

Response to

Request for Additional Information No.606, Supplement 1

9/11/2013

U.S. EPR Standard Design Certification

AREVA Inc.

Docket No. 52-020

SRP Section: 16 - Technical Specifications

Application Section: TS Section 3.7

SRSB Branch

Question 16-324:

Upon review of Revision 5 of the U.S. EPR Tier 2, FSAR, Chapter 16, "Technical Specifications (TS)," and after discussions between AREVA and the staff during the August 7-8, 2013 EPR DC Public Meeting the following items were developed to address accuracy and completeness in the EPR TS and Bases:

1. Pages 3.7.22-1 through 3.7.22-2: For the new TS 3.7.22, "Steam Generator (SG) Blowdown Transfer Valves," the proposed requirements address only the safety function of these valves in their closed positions. These SG Blowdown transfer valves also perform a safety function of transferring water inventory between the affected SG and the intact SG during a steam generator tube rupture (SGTR) event. The applicant is requested to provide requirements which address their capability to open under the SGTR accident condition.
2. Page 3.7.22-2: For SR 3.7.22.1, the frequency should be "12 hours" instead of "31 days" since the failure of this surveillance potentially affects at least two independent SG loops. See SR 3.5.4.1 in TS 3.5.4, "IRWST - Operating," for a similar application.
3. Page B 3.7.22-2: In the discussion of Action B.1, the phrase "to remove power from the loop isolation valve operators" is not relevant to the required action to close the affected valves. Revise the discussion accordingly.
4. Page B 3.7.22-3: In the discussion of SR 3.7.22.1, the phrase "ensures that the required flow can be made available" is not relevant to the verification that the valves are closed with power removed from the valve operators. Revise the discussion accordingly.

Response to Question 16-324:

The requested changes have been made to U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification 3.7.22, "Steam Generator (SG) Slowdown Transfer Valves" and associated Bases.

This RAI response also addresses the following oral comments received from the NRC on April 14, 2014:

- The SG Blowdown Isolation valves provide a safety function of preserving SG inventory following events that require an Emergency Feedwater System actuation. These valves need to be added to Technical Specification 3.7.22, or a separate Technical Specification. Add appropriate Limiting Conditions for Operation (LCO), Actions, Surveillances and Bases.
- Two bullets are needed for the transfer valve LCO:
 - 1) Shall be operable, and
 - 2) Shall be closed with power removed.
- A Note should reflect the condition entry for each valve group.
- Combine ACTIONS that have the same Completion Time.
- Verify transfer valve strokes open in Surveillance Requirement (SR) 3.7.22.2.
- In the first paragraph of the Bases Background and in the Applicable Safety Analysis, provide the reason for requiring transfer valves to be closed.
- In the Bases, clarify use of "isolation valves" and "transfer valves".

- Include appropriate FSAR references in the Bases.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification 3.7.22 and associated Bases will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

3.7 PLANT SYSTEMS

3.7.22 Steam Generator (SG) Blowdown Transfer and Isolation Valves

LCO 3.7.22 The SG blowdown isolation and transfer valves shall be OPERABLE:

- a. Three SG blowdown isolation valves per SG.
- b. Four SG blowdown transfer valves
 - 1. Shall be OPERABLE
 - 2. Shall be closed with power removed from each valve operator.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

-----NOTE-----

Separate Condition entry is allowed for each pair of SG blowdown transfer valves and for each set of SG blowdown isolation valves.

<u>CONDITION</u>	<u>REQUIRED ACTION</u>	<u>COMPLETION TIME</u>
<u>A. One or more SG blowdown lines with one isolation valve inoperable.</u>	<u>A.1 Restore SG blowdown isolation valve(s) to OPERABLE status.</u>	<u>72 hours</u>
<u>B. One SG blowdown transfer valve inoperable in one or both transfer lines.</u>	<u>B.1 Restore SG blowdown transfer valve(s) to OPERABLE status.</u>	<u>72 hours</u>
<u>C. Two or more SG blowdown isolation valves inoperable in the same SG blowdown line.</u>	<u>C.1 Restore SG blowdown isolation valves to OPERABLE status.</u>	<u>1 hour</u>

