AREVAEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, October 14, 2011 10:34 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); CRIBB Arnie (EXTERNAL AREVA); DELANO Karen (AREVA); HATHCOCK Phillip (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); LENTZ Tony (EXTERNAL AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 484 (5724), FSARCh. 16, NEW PHASE 4 RAI, Question 16-322
Attachments: RAI 484 Question 16-322 Response US EPR DC - DRAFT.pdf

Getachew,

Attached is a draft response for RAI No. 484, FSAR Ch. 16, Question 16-322 in advance of the November 17, 2011 final date.

Let me know if the staff has questions or if this can be sent as a final response.

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, September 09, 2011 1:49 PM
To: Getachew.Tesfaye@nrc.gov
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. 484 (5724), FSARCh. 16, NEW PHASE 4 RAI, Supplement 2

Getachew,

On May 25, 2011, AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the single question in RAI 484. Supplement 1 response to RAI No. 484 was sent on July 19, 2011 to provide a revised schedule.

The schedule for a technically correct and complete final response to this question has been changed as provided below.

Question #	Response Date
RAI 484 — 16-322	**November 17, 2011**

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: Tuesday, July 19, 2011 10:55 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. 484 (5724), FSARCh. 16, NEW PHASE 4 RAI, Supplement 1

Getachew,

On May 25, 2011, AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the single question in RAI 484.

The schedule for a technically correct and complete FINAL response to this question has been changed as provided below.

Question #	Response Date
RAI 484 — 16-322	**September 12, 2011**

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: Wednesday, May 25, 2011 8:41 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); LENTZ Tony (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 484 (5724), FSARCh. 16, NEW PHASE 4 RAI

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file provides a schedule since a technically correct and complete response to the 1 question cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 484 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 484 — 16-322	2	2

A complete answer is not provided for the 1 question in RAI 484. The schedule for a technically correct and complete FINAL response to this question is provided below.

Question #	Response Date
RAI 484 — 16-322	July 28, 2011

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Monday, April 25, 2011 7:54 PM
To: ZZ-DL-A-USEPR-DL
Cc: DeMarshall, Joseph; Kowal, Mark; Hearn, Peter; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 484 (5724), FSARCh. 16, NEW PHASE 4 RAI

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on April 20, 2011, and discussed with your staff on April 20, 2011. Draft RAI Question 16-322 was revised as a result of that discussion. 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: 3477

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D49378B0)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 484 (5724), FSARCh. 16, NEW PHASE 4 RAI, Question 16-322
Sent Date: 10/14/2011 10:33:43 AM
Received Date: 10/14/2011 10:34:51 AM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Files	**Size**	**Date & Time**
MESSAGE	5221	10/14/2011 10:34:51 AM
RAI 484 Question 16-322 Response US EPR DC - DRAFT.pdf	584290	

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

Response to

Request for Additional Information No. 484 DRAFT

4/25/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 16 - Technical Specifications
Application Section: SRP 16

QUESTIONS for Technical Specification Branch (CTSB)

Question 16-322:

NEW PHASE 4 RAI

OPEN ITEM

The U.S. EPR Technical Specifications (TS) do not include a Limiting Condition for Operation (LCO) for the Diverse Actuation System (DAS) in the Instrumentation section of the TS. DCD Section 7.8.1.1.3, "Diverse Actuation System," states that the DAS executes manual functions initiated from the Process Information and Control System (PICS) and automatic functions to mitigate an anticipated transient without scram (ATWS) or software common cause failure (SWCCF) of the protection system (PS). Section 7.8.1.1.3 also states that the DAS is diverse from the PS. In addition, DCD Section 15.8.1.3 states that the DAS includes logic that fulfills the ATWS requirements of 10 CFR 50.62 and that the DAS logic is independent from sensor output to the final actuation device from the primary safety-related TXS protection system (PS) design features, and provides a diverse means to trip the reactor, trip the turbine, and initiate emergency feedwater (EFW) on conditions indicative of an ATWS. It also states that these diverse functions provided by the DAS provide reasonable assurance that a pressure increase does not exceed the ASME Service Level C limit of 3200 psig or does not exceed containment safety parameters.

