

Industry/TSTF Standard Technical Specification Change Traveler**Revise 3.4.17 Bases to Match Specification**

Classification: 4) Change Bases

NUREGs Affected: ☐ 1430 ☒ 1431 ☐ 1432 ☐ 1433 ☐ 1434**Description:**

The Background, Applicable Safety Analysis, LCO, and Applicability sections of the Bases for ITS 3.4.17, RCS Loop Isolation Valves are rewritten. The ISTS Bases for this Specification, which are very similar to the Bases for ITS 3.4.18, "RCS Isolated Loop Startup," are not accurate for ITS 3.4.17. The ISTS Bases describe the safety consequences of the startup of an isolated loop but do not address the safety consequences of the closure of a loop isolation valve. Ensuring that a loop isolation valve is not inadvertently closed is the purpose of ITS 3.4.17. The Bases have been revised to describe the loop isolation valves, their purpose, the relevant FSAR analyses, and the MODES of applicability. The Bases of Actions A.1 and B.1, B.2, and B.3 have also been revised to describe the safety function being protected by the Actions.

Justification:

The current Bases for NUREG-1431 Specification 3.4.17 do not describe the Specification or its safety basis. The Bases are corrected.

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Revision History**OG Revision 0****Revision Status: Active****Next Action: NRC**

Revision Proposed by: North Anna

Revision Description:

Original Issue

Owners Group Review Information

Date Originated by OG: 01-Dec-98

Owners Group Comments

WOG only

Owners Group Resolution: Approved Date: 01-Dec-98

TSTF Review Information

TSTF Received Date: 19-Feb-99

Date Distributed for Review 09-Mar-99

OG Review Completed: ☒ BWOG ☒ WOG ☒ CEOG ☒ BWROG

TSTF Comments:

WOG Only.

TSTF Resolution: Approved Date: 09-Apr-99

NRC Review Information

NRC Received Date: 30-Apr-99

4/28/99

OG Revision 0**Revision Status: Active****Next Action: NRC**

NRC Comments:

(No Comments)

Final Resolution: NRC Action Pending

Final Resolution Date:

Incorporation Into the NUREGs

File to BBS/LAN Date:

TSTF Informed Date:

TSTF Approved Date:

NUREG Rev Incorporated:

Affected Technical Specifications

Bkgnd 3.4.17 Bases RCS Loop Isolation Valves

S/A 3.4.17 Bases RCS Loop Isolation Valves

LCO 3.4.17 Bases RCS Loop Isolation Valves

Appl. 3.4.17 Bases RCS Loop Isolation Valves

Action 3.4.17.A Bases RCS Loop Isolation Valves

Action 3.4.17.B Bases RCS Loop Isolation Valves

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INSERT 1

The reactor coolant loops are equipped with loop isolation valves that permit any loop to be isolated from the reactor vessel. One valve is installed on each hot leg and one on each cold leg. The loop isolation valves are used to perform maintenance on an isolated loop. Power operation with a loop isolated is not permitted.

To ensure that inadvertent closure of a loop isolation valve does not occur, the valves must be open with power to the valve operators removed in MODES 1, 2, 3 and 4. If the valves are closed, a set of administrative controls and equipment interlocks must be satisfied prior to opening the isolation valves as described in LCO 3.4.18, "RCS Isolated Loop Startup."

INSERT 2

The safety analyses performed for the reactor at power assume that all reactor coolant loops are initially in operation and the loop isolation valves are open. This LCO places controls on the loop isolation valves to ensure that the valves are not inadvertently closed in MODES 1, 2, 3 and 4. The inadvertent closure of a loop isolation valve when the Reactor Coolant Pumps (RCPs) are operating will result in a partial loss of forced reactor coolant flow (Ref. 1). If the reactor is at power at the time of the event, the effect of the partial loss of forced coolant flow is a rapid increase in the coolant temperature which could result in DNB with subsequent fuel damage if the reactor is not tripped by the Low Flow reactor trip. If the reactor is shutdown and an RCS loop is in operation removing decay heat, closure of the loop isolation valve associated with the operating loop could also result in increasing coolant temperature and the possibility of fuel damage.

RCS Loop Isolation Valves satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

INSERT 3

This LCO ensures that the loop isolation valves are open and power to the valve operators is removed. Loop isolation valves are used for performing maintenance in MODES 5 and 6. The safety analyses assume that the loop isolation valves are open in any RCS loops required to be OPERABLE by LCO 3.4.4, "RCS Loops – MODES 1 and 2," LCO 3.4.5, "RCS Loops – MODE 3," or LCO 3.4.6, "RCS Loops – MODE 4."

INSERT 4

In MODES 1 through 4, this LCO ensures that the loop isolation valves are open and power to the valve operators is removed. The safety analyses assume that the loop isolation valves are open in any RCS loops required to be OPERABLE.

In MODES 5 and 6, the loop isolation valves may be closed. Controlled startup of an isolated loop is governed by the requirements of LCO 3.4.18, "RCS Isolated Loop Startup."