<u>ACTIONS (continued)</u>		
<u>CONDITION</u>	<u>REQUIRED ACTION</u>	<u>COMPLETION TIME</u>
<u>D. Two SG blowdown transfer valves inoperable in the same SG blowdown transfer line.</u>	<u>D.1 Restore SG blowdown transfer valves to OPERABLE status.</u>	<u>1 hour</u>
<u>E. Power available to one or more SG blowdown transfer valve operators or one or more SG blowdown transfer valves open.</u>	<u>E.1 Close valve(s).</u> <u>AND</u> <u>E.2 Remove power from SG blowdown transfer valve operators.</u>	<u>30 minutes</u>
<u>F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met.</u>	<u>F.1 Be in MODE 3.</u> <u>AND</u> <u>F.2 Be in MODE 5.</u>	<u>6 hours</u> <u>36 hours</u>
<u>SURVEILLANCE REQUIREMENTS</u>		
<u>SURVEILLANCE</u>		<u>FREQUENCY</u>
<u>SR 3.7.22.1</u>	<u>Verify each SG blowdown transfer valve is closed and power is removed from each SG blowdown transfer valve operator.</u>	<u>12 hours</u>
<u>SR 3.7.22.2</u>	<u>Verify the isolation time of each SG blowdown isolation valve is within limits.</u>	<u>In accordance with the Inservice Testing Program.</u>
<u>SR 3.7.22.3</u>	<u>Verify each SG blowdown transfer valve strokes open.</u>	<u>24 months</u>

SURVEILLANCE REQUIREMENTS (continued)

<u>SURVEILLANCE</u>	<u>FREQUENCY</u>
<u>SR 3.7.22.4</u> <u>Verify the SG blowdown isolation valves actuate to the isolation position on an actual or simulated actuation signal.</u>	<u>24 months</u>

~~3.7 PLANT SYSTEMS~~

~~3.7.22 Steam Generator (SG) Blowdown Transfer Valves~~

~~LCO 3.7.22 Four SG blowdown transfer valves shall be OPERABLE.~~

~~APPLICABILITY: MODES 1, 2, 3, and 4.~~

~~ACTIONS~~

~~NOTE~~

~~Separate Condition entry is allowed for each SG blowdown transfer valve.~~

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SG blowdown transfer valve inoperable	A.1 Restore SG blowdown transfer valve to OPERABLE status.	72 hours
B. Power available to one or more SG blowdown transfer valve operators.	B.1 Remove power from SG blowdown transfer valve operators.	30 minutes
C. One or more SG blowdown transfer valves open.	C.1 Close valve(s).	30 minutes

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A or B not met.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.7.22.1 — Verify each SG blowdown transfer valve is closed and power is removed from each transfer valve operator.	12 hours
SR 3.7.22.2 — Verify each blowdown transfer valve is OPERABLE in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program.

~~B 3.7 Plant Systems~~~~B 3.7.22 Steam Generator (SG) Blowdown Transfer Valves~~~~BASES~~

~~BACKGROUND~~ — The SG blowdown system includes piping and valves that cross-connect SGs 1 and 2, and SGs 3 and 4. Two parallel isolation valves powered from respective emergency power supplies ensure the ability to establish a blowdown flow path between the secondary side of each SG pair. The SG blowdown transfer valves are used to transfer inventory between SGs in the event of a steam generator tube rupture (SGTR) and loss of offsite power. Power operation with a SG blowdown transfer valve open is not permitted.

To ensure that inadvertent opening of a SG blowdown transfer valve does not occur, the valves must be closed with power to the valve operators removed in MODES 1, 2, 3, and 4. Administrative controls and equipment interlocks (P18 permissive) must be satisfied prior to opening the isolation valves as described in TS 3.3.3.

