Advanced Passive 1000 (AP1000)
Generic Technical Specification Traveler (GTST)

Title: Changes Related to LCO 3.7.2, Main Steam Isolation Valves (MSIVs)

I. Technical Specifications Task Force (TSTF) Travelers, Approved Since Revision 2 of STS NUREG-1431, and Used to Develop this GTST

TSTF Number and Title:

TSTF-479-A, Rev 0,	Changes to Reflect Revision of 10 CFR 50.55a
TSTF-491-A, Rev 2,	Removal of Main Steam and Main Feedwater Valve Isolation Times from Technical Specifications
TSTF-504-T, Rev 0,	Revised the MSIV and MFIV Specifications to Provide Actions for Actuator Trains

STS NUREGs Affected:

TSTF-479-A, Rev 0:	NUREGs 1430, 1431, 1432, 1433, and 1434
TSTF-491-A, Rev 2:	NUREGs 1430, 1431, and 1432
TSTF-504-T, Rev 0:	NUREGs 1431 and 1432

NRC Approval Date:

TSTF-479-A, Rev 0:	06-Dec-05
TSTF-491-A, Rev 2:	05-Oct-06
TSTF-504-T, Rev 0:	Approved for Use by TSTF 14-Sep-07

TSTF Classification:

TSTF-479-A, Rev 0:	Technical Change
TSTF-491-A, Rev 2:	Technical Change
TSTF-504-T, Rev 0:	Technical Change

II. Reference Combined License (RCOL) Standard Departures (Std. Dep.), RCOL COL Items, and RCOL Plant-Specific Technical Specifications (PTS) Changes Used to Develop this GTST

RCOL Std. Dep. Number and Title:

There are no Vogtle departures applicable to Specification 3.7.2.

RCOL COL Item Number and Title:

There are no Vogtle COL items applicable to Specification 3.7.2.

RCOL PTS Change Number and Title:

VEGP LAR DOC A003:	References to various Chapters and Sections of the Final Safety Analysis Report (FSAR) are revised to include FSAR.
VEGP LAR DOC A094:	TS 3.7.2 title and description revisions
VEGP LAR DOC A095:	TS 3.7.2 Conditions and Required Action revisions
VEGP LAR DOC M11:	Containment valve isolation revisions to TS 3.7.2
VEGP LAR DOC M15:	Applicability revision to TS 3.7.2
VEGP LAR DOC L20:	TS 3.7.2 Condition D revision
VEGP LAR DOC D09:	Closure time removal

III. Comments on Relations Among TSTFs, RCOL Std. Dep., RCOL COL Items, and RCOL PTS Changes

This section discusses the considered changes that are: (1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

TSTF-479-A, Rev. 0 has been applied to AP1000 GTS 3.7.2, Rev 19 by Westinghouse. TSTF-479-A will not be discussed further as a part of this GTST.

TSTF-491-A, Rev. 2 changes to the SR Bases (to only reference document containing the MSIV and alternate downstream valve closure times) are not adopted, based on APOG presentation preference expressed in DOC D09. DOC D09 is consistent with TSTF-491, which allowed the closure times to be moved to a plant-controlled document (SR 3.7.2.1 and SR 3.7.2.2 Bases discussion).

TSTF-504-T, Rev. 0 revises WOG Specification 3.7.2 based on license amendments granted for Wolf Creek, Callaway, and Palo Verde regarding dual actuator trains for isolation valves. A specific need should be identified for the AP1000 design and a separate AP1000-specific TSTF issued to implement a similar change. Therefore, the TSTF-504-T changes are not applicable and are not incorporated in the AP1000 Technical Specifications. TSTF-504-T will not be discussed further as a part of this GTST.

IV. Additional Changes Proposed as Part of this GTST (modifications proposed by NRC staff and/or clear editorial changes or deviations identified by preparer of GTST)

Minor corrections were made to correct grammatical errors in the bases.

