ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Thursday, June 30, 2011 8:40 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); HALLINGER Pat (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); KOWALSKI David (AREVA); PATTON Jeff (AREVA); BALLARD Bob (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, Question 10.02-9
Attachments: RAI 430 Question 10.02-9 Response US EPR DC DRAFT.pdf

Getachew,

Attached is a draft response to RAI 430, Question 10.02-9. Earlier today, AREVA submitted Supplement 9 that provided a date for the final response as July 28, 2011. Let us know if you have any questions or if we can submit this response as final.

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, June 30, 2011 8:31 AM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 9

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8. Supplement 2 response to RAI No. 430 was sent on December 10, 2010 to provide a revised schedule for Questions 10.02-9 and 10.02-10. Supplement 3, Supplement 4, Supplement 5, Supplement 6 and Supplement 7 responses to RAI No. 430 were sent on December 20, 2010, February 23, 2011, March 24, 2011, April 26, 2011 and May 27, 2011, respectively, to provide a revised schedule for the three questions. Supplement 8 response to RAI No. 430 was sent on June 9, 2011 to provide a technically correct and complete final response to Question 10.02-8.

The schedule for technically correct and complete responses to the remaining two questions has changed and is provided below:

Question #	Response Date
RAI 430 — 10.02-9	**July 28, 2011**
RAI 430 — 10.02-10	**August 11, 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, June 09, 2011 8:45 AM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 8

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8. Supplement 2 response to RAI No. 430 was sent on December 10, 2010 to provide a revised schedule for Questions 10.02-9 and 10.02-10. Supplement 3, Supplement 4, Supplement 5, Supplement 6 and Supplement 7 responses to RAI No. 430 were sent on December 20, 2010, February 23, 2011, March 24, 2011, April 26, 2011 and May 27, 2011, respectively, to provide a revised schedule for the three questions.

The attached file, "RAI 430 Supplement 8 Response US EPR DC.pdf" provides a technically correct and complete FINAL response to Question 10.02-8.

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 430 Question 10.02-8.

The following table indicates the respective pages in the response document, "RAI 430 Supplement 8 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 430 — 10.02-8	2	3

The schedule for technically correct and complete responses to the remaining two questions has not changed and is provided below:

Question #	Response Date
RAI 430 — 10.02-9	June 30, 2011
RAI 430 — 10.02-10	June 30, 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: Friday, May 27, 2011 11:46 AM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 7

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8. Supplement 2 response to RAI No. 430 was sent on December 10, 2010 to provide a revised schedule for Questions 10.02-9 and 10.02-10. Supplement 3, Supplement 4, Supplement 5 and Supplement 6 responses to RAI No. 430 were sent on December 20, 2010, February 23, 2011, March 24, 2011 and April 26, 2011, respectively, to provide a revised schedule for the three questions.

The schedule for technically correct and complete responses to the three questions has been changed and is provided below.

Question #	Response Date
RAI 430 — 10.02-8	June 10, 2011
RAI 430 — 10.02-9	June 30, 2011
RAI 430 — 10.02-10	June 30, 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: WELLS Russell (RS/NB)
Sent: Tuesday, April 26, 2011 5:49 PM
To: 'Tesfaye, Getachew'
Cc: KOWALSKI David (RS/NB); 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. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 6

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8. Supplement 2 response to RAI No. 430 was sent on December 10, 2010 to provide a revised schedule for Questions 10.02-9 and 10.02-10. Supplement 3, Supplement 4 and Supplement 5 responses to RAI No. 430 were sent on December 20, 2010, February 23, 2011 and March 24, 2011, respectively, to provide a revised schedule for the three questions.

To provide additional time to interact with the NRC, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the three questions is provided below:

Question #	Response Date
RAI 430 — 10.02-8	May 27, 2011
RAI 430 — 10.02-9	May 27, 2011
RAI 430 — 10.02-10	May 27, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Thursday, March 24, 2011 1:41 PM
To: 'Tesfaye, Getachew'
Cc: KOWALSKI David (RS/NB); 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. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 5

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8. Supplement 2 response to RAI No. 430 was sent on December 10, 2010 to provide a revised schedule for Questions 10.02-9 and 10.02-10. Supplement 3 and Supplement 4 responses to RAI No. 430 were sent on December 20, 2010 and February 23, 2011, respectively, to provide a revised schedule for the three questions.

To provide additional time to interact with the NRC, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the three questions is provided below:

Question #	Response Date

RAI 430 — 10.02-8	April 28, 2011
RAI 430 — 10.02-9	April 28, 2011
RAI 430 — 10.02-10	April 28, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Wednesday, February 23, 2011 4:35 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); BRYAN Martin (External RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 4

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8. Supplement 2 response to RAI No. 430 was sent on December 10, 2010 to provide a revised schedule for Questions 10.02-9 and 10.02-10. Supplement 3 response to RAI No. 430 was sent on December 20, 2010 to provide a revised schedule for the three questions.

To provide additional time to interact with the NRC, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the three questions is provided below:

Question #	Response Date
RAI 430 — 10.02-8	March 25, 2011
RAI 430 — 10.02-9	March 25, 2011
RAI 430 — 10.02-10	March 25, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)
Sent: Monday, December 20, 2010 12:16 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB); Carneal, Jason
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8. Supplement 2 response to RAI No. 430 was sent on December 10, 2010 to provide a revised schedule.

To provide additional time to interact with the NRC, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the three questions is provided below:

Question #	Response Date
RAI 430 — 10.02-8	February 24, 2011
RAI 430 — 10.02-9	February 24, 2011
RAI 430 — 10.02-10	February 24, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Friday, December 10, 2010 1:24 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010. Supplement 1 response to RAI No. 430 was sent on November 17, 2010 to provide a revised schedule for Question 10.02-8.