The staff requests the applicant to explain how the Instrumentation section of the U.S. EPR TS meets the requirements of Criterion 4 in 10 CFR 50.36 (c)(2)(ii)(D) with respect to the DAS/ATWS system. Criterion 4 states "A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

Response to Question 16-322:

DCD Section 7.8.1.1.3, "Diverse Actuation System," was revised in Revision 3 of the U.S. EPR FSAR to state that the DAS executes manual functions initiated from the Safety Information and Control System (SICS) and automatic functions to mitigate an anticipated transient without scram (ATWS) or software common cause failure (SWCCF) of the protection system (PS).

A new Technical Specification for DAS will be added to U.S. EPR FSAR Chapter 16.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Section 3.3.4 will be added as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

1.0 USE AND APPLICATION

1.1 DEFINITIONS

--NOTE--
The defined terms of this section appear in capitalized type and are applicable throughout these Technical Specifications and Bases.

Term	Definition
ACTIONS	ACTIONS shall be that part of a Specification that prescribes Required Actions to be taken under designated Conditions within specified Completion Times.
ACTUATION LOGIC TEST	An ACTUATION LOGIC TEST shall be the application of various simulated or actual input combinations in conjunction with each possible interlock logic state required for OPERABILITY of a logic circuit and the verification of the required logic output. The ACTUATION LOGIC TEST, as a minimum, shall include a continuity check of output devices.
ACTUATING DEVICE OPERATIONAL TEST (ADOT)	An ADOT shall consist of operating the actuating device and verifying the OPERABILITY of all devices in the division required for actuating device OPERABILITY. The ADOT may be performed by means of any series of sequential, overlapping, or total division steps.
AXIAL OFFSET (AO)	AXIAL OFFSET (%) shall be the power generated in the upper half of the core less the power generated in the lower half of the core, divided by the sum of the power generated in the lower and upper halves of the core. $$AO = \left((Upper - Lower)\ /\ (Lower + Upper)\right) * 100$$
AZIMUTHAL POWER IMBALANCE (AZI)	AZIMUTHAL POWER IMBALANCE shall be the difference between the maximum power generated in any core quadrant (QN_{max}) and the minimum power generated in any core quadrant (QN_{min}), as measured by the power range excore detectors. $$AZI = QN_{max} - QN_{min}$$

All changes are in response to RAI 484, Question 16-322

3.3 INSTRUMENTATION

3.3.4 Diverse Actuation System (DAS)

LCO 3.3.4 The DAS for each Function specified in Table 3.3.4-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.4-1.

ACTIONS

-- NOTE --
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required Functions inoperable.	A.1 Restore required Function to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Enter the applicable Condition referenced in Table 3.3.4-1.	Immediately
C. As required by the applicable Required Action from the above Conditions and referenced in Table 3.3.4-1.	C.1 Reduce THERMAL POWER to < 70% RTP.	2 hours
D. As required by the applicable Required Action from the above Conditions and referenced in Table 3.3.4-1.	D.1 Reduce THERMAL POWER to < 10% RTP.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.4.1	Perform SENSOR OPERATIONAL TEST.	24 months
SR 3.3.4.2	Perform CALIBRATION.	24 months
SR 3.3.4.3	Perform ACTUATION LOGIC TEST.	24 months
SR 3.3.4.4	Perform ACTUATING DEVICE OPERATIONAL TEST.	24 months

All changes are in response to RAI 484, Question 16-322

Table 3.3.4-1 (page 1 of 3)
DAS Functions

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED NUMBER	CONDITIONS	SURVEILLANCE REQUIREMENTS
1. Reactor Trip				
a. Automatic Actuation Logic and Actuation Outputs	1(a)	3	D	SR 3.3.4.3
b. High Neutron Flux Rate of Change (Power Range)	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2
c. Low-Low Reactor Coolant System (RCS) Flow Rate in One Loop	1(b)	3	C	SR 3.3.4.1 SR 3.3.4.2
d. Low RCS Flow Rate in Two Loops	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2
e. High Pressurizer Pressure	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2
f. Low Hot Leg Pressure	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2
g. Low Steam Generator Pressure	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2
h. Low Steam Generator Level	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2
i. High Steam Generator Level	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2
j. Manual	1(a)	3	D	SR 3.3.4.4
k. Reactor Trip Breakers Shunt Trip Coils	1(a)	3	D	SR 3.3.4.4
2. Turbine Trip				
a. Automatic Actuation Logic and Actuation Outputs	1(a)	3	D	SR 3.3.4.3
b. Reactor Trip Initiation	1(a)	3	D	SR 3.3.4.1 SR 3.3.4.2

(a) With D2 permissive validated.

