ArevaEPRDCPEm Resource

From: RYAN Tom (AREVA) [Tom.Ryan@areva.com]
Sent: Friday, December 09, 2011 8:18 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); CRIBB Arnie (EXTERNAL AREVA); DELANO Karen (AREVA); HATHCOCK Phillip (AREVA); ROMINE Judy (AREVA); LENTZ Tony (EXTERNAL AREVA); HUDSON Greg (AREVA); MEACHAM Robert (AREVA); WILLIFORD Dennis (AREVA); RYAN Tom (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Batch 1a
Attachments: RAI 505 Draft 1a Response US EPR DC.pdf

Getachew,

Attached is a revised draft response for RAI 505, Questions 7.4-15, 7.5-11, 7.8-43, and 7.8-49 in advance of the final response date of December 11, 2011 shown below.

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

Thanks,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, November 22, 2011 2:51 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. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 3

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. On October 27, 2011, and November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33.

After discussions with NRC staff, the attached file, “RAI 505 Supplement 3 Response US EPR DC.pdf” provides technically correct and complete responses to 4 of the 34 questions. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the responses to RAI 505 Question 07.07-23, Question 07.08 -46 and Question 07.09.02-72.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 505 — 07.01-43	2	3
RAI 505 — 07.07-23	4	4
RAI 505 — 07.08-46	5	5
RAI 505 — 07.09-72	6	7

The schedule for the response to the remaining 30 questions remains unchanged, as indicated below. In addition, the preliminary revised schedule for a response to Question 07.01-33 remains unchanged. The schedule for Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

Question #	Response Date
RAI 505 — 07.01-33	December 14, 2011
RAI 505 — 07.01-34	January 10, 2012
RAI 505 — 07.01-35	January 10, 2012
RAI 505 — 07.01-36	January 10, 2012
RAI 505 — 07.01-37	December 11, 2011
RAI 505 — 07.01-38	January 10, 2012
RAI 505 — 07.01-39	January 10, 2012
RAI 505 — 07.01-40	January 10, 2012
RAI 505 — 07.01-41	January 10, 2012
RAI 505 — 07.01-42	January 10, 2012
RAI 505 — 07.01-44	January 10, 2012
RAI 505 — 07.01-45	January 10, 2012
RAI 505 — 07.01-46	January 10, 2012
RAI 505 — 07.01-47	January 10, 2012
RAI 505 — 07.01-48	January 10, 2012
RAI 505 — 07.01-49	January 10, 2012
RAI 505 — 07.01-50	January 10, 2012
RAI 505 — 07.01-51	January 10, 2012
RAI 505 — 07.03-37	December 11, 2011
RAI 505 — 07.03-38	January 10, 2012
RAI 505 — 07.04-15	December 11, 2011
RAI 505 — 07.05-10	December 11, 2011
RAI 505 — 07.05-11	December 11, 2011
RAI 505 — 07.08-43	December 11, 2011
RAI 505 — 07.08-44	January 10, 2012
RAI 505 — 07.08-45	January 10, 2012
RAI 505 — 07.08-47	January 10, 2012
RAI 505 — 07.08-48	January 10, 2012
RAI 505 — 07.08-49	December 11, 2011
RAI 505 — 07.09-71	January 10, 2012

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, November 17, 2011 5:44 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. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 2

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. On October 27, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 13 questions and a preliminary revised schedule for Question 07.01-33.

The schedule for the final responses has been revised, as indicated in bold below. In addition, the preliminary revised schedule for a response to Question 07.01-33 has been revised. The schedule for Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

Question #	Response Date
RAI 505 — 07.01-33	**December 14, 2011**
RAI 505 — 07.01-34	**January 10, 2012**
RAI 505 — 07.01-35	**January 10, 2012**
RAI 505 — 07.01-36	**January 10, 2012**
RAI 505 — 07.01-37	**December 11, 2011**
RAI 505 — 07.01-38	January 10, 2012
RAI 505 — 07.01-39	**January 10, 2012**
RAI 505 — 07.01-40	**January 10, 2012**
RAI 505 — 07.01-41	**January 10, 2012**
RAI 505 — 07.01-42	**January 10, 2012**
RAI 505 — 07.01-43	**December 11, 2011**
RAI 505 — 07.01-44	January 10, 2012
RAI 505 — 07.01-45	January 10, 2012
RAI 505 — 07.01-46	January 10, 2012
RAI 505 — 07.01-47	January 10, 2012
RAI 505 — 07.01-48	January 10, 2012
RAI 505 — 07.01-49	January 10, 2012

RAI 505 — 07.01-50	January 10, 2012
RAI 505 — 07.01-51	January 10, 2012
RAI 505 — 07.03-37	**December 11, 2011**
RAI 505 — 07.03-38	January 10, 2012
RAI 505 — 07.04-15	**December 11, 2011**
RAI 505 — 07.05-10	**December 11, 2011**
RAI 505 — 07.05-11	**December 11, 2011**
RAI 505 — 07.07-23	**December 11, 2011**
RAI 505 — 07.08-43	**December 11, 2011**
RAI 505 — 07.08-44	**January 10, 2012**
RAI 505 — 07.08-45	**January 10, 2012**
RAI 505 — 07.08-46	**December 11, 2011**
RAI 505 — 07.08-47	January 10, 2012
RAI 505 — 07.08-48	January 10, 2012
RAI 505 — 07.08-49	**December 11, 2011**
RAI 505 — 07.09-71	**January 10, 2012**
RAI 505 — 07.09-72	**January 10, 2012**

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, October 27, 2011 11:22 AM
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. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 1

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for a technically correct and complete response to the 34 questions in RAI 505.