To provide additional time to interact with the NRC, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the three questions is provided below:

Question #	Response Date
RAI 430 — 10.02-8	February 24, 2011
RAI 430 — 10.02-9	December 21, 2010
RAI 430 — 10.02-10	December 21, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Wednesday, November 17, 2010 1:55 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB); 'Miernicki, Michael'
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the three questions in RAI No. 430 on October 14, 2010.

Since a response to Question 10.02-8 remains in process, a revised schedule is provided in this email.

The schedule for technically correct and complete responses to the three questions is provided below:

Question #	Response Date
RAI 430 — 10.02-8	December 10, 2010
RAI 430 — 10.02-9	December 21, 2010
RAI 430 — 10.02-10	December 21, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Thursday, October 14, 2010 2:52 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 430 Response US EPR DC," provides a schedule since technically correct and complete responses to the three questions are not provided.

The following table indicates the respective pages in the response document, "RAI 430 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 430 — 10.02-8	2	2
RAI 430 — 10.02-9	3	4
RAI 430 — 10.02-10	5	7

The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 430 — 10.02-8	November 17, 2010
RAI 430 — 10.02-9	December 21, 2010
RAI 430 — 10.02-10	December 21, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, September 14, 2010 1:37 PM
To: ZZ-DL-A-USEPR-DL
Cc: Reddy, Devender; Lee, Samuel; Segala, John; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 430 (4801), FSARCh. 10, NEW PHASE 4 RAI

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 5, 2010, and on September 14, 2010, 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: 3184

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D47AF3E0)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, Question 10.02-9
Sent Date: 6/30/2011 8:39:55 AM
Received Date: 6/30/2011 8:39:59 AM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

Recipients:
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"HALLINGER Pat (EXTERNAL AREVA)" <Pat.Hallinger.ext@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"KOWALSKI David (AREVA)" <David.Kowalski@areva.com>
Tracking Status: None
"PATTON Jeff (AREVA)" <Jeff.Patton@areva.com>
Tracking Status: None
"BALLARD Bob (AREVA)" <Robert.Ballard@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	17316	6/30/2011 8:39:59 AM
RAI 430 Question 10.02-9 Response US EPR DC DRAFT.pdf	373779	

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

Response to

Request for Additional Information No. 430

9/14/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 10.02 - Turbine Generator
Application Section: 10.2

QUESTIONS for Balance of Plant Branch 1 (SBPA)

Question 10.02-9:

OPEN ITEM
New Phase 4 RAI

SRP Section 10.2 specifies that turbine overspeed protection systems should include both redundancy and diversity. Additionally, operating experience insights need to be addressed in accordance with 10 CFR 52.47(a)(22) requirements. The October 2, 2008, response to RAI 10.2-2 described the diversity that is provided by the primary and backup overspeed trip systems for the EPR turbine and included a markup of Tier 2 Section 10.2.2.9 to include this information. In general, the response indicated that diversity is provided by design and manufacturing strategies that are used. However, because the EPR design does not provide the same level of diversity as that called for by SRP Section 10.2 (i.e., one electrical and one mechanical overspeed trip system), it tends to be more subject to common cause and common mode failures than designs that include a mechanical overspeed trip system.

In accordance with 10 CFR 52.47(a)(9), ANP-10292, "U.S. EPR Conformance with SRP Acceptance Criteria," AREVA NP Inc., Rev. 1, dated May 2009, needs to be revised to indicate that a mechanical trip device is not used to provide overspeed protection for the EPR turbine and appropriate justification for this exception to the SRP needs to be included in Tier 2 Section 10.2. The discussion in the FSAR should be sufficient for the staff to find that the level of protection provided by the overspeed protection system for the U.S. EPR turbine is at least equivalent to the level of protection that would be provided by the diverse design called for by SRP Section 10.2. The following items are pertinent to the staff's evaluation in this regard and should be addressed in this RAI response and reflected in the FSAR as appropriate:

1) The description of the turbine overspeed protection systems (including air and hydraulic systems/interfaces as applicable) need to clearly indicate the parts that are shared between the primary and backup systems. For example, shared air and hydraulic dump lines and components such as dump valves and reservoirs need to be described in the FSAR. For clarity, the response should include schematic diagrams that show these flow paths, applicable components, and valves being actuated.

2) A summary description of the results of a reliability comparison of the two types of overspeed trip systems (or other analysis) is needed that establishes the basis for concluding that the reliability of the proposed design is at least equivalent to those that include a diverse mechanical overspeed trip system.

3) Factors and assumptions that are important for the analysis referred to in (2) to be valid need to be described and COL information items should be established as appropriate to ensure that these considerations are properly implemented and maintained. For example, the amount of time that either the primary or emergency overspeed trip system can be out of service for maintenance without inserting a turbine trip for the affected channel is an important factor. Periodic inspections, maintenance, testing, and corrective actions that are necessary to ensure reliable performance is another important factor in this regard.

4) Common mode and common cause failure vulnerabilities that could prevent the turbine overspeed trip systems from functioning properly and are pertinent to the design need to

be addressed. NUREG-1275, Volume 11, “Operating Experience Feedback Report – Turbine-Generator Overspeed Protection Systems,” dated April 1995, describes problems that have been identified and should be considered in this regard. For example, the performance of solenoid valves, steam isolation valves, hydraulic systems and air systems have historically been problematic. Also, the potential for flow restrictions to occur in hydraulic or air system dump lines is of concern (especially in those cases when redundant flow paths are not provided) and need to be addressed. Design and programmatic measures that provide assurance that these common mode and common cause failures are not likely to occur need to be described and means to ensure proper implementation by COL applicants should be established as appropriate.

a. The use of certain materials that are not subject to corrosion, conditioning equipment, desiccants, filters and design standards are examples of design considerations that may be pertinent for addressing common mode and common cause failures.

b. Implementation of periodic surveillance and inspections (including diagnostic routines that assess the status of turbine generator control and overspeed protection functions), maintenance, testing, and corrective actions are examples of programmatic controls that may be applicable for assuring that common mode and common cause failures are prevented from occurring. For example, measures that assure the reliable performance of components and the quality of hydraulic and air systems are pertinent in this regard.