Revise the third paragraph of the “Background” section of the Bases to state:

> The MSIVs, turbine stop and control valves, turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves close on a ~~main~~ steam **line** isolation signal **from either of two Class 1E power divisions** generated ~~by~~ **on** ~~either low steam line pressure~~ **Steam Line Pressure - Low (Table 3.3.8-1 Function 24)**, ~~high~~ **Containment Pressure - High 2 (Function 2)**~~containment pressure~~, ~~Low Tcold~~ **T_{cold} - Low 2 (Function 11)**, or ~~high negative steam pressure rate~~**if below P-11 Setpoint, Steam Line Pressure - Negative Rate - High (Function 25)**. The MSIVs fail close~~d~~ on loss of control air ~~or actuation signal from either of two 1E power divisions~~.

Revise the second, third, and fourth paragraphs of the “ASA” section of the Bases to state:

> Design basis events of concern for containment analysis are SLB inside containment with the failure of the associated MSIV to close, or a main ~~feedline~~**feedwater line** break with the associated failure of a **main** ~~feedline~~**feedwater** isolation or control valve to close. At lower powers, the steam generator **secondary water** inventory and temperature are at their maximum, ~~maximizing~~**which conservatively maximizes** the analyzed mass and energy release**d** to the containment. Due to **the failure of the MSIV to close and the resulting** reverse flow ~~and failure of the MSIV to close~~, the additional mass and energy in the steam headers, downstream from the other MSIV, contribute to the total release **in containment**. With the most reactive **control** rod ~~cluster control assembly~~ assumed stuck in the fully withdrawn position, there is an increased possibility that the **resulting reactor coolant system (RCS) cooldown will cause the** core ~~will~~ **to** become critical and return to power. The core is ultimately shut down by the boric acid injection delivered by the Core Makeup Tanks (CMTs).
>
> The accident analysis compares several different SLB events against different acceptance criteria. The large SLB outside containment upstream of the MSIV is limiting for offsite dose, although a break in this short section of main steam header **piping** has a very low probability. The large SLB inside containment at hot zero power is the limiting case for a post trip return to power. The analysis includes consideration of scenarios with offsite power available, and with a loss of offsite power. With offsite power available, the reactor coolant pumps continue to circulate coolant for a longer period through the steam generators, maximizing the ~~Reactor Coolant System~~**RCS** cooldown. The ~~reactor protection system~~**PMS** includes a safety related signal that initiates the coastdown of the reactor coolant pumps early in the large SLB transient **(trip of all reactor coolant pumps on CMT actuation)**. Therefore, there is very little difference in the predicted departure from nucleate boiling ratio between cases with and without offsite power. Significant single failures considered include failure of an MSIV to close.
>
> The **four sets of** ~~non-safety related~~ turbine stop ~~or~~**and** control valves, in combination with the **six** turbine bypass **valves**, and **the two** moisture separator

reheater ~~2nd~~**2nd** stage steam isolation valves, are assumed as a **non-safety related** backup to isolate the steam flow path given a single failure of an MSIV **to close**. The safety analyses do not differentiate between the availability of ~~the~~ **a** turbine stop valve ~~or~~**and** its **in-**series control valve. Either the turbine stop ~~valves~~**valve** or ~~its~~**its** associated turbine control valve**, in each of the four sets,** ~~are~~**is** required by this LCO to be OPERABLE. These valves, along with the turbine bypass, and moisture separator reheater ~~2nd~~**2nd** stage steam isolation valves are considered as alternate downstream **isolation** valves.