The schedule for the final response to Questions 07.01-38, 07.01-44, 07.01-45, 07.01-46, 07.01-47, 07.01-48, 07.01-49, 07.01-50, 07.01-51, 07.03-38, 07.08-43, 07.08-47, 07.08-48 has been revised, as indicated in bold below. In addition, a preliminary revised schedule for a technically correct and complete response to Question 07.01-33 is provided below. The schedule for Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by November 17, 2011.

Question #	**Response Date**

RAI 505 — 07.01-33	**November 17, 2011**
RAI 505 — 07.01-34	December 8, 2011
RAI 505 — 07.01-35	November 17, 2011
RAI 505 — 07.01-36	December 8, 2011
RAI 505 — 07.01-37	December 8, 2011
RAI 505 — 07.01-38	**January 10, 2012**
RAI 505 — 07.01-39	December 8, 2011
RAI 505 — 07.01-40	December 8, 2011
RAI 505 — 07.01-41	November 17, 2011
RAI 505 — 07.01-42	December 20, 2011
RAI 505 — 07.01-43	November 17, 2011
RAI 505 — 07.01-44	**January 10, 2012**
RAI 505 — 07.01-45	**January 10, 2012**
RAI 505 — 07.01-46	**January 10, 2012**
RAI 505 — 07.01-47	**January 10, 2012**
RAI 505 — 07.01-48	**January 10, 2012**
RAI 505 — 07.01-49	**January 10, 2012**
RAI 505 — 07.01-50	**January 10, 2012**
RAI 505 — 07.01-51	**January 10, 2012**
RAI 505 — 07.03-37	November 17, 2011
RAI 505 — 07.03-38	**January 10, 2012**
RAI 505 — 07.04-15	November 17, 2011
RAI 505 — 07.05-10	November 17, 2011
RAI 505 — 07.05-11	November 17, 2011
RAI 505 — 07.07-23	November 17, 2011
RAI 505 — 07.08-43	**January 10, 2012**
RAI 505 — 07.08-44	December 8, 2011
RAI 505 — 07.08-45	December 8, 2011
RAI 505 — 07.08-46	December 8, 2011
RAI 505 — 07.08-47	**January 10, 2012**
RAI 505 — 07.08-48	**January 10, 2012**
RAI 505 — 07.08-49	November 17, 2011
RAI 505 — 07.09-71	December 8, 2011
RAI 505 — 07.09-72	December 8, 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: Thursday, September 29, 2011 11:04 AM
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. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 505 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the 34 questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 505 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 505 — 07.01-33	2	2
RAI 505 — 07.01-34	3	3
RAI 505 — 07.01-35	4	4
RAI 505 — 07.01-36	5	5
RAI 505 — 07.01-37	6	6
RAI 505 — 07.01-38	7	7
RAI 505 — 07.01-39	8	8
RAI 505 — 07.01-40	9	9
RAI 505 — 07.01-41	10	10
RAI 505 — 07.01-42	11	11
RAI 505 — 07.01-43	12	12
RAI 505 — 07.01-44	13	13
RAI 505 — 07.01-45	14	14
RAI 505 — 07.01-46	15	15
RAI 505 — 07.01-47	16	16
RAI 505 — 07.01-48	17	18
RAI 505 — 07.01-49	19	19
RAI 505 — 07.01-50	20	20
RAI 505 — 07.01-51	21	22
RAI 505 — 07.03-37	23	23
RAI 505 — 07.03-38	24	24
RAI 505 — 07.04-15	25	25
RAI 505 — 07.05-10	26	26
RAI 505 — 07.05-11	27	27
RAI 505 — 07.07-23	28	28
RAI 505 — 07.08-43	29	29
RAI 505 — 07.08-44	30	30
RAI 505 — 07.08-45	31	31
RAI 505 — 07.08-46	32	32
RAI 505 — 07.08-47	33	33

RAI 505 — 07.08-48	34	34
RAI 505 — 07.08-49	35	35
RAI 505 — 07.09-71	36	36
RAI 505 — 07.09-72	37	37

A complete answer is not provided for the 34 questions. The schedule for a technically correct and complete response to these questions is provided below.

Please note that the date for the response to Question 07.01-33 is a commitment date to provide a final schedule for the response in a follow-up letter.

Question #	**Response Date**
RAI 505 — 07.01-33	October 27, 2011
RAI 505 — 07.01-34	December 8, 2011
RAI 505 — 07.01-35	November 17, 2011
RAI 505 — 07.01-36	December 8, 2011
RAI 505 — 07.01-37	December 8, 2011
RAI 505 — 07.01-38	December 20, 2011
RAI 505 — 07.01-39	December 8, 2011
RAI 505 — 07.01-40	December 8, 2011
RAI 505 — 07.01-41	November 17, 2011
RAI 505 — 07.01-42	December 20, 2011
RAI 505 — 07.01-43	November 17, 2011
RAI 505 — 07.01-44	December 20, 2011
RAI 505 — 07.01-45	December 20, 2011
RAI 505 — 07.01-46	December 20, 2011
RAI 505 — 07.01-47	December 8, 2011
RAI 505 — 07.01-48	December 20, 2011
RAI 505 — 07.01-49	December 20, 2011
RAI 505 — 07.01-50	December 20, 2011
RAI 505 — 07.01-51	December 20, 2011
RAI 505 — 07.03-37	November 17, 2011
RAI 505 — 07.03-38	December 20, 2011
RAI 505 — 07.04-15	November 17, 2011
RAI 505 — 07.05-10	November 17, 2011
RAI 505 — 07.05-11	November 17, 2011
RAI 505 — 07.07-23	November 17, 2011
RAI 505 — 07.08-43	December 20, 2011
RAI 505 — 07.08-44	December 8, 2011
RAI 505 — 07.08-45	December 8, 2011
RAI 505 — 07.08-46	December 8, 2011
RAI 505 — 07.08-47	December 20, 2011
RAI 505 — 07.08-48	December 20, 2011
RAI 505 — 07.08-49	November 17, 2011
RAI 505 — 07.09-71	December 8, 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: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, August 30, 2011 1:23 PM
To: ZZ-DL-A-USEPR-DL
Cc: Zhang, Deanna; Morton, Wendell; Spaulding, Deirdre; Mott, Kenneth; Truong, Tung; Zhao, Jack; Mills, Daniel; Jackson, Terry; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 12, 2011, and discussed with your staff on August 22 and 25, 2011. No change is made to the draft RAI as a result of those discussions. 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: 3614