INSERT 5

Once in MODE 5, the isolated loop may be started in a controlled manner in accordance with LCO 3.4.18, "RCS Isolated Loop Startup." Opening the closed isolation valve in MODES 1 through 4 could result in colder water or water at a lower boron concentration being mixed with the operating RCS loops resulting in positive reactivity insertion.

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B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.17 RCS Loop Isolation Valves

BASES

BACKGROUND

The RCS may be operated with loops isolated in order to perform maintenance. While operating with a loop isolated, there is potential for inadvertently opening the isolation valves in the isolated loop. In this event, the coolant in the isolated loop would suddenly begin to mix with the coolant in the operating loops. This situation has the potential of causing a positive reactivity addition with a corresponding reduction of SDH if:

- a. The temperature in the isolated loop is lower than the temperature in the operating loops (cold water incident); or
- b. The boron concentration in the isolated loop is lower than the boron concentration in the operating loops (boron dilution incident).

Insert 1

As discussed in the FSAR (Ref. 1), the startup of an isolated loop is performed in a controlled manner that virtually eliminates any sudden positive reactivity addition from cold water and/or boron dilution because:

- a. LCO 3.4.18, "RCS Isolated Loop Startup," and plant operating procedures require that the boron concentration in the isolated loop be maintained higher than the boron concentration of the operating loops, thus eliminating the potential for introducing coolant from the isolated loop that could dilute the boron concentration in the operating loops;
- b. The cold leg loop isolation valve cannot be opened unless the temperatures of both the hot and cold legs of the isolated loop are within 20°F of the temperatures of the hot and cold legs of the operating loops (compliance is ensured by operating procedures and automatic interlocks); and
- c. Other automatic interlocks, all of which are part of the Reactor Protection System (RPS), prevent opening the hot leg loop isolation valve unless the cold leg loop isolation valve is fully closed.

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BASES (continued)

APPLICABLE
SAFETY ANALYSES

Insert 2

During startup of an isolated loop in accordance with LCO 3.4.18, the cold leg loop isolation valve interlocks and operating procedures prevent opening of the valve until the isolated loop and operating loop boron concentrations and temperatures are equalized. This ensures that any undesirable reactivity effect from the isolated loop does not occur.

The safety analyses assume a minimum SDM as an initial condition for Design Basis Accidents (DBAs) (Ref. 1). Violation of the LCO, combined with mixing of the isolated loop coolant into the operating loops, could result in the SDM being less than that assumed in the safety analyses.

The above analyses are for DBAs that establish the acceptance limits for the RCS loop isolation valves. Reference to the analyses for these DBAs is used to assess changes to the RCS loop isolation valves as they relate to the acceptance limits.

The boron concentration of an isolated loop may affect SDM and therefore RCS loop isolation valves satisfy Criterion 2 of the NRC Policy Statement.

LCO

Insert 3

This LCO ensures that a loop isolation valve that becomes closed in MODES 1 through 4 is fully isolated and the plant placed in MODE 5. Loop isolation valves are used for performing maintenance when the plant is in MODE 5 or 6, and startup of an isolated loop is covered by LCO 3.4.18.

APPLICABILITY

Insert 4

In MODES 1 through 4, this LCO is applicable when unisolating an isolated loop with a boron concentration less than that of the operating loops may cause an inadvertent criticality.

In MODES 5 and 6, the SDM of the operating loops is large enough to permit operation with isolated loops. In these MODES, controlled startup of isolated loops is possible without significant risk of inadvertent criticality.

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BASES (continued)

ACTIONS

The Actions have been provided with a Note to clarify that all RCS loop isolation valves for this LCO are treated as separate entities, each with separate Completion Times, i.e., the Completion Time is on a component basis.

A.1

If power is inadvertently restored to one or more loop isolation valve operators, the potential exists for accidental isolation of a loop with a subsequent inadvertent startup of the isolated loop. The loop isolation 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.

B.1, B.2, and B.3

Should a loop isolation valve be closed in MODES 1 through 4, the affected loop must be fully isolated immediately and the plant placed in MODE 5 to preclude inadvertent startup of the loop and the potential inadvertent criticality. The Completion Time of Required Action B.1 allows time for borating the operating loops to a shutdown boration level such that the plant can be brought to MODE 3 within 6 hours and 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
REQUIREMENTS

SR 3.4.17.1

The Surveillance is performed at least once per 31 days to ensure that the RCS loop isolation valves are open, with power removed from the loop isolation valve operators. The

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BASES

SURVEILLANCE
REQUIREMENTS

SR 3.4.17.1 (continued)

primary function of this Surveillance is to ensure that power is removed from the valve operators, since SR 3.4.4.1 of LCO 3.4.4, "RCS Loops—MODES 1 and 2," ensures that the loop isolation valves are open by verifying every 12 hours that all loops are operating and circulating reactor coolant. The Frequency of 31 days ensures that the required flow can be made available, is based on engineering judgment, and has proven to be acceptable. Operating experience has shown that the failure rate is so low that the 31 day Frequency is justified.

REFERENCES

1. FSAR, Section [15.2.6].
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