Revise the fifth paragraph of the "ASA" section of the Bases to state (APOG Comment and NRC Staff Edit):

...

a. **A high**~~High~~ energy line break inside containment. In order to maximize the mass and energy release into containment, the analysis assumes that the MSIV in the affected steam generator remains open. For this accident scenario, steam is discharged into containment from both steam generators until the unaffected ~~loop~~**steam generator** MSIV closes. After MSIV closure, steam is discharged into containment only from the affected steam generator and from the residual steam in the main steam header downstream of the closed MSIV in the unaffected loop. Closure of the MSIV isolates the break from the unaffected steam generator.

b. A **steamline** break outside of containment, and upstream **of an MSIV** or downstream ~~from~~**of** the MSIVs~~, is not a containment pressurization concern~~. The uncontrolled blowdown of more than one steam generator must be prevented to limit the potential for **an** uncontrolled ~~Reactor Coolant System (RCS)~~ **RCS** cooldown and positive reactivity addition. Closure of the MSIVs or alternate downstream valves isolates the break, and limits the blowdown to a single steam generator.

c. ~~Following a~~**A** steam generator tube rupture**. Closure**~~, closure~~ of the MSIVs isolates the ruptured steam generator to minimize radiological releases.

These non-technical changes provide improved clarity, consistency, and operator usability. (NRC Staff Comment)

<u>APOG Recommended Changes to Improve the Bases</u>

Throughout the Bases, references to Sections and Chapters of the FSAR do not include the "FSAR" clarifier. Since these Section and Chapter references are to an external document, it is appropriate to include the "FSAR" modifier. (DOC A003)

Required Action B.1 has a change that adds "s" to the word "valve." It should be "(s)" Change "s" to "(s)" per DOC A095.

Revise the first paragraph of the "Background" section of the Bases to state:

Each main steam line has one ~~safety related~~ MSIV **(which is safety related)** to isolate steam flow from the secondary side of the steam generators**, which may be required** following a high energy line break. ~~MSIV closure terminates flow from the unaffected (intact) steam generator.~~

Revise the fifth paragraph of the "Background" section of the Bases to state:

A description of the MSIVs is found in ~~the~~**FSAR** Section 10.3 (Ref. 1). Descriptions for the turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves are found in ~~the~~**FSAR** Section 10.4 (Ref. **2**~~6~~).

Revise the first paragraph of the “ASA” section of the Bases to state:

The design basis of the MSIVs is established by the containment analysis for the large steam line break (SLB) inside containment, discussed in ~~the~~ **FSAR** Section 6.2 (Ref. ~~2~~**3**). It is also affected by the accident analysis of the SLB events presented in ~~the~~ **FSAR** Section 15.1 (Ref. ~~3~~**4**).

These non-technical changes provide improved clarity, consistency, and operator usability.

Revise the fifth paragraph of the “ASA” section of the Bases to state:

...

b. A break outside of containment, and upstream or downstream from the MSIVs~~, is not a containment pressurization concern~~. The uncontrolled blowdown of more than one steam generator . . .

c. Following a steam generator tube rupture~~.,~~ ~~o~~**C**losure of the MSIVs . . .

d. ~~The MSIVs are also utilized during o~~**O**ther events such as a feedwater line line break.~~; h~~**H**owever, these events . . .

This non-technical change removes excess detail and provides improved clarity, consistency, and operator usability.

Revise the first paragraph of the “Applicability” section of the Bases to state:

... 2nd stage steam isolation valves must be OPERABLE in ~~MODES 1, and~~ MODES **1,** 2, 3, and 4, when there is significant mass and energy...

This non-technical change provides improved clarity, consistency, and operator usability.

Revise the first paragraph of the “SRs” section of the Bases, under the heading “SR 3.7.2.1” to state:

This SR verifies that **MSIV**~~the~~ closure time ~~of each MSIV~~ **is ≤ 5.0 seconds,** on an actual or simulated actuation signal**. The MSIV isolation time** is ~~within the limit given in Reference 7 and is within that~~ assumed in the accident and containment analyses. ~~This SR also verifies the valve closure time is in accordance with the Inservice Testing Program.~~ This **Surveillance** ~~SR~~ is normally performed upon returning the unit to operation following a refueling outage. The MSIVs should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the MSIVs are not tested at power, they are exempt from the ASME OM Code (Ref. ~~8~~**6**) requirements during operation in MODE 1 or 2.