Mail Envelope Properties (68A588D0DDE96547855C97AF83A8CAFD7CC7CB)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Batch 1a
Sent Date: 12/9/2011 8:17:51 AM
Received Date: 12/9/2011 8:18:08 AM
From: RYAN Tom (AREVA)

Created By: Tom.Ryan@areva.com

Recipients:
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"CRIBB Arnie (EXTERNAL AREVA)" <arnie.cribb.ext@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"HATHCOCK Phillip (AREVA)" <Phillip.Hathcock@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"LENTZ Tony (EXTERNAL AREVA)" <Tony.Lentz.ext@areva.com>
Tracking Status: None
"HUDSON Greg (AREVA)" <Greg.Hudson@areva.com>
Tracking Status: None
"MEACHAM Robert (AREVA)" <Robert.Meacham@areva.com>
Tracking Status: None
"WILLIFORD Dennis (AREVA)" <Dennis.Williford@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: auscharmx02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	15050	12/9/2011 8:18:08 AM
RAI 505 Draft 1a Response US EPR DC.pdf	872819	

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

Response to

Request for Additional Information No. 505 (5902,5735,5869,5754,5803,5950,5744), Revision 0

8/30/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 07.01 - Instrumentation and Controls - Introduction
SRP Section: 07.03 - Engineered Safety Features Systems
SRP Section: 07.04 - Safe Shutdown Systems
SRP Section: 07.05 - Information Systems Important to Safety
SRP Section: 07.07 - Control Systems
SRP Section: 07.08 - Diverse Instrumentation and Control Systems
SRP Section: 07.09 - Data Communication Systems

Application Section: FSAR Chapter 7

QUESTIONS for Instrumentation, Controls and Electrical Engineering 1 (AP1000/EPR Projects) (ICE1)

Question 07.04-15:

OPEN ITEM

Clarify the display and control capability of the safety information and control system (SICS) in the remote shutdown station (RSS) and address inspection, tests, analyses, and acceptance criteria (ITAAC) for engineered safety feature (ESF) controls, including those associated with safety automation system (SAS).

10 CFR 52.47(a)(2) requires, in part, a description of structures, systems, and components sufficient to permit understanding of the system design. U.S. EPR Design Control Document, Tier 2, Section 7.4.1.3.4, Interim Revision 3 mark-ups, Page 7.4-7, states, in part:

> *"… the HMI [PICS and the SICS] workstation both in the MCR and RSS will continue to display …"*
>
> *"… The SICS and PICS provide the displays and controls in the RSS to allow the monitoring and control and control of the following safe shutdown …"*

Tier 2, Section 7.4.1.3.4, Interim Revision 3 mark-ups, Page 7.4-9, states "An indication on the PICS and SICS shows that RSS control has been established." During the review, the staff questioned whether SICS provides displays and the necessary manual controls in the RSS. Also, the staff questioned if any SAS manual controls were needed in the RSS. The staff did not identify any ITAAC in Tier 1, Section 2.4, addressing ESF manual actuations in the RSS. The applicant is requested to confirm the scope of displays and controls for SICS in the RSS and to provide ITAAC that verify the manual controls in RSS.

Response to Question 07.04-15:

Display Capability of SICS in RSS:

There are no indications in the RSS that are part of SICS. The indications needed for safe shutdown are available on PICS, including permissives status. Since there are no SICS indications in the RSS, there are no ITAAC associated with SICS indications.

Control Capability of SICS in RSS:

The SICS controls inventory in the RSS are the controls that are not available on PICS, and are needed to reach and maintain safe shutdown. The list of controls available on SICS in the RSS is listed in U.S. EPR FSAR Tier 2, Section 7.4.1.1. The other controls needed to reach and maintain safe shutdown are available from PICS. U.S. EPR FSAR Tier 2, Section 7.4.1.3.4 will be modified to clarify the scope of the RSS controls and indications.

An ITAAC that verifies the inventory of controls in the RSS on the SICS was provided as part of the Response to RAI 506 14.04.05-38.

No SAS controls are needed in the RSS to reach and maintain safe shutdown following evacuation of the main control room. All of the SICS controls located in the RSS are related to the protection system. No system level ESF actuations are needed in the RSS because the RSS is only provided for safe shutdown and not accident mitigation.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 7.4.1.3.4 will be revised as described in the response and indicated on the enclosed markup.

Question 07.05-11:

OPEN ITEM

Is a COL Information Item necessary for verification of the PAMS instrument list, and are there any site-specific PAMS instrumentation for the U.S. EPR?