Response to Question 10.02-9:

Item (1):

Technical Report ANP-10292 will be revised to indicate that the steam turbine has two redundant and diverse electrical overspeed systems that meet the single failure criterion. A mechanical overspeed protection system is not provided on the U.S. EPR turbine but a suitable alternative system is included. U.S. EPR FSAR Tier 2, Section 10.2.2.9 demonstrates that the electrical overspeed protection systems on the U.S. EPR turbine are as diverse as the mechanical and electrical protection systems listed in Paragraph III.2.c of SRP Section 10.2.

The two overspeed protection systems are redundant from the speed probes to the turbine trip (TT) relays. Each overspeed protection system has three independent speed probes and processing to provide the two out of three trip logic through the trip block. Refer to the Response to RAI 243, Question 10.02-6.

Though the trip block is a single unit, it has three channels with three solenoid valves and six plate valves. The trip block is redundant by design. The only single failure cause would be the supply orifice, which could leak or plug. Plugging or leakage of the supply orifice would result in an interruption of the control fluid supply and closing of the main steam and reheat stop and control valves. The trip block is automatically tested daily as part of the safety channel tests, as described in U.S. EPR FSAR Tier 2, Section 10.2.2.12. Failure of two-out-of-three trip signals will cause the control fluid to drain from the trip block directly to the tank through two drain lines. The drain piping from the trip block is independent of the drain headers from the main steam and reheat stop and control valves.

The control fluid system includes one control fluid reservoir with two 100 percent capacity pumps, two 100 percent capacity 25 micron filters, associated valves and instrumentation, regeneration system and control fluid cooling system. The system provides high pressure hydraulic fluid to open the main steam and reheat stop and control valves. Stainless steel piping is used to supply hydraulic fluid to the valve actuators. Connections at the actuator are made with a flexible hose to protect the pipe from vibration. Control fluid from the valve actuators is collected in two stainless steel drain headers, one on each side of the turbine. These drain headers combine into one common drain header, which is sloped back to the control fluid reservoir. The drain headers are sized to handle the maximum control fluid flow requirements maintaining the required valve stroke times. See Figure 10.02-9-1 for a schematic of the control fluid drain lines.

When a trip signal is caused by the overspeed protection system or by any other trip signals, the control fluid is rapidly discharged to the drain manifold. The fluid pressure quickly reduces to atmospheric pressure enabling the spring to close the valves. The fluid returns to the control fluid tank by gravity through the drain headers.

The sizing of the return lines, the materials of construction of the system and the continuous filtration of the control fluid minimizes the potential for blockage of the return lines. Periodic testing of the turbine valves confirms that the return lines are not plugged. Daily testing of the primary and backup overspeed protection systems, including the trip block, confirms that the valves of the trip block are functional. Testing and inspections of turbine components is described in U.S. EPR FSAR Tier 2, Section 10.2.2.12.

The turbine extraction non-return valves are either air-assisted, swing check valves with piston actuators or non-actuated swing check valves. For actuated valves, the actuator in the full open position allows the check valve disc to operate as a swing check valve that is free to open or close in response to the extraction steam flow. The air is supplied from the station instrument air system. Instrument air quality will be in accordance with the requirements of Instrumentation, Systems, and Automation Society (ISA) Standard 7.0.01, Quality Standard for Instrument Air, as stated in U.S. EPR FSAR Tier 2, Section 9.3.1.1.

Loss of air to the actuated valves will cause a spring to push the actuator piston to the closed position, rotating the valve shaft so that the valve disc begins to enter the flow stream to facilitate closure of the valve upon start of flow reversal. The actuator will be sized in such a way that the spring cannot force the valve closed upon loss of air during normal extraction flow. The extraction flow would have to be closed to flow reversal for closure to occur.

Each actuator is furnished with a three-way solenoid valve and a quick exhaust valve that locally vents the air from the actuator in response to a trip signal from the turbine control system. Air exhaust piping is not used. When the quick exhaust valve senses a loss of pressure at its inlet, it will shift position and rapidly vent the air through its vent port. The three-way solenoid valve includes an integral test switch which will allow local exercising of the extraction check valve and solenoid valve. Figure 10.02-9-2 is a representative schematic diagram of the air line to the non-return valve actuator.

U.S. EPR FSAR Tier 2, Section 10.2.2.1.1 will be revised to reflect information on the control fluid system and extraction non-return valves. U.S. EPR FSAR Tier 2, Section 10.2.2.9 will be revised to include information on the extraction non-return valves.

Item (2):

Overspeed protection for the turbine is provided by:

- Electro-hydraulic governor system.
- Primary electrical overspeed trip system.
- Backup electrical overspeed trip system.
- Manual trip button located in the main control room and manual trip button local to the turbine.

The electrical overspeed trip system provides acceptable diversity with respect to SRP 10.2 acceptance criteria. The mechanical and electrical systems both generate a TT by dumping hydraulic fluid from the valve actuators to the hydraulic fluid tank.

EPRI Technical Report 1013461, "Turbine Overspeed Trip Modernization" addresses the existing plants, where mechanical and electrical overspeed trip systems are used, and it provides information on the advantages and disadvantages of replacing the mechanical system with a digital electronic system.

The following are the disadvantages identified in the report for the mechanical overspeed trip system:

- Limited accuracy and reliability.
- No on-line diagnostics or surveillance available.
- Difficult to set, maintain and calibrate.
- Requires high risk test procedures.

The following are the advantages identified in the report for the electrical overspeed trip system:

- Improved accuracy, safety and reliability.
- Automated calibration, diagnostics and alarms.
- Eliminates need for high risk tests.