Revise the first paragraph of the “SRs” section of the Bases, under the heading “SR 3.7.2.2” to state:

This SR verifies that the turbine stop, turbine control, turbine bypass, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves' closure time is **~~within the limit given in Reference 7~~** ~~≤ 5.0 seconds,~~ **≤ 5.0 seconds,** on an actual or simulated actuation signal**.** These alternate downstream isolation valves must meet the MSIV isolation time assumed in the accident and containment analyses. **~~This SR also verifies the valve closure time is in accordance with the Inservice Testing Program.~~** This ~~Surveillance~~ **SRSurveillance** is normally performed upon returning the unit to operation following a refueling outage. The alternate downstream valves should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the alternate downstream valves are not tested at power, they are exempt from the ASME OM Code (Ref. ~~7~~**86**) requirements during operation in MODE 1 or 2.

DOC D09 made the Regulatory commitment to relocate the closure time to the Bases. Similarly, V.C. Summer TSU LAR proposes the same commitment to the Bases. Since each represented AP1000 Utility is committed to maintaining standardization, there currently is no rationale for an AP1000 STS that differs from the TSU LAR commitments and plant- specific Bases for VEGP. The TSTF-491-A changes should be removed. The remainder of the change is non-technical and provides improved clarity, consistency, and operator usability.

Revise the first paragraph, last sentence of the "SRs" section of the Bases, under the heading "SR 3.7.2.3" to state:

. . . The isolation times are specified in **FSAR** Section 6.2.3 (Ref. ~~9~~**7**) and Frequency of this SR is in accordance with the Inservice Testing Program.

This non-technical change provides improved clarity, consistency, and operator usability.

Revise and reorder the "References" section of the Bases to state:

1. **FSAR** Section 10.3, "Main Steam System."

2. **FSAR Section 10.4, "Other Features of Steam and Power Conversion Systems."**

~~2~~**3**. **FSAR** Section 6.2.1, "Containment Functional Design."

~~3~~**4**. **FSAR** Section 15.1, "Increase in Heat Removal by Secondary System."

~~4. Not used.~~

5. NUREG-138, Issue 1, "Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director NRR to NRR Staff."

~~6. Section 10.4, "Other Features of Steam and Power Conversion Systems."~~

~~7~~**6**. ASME OM Code, "Code for Operation and Maintenance of Nuclear Power Plants."

7. **FSAR Section 6.2, "Containment Systems."**

This non-technical change provides improved clarity, consistency, and operator usability.

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.7.2, Main Steam Line Flow Path Isolation Valves (MSIVs)

Changes to the Generic Technical Specifications and Bases:

The LCO title and Specification statement are revised to indicate flow path isolation. This provides clarification of LCO coverage. (DOC A094)

The Applicability statement is revised to remove the exception statement. (DOC M11 and DOC M15)

GTS 3.7.2 Conditions B, C and D and the associated Required Actions are revised by editorial corrections. (DOC A095)

GTS 3.7.2 Condition D Note is revised. The term “MSIV” is changed to “main steam line flow path.” (DOC L20)

STS 3.7.2 Condition E and Required Actions E.1 and E.2 are added to provide consistency with GTS 3.6.3. (DOC M11)

GTS 3.7.2 Condition E is relabeled as STS 3.7.2 Condition F and Required Action F.3 is added. This provides consistency with GTS 3.6.3 and provisions to exit the LCO. (DOC M11 and DOC M15)

The specific closure times associated with SR 3.7.2.1 and SR 3.7.2.2 are replaced with the phrase “within limits.” The affected valve isolation times are important to the safety analyses because they are part of the associated overall ESF Response Time assumed in the safety analyses. However, the individual component actuation times that make up the total ESF Response Time are not modeled in the associated safety analysis. Only the overall or total Response Time is considered in the safety analysis. The NRC has already determined (per Generic Letter 93-08) that the ESF Response Times (which include, by technical specification definition, the associated equipment actuation times) do not need to be in the TS. (TSTF-491-A and DOC D09)