10 CFR Part 50, Appendix A, General Design Criteria 13, "Instrumentation and Controls," requires, in part, that instrumentation be provided to monitor variables and systems over their anticipated ranges for normal operation, anticipated operational occurrences, and accident conditions. During the review of the U.S. EPR design certification and the Calvert Cliffs combined license (COL) application, the staff noted that the Calvert Cliffs COL application addressed a COL information item associated with updating the PAMS instrument list. Given the existence of ITAAC in Section 3.7 of the U.S. EPR FSAR, Tier 1, to verify the PAMS instrument list following completion of the emergency procedures, is there a need for a COL information item related to verification of the PAMS instrument list? Second, the staff did not see discussion in the U.S. EPR FSAR related to any site-specific PAMS instruments. For example, meteorological instruments and instruments associated with other site-specific structures, systems, and components may be PAMS instruments. The applicant is requested to address the need for a COL information item to address site-specific PAMS instruments.

Response to Question 07.05-11:

The inspections, tests, analyses and acceptance criteria (ITAAC) in U.S. EPR Tier 1, Section 3.7 will be revised in response to Question 7.5-10 of this RAI. This ITAAC item does not "verify the PAMS Instrument List" as suggested in the question. A combined license (COL) item is currently included to confirm that the procedures are consistent with the inventory list of PAM variables, upon completion of the emergency operating and abnormal operating procedures. This type of activity does not meet the criteria for inclusion in ITAAC, as described in U.S. EPR FSAR Tier 2, Section 14.3.

A new COL information item in U.S. EPR FSAR will be added to, U.S. EPR Tier 2, Section 7.5.2.2.1, to address site-specific PAMS variables.

FSAR Impact:

The U.S. EPR FSAR Tier 2, Sections 1.8 and 7.5.2.2.1 will be revised as described in the response and indicated on the enclosed markup.

Question 07.08-43:

OPEN ITEM

The staff requests the applicant to provide clear and unambiguous design commitment descriptions for (1) the DAS and PS credited human diversity and (2) credited SICS indications.

10 CFR 52.47(a)(2) requires that a description and analysis of the structures, systems, and components (SSCs) of the facility shall be sufficient to permit understanding of the system designs and their relationship to the safety evaluations. The information provided for the design basis items, taken alone and in combination, should have one and only one interpretation. The staff requests the applicant to clarify the following design descriptions:

a. Section 3.2.1 of Technical Report ANP-10304 provides a diversity design commitment between the PS TXS platform and the DAS platform that the design organization, management, designers, programmers, and testing engineers will be different. However, Section 4.2 of the same report states that it is likely that different design organizations will be responsible for the design of the two systems and that this will not be determined until the detailed design of these systems is in progress. These two design statements for the DAS and PS credited human diversity are conflicting. The applicant is requested to clarify the commitment for human diversity.

b. Table 2-1 of Technical Report ANP-10304 states that the SICS indicators can include programmable electronic I&C technology, which, according to Tier 2, Section 7.1, Interim Revision 3 mark-ups, can be TXS microprocessor-based. By contrast, Section 4.2 of Technical Report ANP-10304, SICS design diversity, states that the indications provided in SICS are performed by hardwired, analog components. The information provided for the design basis items, taken alone and in combination, should have one and only one interpretation. The staff request the applicant to provide clear design descriptions about the type of SICS indicators that are credited in the Technical Report ANP-10304.

Response to Question 07.08-43:

a) Technical Report ANP-10304 will be revised to clarify the commitment that different design organizations will be responsible for the design of the two systems.

b) Section 4.2 in Technical Report ANP-10304 will be revised as shown in the attached markups.

c) U.S. EPR FSAR Tier 2, Section 7.1 defines programmable electronic instrumentation and control (I&C) technology as: “I&C technology that is based on solid state components whose function is programmed via software.” While this can include microprocessors, the safety information and control system (SICS) indicators credited in the defense-in-depth analysis do not use Teleperm XS (TXS) microprocessor-based programmable electronics.

d) Section 4.2 in Technical Report ANP-10304 will be revised as shown in the attached markups.

FSAR Impact:

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

Technical Report ANP-10304, Revision 4 will be revised as described in the response and indicated on the enclosed markup. ANP-10304, Revision 5 will be submitted by separate letter after completion of all the responses to RAI 505.

Question 07.08-49:

OPEN ITEM

The staff request the applicant to identify or provide design descriptions that would define what the design characteristics are of the credited DAS “software structure” and to demonstrate the diversity achieved between the TXS software attributes and the credited software attributes of the DAS "software structure."

10CFR50.62(c)(1) and (c)(6) requires that ATWS equipment must be diverse from the reactor trip system. 10CFR52.47(a)(2) requires that a description and analysis of the structures, systems, and components (SSCs) of the facility shall be sufficient to permit understanding of the system designs and their relationship to the safety evaluations. The applicant states in Section 4.2 of Technical Report ANP-10304 that if the DAS uses programmable electronic technology that it will not be microprocessor based and that the *software structure* will be *fundamentally different*. The staff reviewed the U.S. EPR DAS design descriptions in the U.S. EPR, Tier 1 and 2, U.S. EPR FSAR, Interim Revision 3 mark-ups, and Technical Report ANP-10309, Revision 4, and could not identify design descriptions that would demonstrate the design characteristics and credited diversity attributes of the DAS possible implementation using "structured software." Therefore, the staff requests the applicant to provide this design information.

Response to Question 07.08-49:

The diverse actuation system (DAS) will not be microprocessor based programmable electronic technology. The following types of technology may be used:

- Non-microprocessor based programmable electronics – The two primary types of technologies in this category include programmable logic devicess and field-programmable gate arrays. These devices are programmed with firmware and do not contain application software and system software as they exist in microprocessors.

- Electronic technology – This technology consists of discrete electronics whose logic is determined by physically changing connections. No software exists.

- Electrical technology – This includes electrical components such as relays. No software exists.