The mechanical system cannot be set to a precise trip set point at a given speed. Variation can be within three percent. Over time of operation, the trip set point can drift, changing the point where the system trips the turbine.

The mechanical system also lacks diagnostics. There are no signals back to the control system on rotor speed or failures in the system. The mechanical system provides no indication of system failure until the turbine fails to trip. The only way the system can be tested to confirm the trip set point, or to verify that the system is operational is to overspeed the turbine to the trip speed. If the second overspeed protection system has to be taken offline to perform this test, the only means to prevent overspeed beyond the trip point is for the mechanical system to perform correctly or for the operator to perform a manual trip. In any case, this test unnecessarily stresses the turbine rotor. The referenced EPRI Technical Report states that insurers estimate that fifty percent of all catastrophic overspeed events at power plants have occurred during failed overspeed tests.

The electric overspeed system can be tested during operation without actually overspeeding the turbine. The trip point can be set within one percent of the desired trip speed. The system provides feedback on failure of system components and provides a speed signal back to the turbine control system to monitor speed sensor accuracy. The electrical system also allows redundancy in the components and two out of three trip logic, which will minimize the number of false trips of the turbine. A specific turbine manufacturer will be selected by the COL Applicant. Therefore, a direct reliability comparison of the two types of overspeed trip systems is not available at this time. However, the design requires that the electrical system will have a minimum Safety Integrity Level (SIL) rating of 3, which in accordance with IEC 61508-1, “Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems,” would give a probability of a failure per hour of ≥ 10E-8 < 10E-7.

Because the speed sensors are located near the turbine front bearing, they are protected from the effects of missiles and pipe breaks. Failure of the hydraulic piping will cause a loss of pressure which closes the turbine valves.

The electrical system will provide a safer, more reliable overspeed protection system than the mechanical system because it can be tested during operation, it can provide continuous status feedback and alarms of component failures or signal discrepancies, and it can be tested without stressing the turbine in an overspeed event.

Reliability considerations for the trip solenoid valves, the main steam and reheat stop and control valves, the steam extraction non-return valves, the hydraulic system, the instrument air system, shared components and plugged drain lines are the same on both the mechanical and electrical systems. Periodic testing of the valves, including the trip solenoid valves, will demonstrate the operability of the valves. See the Response to Question 10.2-9, Item (1). The design of the hydraulic system minimizes the contamination of the hydraulic fluid and concerns of plugged drain lines using filters and stainless steel components and piping. The instrument air uses dry, filtered air and is routed in stainless steel piping. The trip valves exhaust air from the actuator locally with no exhaust piping.

In the case of TT, the failure of one extraction non-return valve to close will not cause a turbine overspeed.

U.S. EPR FSAR Tier 2, Section 10.2.2.9 will be revised to list the means of overspeed protection and the location of the speed sensors.

<u>Item (3):</u>

The factors influencing reliability of the two electrical overspeed protection systems are the redundancy and diversity of the hardware and software/firmware of the two designs. The redundancy and diversity are described in U.S. EPR FSAR Tier 2, Section 10.2.2, as modified by the responses to RAI 430, Questions 10.2-9 and 10.2-10. Each overspeed protection system is tested daily. While there is no specific time limit for how long a protection system channel component can be out of service, component failures are accessible for repair or replacement during turbine operation, except for speed sensors. These speed sensors are provided within each overspeed protection system. Both overspeed protection systems are required to be operational prior to startup of the turbine generator.

In case of a component failure, the internal system monitoring function detects the failure and annunciates an alarm in the main control room. The failure and status alarm sheet gives information on the failure characteristics.

The design requirement to meet IEC 61508-1 SIL 3 will be added to U.S. EPR FSAR Tier 2, Section 10.2.2.9 to document the reliability assumptions of the electrical overspeed protection system.

Item (4):

a. Piping, valves and equipment in the control fluid system are fabricated from stainless steel, including the fluid reservoir. Flow from the discharge of the control fluid pump travels through a 25 micron filter before being routed to the valve actuators. The system also includes:

   - A closed loop cooling system that routes fluid from the reservoir through one of two 100 percent coolers and then back to the tank to maintain the fluid temperature at a uniform value through the tank. The cooling system has a dedicated pump and heat exchanger bypass.
   - A closed loop regeneration system that routes fluid from the reservoir through a chemical filter followed by a particulate filter, to maintain the control fluid characteristics recommended by the manufacturer, before being routed back to the reservoir. The regeneration system has a dedicated pump.
   - A control fluid reservoir which includes an inlet breather desiccant filter to minimize the amount of moisture entering the reservoir.
   - A control fluid reservoir which includes an electrical heater that can be used to heat the control fluid for startup and during prolonged shutdown.

   There are two 100 percent capacity main control fluid pumps and two 100 percent capacity 25 micron filters. The three-way change-over valve enables switching from the filter in operation to the stand-by filter, without stopping the control fluid flow rate.

   U.S. EPR FSAR Tier 2, Section 10.2.2.1.1 will be revised to include this information.

   Loss of air supply or loss of power to the extraction non-return valve actuators will cause the actuator to move to the closed position under spring force. The non-return valve will not fully close until extraction steam flow is close to full reversal. The compressed air system is described in U.S. EPR FSAR Tier 2, Section 9.3.1.

b. As indicated in U.S. EPR FSAR Tier 2, Section 10.2.2.12, the main steam stop and control valves, the reheat stop and intercept valves, and one of each type of steam extraction non-return valve are dismantled for inspection at intervals of approximately three and one-third years. If any valve is shown to have flaws, excessive corrosion or improper clearance, the valve will be repaired and other valves of the same type will be dismantled and inspected.

   The main steam stop and control valves, the reheat stop and intercept valves, and the steam extraction non-return valves are exercised monthly, as indicated in U.S. EPR FSAR Tier 2, Section 10.2.2.12. Exercising the valves also exercises the solenoid valves associated with the valve actuators. The stop valves and control valves are in series in the steam lines so failure of both valves would be required to prevent isolation of the turbine.