(b) With D3 permissive validated.

Table 3.3.4-1 (page 2 of 3)
DAS Functions

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS
3. Safety Injection System Actuation				
a. Automatic Actuation Logic and Actuation Outputs	1[(a)]	2	D	SR 3.3.4.3
b. Low Pressurizer Pressure	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
c. Manual	1[(a)]	3	D	SR 3.3.4.4
4. Feedwater Isolation				
a. Automatic Actuation Logic and Actuation Outputs	1[(a)]	2	D	SR 3.3.4.3
b. Full Load Isolation on High SG Level (Affected SG)	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
c. SSS Isolation on High SG Level for Period of Time (Affected SG)	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
d. SSS Isolation on Low SG Pressure (Affected SG)	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
5. EFWS Actuation				
a. Automatic Actuation Logic and Actuation Outputs	1[(a)]	2	D	SR 3.3.4.3
b. Low SG Level (Affected SG)	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
c. Manual	1[(a)]	3	D	SR 3.3.4.4
6. Main Steam Isolation				
a. Automatic Actuation Logic and Actuation Outputs	1[(a)]	2	D	SR 3.3.4.3
b. Low Steam Generator Pressure	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2

(a) With D2 permissive validated.

Table 3.3.4-1 (page 3 of 3)
DAS Functions

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS
7. Containment Isolation (Stage 1)				
a. Automatic Actuation Logic and Actuation Outputs	1[(a)]	2	D	SR 3.3.4.3
b. High Containment Radiation	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
c. Manual	1[(a)]	3	D	SR 3.3.4.4
8. Hydrogen Mixing Dampers (HMD) Opening				
a. Automatic Actuation Logic and Actuation Outputs	1[(a)]	2	D	SR 3.3.4.3
b. High Containment Pressure	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
c. Manual	1[(a)]	3	D	SR 3.3.4.4
9. Station Blackout Diesel Actuation				
a. Automatic Actuation Logic and Actuation Outputs	1[(a)]	2	D	SR 3.3.4.3
b. Loss of Voltage	1[(a)]	3	D	SR 3.3.4.1 SR 3.3.4.2
10. Permissives				
a. D2 - Flux (Power Range) Measurement Higher than First Threshold	1	3	D	SR 3.3.4.1 SR 3.3.4.2
b. D3 - Flux (Power Range) Measurement Higher than Second Threshold	1	3	C	SR 3.3.4.1 SR 3.3.4.2

(a) With D2 permissive validated.

B 3.3 INSTRUMENTATION

B 3.3.4 Diverse Actuation System (DAS)

BASES

BACKGROUND

The Diverse Actuation System (DAS) provides non-Class 1E backup controls in case of beyond design basis Anticipated Transient Without Scram events or a software common cause failure (SWCCF) of the Protection System (PS). The DAS is not credited for mitigating accidents in the FSAR Chapter 15 analyses.

The DAS executes diverse actuation of reactor trip, engineered safety feature (ESF), and permissive functions listed in Table 3.3.4-1, and provides alarm and display functions. Sensor information is acquired by the DAS from the Signal Conditioning and Distribution System (SCDS) using a hardwired signal that is not affected by a software common-cause failure (SWCCF). The DAS also processes the manual, system-level actuation of critical safety functions for reactor trip, EFWS actuation, SIS actuation, containment isolation, and opening of the containment hydrogen mixing dampers. The DAS also starts both station blackout diesels for manual loading by the operator.

For reactor trip functions, outputs from the DAS are sent to the shunt trip coils of the reactor trip breakers, which are a diverse means of opening the breakers from the undervoltage coils that are actuated by the Protection System. For ESF functions, outputs are sent directly to the Priority and Actuator Control System (PACS). This path is not affected by a SWCCF of the Protection System. Outputs for turbine trip are sent directly to the Turbine Generator Instrumentation and Control (TG I&C) System via a hardwired connection (one per division). The TG I&C performs 2 out of 4 voting logic on the turbine trip signals.

The following features are implemented so that the automatic DAS Functions do not interfere with Protection System Functions under normal circumstances, and so that the Protection System is given the opportunity to actuate before the DAS:

- DAS setpoints are selected to provide reasonable assurance that they will be reached after a corresponding Protection System setpoint is reached.
- Voting logic within the DAS is such that single failures do not result in spurious actuations of the automatic DAS Functions.
- Priority logic within the PACS dictates that in the case of conflicting orders between the Protection System and the DAS, the Protection System orders have a higher priority.