New SR 3.7.2.3 and SR 3.7.2.4 are added. This provides consistency with GTS 3.6.3. (DOC M11)

The first paragraph of the “Background” section of the Bases is revised to improve clarity, consistency, and operator usability. (APOG Comment)

The third paragraph of the “Background” section of the Bases is revised to improve clarity, consistency, and operator usability. (NRC Staff Comment)

The fifth paragraph of the “Background” section of the Bases is revised to improve clarity, consistency, and operator usability. (APOG Comment)

The first paragraph of the “ASA” section of the Bases is revised to improve clarity, consistency, and operator usability. (APOG Comment)

The second, third, and fourth paragraphs of the “ASA” section of the Bases are revised to improve clarity, consistency, and operator usability. (NRC Staff Comment)

The fifth paragraph of the “ASA” section of the Bases is revised to remove excess detail and improve clarity. (APOG Comment and NRC Staff Comment)

The first paragraph of the “Applicability” section of the Bases is revised to improve clarity, consistency, and operator usability. (APOG Comment and NRC Staff Comment)

The first paragraph of the “SRs” section of the Bases under the heading “SR 3.7.2.1” is revised. (DOC D09, APOG Comment, and NRC Staff Edit)

The first paragraph of the “SRs” section of the Bases under the heading “SR 3.7.2.2” is revised. (DOC D09, APOG Comment, and NRC Staff Edit)

The first paragraph, last sentence of the “SRs” section of the Bases under the heading “SR 3.7.2.3” is revised. (APOG Comment)

The “References” section of the Bases is revised and reordered. (APOG Comment)

The acronym “FSAR” is added to modify “Section” and “Chapter” in references to the FSAR throughout the Bases. (DOC A003) (APOG Comment)

VI. Traveler Information

Description of TSTF changes:

The proposed change removes the specific isolation time for the isolation valves from the associated AP1000 GTS Surveillance Requirements (SRs). The isolation times in the AP1000 GTS SRs are replaced with the requirement to verify the valve isolation time is within limits. The specific valve isolation time required to meet the AP1000 STS surveillances would be located outside of the technical specifications in a document subject to control by the 10 CFR 50.59 process.

Rationale for TSTF changes:

In accordance with the Improved Standard Technical Specification (ISTS) definition of Engineered Safety Feature (ESF) Response Time, the affected valve isolation times are part of the ESF Response Time. The ISTS does not specify the specific ESF Response Time acceptance criteria in the technical specifications or Bases. The ISTS only requires the ESF response time to be verified within the limit. The proposed change would make the requirements pertaining to ESF Response Times consistent within the ISTS.

Similar to the GTS allowance for the ESF and Reactor Trip System (RTS) Response Times to be located outside the technical specifications, the proposed change will allow the affected valve isolation times to be revised in accordance with 10 CFR 50.59 instead of a license amendment request. See references 4-9.

Description of changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes:

DOC A094 revises GTS 3.7.2, “Main Steam Isolation Valves (MSIVs),” to STS 3.7.2, “Main Steam Line Flow Path Isolation Valves.” The LCO statement is revised to state “Each of the following main steam line flow path isolation valves shall be OPERABLE:
a. Main steam isolation valves (MSIVs);
b. MSIV bypass valves;
c. Main steam line drain valves;
d. Turbine stop valves or turbine control valves;
e. Turbine bypass valves; and
f. Moisture separator reheater 2nd stage steam isolation valves.”

In addition, GTS 3.7.2 Required Action D.1 is revised from “steam flow path” to “main steam line flow path.” Also, GTS SR 3.7.2.2 is revised to add “required.”

DOC A095 provides editorial corrections to GTS 3.7.2 Conditions B, C, and D and the associated Required Actions.

