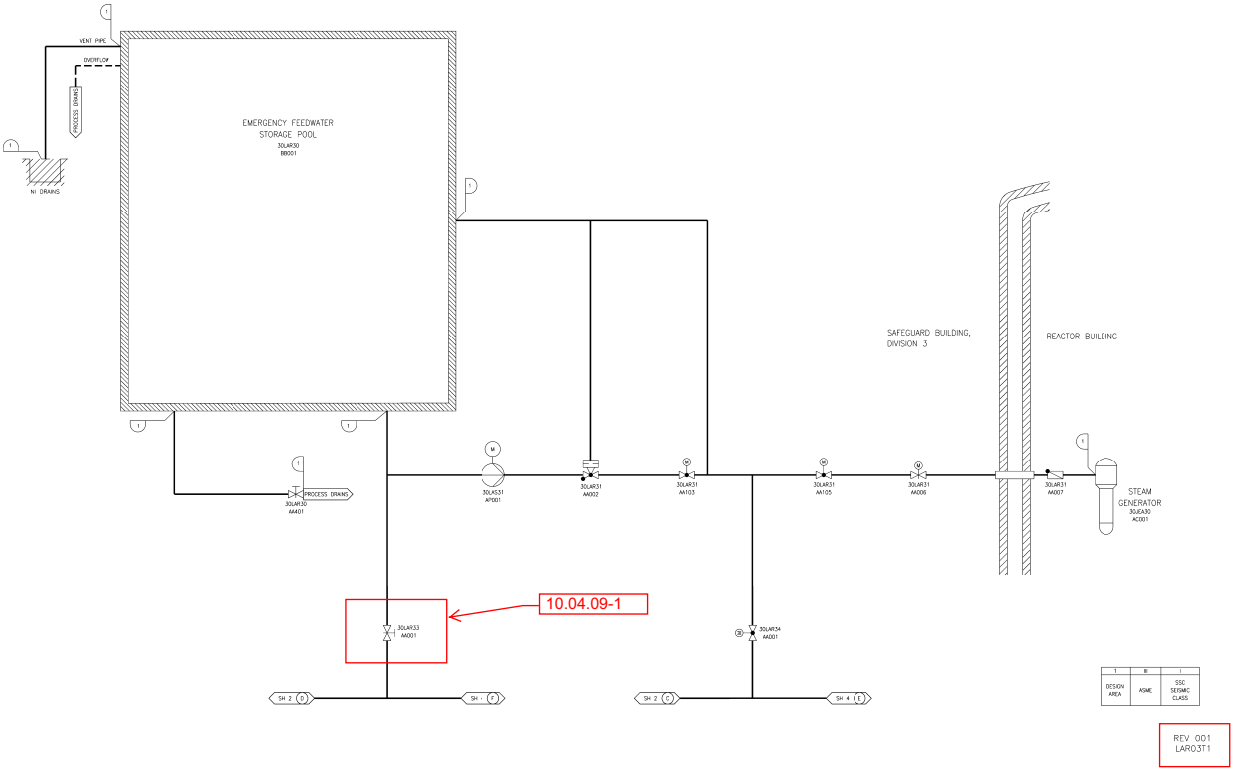
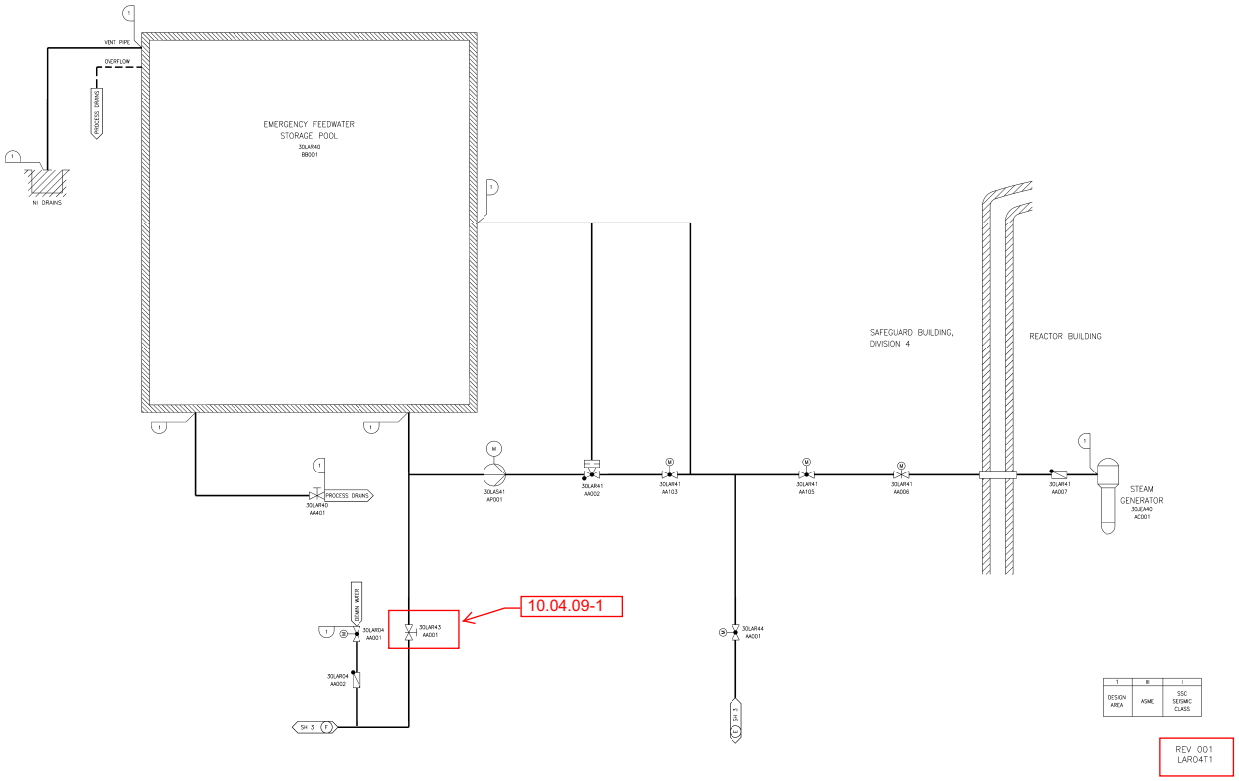


