

ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Thursday, September 17, 2009 6:17 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 251, FSAR Ch. 9, Supplement 1
Attachments: RAI 251 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 4 of the 6 questions of RAI No. 251 on July 24, 2009. The attached file, "RAI 251 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to the remaining 2 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 251 Question 09.05.05-7.

The following table indicates the respective pages in the response document, "RAI 251 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 251 — 09.05.05-7	2	3
RAI 251 — 09.05.06-10	4	4

This concludes the formal AREVA NP response to RAI 251, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Ronda Pederson

ronda.pederson@areva.com

Licensing Manager, U.S. EPR Design Certification

AREVA NP Inc.

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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, July 24, 2009 4:45 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KOWALSKI David J (AREVA NP INC); HARRIS Carolyn A (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 251, FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 251 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 6 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 251 Questions 09.05.04-20, and 09.05.06-11.

The following table indicates the respective pages in the response document, "RAI 251 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 251 — 09.05.04-20	2	2
RAI 251 — 09.05.05-7	3	3
RAI 251 — 09.05.06-9	4	5
RAI 251 — 09.05.06-10	6	6
RAI 251 — 09.05.06-11	7	8
RAI 251 — 09.05.07-11	9	9

A complete answer is not provided for 2 of the 6 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 251 — 09.05.05-7	September 25, 2009
RAI 251 — 09.05.06-10	September 25, 2009

Sincerely,

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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]

Sent: Thursday, June 25, 2009 7:07 AM

To: ZZ-DL-A-USEPR-DL

Cc: Wolfgang, Robert; Segala, John; Bloom, Steven; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No. 251(3070,3062,3064,3066), FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on May 18, 2009, and on June 24, 2009, 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: 821

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Response to

Request for Additional Information No. 251, Supplement 1

6/25/2009

U.S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

**SRP Section: 09.05.04 - Emergency Diesel Engine Fuel Oil Storage and Transfer
System**

SRP Section: 09.05.05 - Emergency Diesel Engine Cooling Water System

SRP Section: 09.05.06 - Emergency Diesel Engine Starting System

SRP Section: 09.05.07 - Emergency Diesel Engine Lubrication System

Application Section: FSAR Ch. 9

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

Question 09.05.05-7:

In RAI 09.05.05-6 the staff asked the applicant to provide descriptions and ITAAC for EDG cooling water system instrumentation and alarms. The applicant responded that the EDG cooling water system does not have alarms, displays, or controls that are required to perform emergency operating procedures. The staff did not concur with the applicant's conclusion. The staff found that some automatic controls are essential for emergency EDG operation (such as controls for the jacket water and intercooler three-way valves and the automatic EDG trips on loss of ESWS flow), and therefore there was no relevance to the applicant's assertion that alarms, controls, or displays were not required for the emergency operating procedures. The staff also noted that a general EDG trouble alarm is annunciated in the main control room.

In view of the above, justify not including these alarms or controls in FSAR Tier 2 Table 18.7-1 or FSAR Tier 1 Table 2.5.4-3. In the absence of ITAAC items to confirm the adequacy of essential EDG cooling water system alarms, displays or controls, justify the satisfactory operations of the EDG under postulated.

Response to Question 09.05.05-7:

The motor-operated temperature control valves associated with the jacket water and intercooler systems have been replaced with thermostat control valves. These valves do not require external power or control for operation.

There are alarms and emergency trips associated with the diesel generator cooling water system (DGCWS). Alarms are received for low essential service water system (ESWS) pressure and high jacket water temperature. There are two emergency mode trips that prevent catastrophic damage to the emergency diesel generator (EDG). The EDG trips on very low ESWS pressure, where the ESWS is unable to provide an adequate heat sink for diesel operation. The ESWS alarm and trip functions are disabled during an EDG emergency start/load sequence to allow the ESWS pump sequencing and system pressure to reach the required level. The EDG trips on very high jacket water temperature in the emergency mode. Alarms and trips are annunciated at the local panel and result in a general diesel alarm in the main control room (MCR). Access to the individual alarms is available in the MCR and at the remote shutdown station.

U.S. EPR FSAR Tier 1, Table 2.5.4-3—Emergency Diesel Generator Electrical Equipment Design and U.S. EPR FSAR Tier 2, Section 9.5.5.6 will be revised to include this information.

SRP 14.3, Appendix C, Fluid Systems Review Checklist, Item II.B.viii, states:

- “(viii) Interlocks. Interlocks needed for direct safety functions should be included in the system design description and ITAAC. Examples include the interlocks to prevent ISLOCA and an interlock that switches the system or component from one mode to a safety function mode. Other interlocks that are more equipment protective in nature, are only in the DCD Tier 2. All of the interlocks are not tested in the system ITAAC because the overall logic is checked in the I&C ITAACs for the safety system logic.”