BASES

BACKGROUND (continued)

The DAS Functions are designed in such a way that, once initiated, they proceed to completion. The DAS Functions use the same techniques as the similar Protection System Functions to satisfy this requirement.

The DAS is periodically tested to ensure the system will execute its functions. Sensors and function processors that are shared by the Protection System and the DAS are periodically tested as part of the Protection System and are not required to be tested separately as part of the DAS periodic testing.

FSAR Chapter 7 (Reference 1) provides a description of the DAS.

The DAS instrumentation is segmented into three distinct but interconnected modules as described in FSAR Chapter 7 (Ref. 3), and as identified below:

– Sensors and signal distribution devices: provide a measurable electronic signal based upon the physical characteristics of the parameter being measured. The DAS shares sensors and signal distribution devices with the PS. Operability requirements for sensors and the SCDS are specified in LCO 3.3.1, "Distributed Control System."
– The Diverse Actuation Unit (DAU): provides analog bistable setpoint comparison, process algorithm actuation, compatible electrical signal output to actuation devices, and control room indications. DAU outputs provide the means to interrupt power to the Reactor Trip Breaker shunt coils for reactor trip and means to actuate turbine trip and other ESF functions, through the PACS.
– Safety Information and Control System (SICS): provides the ability to manually trip the reactor and initiate system-level critical safety functions via the DAS. The SICS is the primary human machine interface (HMI) for the DAS. Operability requirements for manual actuation switches in SICS are specified in LCO 3.3.1, "Distributed Control System."

The Priority and Actuator Control System (PACS), performs prioritization of signals from different I&C systems, drive actuation, and monitoring plant actuators. Operability requirements for the PACS are addressed as part of the actuated component.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The DAS is required to provide a diverse capability to trip the reactor and actuate the specified safety-related equipment. The DAS is not credited for mitigating accidents in the FSAR Chapter 15 safety analyses. The DAS satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

The Limiting Conditions for Operation (LCO) provides the requirements for the OPERABILITY of the DAS Functions necessary to place the reactor in a shutdown condition, and to remove decay heat in the event that the required Protection System function processors do not function because of a SWCCF.

The DAS is required to be OPERABLE in the MODES specified in Table 3.3.4-1 as credited in Reference 1.

The DAS Functions are as follows:

1. Reactor Trips

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the Control Rod Drive Control System and reactor trip breaker shunt coils.

b. High Neutron Flux Rate of Change (Power Range)

There are four divisions of High Neutron Flux Rate of Change (Power Range) trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the High Neutron Flux Rate of Change (Power Range) trip function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the High Neutron Flux Rate of Change trip when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the trip is disabled by manual inhibition of the D2 permissive.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

c. Low-Low RCS Flow Rate in One Loop

There are four divisions of Low-Low RCS Flow Rate in One Loop trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the Low-Low RCS Flow Rate in One Loop trip function are required to be OPERABLE in MODE 1 with D3 permissive validated.

Validation of the D3 permissive automatically enables the Low-Low RCS Flow Rate in One Loop trip when the reactor power level is greater than approximately 70% RTP. When the reactor power level is below this threshold, the trip is automatically disabled by inhibition of the D3 permissive.

d. Low RCS Flow Rate in Two Loops

There are four divisions of Low RCS Flow Rate in Two Loops trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the Low RCS Flow Rate in Two Loops trip function are required to be OPERABLE in MODE 1 with D2 permissive validated.

Validation of the D2 permissive automatically enables the Low RCS Flow Rate in Two Loops trip when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the trip is disabled by manual inhibition of the D2 permissive.

e. High Pressurizer Pressure

There are four divisions of High Pressurizer Pressure trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the High Pressurizer Pressure trip function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the High Pressurizer Pressure trip when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the trip is disabled by manual inhibition of the D2 permissive.

f. Low Hot Leg Pressure

There are four divisions of Low Hot Leg Pressure trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the Low Hot Leg Pressure trip function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Validation of the D2 permissive automatically enables the Low Hot Leg Pressure trip when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the trip is disabled by manual inhibition of the D2 permissive.

g. Low Steam Generator Pressure

There are four divisions of Low Steam Generator Pressure trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the Low SG Pressure trip function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the Low Steam Generator Pressure trip when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the trip is disabled by manual inhibition of the D2 permissive.