Figure 2.2.4-1—Emergency Feedwater System Functional Arrangement
Sheet 4 of 4



Next File

cool the plant to the RHR system cut-in temperature assuming a single active failure with the loss of offsite power (GDC 34 and GDC 44).

- Safety-related portions of the EFWS are designed to permit appropriate periodic inspection of components important to the integrity and capability of the system (GDC 45).

- Safety-related portions of the EFWS are designed to include the capability for testing through the full operational sequence that brings the system into operation for reactor shutdown and for loss-of-coolant accidents, including operation of applicable portions of the protection system and the transfer between normal and emergency buses (GDC 46).

- Safety-related portions of the EFWS are capable of automatic initiation under conditions indicative of an anticipated transient without scram (ATWS) (10 CFR 50.62).

- The EFWS is capable of providing sufficient decay heat removal during a station blackout (SBO) (10 CFR 50.63). This is a non-safety-related function.

The EFWS is a safety-related system and is not required to operate during normal plant operation. As described in Section 10.4.7, during normal power operation the heat removal function is performed by the main feedwater system (MFWS) or the startup and shutdown system (SSS).

10.4.9.2 System Description

10.4.9.2.1 General System Description

A flow diagram of the EFWS is shown in Figure 10.4.9-1—Emergency Feedwater System Flow Diagram. The EFWS has four separate trains, each consisting of a water storage pool, pump, control valves, isolation valves, piping and instrumentation. A supply header is provided that allows a cross-connection of the storage pools to the pump suctions and another header that allows cross-connection of the discharge of the pumps to the SGs. The supply headers have manual isolation valves that are normally maintained in the ~~open~~closed position, while the discharge header is isolated by motor-operated valves (MOV), which allow changing pump discharge alignment from the main control room (MCR).

10.04.09-1

One EFWS train is located in the lower levels of each of the Safeguard Buildings that provide separation and physical protection from external and internal hazards. The storage pools are stainless steel-lined concrete which are part of each Safeguard Building structure.

The demineralized water distribution system is used to initially fill the EFWS storage pools and can be aligned from the MCR to provide makeup to the storage pools.

EFW Steam Generator Isolation Valves

The EFW SG isolation valves are motor operated gate valves that are in the open position during normal plant operation and receive a closure signal upon SG high level following a SGTR to prevent SG overfill and provide the outside containment isolation boundary. The valves also can be manually closed from the MCR to isolate EFW flow to an affected SG.

EFW Minimum Flow Check Valves

The EFW minimum flow check valves prevent backflow and also open when the EFW pump is running. If flow to the SG is below the minimum required pump flow, the bypass flow path is opened to provide the minimum EFW pump flow back to the storage pool. This minimum recirculation path automatically closes when the SG injection flow increases above the minimum required pump flow. The design temperature of the minimum recirculation valve and piping conservatively reflects the increased temperature of the recirculation flow.