DOC M11 revises LCO 3.7.2 to include the MSIV bypass valves and main steam line drain valves as part of the LCO requirements, specifically: “b. MSIV bypass valves;” and “c. Main steam line drain valves.” The Applicability is revised to “MODES 1, 2, 3, and 4.” STS 3.7.2 Condition E is added stating “One or more MSIV bypass or main steam line drain valves inoperable.” Required Actions E.1 and E.2 and associated Completion Times are moved from GTS 3.6.3 Required Actions C.1 and C.2. GTS 3.7.2 Condition E and associated Required Actions are relabeled as Action F and revised to include reference to STS 3.7.2 Condition E.

STS 3.7.2 Required Action F.3 as it pertains to MSIVs only is added, stating to “Be in MODE 5” in 36 hours. A new SR 3.7.2.3 is added. A new SR 3.7.2.4 is added.

DOC M15 revises the Applicability to be MODES 1, 2, 3, and 4, with no exceptions. STS 3.7.2 Required Action F.3 is added to be in MODE 5 within 36 hours to provide an exit from the Specification requirement.

GTS 3.7.2 Condition D is modified by a Note that states “Separate Condition entry is allowed for each MSIV.” DOC L20 revises the term “MSIV” to “main steam line flow path.”

DOC D09 provides the same change implemented by TSTF 491-A described above.

A more detailed description of each DOC can be found in Reference 2, VEGP TSU LAR Enclosure 1, and the NRC staff safety evaluation can be found in Reference 3, VEGP LAR SER. The VEGP TSU LAR was modified in response to NRC staff RAIs in Reference 11 and the Southern Nuclear Operating Company RAI Response in Reference 12.

Rationale for changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes:

DOC A094 provides clarity for the LCO requirements.

DOC A095 is consistent with the TS Writers Guide (Reference 10).

DOC M11 provides closed system containment isolation valve requirements that are either consistent with or more restrictive than those in GTS 3.6.3.

DOC M15 removes the exception statement from the LCO Applicability. When the unit is in MODE 2, 3, or 4, GTS 3.7.2 does not apply to the valves whose flow path is isolated. Thus, when a main steam flow path isolation valve (e.g., a turbine stop valve) is inoperable in MODE 2, 3, or 4, once the affected steam flow path is isolated as required by Required Action D.1, GTS 3.7.2 would not apply and the periodic verification of Required Action D.2 would not be required. This change will ensure that the periodic verification of Required Action D.2 is performed as long as a valve in the affected flow path remains inoperable.

DOC L20 notes that Condition D applies to all valves required by the LCO, not just the MSIVs. The manner in which the Note is written does not allow Required Actions D.1 and D.2 to be taken for each affected flow path associated with any valves other than the MSIVs.

DOC D09 implements the same changes as TSTF-491-A.

Description of additional changes proposed by NRC staff/preparer of GTST:

The first paragraph of the “Background” section of the Bases is revised to state (APOG Comment and NRC Staff Edit):

> Each main steam line has one ~~safety related~~ MSIV**, which is safety related,** to isolate steam flow from the secondary side of the steam generators**, which may be required** following a high energy line break. MSIV closure terminates flow from the unaffected (intact) steam generator.

The third paragraph of the “Background” section of the Bases is revised to state (NRC Staff Comment):

The MSIVs, turbine stop and control valves, turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves close on a ~~main~~ steam **line** isolation signal **from either of two Class 1E power divisions** generated ~~by~~ **on** ~~either low steam line pressure~~ **Steam Line Pressure - Low (Table 3.3.8-1 Function 24)**, ~~high~~ **Containment Pressure - High 2 (Function 2)**~~containment pressure~~, ~~Low Tcold~~ **T_{cold} - Low 2 (Function 11)**, or ~~high negative steam pressure rate~~**if below P-11 Setpoint, Steam Line Pressure - Negative Rate - High (Function 25)**. The MSIVs fail close~~d~~ on loss of control air ~~or actuation signal from either of two 1E power divisions~~.