As a result, the functioning logic will not be accomplished in a software based system, such as what is in a microprocessor. This provides a stronger case of “software diversity” because a potential common cause failure that could affect the application or system software of a microprocessor-based system would not affect the DAS. U.S. EPR FSAR Tier 2, Section 7.1.1.4.7 and Technical Report ANP-10304 will be modified to clarify the types of technology that may be used.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 7.1.1.4.7 will be revised as described in the response and indicated on the enclosed markup.

Technical Report ANP-10304, Revision 4 will be revised as described in the response and indicated on the enclosed markup. ANP-10304, Revision 5 will be submitted by separate letter after completion of all the responses to RAI 505.

U.S. EPR Final Safety Analysis Report Markups

Table 1.8-2—U.S. EPR Combined License Information Items
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Item No.	Description	Section
6.4 3	A COL applicant that references the U.S. EPR design certification will evaluate the results of the toxic chemical accidents from Section 2.2.3, address their impact on control room habitability in accordance with RG 1.78, and if necessary, identify the types of sensors and automatic control functions required for control room operator protection.	6.4.1
6.4 4	A COL applicant that references the U.S. EPR design certification will confirm that the radiation exposure of main control room occupants resulting from a design basis accident at a nearby unit on a multi unit site is bounded by the radiation exposure from the postulated design basis accidents analyzed for the U.S. EPR; or confirm that the limits of GDC 19 are met.	6.4.4
6.6 1	A COL applicant that references the U.S. EPR d sign c rtification will identify the implementation milestones for the site s ecific ASME Section XI preservice and inservice nspection program for the Class 2 and Class 3 components, con istent w th the requirements of 10 CFR 50.55a (g). The p gr m will identify the applicable edition and addenda of the ASME Code Section XI, and will identify additional relief reques and alter atives to Code requirements.	6.6
7.1 1	A COL applicant that ref nces th U.S. EPR design certification will confirm the inventory li t of PAM variables in Table 7.5 1 Inventory of Post ccident Monitoring Variables upon completion of the em rg ncy operating and abnormal operating procedures p to fuel oading.	7.5.2.2.1
7.1 2	A COL applicant tha refere ces the U.S. EPR design certification will, foll wing selecti n of the actual plant operating instrument ion and alculation of the instrumentation uncertainties of th operating plant parameters, prior to fuel load, calculate the primary power calorimetric uncertainty. The calculations will be completed using an NRC acceptable method and confirm that the safety analysis primary power calorimetric uncertainty bounds the calculated values.	7.7.2.3.5
7.1 3	A COL applicant that references the U.S. EPR design certification will identify the need for any site specific PAM variables.	7.5.2.2.1
8.1 1	A COL applicant that references the U.S. EPR design certification will provide site specific information describing the interface between the offsite transmission system, and the nuclear unit, including switchyard interconnections.	8.1.1
8.1 2	A COL applicant that references the U.S. EPR design certification will identify site specific loading differences that raise EDG or Class 1E battery loading, and demonstrate the electrical distribution system is adequately sized for the additional load.	8.1.3

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appropriate reviews, verification, tests, and approvals. Sufficient quality is achieved in the design of the DAS through the following measures:

- The DAS is designed, fabricated, erected, and tested under the quality assurance program described in ANP 10266A, Addendum A (Reference 42). This quality assurance program is consistent with the guidance of Generic Letter 85 06 (Reference 43).
- The design of the DAS is accomplished through a phased approach including the following (or equivalent) phases:
  - System requirements phase.
  - System design phase.
  - Software/hardware requirements phase.
  - Software/hardware design phase.
  - Software/hardware implementati n phase.
  - Software/hardware validation ph se
  - System integration pha e.
  - System validation phase.
- A criticality an ysis is performe for the DAS software in accordance with accepted indu rial pr i
- V&V of the AS so ware is performed according to a V&V plan that is consistent with accepted i dustri l practice.
- DAS r quiremen are documented in a traceable form that is under configuration managem nt.
- The DAS design is validated through acceptance test in the system validation (or equivalent) phase.

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Diversity Requirements

The DAS is required to be ~~either an electrical, electronic, or programmable electronic I&C technology other than~~ non microprocessor based technology. See ANP 10304 (Reference 8) for further information on defense in depth and diversity.

Data Communications

There are no data communications associated with the DAS.

- A single failure of a system, structure, or component required to bring the plant to safe shutdown (in the event of a fire, no additional single failure, unrelated to the damage caused by the fire, is considered).

- A sustained loss of either onsite or offsite AC power.

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The RSS contains both the PICS and the SICS. The PICS provides most of the necessary controls for safe shutdown. The SICS controls are only those controls needed to achieve safe shutdown that are unavailable on the PICS. These SICS controls are listed in Section 7.4.1.1. The PICS provides all displays necessary to reach and maintain safe shutdown. The architecture of the SICS and PICS is described in Section 7.1. Communication equipment is described in Section 9.5.2.

The ~~SICS and PICS provide the~~ displays and controls in the RSS to allow the monitoring and control of the following safe shutdown functions during a postulated fire in the MCR or during an event that could cau the MCR to become uninhabitable, coupled with a single failure:

- Reactivity control.

- Reactor coolant makeup.

- Reactor coolant system pres ure ntrol.

- Decay heat removal

- Control and m nitorin of safety support systems for the above functions, as well as essential serv ce w ter, co ponent cooling water, and onsite power including the emerg ncy die el generators.

The ph sical layout f the RSS and equipment located in it is taken into consideration in the hu an factors ngineering program described in Chapter 18.