The check valve minimum flow path capability is sized to provide the required minimum pump flow of approximately 88 gpm. This value of required minimum recirculation flow is based on preliminary vendor information, which will be refined during the pump procurement process and confirmed by vendor performed analysis and/or testing. The objective will be to use the minimum recirculation flow that provides stable flow conditions with respect to rotor and hydraulic stability, as well as acceptable thermal conditions as required by IE Bulletin 88-04. The concern identified in IE Bulletin 88-04 that is related to the potential dead heading of one or more pumps that have a minimum flow line common to two or more pumps does not apply to the U.S. EPR design since each pump has a separate and independent minimum flow recirculation line.

EFW Isolation Check Valves

The EFW containment isolation check valves provide the inside containment isolation boundary and prevent the backflow of contaminated liquid outside the containment following an SGTR.

EFW Supply Header and Discharge Header Isolation Valves

The supply header isolation valves are maintained open and the discharge header isolation valves are maintained closed during normal plant operation and can be opened, as necessary, to change component alignments. The discharge header isolation valves are motor operated and also have manual hand wheels so that they can be operated from the MCR or locally.

10.04.09-1

10.4.9.2.2.4 EFWS Piping

The EFWS piping is routed to minimize the potential for destructive water hammer during startup. The EFWS piping connects directly to the SGs so it is not directly impacted by pressure transients in the main feedwater (MFW) piping. The EFWS piping continuously rises from the containment penetration to the connection with the SG. Each EFWS injection path also includes a check valve within the containment. Within the SGs, the EFW flow is routed through a split ring header. EFWS flow exits the ring header via vertical tubes so that the ring header is maintained full of water.

Piping in the EFWS is required to be maintained full of water. Procedures are required to assure that the piping is properly filled, vented, and maintained full of water. System maintenance and operating procedures will also include guidance and precautions to be exercised during system and component testing when changing valve alignments or when starting or stopping of pumps.

10.4.9.2.2.5 Electrical Power Supply

Each EFWS train receives power from a separate Class 1E emergency power system. In the event of loss of normal onsite and offsite power, power is supplied by the EDGs. The level control valves, SG isolation valves, and discharge header cross-connect valves are also provided uninterruptible battery power.

In addition, EFWS trains 1 and 4 can be powered from the SBODGs.

A more detailed description of the onsite power systems is provided in Section 8.3.

10.4.9.2.3 System Operation

10.4.9.2.3.1 Normal Plant Operation

During normal plant operation, the heat removal function is performed by the MFWS or the SSS. The EFWS is maintained in standby condition ready for actuation. The EFWS is aligned as follows:

- The EFWS pumps are available on standby, ready to start.
- The SG level control valves are open.
- The flow control valves are closed at their mechanical stop.
- The SG isolation valves are open.
- The discharge header isolation valves are closed.
- The pool supply header isolation valves are ~~open~~closed.

10.04.09-1

single internal hazard. The EFWS components are located in the Safeguard Buildings (SBs) and the Reactor Building (RB). No piping has been identified which could result in internally generated missiles, pipe whip, or jet impingement forces that could impact operation of the EFWS. Refer to U.S. EPR FSAR Tier 2, Section 3.6.1 for information regarding the plant design for protection against postulated piping failures in fluid systems outside of containment.

- Each EFWS train, including the storage pools, is located within a Safeguard Building which is Seismic Category I and provides protection from external missiles. External missiles are addressed in U.S. EPR FSAR Tier 2, Section 3.5.

- EFWS components located within the Reactor Building are qualified for accident environmental conditions (radiation, temperature, pressure, and humidity). EFWS components located in the Safeguard Buildings are qualified for accident environmental radiation conditions. The Safeguard Building heating, ventilation and air conditioning (HVAC) system maintains acceptable environmental conditions for operation of the active EFWS equipment. Refer to U.S. EPR FSAR Tier 2, Section 3.11 for equipment qualification.

The design of the safety-related portions of the EFWS satisfies GDC 5 regarding sharing of systems. The EFWS is not shared among nuclear power units.

The design of the safety-related portions of the EFWS satisfies GDC 19 and Reference 1 regarding the capability to support RCS cooldown from the MCR using only safety grade equipment and assuming any single active failure.