The fifth paragraph of the “Background” section of the Bases is revised to state (APOG Comment):

A description of the MSIVs is found in ~~the~~**FSAR** Section 10.3 (Ref. 1). Descriptions for the turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves are found in ~~the~~**FSAR** Section 10.4 (Ref. **2**~~6~~).

The first paragraph of the “ASA” section of the Bases is revised to state (APOG Comment):

The design basis of the MSIVs is established by the containment analysis for the large steam line break (SLB) inside containment, discussed in ~~the~~ **FSAR** Section 6.2 (Ref. ~~2~~**3**). It is also affected by the accident analysis of the SLB events presented in ~~the~~ **FSAR** Section 15.1 (Ref. ~~3~~**4**).

The second, third, and fourth paragraphs of the “ASA” section of the Bases are revised to state (NRC Staff Comment):

Design basis events of concern for containment analysis are SLB inside containment with the failure of the associated MSIV to close, or a main ~~feedline~~**feedwater line** break with the associated failure of a **main** ~~feedline~~**feedwater** isolation or control valve to close. At lower powers, the steam generator **secondary water** inventory and temperature are at their maximum, ~~maximizing~~**which conservatively maximizes** the analyzed mass and energy release**d** to the containment. Due to **the failure of the MSIV to close and the resulting** reverse flow ~~and failure of the MSIV to close~~, the additional mass and energy in the steam headers, downstream from the other MSIV, contribute to the total release **in containment**. With the most reactive **control** rod ~~cluster control assembly~~ assumed stuck in the fully withdrawn position, there is an increased possibility that the **resulting reactor coolant system (RCS) cooldown will cause the** core ~~will~~ **to** become critical and return to power. The core is ultimately shut down by the boric acid injection delivered by the Core Makeup Tanks (CMTs).

The accident analysis compares several different SLB events against different acceptance criteria. The large SLB outside containment upstream of the MSIV is limiting for offsite dose, although a break in this short section of main steam header **piping** has a very low probability. The large SLB inside containment at hot zero power is the limiting case for a post trip return to power. The analysis includes consideration of scenarios with offsite power available, and with a loss of offsite power. With offsite power available, the reactor coolant pumps continue to circulate coolant for a longer period through the steam generators, maximizing the ~~Reactor Coolant System~~**RCS** cooldown. The ~~reactor protection system~~**PMS** includes a safety related signal that initiates the coastdown of the reactor coolant

pumps early in the large SLB transient **(trip of all reactor coolant pumps on CMT actuation)**. Therefore, there is very little difference in the predicted departure from nucleate boiling ratio between cases with and without offsite power. Significant single failures considered include failure of an MSIV to close.

The **four sets of** ~~non-safety related~~ turbine stop ~~or~~**and** control valves, in combination with the **six** turbine bypass **valves**, and **the two** moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves, are assumed as a **non-safety related** backup to isolate the steam flow path given a single failure of an MSIV **to close**. The safety analyses do not differentiate between the availability of ~~the~~ **a** turbine stop valve ~~or~~**and** its **in-**series control valve. Either the turbine stop ~~valves~~**valve** or ~~its~~**its** associated turbine control valve**, in each of the four sets,** ~~are~~**is** required by this LCO to be OPERABLE. These valves, along with the turbine bypass, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves are considered as alternate downstream **isolation** valves.

The fifth paragraph of the "ASA" section of the Bases is revised to state (APOG Comment and NRC Staff Edit):

...

a. **A high**~~High~~ energy line break inside containment. In order to maximize the mass and energy release into containment, the analysis assumes that the MSIV in the affected steam generator remains open. For this accident scenario, steam is discharged into containment from both steam generators until the unaffected ~~loop~~**steam generator** MSIV closes. After MSIV closure, steam is discharged into containment only from the affected steam generator and from the residual steam in the main steam header downstream of the closed MSIV in the unaffected loop. Closure of the MSIV isolates the break from the unaffected steam generator.