All turbine protection system channels, including the trip block valves, are tested daily. Additional components are tested at regular intervals. The system components are continuously monitored for faults.

The components of the turbine governor system are also tested daily when the turbine is in operation.

Each channel of the primary and secondary overspeed protection systems is tested daily when the turbine is in operation. This consists of simulating a speed increase at the card level leading to a trip order on the involved channel, de-energizing the trip block solenoid valve and opening two trip block plate valves. The two-out-of-three trip logic keeps the turbine from tripping. The trip block plate valves have position indicators for confirmation of the test results. These tests indicate if there has been a failure of a speed sensor, electronic card, interposing relay, trip block solenoid valve or trip block plate valve.

U.S. EPR FSAR Tier 2, Section 10.2.2.1.1 will be revised to include the requirements that the extraction non-return valve actuators fail close on loss of air or power. U.S. EPR FSAR Tier 2, Section 10.2.2.12 states that the turbine valves and non-return valves are exercised monthly and will be revised to add that the governor system and overspeed protection systems are both tested daily.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 10.2.2.1.1, 10.2.2.9 and 10.2.2.12 will be revised as described in the response and indicated on the enclosed markup.

Technical Report Impact:

ANP-10292, “U.S. EPR Conformance with Standard Review Plan (NUREG-0800),” will be revised as described in the response and indicated on the enclosed markup.

Figure 10.02-9-1—Control Fluid Drain Headers

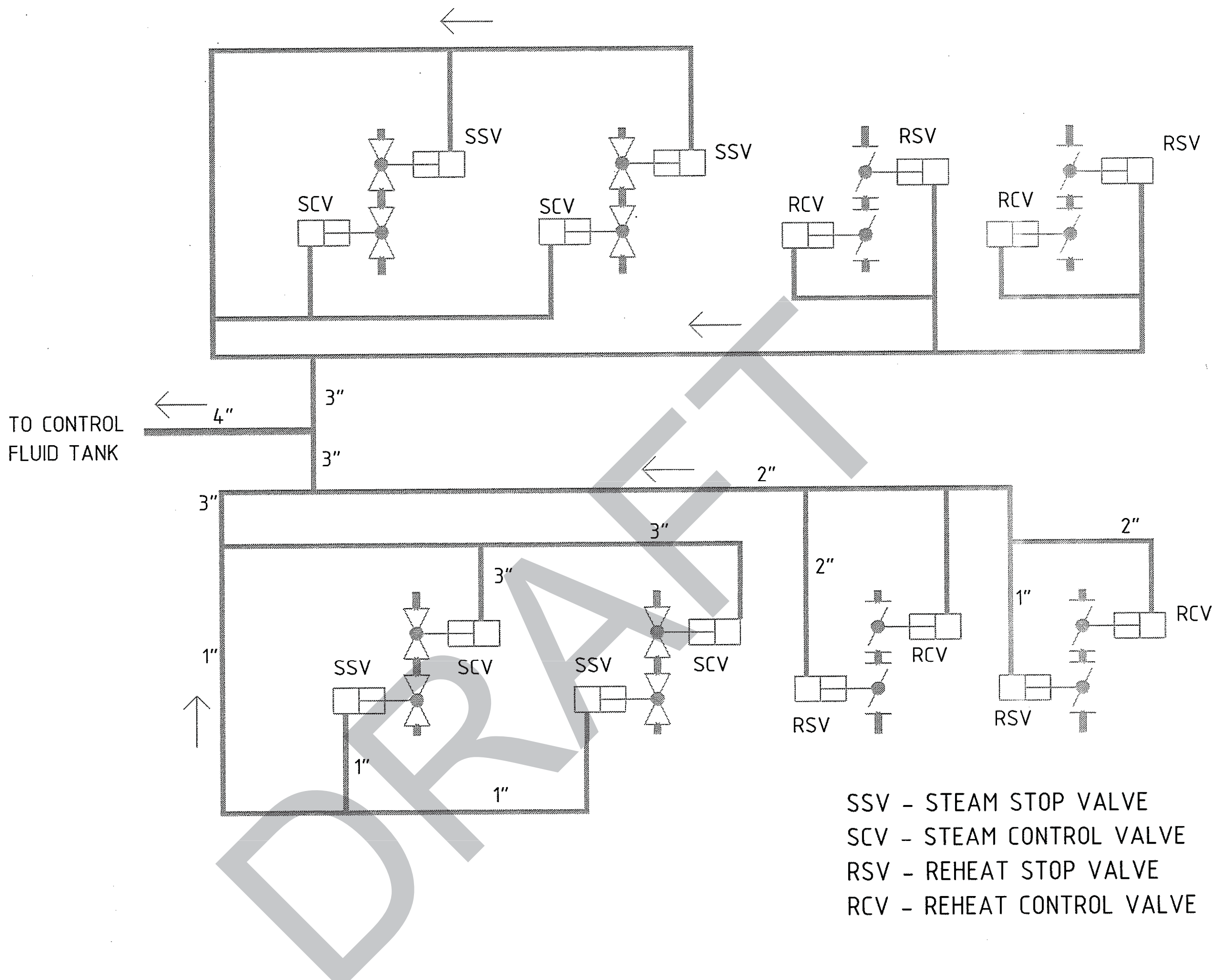
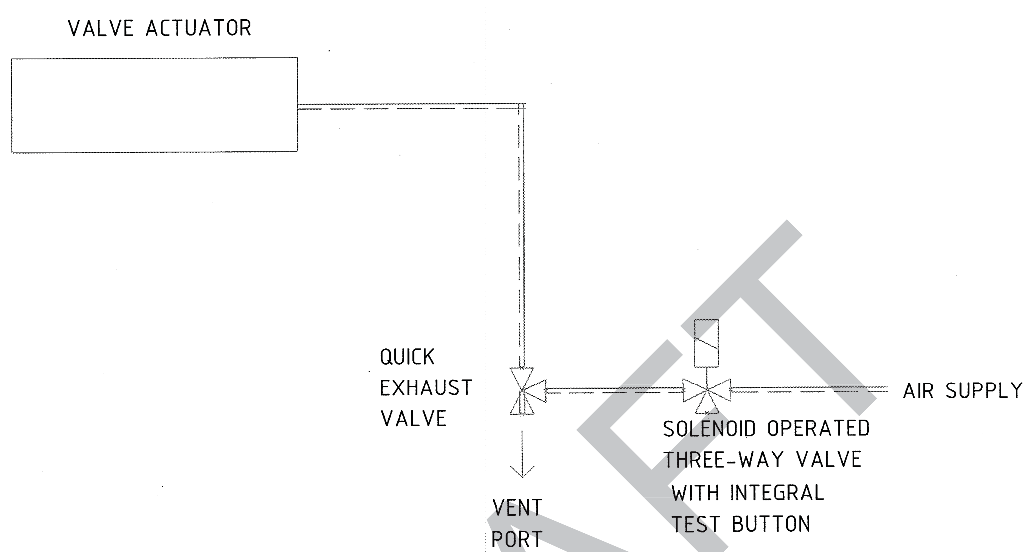