h. Low Steam Generator Level

There are four divisions of Low Steam Generator Level trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the Low SG Level trip function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the Low Steam Generator Level trip when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the trip is disabled by manual inhibition of the D2 permissive.

i. High Steam Generator Level

There are four divisions of High Steam Generator Level trip function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the High SG Level trip function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the High Steam Generator Level trip when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the trip is disabled by manual inhibition of the D2 permissive.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

j. Manual

There are four divisions of Manual trip function. Three divisions of the Manual trip function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

k. Reactor Trip Breakers Shunt Trip Coils

There are two Reactor Trip Breakers in Divisions 2 and 3 only. Two Reactor Trip Breakers Shunt Trip Coils per division (Divisions 2 and 3 only) are required to be OPERABLE in MODE 1 with the D2 permissive validated.

These trip actuation devices support the reactor trip functions.

2. Turbine Trip

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the TG I&C System.

b. Reactor Trip Initiation

There are four divisions of Turbine Trip on Reactor Trip Initiation function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic Turbine Trip on Reactor Trip Initiation function are required to be OPERABLE in MODES 1 and 2.

Validation of the D2 permissive automatically enables the Turbine Trip on Reactor Trip Initiation function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

3. Safety Injection Actuation

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the PACS.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

b. Low Pressurizer Pressure

There are four divisions of SIS Actuation on Low Pressurizer Pressure function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the SIS Actuation on Low Pressurizer Pressure function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the SIS Actuation on Low Pressurizer Pressure function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

c. Manual

There are four divisions of Manual actuation function. Three divisions of the Manual actuation function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

4. Feedwater Isolation

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the PACS.

b. Full Load Isolation on High SG Level (Affected SG)

There are four divisions of Main Feedwater Full Load Isolation on High SG Level (Affected SG) function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic Main Feedwater Full Load Isolation on High SG Level (Affected SG) function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the Main Feedwater Full Load Isolation on High SG Level (Affected SG) function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

c. SSS Isolation on High SG Level for Period of Time (Affected SG)

There are four divisions of SSS Isolation on High SG Level for Period of Time (Affected SG) function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic SSS Isolation on High SG Level for Period of Time (Affected SG) function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the SSS Isolation on High SG Level for Period of Time function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

d. SSS Isolation on Low SG Pressure (Affected SG)

There are four divisions of SSS Isolation on Low SG Pressure (Affected SG) function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic SSS Isolation on Low SG Pressure (Affected SG) function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the SSS Isolation on Low SG Pressure (Affected SG) function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

5. EFWS Actuation

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the PACS.

b. Low SG Level (Affected SG)

There are four divisions of EFWS Actuation on Low SG Level (Affected SG) function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic EFWS Actuation on Low SG Level (Affected SG) function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

All changes are in response to RAI 484, Question 16-322

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Validation of the D2 permissive automatically enables the EFWS Actuation on Low SG Level (Affected SG) function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

c. Manual

There are four divisions of Manual actuation function. Three divisions of the Manual actuation function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

6. Main Steam Isolation

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the PACS.

b. Low SG Pressure (All SGs)

There are four divisions of Main Steam Isolation on Low SG Pressure (All SGs) function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic Main Steam Isolation on Low SG Pressure (All SGs) function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the Main Steam Isolation on Low SG Pressure (All SGs) function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

7. Containment Isolation (Stage 1)

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the PACS.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

b. High Containment Radiation

There are four divisions of Containment Isolation (Stage 1) on High Containment Radiation function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic Containment Isolation (Stage 1) on High Containment Radiation function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the Containment Isolation (Stage 1) on High Containment Radiation function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

8. Hydrogen Mixing Dampers Opening

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the PACS.

b. High Containment Pressure

There are four divisions of Hydrogen Mixing Dampers Opening on High Containment Pressure function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic Hydrogen Mixing Dampers Opening on High Containment Pressure function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the Hydrogen Mixing Dampers Opening on High Containment Pressure function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

9. Station Blackout Diesels Actuation

a. Automatic Actuation Logic and Actuation Outputs

This LCO requires three divisions to be OPERABLE. Actuation logic consists of all circuitry housed within the DAUs, up to the input to the PACS.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

b. Loss of Voltage

There are four divisions of Station Blackout Diesels Actuation on Loss of Voltage function. These divisions are processed through 2 out of 4 voting logic. Three divisions of the automatic Station Blackout Diesels Actuation on Loss of Voltage function are required to be OPERABLE in MODE 1 with the D2 permissive validated.