~~APPLICABLE SAFETY ANALYSES~~ — Following a postulated SGTR with a loss of offsite power, the faulted SG is isolated to limit offsite doses (Ref. 1). To cool the unit to cold shutdown conditions, the faulted SG must be cooled and depressurized. The SG transfer flow path allows SG inventory to be transferred from a faulted SG to an intact SG. This LCO places controls on the SG blowdown transfer valves so that the valves are not inadvertently opened in MODES 1, 2, 3, and 4. The inadvertent opening of a SG blowdown transfer valve does not impact continued unit operation. However, the safety analyses for either a main steam line break or main feedwater line break assume that the SG blowdown transfer valves are closed. Therefore, during normal operation, the SG blowdown transfer valves must remain closed.

The SG blowdown transfer valves satisfy Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).

~~LCO~~ — The accident analysis assumes that the SG blowdown transfer valves are closed at the start of design basis transients. The steam generator tube rupture (SGTR) event assumes that the SG blowdown transfer valves are OPERABLE to aid in RCS cooldown to RHR entry conditions.

The OPERABILITY of the SG blowdown transfer valves requires that the valves are closed and power removed in the Applicable Modes. The OPERABILITY of the SG blowdown transfer valves is determined by periodic surveillance testing in accordance with the Inservice Testing Program.

BASES**LCO (continued)**

This LCO provides assurance that the SG blowdown transfer valves will perform their design safety function to mitigate the consequences of a postulated SGTR while maintaining separation of the SGs for other postulated events.

APPLICABILITY — In MODES 1 through 4, this LCO ensures that the SG blowdown transfer valves are closed and power to the valve operators is removed. This LCO also ensures that the SG blowdown transfer valves are OPERABLE for mitigation of an SGTR with loss of offsite power. The safety analyses assume that the SG blowdown transfer valves are closed at the onset of any postulated event but can be opened in the event of a SGTR.

In MODES 5 and 6, the SG blowdown transfer valves may be open or closed as needed.

ACTIONS — The Actions have been provided with a Note to clarify that all SG blowdown transfer valves for this LCO are treated as separate entities, each with separate Completion Times, which means that the Completion Time is on a component basis.

A.1

With one SG blowdown transfer valve inoperable, action must be taken to restore the inoperable valve to OPERABLE status in 72 hours. The 72 hour Completion Time is reasonable since a redundant, parallel valve is available in each SG blowdown transfer flow path.

B.1

If power is inadvertently restored to one or more SG blowdown transfer valves, the potential exists for accidental opening of the SG blowdown transfer flow path. The SG blowdown transfer valves have motor operators. Therefore, these valves will maintain their last position when power is removed from the valve operator. With power applied to the valve operators, only the interlocks prevent the valve from being operated. Although operating procedures and interlocks make the occurrence of this event unlikely, the prudent action is to remove power from the loop isolation valve operators. The Completion Time of 30 minutes to remove power from the loop isolation valve operators is sufficient considering the complexity of the task.

BASES**ACTIONS** (continued)C.1

If an SG blowdown transfer valve is open in MODES 1 through 4, the affected valve must be closed. The Completion Time of 30 minutes to close the isolation valve is sufficient considering the complexity of the task.

D.1

If a Required Action of Condition A, B or C cannot be met, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE — SR 3.7.22.1
REQUIREMENTS

The Surveillance is performed at least once per 12 hours to ensure that the SG blowdown transfer valves are closed, with power removed from the valve operators. The Frequency of 12 hours is based on engineering judgment, and has proven to be acceptable. Operating experience has shown that the failure rate is low enough for the 12 hour Frequency to be justified.

SR 3.7.22.2

This SR verifies the OPERABILITY of the SG blowdown transfer valves in accordance with the Inservice Testing Program.

The Frequency is in accordance with the Inservice Testing Program and is in accordance with the ASME OM Code (Ref. 2).

REFERENCES — 1. FSAR Chapter 15.

2. ASME Code for Operation and Maintenance of Nuclear Power Plants.

B 3.7 Plant SystemsB 3.7.22 Steam Generator (SG) Blowdown Transfer and Isolation Valves

BASES

BACKGROUND The steam generator (SG) blowdown system includes piping and valves that are used to conserve SG inventory following events discussed in Ref. 1, as well as piping and valves that assist in plant cooldown following a postulated steam generator tube rupture. The SG Blowdown System is discussed in more detail in Ref. 2.