Figure 10.02-9-2—Non-Return Valve Air Schematic



U.S. EPR Final Safety Analysis Report Markups

no-load or low-load operation. Extraction steam from the LP turbines supplies the first and second stages of feedwater heating.

HP Main Stop and Control Valves

Four HP main stop and control valves admit steam to the HP turbine. The primary function of the main stop valves is to quickly shut off the steam flow to the turbine under emergency conditions. The primary function of the control valves is to control steam flow to the turbine in response to the turbine control system. Each control valve is operated by a single-acting, spring-closed servomotor opened by a high pressure fire-resistant fluid supplied through a servo valve. The stop and control valves close in approximately 0.30 seconds. Each HP stop valve contains a permanent steam strainer to prevent foreign matter from entering the control valves and turbine.

Reheat Stop and Intercept Valves

The reheat stop and intercept valves are arranged between the MSRs and IP turbine inlet. The IP steam inlet is controlled by four sets of two series-mounted individual valves. One valve fulfills a turbine protection function (stop valve) and the other, a control and protection function (intercept valve). The valves are butterfly-type valves. The disc of each valve can rotate 90 degrees, from closed to open position, by means of a servomotor. The stop and intercept valves close in approximately 0.30 seconds.

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Control Fluid System

The control fluid system provides high pressure hydraulic fluid to open the main steam stop and control valves, and the reheat stop and control valves. The system includes two 100 percent capacity pumps, two 100 percent capacity filters, associated valves and instrumentation, hydraulic fluid regeneration system, and cooling system. The piping, valves, and equipment in the control fluid system are fabricated from stainless steel, including the fluid reservoir. Flow from the discharge of the control fluid pump flows through a 25 micron filter before being routed to the valve actuators. The piping connection at each valve actuator is with a flexible hose to protect the control fluid piping from vibration. The system also includes:

- Closed loop cooling system that routes fluid from the reservoir through two 100 percent coolers and back to the tank to maintain the fluid temperature at a uniform value. The cooling system has a dedicated pump and heat exchanger bypass.
- Closed loop regeneration system that pumps fluid from the reservoir through a chemical filter followed by a particulate filter to maintain the manufacturer's recommended characteristics of the control fluid, before being routed back to the reservoir. The regeneration system has a dedicated pump.

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- Control fluid reservoir includes an inlet breather desiccant filter to minimize the amount of moisture entering the reservoir.

Extraction Non-Return Valves

Non-return valves are used in selected turbine steam extraction lines to minimize the potential for turbine overspeed and prevent water induction into the turbine. The number of valves, type of valve, and maximum steam volume allowable between the valve and turbine extraction nozzle will be in accordance with the turbine manufacturer's requirements.

Two types of non-return valves are provided:

- Air-assisted swing check valve with piston actuator, air-to-open, spring-to-close type are used on the high pressure extraction lines to feedwater heaters 6 and 7, and on the intermediate extraction lines to feedwater heaters 3 and 4 to prevent turbine overspeed .
- Swing check valve without actuator type is used on the extraction line to the deaerating feedwater heater to prevent water induction into the turbine.

Non-return valves are not required for the extraction steam lines to feedwater heaters 1 and 2 because of the low pressure in these heaters.

The air-assisted check valves are held open with instrument air and the valve can operate as a non-actuated swing check valve. The actuator will return to the closed position when a trip signal is received by the solenoid valve used to supply air to the actuator. The solenoid valve shifts to the exhaust position causing a loss of inlet pressure on the quick exhaust valve. Loss of inlet pressure causes the quick exhaust valve to rapidly vent the actuator piston chamber allowing the actuator spring to rotate the valve shaft and push the valve disc into the flow stream. Closure time of the non-return valve is within one second after the solenoid valve receives a trip signal. A test switch on the solenoid valve allows both the check valve and the solenoid valve to be periodically exercised. Loss of air supply or power to the extraction non-return valve actuator will cause the actuator to move to the close position under spring force.

Generator

The generator is a four-pole machine directly driven by the turbine and supplies the step-up transformer with high voltage electrical output. The field winding is directly cooled by hydrogen gas. The stator winding is directly cooled by an internal circulation of de-ionized water (stator cooling water). The generator static excitation system is controlled by an automatic voltage regulator. The generator rotor is made from a solid alloy steel forging with high tensile strength. The slots for the field coils are milled in the central body of the rotor.