Based on the guidance in SRP 14.3, the alarms and trips associated with the ESWS are for equipment protection and are not included in U.S. EPR FSAR Tier 1, Table 2.5.4-3. The

general EDG trouble alarm will be added to U.S. EPR FSAR Tier 2, Table 18.7-1—Minimum Inventory of Main Control Room Fixed Alarms, Displays, and Controls.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.5.4-3 and U.S. EPR FSAR Tier 2, Section 9.5.5.6 and Table 18.7-1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.06-10:

In replying to RAI No. 09.05.06-7, the applicant noted that the RAI implied that a design description and ITAAC for EDG starting air system instrumentation and alarms are needed. The applicant stated that the EDG starting air system does not have alarms, displays, or controls that are required to perform emergency operating procedures. Therefore, the applicant stated, there are no EDG starting air system instrumentation and alarms, included in FSAR Tier 1, Table 2.5.4-3, Emergency Diesel Generator Electrical Equipment Design.

Although individual alarms are annunciated on local EDG control panels, a general EDG trouble alarm is annunciated in the main control room. The staff does not concur with the applicant's conclusion regarding descriptions and ITAAC for EDG starting air system instrumentation and alarms. Whether alarms, displays, or controls are required to perform emergency operating procedures is not relevant to implementing automatic controls that are essential to emergency operation.

Provide further information relative to ITAAC items needed to confirm the adequacy of essential alarms, displays, or controls that are required to assure proper EDG operations under postulated accident conditions.

Response to Question 09.05.06-10:

The safety-related function of the diesel generator starting air system (DGSAS) is to start the emergency diesel generator (EDG) on an emergency actuation. The safety-related actuation of the EDG starting air system is directly provided from the plant protection system (PS). The inspections, tests, analyses, and acceptance criteria (ITAAC) for these functions are addressed in U.S. EPR FSAR Tier 1, Table 2.5.4-4—Emergency Diesel Generator ITAAC, Item 6.1, Item 6.3, and Item 6.3.

The EDG control system monitors the starting air system receiver pressure and provides system pressure indication, and start and stop control to the non-safety-related air compressors. Off-normal conditions are annunciated locally and result in a general trouble alarm in the main control room (MCR).

As part of the Response to Question 09.05.05-7, the general EDG trouble alarm will be added to U.S. EPR FSAR Tier 1, Table 2.5.4-3—Emergency Diesel Generator Electrical Equipment Design and to U.S. EPR FSAR Tier 2, Table 18.7-1—Minimum Inventory of Main Control Room Fixed Alarms, Displays, and Controls.

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



Table 2.5.4-3—Emergency Diesel Generator Electrical Equipment Design

Equipment Description	Equipment Tag Number ⁽¹⁾	MCR / RSS Displays	MCR / RSS Controls 09.05.05-7
Emergency Diesel Generator	30XKA10AG- ⁽²⁾ 09.05.05-7 →	Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u> / Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u> .	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop- <u>emergency trip</u> , governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop- <u>emergency trip</u> , governor raise-lower
<u>Emergency Diesel Generator</u>	<u>30XKA20AG⁽²⁾</u> 09.05.05-7 →	<u>Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u> / Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u>.</u>	<u>Generator output voltage raise-lower, output breaker close-trip. Engine start-stop-<u>emergency trip</u>, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop-<u>emergency trip</u>, governor raise-lower</u> 09.05.05-7
Emergency Diesel Generator	30XKA30AG- ⁽²⁾ 09.05.05-7 →	Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u> / Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u> .	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop- <u>emergency trip</u> , governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop- <u>emergency trip</u> , governor raise-lower
Emergency Diesel Generator	30XKA40AG- ⁽²⁾	Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u> / Generator voltage, current, frequency, power, reactive power. Engine running, not running, <u>tripped, general EDG trouble alarm</u> .	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop- <u>emergency trip</u> , governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop- <u>emergency trip</u> , governor raise-lower

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

2) Emergency Diesel Generators are Class 1E.

09.05.05-7

9.5.5.5 Inspection and Testing Requirements

9.5.5.5.1 Normal Testing

Preoperational testing is described in Chapter 14 and Section 14.2, tests #104, 105, and 106.

The DGCWS is tested periodically along with the complete EDG system. This test demonstrates the performance, structural, and leak tight integrity of each system component.