Each SG has three motor operated blowdown isolation valves. One isolates the blowdown cold leg, and another isolates the blowdown hot leg. Downstream of both of these valves is a common leg blowdown isolation valve. Closing the SG blowdown isolation valves prevents loss of SG secondary inventory, and limits the amount of emergency feedwater required.

Piping cross-connects SGs 1 and 2, and SGs 3 and 4. Two parallel transfer valves ensure the ability to establish a blowdown flow path between the secondary sides of each SG pair. The SG blowdown transfer valves are used to transfer inventory between SGs in the event of a steam generator tube rupture (SGTR) and loss of offsite power. Power operation with an SG blowdown transfer valve open is not permitted since this could result in the blowdown of two SGs in the event of a main steam line or feedline break.

To ensure that inadvertent opening of an SG blowdown transfer valve does not occur, the valves must be closed with power to the valve operators removed in MODES 1, 2, 3, and 4. Administrative controls and equipment interlocks must be satisfied prior to opening an SG blowdown transfer valve as described in Ref 3. With hot leg temperature > 194°F and no reactor trip, the P18 interlock prevents opening of the SG blowdown transfer valves.

BASES

APPLICABLE SAFETY ANALYSES Following a postulated steam generator tube rupture (SGTR) with a loss of offsite power, the faulted steam generator is isolated to limit offsite doses (Ref. 1). In order to cool the unit to cold shutdown conditions, the faulted SG must be cooled and depressurized. The SG transfer flow path allows SG inventory to be transferred from a faulted SG to an intact SG. This LCO places controls on the SG blowdown transfer valves to ensure that the valves are not inadvertently opened in MODES 1, 2, 3, and 4. The inadvertent opening of a SG blowdown transfer valve does not impact continued unit operation. However, the safety analyses for either a main steam line break or main feedwater line break assume that the SG blowdown transfer valves are closed to maintain SG separation. Therefore, during normal operation, the SG blowdown transfer valves must remain closed.

During power operation, the SG isolation valves are open to provide a SG blowdown flow path. For accidents that generate a containment isolation signal, an emergency feedwater actuation signal, or a main steam line isolation signal with low SG pressure or high SG pressure drop, all twelve SG isolation valves receive a closure signal. In the case of a partial cooldown signal with either a high activity in main steam, or an SG level outside of the narrow range, the three SG isolation valves for the affected SG receive a closure signal. Closure of the SG isolation valves is necessary for blowdown system isolation, to prevent loss of SG secondary inventory to limit the amount of emergency feedwater required, and to minimize release of radioactive inventory in the event of an SGTR.

The SG blowdown transfer and isolation valves satisfy Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).

LCO The accident analyses assume that the SG blowdown transfer valves are closed at the start of design basis transients and that the SG isolation valves close to conserve SG inventory. The SGTR event with loss of offsite power assumes that the SG blowdown transfer valves are OPERABLE to aid in RCS cooldown to RHR entry conditions.

This LCO ensures that the SG blowdown transfer valves are closed in the applicable MODES, and that the SG isolation valves are OPERABLE in applicable MODES. The OPERABILITY of the SG blowdown transfer and isolation valves is determined by periodic surveillance testing.

This LCO provides assurance that the SG blowdown transfer and isolation valves will perform their design safety functions to mitigate the consequences of postulated accidents while maintaining separation of the SGs for other postulated events.

BASES

APPLICABILITY In MODES 1 through 4, this LCO ensures that the SG blowdown transfer valves are closed and power to the valve operators is removed, and that the SG blowdown isolation valves are OPERABLE. This LCO also ensures that the SG blowdown transfer valves are OPERABLE for mitigation of an SGTR with loss of offsite power. The safety analyses assume that the SG blowdown transfer valves are closed at the onset of any postulated event, but can be opened in the event of an SGTR with loss of offsite power. The safety analyses also assume that SG blowdown can be isolated to conserve secondary side inventory.