Validation of the D2 permissive automatically enables the Station Blackout Diesels Actuation on Loss of Voltage function when the reactor power level is greater than approximately 10% RTP. When the reactor power level is below this threshold, the function is disabled by manual inhibition of the D2 permissive.

10. Permissives

a. D2, Flux (Power Range) Measurement Higher than First Threshold

The D2 permissive is intended, in normal operation, to allow the operator to reach the shutdown states without inadvertent DAS Function actuation. The D2 permissive uses the same excore power measurement devices as the Protection System P2 permissive.

The D2 permissive is automatically validated when the reactor power level increases above the setpoint (approximately 10% RTP) and can be manually inhibited when the reactor power level is below the setpoint. The validation of the D2 permissive automatically enables all of the DAS functions except the Reactor Trip on Low-low Reactor Coolant System (RCS) Flow (One Loop). The inhibition of the D2 permissive automatically disables all of the DAS functions except the Reactor Trip on Low-low RCS Flow (One Loop).

b. D3, Flux (Power Range) Measurement Higher than Second Threshold

The D3 permissive is intended to prevent a full reactor trip actuation following a partial reactor trip due to the loss of one Reactor Coolant Pump (RCP) event. The D3 permissive uses the same excore power measurement devices as the Protection System P3 permissive.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The D3 permissive is automatically validated when the reactor power level increases above the setpoint (approximately 70% RTP) and automatically inhibited when the reactor power level decreases below the setpoint. The validation of the D3 permissive automatically enables the Reactor Trip on Low-Low RCS Flow Rate in One Loop function. The inhibition of the D3 permissive automatically disables the Reactor Trip on Low-Low RCS Flow Rate in One Loop function.

ACTIONS

A Note has been added to the ACTIONS to clarify the application of the Completion Time rules. The Conditions of this Specification may be entered independently for each DAS Function. The Completion Times of each inoperable Function will be tracked separately for each Function, starting from the time the Condition was entered.

A.1

In this Condition, the inoperable Function must be restored to OPERABLE status within 72 hours. This Completion Time is acceptable because the required functions will actuate the minimum number of divisions required by the anticipated operational occurrence, concurrent with any single failure.

B.1

Condition B applies when the Required Action and associated Completion Time of Condition A are not. If Required Action A cannot be met within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, then the plant must be brought to a MODE in which the supported Functions are not required to be OPERABLE and any other specified actions must be taken. Required Action B.1 directs entry into the appropriate Condition referenced in Table 3.3.4-1.

C.1

If Table 3.3.1-4 directs entry into Condition C, the plant must be brought to a MODE or other specified condition in which the supported Functions are not required to be OPERABLE. The allowed Completion Time of 2 hours is reasonable, based on operating experience, to reduce THERMAL POWER from full power conditions to less than 70% RTP in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

D.1

If Table 3.3.1-4 directs entry into Condition D, the plant must be brought to a MODE or other specified condition in which the supported Functions are not required to be OPERABLE. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reduce THERMAL POWER from full power conditions to less than 10% RTP in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.4.1

A SENSOR OPERATIONAL TEST is performed every 24 months to ensure the devices will perform their intended function when needed. A SENSOR OPERATIONAL TEST shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY of all devices in the channel required for channel OPERABILITY. The SENSOR OPERATIONAL TEST shall include the verification of the accuracy and time constants of the analog input modules. The SENSOR OPERATIONAL TEST may be performed by means of any series of sequential, overlapping, or total steps.

SR 3.3.4.2

A CHANNEL CALIBRATION of each Function every 24 months ensures that each instrument division is reading accurately and within tolerance. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.4.3

An ACTUATION LOGIC TEST is performed on the DAU. The channel being tested is placed in the bypass condition, thus preventing inadvertent actuation. All possible logic combinations are tested for each function. Verification of bistable module, logic module, and output module is included in this test.

SR 3.3.4.4

SR 3.3.4.5 is the performance of an ACTUATING DEVICE OPERATIONAL TEST every 24 months. The ADOT may be performed by means of any series of sequential, overlapping, or total steps.

REFERENCES 1. FSAR Section 7.8.