10.2.2.9 Overspeed Protection

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Overspeed protection for the turbine is provided by:

- Electro-hydraulic governor system.
- Primary electrical overspeed trip system.
- Backup electrical overspeed trip system.
- Manual trip button located in the main control room and manual trip button local to the turbine.

A protective trip system is provided to quickly close the main steam stop and control valves, the reheat stop and intercept valves, and the steam extraction non-return valves~~main stop, control, reheat stop and intercept valves~~ in the event of an unsafe condition or to provide overspeed protection. The system is designed to minimize false and spurious trips during normal operation and allow testing of the trip system during operation. A power load imbalance function is provided, which compares turbine and generator load and initiates an appropriate momentary control valve closure when the turbine load exceeds the generator load by a specified amount.

The steam turbine has two redundant and diverse electrical overspeed systems that meet the single failure criterion. The two overspeed protection systems are redundant from the speed probes to the turbine trip relays. Both overspeed protection systems have three independent speed probes and processing modules acting on one of three electronic tripping channels. Each independent electrical overspeed trip system is designed and manufactured by a different vendor. Each vendor directly manufactures their system components (e.g., motherboards, sensors) and develops ~~the~~ diverse software to transform the analog speed sensor signal into a digital signal. Software between the two overspeed protection systems will be different in parameters, dynamics, or logic. There are no ~~common~~ components, ~~or~~ process inputs, or process outputs shared between the two systems. Each system will be installed in a separate cubicle with separate power sources. Figure 10.2-2—Overspeed Protection System Schematic shows the separate source of power supply to each system and how the sensors are treated by independent motherboard~~card~~s.

The two overspeed protection systems each have three separate electronic boards for signal conversion, processing and activation of an overspeed trip. Digital trip output signals for the overspeed trip will interrupt the power of separate relays as shown in Figure 10.2-2. The trip signals from the two overspeed protection systems are isolated from and independent of each other.

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The electrical system has a minimum Safety Integrity Level rating of 3, in accordance with IEC 61508-1, "Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems," The trip block provides an interface between the electrical and hydraulic systems and consists of three trip solenoid valves. The three independent electronic channels energize three fail safe solenoid valves (trip by loss of power). Each solenoid valve acts on two hydraulic relays of the trip block in order to perform the hydraulic two-out-of-three trip voting. The turbine will be tripped when a least two solenoid valves are de-energized. An interruption and discharge of the fluid supply by the trip block will cause the high pressure and intermediate pressure valves to close by spring action. Figure 10.2-3—Turbine Trip Block Schematic provides a schematic of the trip block.

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Failure of the hydraulic ~~tubing~~piping between the trip block and the valve actuator, or between the hydraulic fluid tank and the valve actuator will cause a loss of fluid pressure, which closes the valves. Thus, the trip block is designed fail safe, due to the fact that any failure (e.g., loss of power, loss of safety fluid pressure, fluid leak) will cause a steam turbine trip.

When the trip block dumps the hydraulic fluid to the control fluid tank, low pressure occurs in the control fluid supply line to the main steam and reheat valves. Low pressure in the fluid supply line causes the exhaust valve on each actuator to trip and exhaust the fluid from the operating piston chamber of the actuator to the opposing chamber and the fluid drain line to the control fluid tank. Pressure in the operating piston chamber rapidly goes to atmospheric and the valves close by spring action.

The speed sensors are located near the turbine front bearing so they are protected from the effects of missiles and pipe breaks.

The primary electrical overspeed trip system fully closes the valves at about 110 percent of rated speed. An independent and redundant backup electrical overspeed trip circuit is provided to fully close these valves at about 111 percent of rated speed. The TG rotor is designed to withstand 120 percent of rated speed.

Each of the digital output signals indicating overspeed trip activation is directly wired to different input cards of the turbine protection system. These signals are processed in the triple redundant turbine protection system for the trip of the three protection channels and for indication of overspeed activation on the human machine interface. When the turbine is tripped, the turbine system extraction non-return valves receive a closing signal. The turbine tripped signal is caused by low control fluid pressure from two out of three analog measurements.

The actuation of the turbine protection system does not rely on components in the electro-hydraulic control system. Conversely, turbine trip initiation devices are not used for normal control of the unit.

Provisions for online testing of the emergency trip system, including individual trip devices, are provided.

After receipt of a trip signal, the hydraulic controllers for the main stop, control, reheat stop and intercept valves close off these valves quickly to preclude an unsafe turbine overspeed. The response of the controllers considers the residual steam in the piping between the valves and the turbine.

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After receipt of a trip signal from the turbine protection system, the air supply solenoid valve of each extraction non-return valve will move to the exhaust position to rapidly close the check valves to preclude an unsafe turbine overspeed because of steam backflow into the turbine. The response time and location of the valves considers the residual steam in the extraction piping between the valve and the turbine. The air supply solenoid valve will send the valve actuator to the closed position upon loss of power.

10.2.2.10 Turbine Supervisory Instrumentation

TSI monitors thermal, hydraulic and electrical parameters; controls equipment components; and initiates automatic alarms and automatic shutdown of the TG in the event of an unsafe condition. Monitoring instrumentation interfaces with the plant PAS. The following conditions initiate a turbine trip:

- Low bearing oil pressure.
- Low control oil (hydraulic fluid) pressure.
- High condenser back pressure.
- Turbine overspeed.
- Thrust bearing excessive wear.
- Remote trip (~~includes manual and~~ reactor trips).
- Excessive 'Time of Operation above No Flow Load' (initiated by generator reverse power relay after time delay specified by turbine designer).
- Loss of speed signals.
- Journal bearing high vibration.
- LP turbines outer casing high temperature.
- Hardwired manual trip button located in the main control room.
- Hardwired manual trip button located close to the turbine front end bearing.

Each measurement important to the protection and proper operation of the turbine generator is monitored and displayed as an alarm when the first threshold is passed over (such as high or low level). If the second threshold is passed over (such as high-diameters are checked for proper clearance. If any valve is shown to have flaws or excessive corrosion or improper clearances, the valve is repaired or replaced and other valves of that type are also dismantled and inspected.