10.04.09-1

- The water inventory of all four storage pools ~~is available~~can be aligned to any available EFWS pump train. The required EFWS water inventory was determined in conformance with Reference 1. Cooldown analyses were performed that included cases with and without offsite power available. Only safety related and Seismic Category I equipment is used to perform the cooldown and required operator actions are performed from the MCR. The exception is that all four RCPs were conservatively assumed (i.e., additional heat load) to be running for the cases with offsite power available. Hot standby conditions were maintained for four hours before initiating the cooldown for all cases. A cooldown rate of 50°F/hr was used for the bounding loss of offsite power case, rather than the normal 90°F/hr rate.

  – The 50°F/hr rate increases the EFWS water usage and is considered a rate that plant operators can readily manage for this natural cooldown case with the restrictions applied by Reference 1.

  – A hot leg subcooling margin of 50 to 25°F is maintained during the cooldown.

  – The total EFWS water used for the bounding cases, with or without offsite power, is less than 300,000 gallons.

  – The combined available water inventory of three storage pools is sufficient to support the bounding cooldown cases.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Four of the pump EFW trains inoperable in MODE 1, 2, or 3.	D.1 ----------NOTE---------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one EFW pump train is restored to OPERABLE status. ---------- Initiate action to restore one EFW pump train to OPERABLE status.	Immediately
E. One required EFW pump train inoperable in MODE 4.	E.1 Initiate action to restore required EFW pump train to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.1	Verify each EFW manual, power operated, and automatic valve in each water flow path that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.5.2	Verify EFW pump suction ~~and supply header~~ isolation valves are locked open.	31 days
SR 3.7.5.3	Cycle each EFW discharge header cross-connect valve.	In accordance with the Inservice Testing Program

10.04.09-10

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.6.1	Verify the EFW Storage Pools contain a usable volume ≥ 300,000 gal.	24 hours
SR 3.7.6.2	Verify each EFW Storage Pool supply cross connect valve is ~~locked open~~closed.	31 days

10.04.09-10

BASES

ACTIONS (continued)

E.1

In MODE 4, either the reactor coolant pumps or the LHSI loops can be used to provide forced circulation. This is addressed in LCO 3.4.6, "RCS Loops - MODE 4." With the one required EFW pump inoperable, action must be taken to immediately restore an inoperable train to OPERABLE status. The immediate Completion Time is consistent with LCO 3.4.6.

SURVEILLANCE REQUIREMENTS

SR 3.7.5.1

Verifying the correct alignment for manual, power operated, and automatic valves in the EFW System flow paths provides assurance that the proper flow paths will exist for EFW operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to locking, sealing, or securing. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This Surveillance does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. For the EFW System, this SR includes the steam generator blowdown isolation valves.

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

10.04.09-10

SR 3.7.5.2

Each EFW pump suction ~~and supply header~~ isolation valve is required to be verified locked open at 31 day intervals. This surveillance is designed to ensure that ~~all~~each EFW pump~~s~~ can access the inventory of ~~all~~its EFW pool~~s~~.

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

SR 3.7.5.3

Each EFW discharge header cross-connect valve is required to be cycled in order to assure the capability for any EFW pump to feed any steam generator as assumed in the main feedwater line break (Ref. 3) The Frequency of this SR is in accordance with the Inservice Testing Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.5.4

Verifying that each EFW pump's developed head at the flow test point is greater than or equal to the required developed head ensures that EFW pump performance has not degraded during the cycle. Flow and differential head are normal tests of centrifugal pump performance required by the ASME Code (Ref. 2). Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. Performance of inservice testing discussed in the ASME Code (Ref. 2) (only required at 3 month intervals) satisfies this requirement.

SR 3.7.5.5

This SR verifies that EFW can be delivered to the appropriate steam generators in the event of any accident or transient that generates a Protection System actuation, by demonstrating that each automatic valve in the flow path actuates to its correct position, each EFW pump starts automatically, and flow rate is controlled within required limits and steam generator level is controlled within limits, on an actual or simulated actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The 24 month Frequency is acceptable based on operating experience and the design reliability of the equipment.

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SR 3.7.5.6

This SR verifies that the EFW is properly aligned by verifying the flow path~~s~~ from each storage pool~~the supply header~~ to its respective steam generator prior to entering MODE 2 after more than 30 days in any combination of MODE 5 or 6 or defueled. OPERABILITY of EFW flow paths must be verified before sufficient core heat is generated that would require the operation of the EFW System during a subsequent shutdown. The Frequency is reasonable, based on engineering judgment and other administrative controls that ensure that flow paths remain OPERABLE. To further ensure EFW System alignment, flow path OPERABILITY is verified following extended outages to determine no misalignment of valves has occurred. This SR ensures that the flow path from the SP to the steam generators is properly aligned.