In MODES 5 and 6, the SG blowdown transfer and isolation valves may be open or closed as needed.

BASES

ACTIONS The Actions have been provided with a Note to clarify that each pair of SG blowdown transfer valves and each set of SG blowdown isolation valves for this LCO are treated as separate entities.

A.1

With one SG blowdown isolation valve inoperable in one or more blowdown lines, action must be taken to restore the inoperable valve to OPERABLE status in 72 hours. The 72 hour Completion Time is reasonable since a redundant isolation valve is available in each SG blowdown flow path.

B.1

With one SG blowdown transfer valve inoperable in one or both transfer lines, action must be taken to restore the inoperable valve to OPERABLE status in 72 hours. The 72 hour Completion Time is reasonable since a redundant, parallel valve is available in each SG blowdown transfer flow path.

C.1

With two or more SG blowdown isolation valves inoperable in the same SG blowdown line, loss of SG secondary side inventory could result in the event of design basis events. Action must be taken to restore the inoperable valves to OPERABLE status in one hour. This Completion Time is acceptable based on risk considerations.

BASESACTIONS (continued)D.1

With two or more SG blowdown transfer valves inoperable in the same SG blowdown transfer line, transfer of SG secondary side inventory could not be accomplished in the event of an SGTR with loss of offsite power. Action must be taken to restore the inoperable valves to OPERABLE status in one hour. This Completion Time is acceptable based on risk considerations.

E.1

If an SG blowdown transfer valve is open in MODES 1 through 4 or power is inadvertently restored to one or more SG blowdown transfer valves, the potential exists for accidental opening of the SG blowdown transfer flow path. The SG blowdown transfer valves have motor operators.

Therefore, these valves will maintain their last position when power is removed from the valve operator. With power applied to the valve operators, only the interlocks prevent the valve from being operated. Although operating procedures and interlocks make the occurrence of this event unlikely, the prudent action is to ensure that the SG blowdown transfer valves are closed and to remove power from the valve operators. The Completion Time of 30 minutes to verify the SG blowdown transfer valves are closed and to remove power from the valve operators is sufficient considering the complexity of the task.

F.1

If a Required Action of Condition A, B, C, D, or E cannot be met, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

SURVEILLANCE SR 3.7.22.1
REQUIREMENTS

Each SG blowdown transfer valve should be verified to be closed with power removed from the valve operator every 12 hours. This verification ensures that the SGs remain separated in the event of a main steam line break or feed line break as assumed in the accident analyses. The 12 hour Frequency is considered reasonable considering the interlocks and BASES administrative controls that ensure that the SG blowdown transfer valves are closed and power removed from the valve operator.

SR 3.7.22.2

Verifying that the isolation time of each SG blowdown isolation valve is within limits is required to demonstrate OPERABILITY. The isolation time test ensures the valve will isolate in a time period less than or equal to that assumed in the safety analyses. The isolation time and Frequency of the SR are in accordance with the Inservice Testing Program and the ASME OM Code (Ref. 4).

SR 3.7.22.3

This surveillance requirement verifies that each SG blowdown transfer valve can be stroked open to transfer SG secondary side inventory from a faulted SG to an intact SG following an SGTR and loss of offsite power.

Since the SG blowdown transfer valves have an interlock that prevents opening the valves in MODES 1 through 4, they are exempt from the 3-month surveillance interval of the ASME OM Code (Ref. 4). This SR is normally performed every 24 months during a refueling outage.

SR.3.7.22.4

This SR verifies that the SG blowdown isolation valves can close on an actual or simulated actuation signal. This Surveillance is normally performed during shutdown.

The Frequency for this SR is every 24 months. The 24 month Frequency for testing is based on the refueling cycle. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency. Therefore, this Frequency is acceptable from a reliability standpoint.

BASES

REFERENCES

1. FSAR Chapter 15.

2. FSAR Section 10.4.8

3. FSAR Section 7.2.1.3

4. ASME Code for Operation and Maintenance of Nuclear Power
Plants.