In the event of ondition requiring MCR evacuation, operators will transfer control from the MCR to the RSS via the MCR RSS transfer switches, which are located in the RSS. MCR actions required per procedures to transfer control to the RSS can be accomplished during a rapid evacuation of the MCR. Communications equipment is provided to support the transfer. If the MCR requires evacuation, the following actions are taken:

- Perform an RT (from the MCR if time allows, from the RSS if there is not enough time).

- Log out of the PICS workstations in the MCR (if time allows).

- Transition to the RSS.

- Actuate the MCR RSS transfer switches, which performs the following actions:

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- A gap evaluation was performed to confirm that critical safety functions and fission product barriers described in IEEE Std 497 2002 were adequately monitored by the list of instruments developed.

The list of PAM variables is provided in Table 7.5 1.

A COL applicant that references the U.S. EPR design certification will identify the need for site specific PAM variables.

Confirmation of the PAM Variables

To meet the guidance of RG 1.97, Revision 4 and Reference 1, a systematic step by step review of the plant specific EOPs for the U.S. EPR is required. See Section 13.5 for more information on U.S. EPR procedure development.

A COL applicant that references the U.S. EPR desi n certification will confirm the inventory list of PAM variables in Table 7.5 1 upon c mpletion of the emergency operating and abnormal operating procedur s prior to fu l loading.

The confirmation that the procedures a e consi tent with ~~of~~ the PAM variables list ~~by the COL Applicant~~ will be documented by the COL Applicant in a table format that includes the following:

- Variable name that indicates he v riable function.
- Variable Type (A, B, C, D or E).
- Range.
- Safet classific ion (E or non 1E).
- Envir nmental a d Seismic Qualification.
- Minimum umber of instruments required.
- Monitoring duration for the variable.

Criteria for Selection of Variable Types

In accordance with RG 1.97, Revision 4, and IEEE Std 497 2002, the PAM variables are selected and the variable types are determined according to its accident management function. These variables are the primary source of post accident monitoring information. Five types of variables exist and the selection criteria are described as follows:

U.S. EPR Diversity and Defense-in-Depth Assessment

Technical Report ANP-10304

MARKUPS

The reactor control, surveillance, and limitation system (RCSL) performs core-related operational and limitation I&C functions. It is a redundant (master - hot standby) control system with physical separation of redundant equipment located in separate Safeguard Buildings. The RCSL utilizes the TXS platform and is a non-safety-related system.

The process automation system (PAS) executes the majority of plant control functions. Specifically, it performs operational and limitation I&C functions, except those performed by RCSL. The PAS is a non-safety-related system and is implemented with an industrial control platform other than TXS.

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The DAS is a non-safety related system that executes those fu ctions needed to mitigate an AOO or PA concurrent with a CCF of the PS. The DAS wil not be microprocessor-based programmable electronic technology. The following ty es of technolo y may be used:

- Non-microprocessor-based Programmable El ctro ics - The two primary types of technologies in this category include programmab e logic devices and field-programmable gate arrays. These de ices a programmed with firmware and do not contain application software and system software as they exist in microprocessors.
- Electronic Technology - This technology c nsists of discrete electronics whose logic is determined by physically c a ging connections. No software exists.
- Electrical Tech ology - Th s incl des electrical components such as relays. No software exists.~~The DAS xecutes those functions needed to mitigate an AOO or PA concurrent with a CCF of the P The DAS is a non-safety related system and will be implemented with either electrical, electronic, or programmable electronic technology that is not microprocessor based.~~

The priority and actuator control system (PACS) is a safety-related system. It performs the following functions: priority control, drive actuation, drive monitoring, and essential component protection. Each safety-related actuator is associated with one PACS communication-priority pair (CoPP). Each CoPP consists of two modules: a safety-related priority logic module, and a non-safety-related communication module. The priority module is subject to 100 percent combinatorial testing and is therefore not subject to an SWCCF. The priority module is designed to the requirements of 10 CFR50.55a(h) subject to the alternative request described in Section 2.1.

been made to credit this type of different logic as a “less effective”, but still relevant, characteristic of software diversity.

Safety Information and Control System:

RAI 505, Q. 07.08-43

The SICS exhibits the following diversity attributes relative to the PS:

- Design diversity–The control functions and most of the indications provided in SICS are performed by dedicated, hardwired I&C components. Some of the indications use non-TXS microprocessor-based programmable electronics. All of the indications credited in the D3 analysis bypass the PS components. The PS uses TXS microprocessor-based programmable electronic technology to implement all ts functions. ~~The control functions and indications provided in SICS are performed by hardwired, analog components. The PS uses micro processor b sed programma le electronic technology to implement its functions.~~ Including differen technology in the design is a “more effective” characteristic of design diversity.
- Equipment diversity–At a minimum, th SICS e uipment will be of fundamentally different design than the PS eq ipment. Section 3.2.1 identifies this commitment. The use of fundamentally diffe ent de gns is a “more effective” characteristic of equipment diversity.
- Functional diver ity–The ICS lfills a fundamentally different purpose, and performs different types f functions, han the PS. The SICS is a human-machine interface system that allows he ope ator to monitor and control plant operation. The PS performs automatic actuation fu ctions specifically designed to respond to AOOs or PAs. Different purpose and function is a “more effective” characteristic of functional diversity.
- Human diversity–At a minimum, different engineers will be responsible for the design of the SICS and PS. It is likely that different design organizations will be responsible for the design of the equipment of the two systems, which is the most effective characteristic of human diversity. This will not be determined until the detailed design of these systems is in progress. As a conservative measure, only the use of different engineers is credited in human diversity, which constitutes a “less effective”, but still relevant, characteristic of human diversity.