The DGCWS supports test runs of the EDGs on a periodic schedule defined by the plant Technical Specifications. The engine is manually started from the MCR and increased to rated speed in two steps. The engine accelerates to idle speed (≈ 60 percent of rated speed) and is maintained there for a short time to achieve proper warming, then is increased to rated speed.

9.5.5.5.2 LOOP Testing

The DGCWS also supports test runs to simulate a LOOP. This test is an auto-actuation, whereby the diesel starts, accelerates to rated speed, and is under the control of the safety-related control system for automatic load sequencing. This test is normally run during a plant outage.

9.5.5.6 Instrumentation Requirements

Each EDG is provided with sufficient instrumentation to monitor the operation of the cooling water system. Alarms are separately annunciated on the local EDG engine control panel, which also signals a general diesel trouble alarm in the MCR. The DGCWS is provided with the indicators and alarms as shown in Table 9.5.5-1—DGCWS Indicators and Alarms.

Instrumentation and controls for the DGCWS are designed to provide the following ~~control~~safety-related functions:

- Emergency protections – The diesel control will monitor ESWS pressure and will alarm when a minimum pressure is reached, at which point the operability of the EDG could be affected. The EDG will trip on a complete loss of ESWS cooling water. The alarm and trip will be delayed for two minutes during LOOP condition to enable the ESW pump to re-establish flow.
- The diesel control will alarm on high jacket water temperature and will trip on high-high jacket water temperature in all EDG operating modes.
- ~~The ESWS provides a cooling function of the diesel engine through a heat exchanger on each of the cooling loops. These loops are the jacket water and intercooler. The actuators used to perform this function are as follows:~~

09.05.05-7

09.05.05-7 →

- ~~Jacket water cooling circuit—three way valve.~~
 - ~~Intercooler cooling circuit—three way valve.~~
- The instrumentation and controls for the DGCWS are designed to provide the following non-safety-related ~~control~~ functions:
 - Standby heating – The engine is kept warm during standby by a heater and a circulation pump located in the jacket water system. The temperature of the system is monitored and the heater is controlled to maintain a preset temperature. The pump and heater stop when the engine is started.
 - Monitoring of cooling systems – The level in the surge tank and the temperature in the cooling system (i.e., diesel engine inlet and outlet) are continuously monitored. An alarm is received for jacket water high temperature or low level.
- Normal protections – During periodic tests, the engine is stopped in case of low-low level or high temperature cooling water.
- ~~Emergency protections—The diesel control will monitor ESWS flow and will alarm when a minimum flow rate is reached, at which point the operability of the EDG could be affected. The EDG will trip on a complete loss of ESWS cooling water flow. The alarm and trip will be delayed for two minutes during LOOP condition to enable the ESW pump to re-establish flow.~~
- ~~The diesel control will alarm on high jacket water temperature and will trip on high-high jacket water temperature in all EDG operating modes.~~

9.5.5.7

References

1. NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability," University of Dayton Research Institute for the U.S. NRC; UDR-TR-79; February 1979.

**Table 18.7-1—Minimum Inventory of Main Control Room Fixed Alarms,
Displays, and Controls**
Sheet 2 of 2

Description	Alarm	Display	Control
Containment Pressure	X	X	
Containment Radiation Level	X	X	
Containment Isolation Valve Position		X	X
Steam Generator (SG) Level	X	X	
SG Pressure	X	X	
SG Blowdown Flow		X	
Main Steam Isolation Valve (MSIV) Position		X	X
Main Steam Safety Valve (MSSV) Position	X	X	
Main Steam Relief Isolation Valve (MSRIV) Position	X	X	X
Main Steam Flow		X	
Main Steam Line Radiation Monitors	X	X	
Main Feedwater (MFW) Flow	X	X	
Emergency Feedwater (EFW) Flow	X	X	
Main Generator Output and Exciter Breaker Position		X	
24 VDC I&C Power	X	X	
Emergency Power Supply System 6.9kV Bus Voltage	X	X	
Emergency Diesel Generator Actuation	X	X	X
Emergency Diesel Generator Trouble	X	X	
Reactor Trip	X	X	X
Turbine Trip	X	X	X
Reactor Coolant Pump (RCP) Trip	X	X	X
EFW Actuation / Control	X	X	X
MSIV Control	X	X	X
EBS Actuation / Control	X	X	X
CVCS Letdown Isolation Valve Position		X	X
Main Steam Relief Train (MSRT) Setpoint Control	X	X	X
MFW Isolation Valve Position		X	X
MHSI Actuation / Control		X	X

09.05.05-7