B 3.7 PLANT SYSTEMS

B 3.7.6 Emergency Feedwater (EFW) Storage Pools

BASES

BACKGROUND

The EFW pumps take suction through separate suction lines from their respective EFW storage pool (SP) and normally pump to their respective steam generator secondary side via separate and independent connections. The steam generators function as a heat sink for core decay heat. The heat load is dissipated by releasing steam to the atmosphere from the steam generators via the main steam safety valves (MSSVs) (LCO 3.7.1) or main steam relief trains (MSRTs) (LCO 3.7.4). If the main condenser is available, steam may be released via the steam bypass valves.

The EFW System consists of four motor driven EFW pumps and four EFW SPs configured into four separate trains. The inventory of the four EFW SPs ~~is available~~can be aligned to all EFW pumps through the common supply header.

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Because the SPs are principal components in removing residual heat from the Reactor Coolant System (RCS), they are designed to withstand earthquakes and other natural phenomena, including missiles that might be generated by natural phenomena. The SPs are designed to Seismic Category I to ensure availability of the feedwater supply. A description of the SPs is found in FSAR Section 10.4.9 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The EFW SPs provide cooling water to remove decay heat and to cool down the unit following all events in the accident analysis as discussed in Chapters 6 and 15 (Ref. 2 and 3, respectively). For anticipated operational occurrences and accidents that do not affect the OPERABILITY of the steam generators, the analysis assumption is generally four hours at MODE 3, steaming through the MSSVs and ~~MSRVs~~ MSRTs followed by a cooldown to residual heat removal (RHR) entry conditions at the design cooldown rate or a lower cooldown rate if offsite power is not available.

The limiting accident for the EFW SPs is a Main Feedwater Line Break (MFWLB) with a natural circulation cooldown.

The EFW SPs satisfy the requirements of Criterion 2 and 3 of 10 CFR 50.36(~~d~~c)(2)(ii).

BASES

LCO

To satisfy accident analysis assumptions, the EFW SPs must contain sufficient water to remove decay heat for four hours following a reactor trip from 102% RTP and then to cool down the RCS to RHR entry conditions, assuming a coincident loss of offsite power and the most adverse single failure. In doing this, it must retain sufficient water to ensure adequate net positive suction head for the EFW pumps during cooldown or before isolating EFW to a faulted steam generator.

The EFW SP required usable volume of 300,000 gallons is based on a cooldown to RHR entry conditions at 50°F/hour, with all four reactor coolant pumps in service. This basis is established in Reference 1 and exceeds the volume required by the accident analysis.

The OPERABILITY of the EFW SPs is determined by summing the available tank volumes. The volume in an SP is considered usable when it is aligned to its respective EFW pump~~the common supply header~~.

APPLICABILITY

In MODES 1, 2, and 3, and in MODE 4, when a steam generator is being relied upon for heat removal, the EFW SPs are required to be OPERABLE to support EFW System operability.

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In MODE 5 or 6, the EFW SPs are not required because the EFW System is not required.

ACTIONS

A.1 and A.2

With one of the EFW SPs inoperable in MODE 1, 2, or 3, or MODE 4, when a steam generator is being relied upon for heat removal, action must be taken to verify the usable volume in the remaining SPs is ≥ 300,000 gal. and to declare the associated EFW train inoperable.

B.1 and B.2

With two or more EFW SPs inoperable or the usable volume of the available SPs is < 300,000 gal., the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 4, without reliance on a steam generator for heat removal, within 24 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner, and without challenging unit systems.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.6.1

This SR verifies that the EFW Storage Pools contain the required volume of cooling water. The 24 hour Frequency is based on operating experience and are not used by other systems and that the SPs have no other function thant to supply water to the EFW trains. Also, the 24 hour Frequency is considered adequate in view of other indications in the control room, including alarms, to alert the operator to abnormal deviations in the SP levels.

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SR 3.7.6.2

This SR verifies every 31 days that the EFW storage pool supply cross connect valves are ~~locked open~~closed. This verification ensures that the usable volume in the SP~~s are~~ is available to ~~all~~ its EFW train~~s~~ to ensure EFW train separation ~~through the supply cross connect header and ensures timely discovery if a valve should be not locked open. If an EFW supply cross connect valve is not open, the usable volume of the SP is not available to each of the four EFW trains as assumed in the safety analysis~~. This Frequency is considered reasonable in view of other administrative controls that ensure a mispositioned EFW supply cross connect valve is unlikely.

REFERENCES

1. FSAR Section 10.4.9.
2. FSAR Chapter 6.
3. FSAR Chapter 15.