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- The main steam stop and control valves, reheat stop and intercept valves, and steam extraction non-return valves are exercised monthly at 97% to 100% load and observations of the valve motions are made.
- The components of the electro-hydraulic governor system~~, as well as the primary and backup overspeed trip,~~ are automatically tested when the turbine is in operation on a daily basis.
- The components of each channel of the primary and backup overspeed protection systems, including the trip block valves, are automatically tested on a daily basis when the turbine is in operation.
- Rate of seat leakage of the main steam stop valves is tested at each refueling.
- The valve closure time of the main steam stop and control valves, and the reheat stop and intercept valves, is tested at each refueling.
- Condition of the valve seats of the extraction non-return valves will be inspected in accordance with the valve manufacturer's recommendations.
- The control room manual trip and local manual trip are tested prior to startup after each outage or if maintenance has been performed on either system.

10.2.3 Turbine Rotor Integrity

Turbine rotor integrity is provided by the integrated combination of material selection, rotor design, fracture toughness requirements, inspections and tests. The combination results in a very low probability of rotor failure.

10.2.3.1 Materials Selection

Turbine rotors are made from vacuum melted or vacuum degassed Ni-Cr-Mo alloy steel by processes that minimize flaw occurrence and provide adequate fracture toughness. Tramp elements are controlled to the lowest practical concentrations consistent with good scrap selection and melting practice, and consistent with obtaining adequate initial and long-life fracture toughness for the environment in which the parts operate. The sulfur and phosphorous concentrations are specified below 0.020 percent (chemical product analysis), which is in accordance with specifications ASTM A470 (Reference 11) and ASTM A471 (Reference 4).

The chemical compositions and mechanical properties used for the turbine rotors are given in Table 10.2-3—HP Rotor, Table 10.2-4—IP Discs and Shaft End, and Table 10.2-5—LP Rotors.

U.S. EPR Conformance with Standard Review Plan (NUREG-0800) ANP-10292 Technical Report Markups

CHAPTER 10 Steam and Power Conversion System			
SRP Criterion	**Description (AC – Acceptance Criteria Requirement, SAC – Specific SRP Acceptance Criteria)**	**U.S. EPR Assessment**	**FSAR Section(s)**
SRP 10.2	**Turbine Generator (R3, 03/2007)**		
10.2-AC-01	**General Design Criterion (GDC 4)** as it relates to the TGS for the protection of SSCs important to safety from the effects of turbine missiles by providing a turbine overspeed protection system (with suitable redundancy) to minimize the probability of generation of turbine missiles.	Y	10.2.4 10.2A.4 3.5.1.1
10.2-AC-02	**10 CFR 52.47(b)(1)**, which requires that a DC application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations;	ITAAC	Tier 1 FSAR 14.3
10.2-AC-03	**10 CFR 52.80(a)**, which requires that a COL application contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act, and the NRC's regulations.	N/A-COL	N/A
10.2-SAC-01	Specific criteria necessary to meet the requirements of **GDC 4** are as follows: A. A turbine control and overspeed protection system should control turbine action under all normal or abnormal operating conditions and should ensure that a fullload turbine trip will not cause the turbine to overspeed beyond acceptable limits. Under these conditions, the control and protection system should permit an orderly reactor shutdown by use of either the turbine bypass system and main steam relief system or other engineered safety systems. The overspeed protection system should meet the single failure criterion and should be testable when the turbine is in operation. B. The turbine main steam stop and control valves and the reheat steam stop and intercept	Y EXCEPTION (The U.S. EPR turbine overspeed protection system utilizes two diverse electrical	A - 10.2.4 10.2A.4 10.2.2.9 10.2A.2.9 B - 10.2.4 10.2A.4 10.2.2.1.1

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CHAPTER 10
Steam and Power Conversion System

SRP Criterion	Description (AC – Acceptance Criteria Requirement, SAC – Specific SRP Acceptance Criteria)	U.S. EPR Assessment	FSAR Section(s)
	valves should protect the turbine from exceeding set speeds and should protect the reactor system from abnormal surges. The reheat stop and intercept valves should be capable of closure concurrent with the main steam stop valves, or of sequential closure within an appropriate time limit, to ensure that turbine overspeed is controlled within acceptable limits. The valve arrangements and valve closure times should be structured so that a failure of any single valve to close will not result in excessive turbine overspeed in the event of a TGS trip signal. C. The TGS should have the capability to permit periodic testing of components important to safety while the unit is operating at rated load.	overspeed protection systems to satisfy the single failure criterion and does not incorporate a mechanical overspeed protection system.)	10.2A.2.1.1 C - 10.2.2.12 10.2A.2.12 10.02-9
10.2-SAC-02	An inservice inspection program for main steam and reheat valves should be established and should include the following provisions: A. At intervals of approximately 3-1/3 years, during refueling or maintenance shutdowns coinciding with the inservice inspection schedule required by **Section XI of the American Society of Mechanical Engineers (ASME) Code** for reactor components, at least one main steam stop valve, one main steam control valve, one reheat stop valve, and one reheat intercept valve should be dismantled, and visual and surface examinations should be conducted of valve seats, disks, and stems. If this process detects unacceptable flaws or excessive corrosion in a valve, all other valves of that type should be dismantled and inspected. Valve bushings should be inspected and cleaned, and bore diameters should be checked for proper clearance. B. Main steam stop and control valves should be exercised at a frequency recommended by the turbine vendor or valve manufacturer.	Y	A - 10.2.2.12 10.2A.2.12 B - 10.2.2.12 10.2A.2.12
10.2-SAC-03	The arrangement of connection joints between the low-pressure turbine exhaust and the main condenser should prevent adverse effects on any safety-related equipment in the	Y	10.2.4 10.2A.4