- Software diversity–Because of its different purpose and function, the SICS uses completely different algorithms and logics in the components that are microprocessor-based. In addition, the SICS functions that are software based use non-TXS microprocessors. All of the indications credited in the D3 analysis bypass the PS components. ~~The SICS uses a hardwired, analog I&C platform to implement a human-machine interface. There is no software running in the SICS, with exception of the QDS, which is for display purposes only and is not credited in the D3 analysis.~~ This constitutes a "more effective" characteristic of software diversity.

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Process Information and Control System:

The PICS exhibits the following diversity attributes relative to the S:

- Design diversity–The PICS architecture is shown in U.S. EPR FSAR Tier 2, Section 7.1, and it is clearly different from the PS architec re. Different architecture is a "less effective", but still relevant, characteristic of desig diversity.
- Equipment diversity–At a minimum, th PICS e uipment will be of fundamentally different design than the PS eq ipment. ection 3.2.1 identifies this commitment. The use of fundamentally diffe ent de gns is a "more effective" characteristic of equipment diversity.
- Functional diver ity–The ICS lfills a fundamentally different purpose, and performs different types f functions, han the PS. The PICS is a human-machine interface system that allows he op rator to monitor and control plant operation. The PS performs automatic actuation functions specifically designed to respond to AOOs or PAs. Two systems with different purposes and functions require significantly different application software structures. This greatly reduces the risk of the same latent software defect existing in the two systems. Different purpose and function is a "more effective" characteristic of functional diversity.
- Human diversity–At a minimum, different engineers will be responsible for the design of the PICS and PS. It is likely that different design organizations will be responsible for the software design of the two systems (the most effective characteristic of human diversity. This will not be determined until the detailed software design of these systems is in progress. As a conservative measure,, only the use of different engineers is

- Functional diversity–The DAS is designed with the intent of allowing the PS to actuate before the DAS, in response to a DBE. This results in different setpoint parameters and delay times for the DAS functions, compared to the PS. Different response timescale is a “less effective”, but still relevant, characteristic of functional diversity.

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- Human diversity–Different design organizations (i.e., different management, engineers, designers, and programmers) will be responsible for the design of the two systems. This establishes a "more effective" case of human diversity.~~At a minimum, different engineers will be responsible for the design of the DAS and PS. It is likely that different design organizations will be responsible for the design of the two systems (the most effective characteristic of human diversity. This will not be determined until the detailed design of these systems is in progress. To be conservative, only the use of different engineers is credited, which constitutes a “less effective”, but still relevant characteristic of human diversity.~~

- Software diversity–The DAS is implemented with non-microprocessor based technology. As such, there is no system software or application software as found in microprocessor based systems. This constitutes a "more effective" characteristic for overall platform diversity.~~If the DAS uses programmable electronic technology, it will not be microprocessor based, so the software structure will be fundamentally different. This establishes a “more effective” case of software diversity.~~

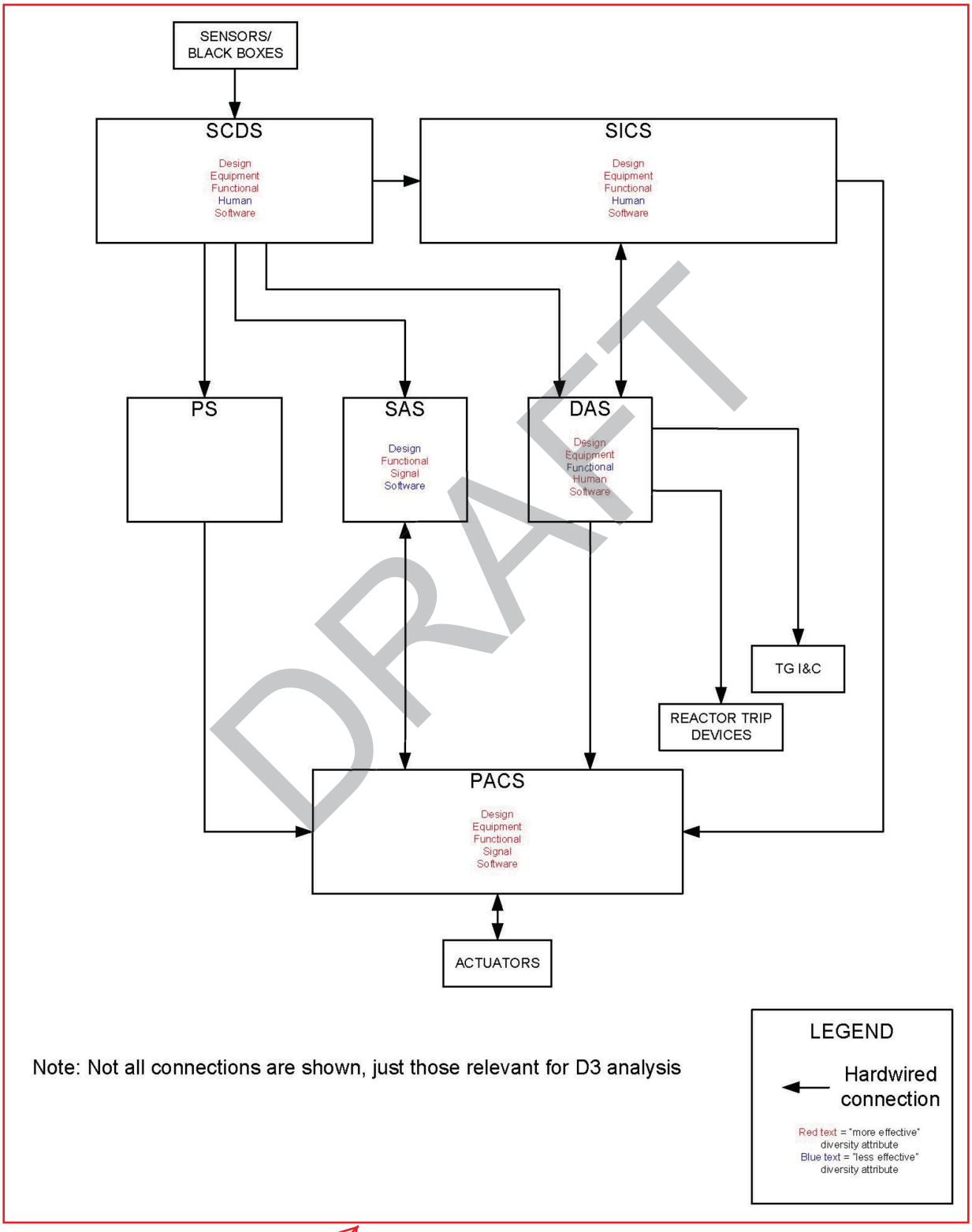
Priority and Actuator Control System:

RAI 505, Q. 07.08-49

The PACS exhibits the following diversity attributes relative to the PS:

- Design diversity–The equipment used in the priority module of the PACS is PLD based PE, which is different from the microprocessor based PE in the PS. This constitutes a different approach within a technology, as listed in Guideline 2. Additionally, the PACS architecture is shown in U.S. EPR FSAR Tier 2, Section 7.1, and it is clearly different from the PS architecture. Most significantly, a standalone portion of the PACS is dedicated to each safety-related plant actuator, while the PS uses its whole architecture to affect groups of actuators. This combination of multiple design characteristics establishes a “more effective” case of design diversity.

Figure 4-2—Block Diagram with Diversity Attributes



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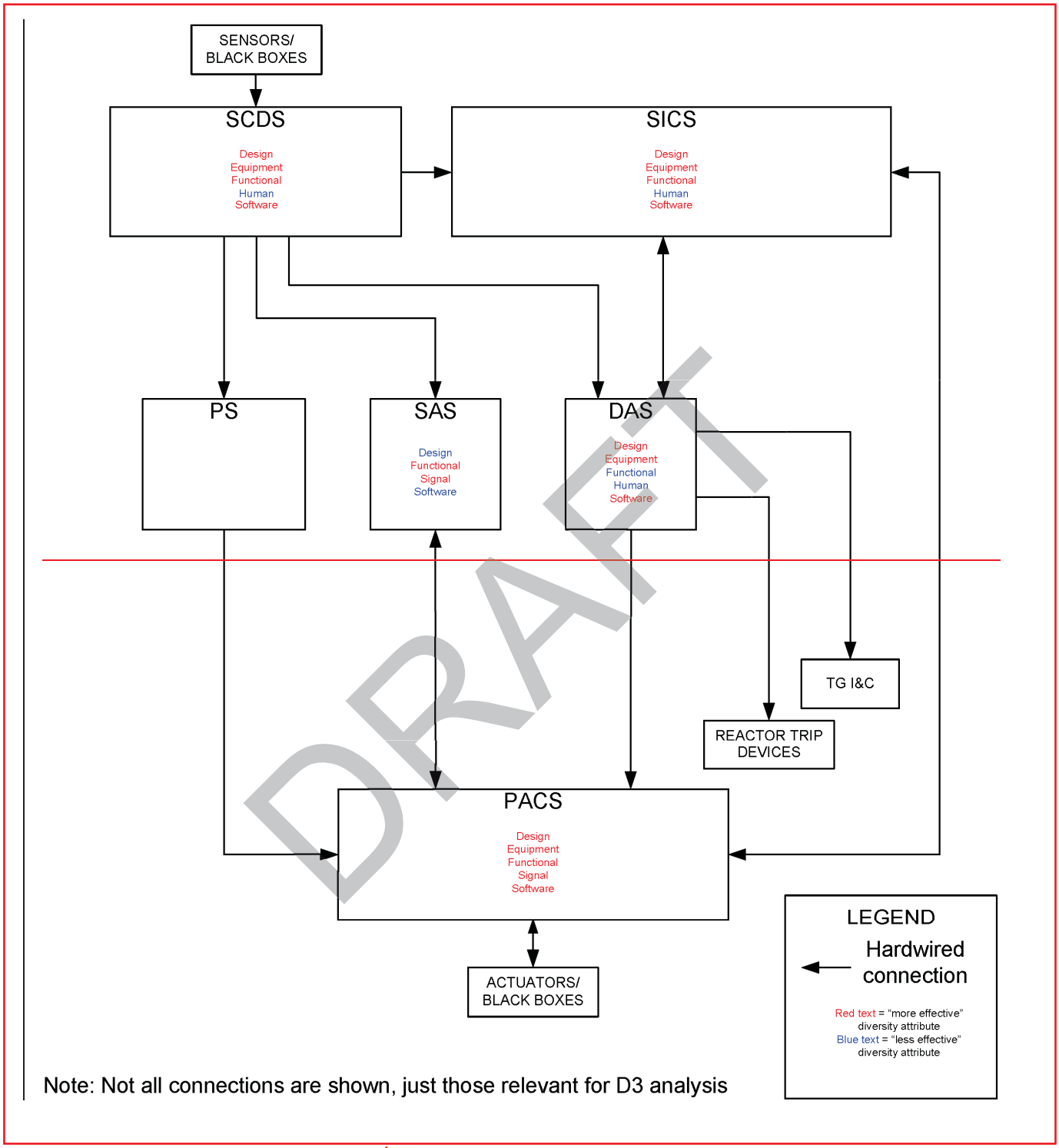

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