b. A **steamline** break outside of containment, and upstream **of an MSIV** or downstream ~~from~~**of** the MSIVs~~, is not a containment pressurization concern~~. The uncontrolled blowdown of more than one steam generator must be prevented to limit the potential for **an** uncontrolled ~~Reactor Coolant System (RCS)~~ **RCS** cooldown and positive reactivity addition. Closure of the MSIVs or alternate downstream valves isolates the break, and limits the blowdown to a single steam generator.

c. ~~Following a~~**A** steam generator tube rupture**. Closure**~~, closure~~ of the MSIVs isolates the ruptured steam generator to minimize radiological releases.

d. ~~The MSIVs are also utilized during other~~ **Other** events such as a feedwater line break~~.; however~~ **However**, these events are less limiting so far as MSIV OPERABILITY is concerned.

The first paragraph of the "Applicability" section of the Bases is revised to state (APOG Comment and NRC Staff Edit):

The MSIVs, MSIV bypass valves, main steam line drain valves, turbine stop or associated turbine control valves, turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves must be OPERABLE in ~~MODE 1 and~~ MODES **1,** 2, 3, and 4, when there is significant mass and energy...

The first paragraph of the “SRs” section of the Bases under the heading “SR 3.7.2.1” is revised to state (DOC D09, APOG Comment and NRC Staff Edit):

> This SR verifies that **MSIV**~~the~~ closure time ~~of each MSIV~~ **is ≤ 5.0 seconds,** on an actual or simulated actuation signal**. The MSIV isolation time** is ~~within the limit given in Reference 7 and is within that~~ assumed in the accident and containment analyses. ~~This SR also verifies the valve closure time is in accordance with the Inservice Testing Program.~~ This **Surveillance** ~~SR~~ is normally performed upon returning the unit to operation following a refueling outage. The MSIVs should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the MSIVs are not tested at power, they are exempt from the ASME OM Code (Ref. ~~8~~**6**) requirements during operation in MODE**S** 1 **and** ~~or~~ 2.

The first paragraph of the “SRs” section of the Bases under the heading “SR 3.7.2.2” is revised to state (DOC D09, APOG Comment, and NRC Staff Edit):

> This SR verifies that the turbine stop, turbine control, turbine bypass, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves’ closure time is **within the limit given in Reference 7**~~≤ 5.0 seconds,~~ **≤ 5.0 seconds,** on an actual or simulated actuation signal**.** These alternate downstream isolation valves must meet the MSIV isolation time assumed in the accident and containment analyses. **This SR also verifies the valve closure time is in accordance with the Inservice Testing Program.** This ~~Surveillance~~ **SRSurveillance** is normally performed upon returning the unit to operation following a refueling outage. The alternate downstream valves should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the alternate downstream valves are not tested at power, they are exempt from the ASME OM Code (Ref. ~~7~~**86**) requirements during operation in MODE**S** 1 **and** ~~or~~ 2.

The first paragraph, last sentence of the “SRs” section of the Bases, under the heading “SR 3.7.2.3” is revised to state (APOG Comment):

> . . . The isolation times are specified in **FSAR** Section 6.2.3 (Ref. ~~9~~**7**) and Frequency of this SR is in accordance with the Inservice Testing Program.

The “References” section of the Bases is revised and reordered to state (APOG Comment):

1. **FSAR** Section 10.3, “Main Steam System.”

2. **FSAR Section 10.4, “Other Features of Steam and Power Conversion Systems.”**

~~2~~**3**. **FSAR** Section 6.2.1, “Containment Functional Design.”

~~3~~**4**. **FSAR** Section 15.1, “Increase in Heat Removal by Secondary System.”

~~4. Not used.~~

5. NUREG-138, Issue 1, “Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director NRR to NRR Staff.”

~~6. Section 10.4, “Other Features of Steam and Power Conversion Systems.”~~

~~7~~**6**. ASME OM Code, “Code for Operation and Maintenance of Nuclear Power Plants.”

7. **FSAR Section 6.2, “Containment Systems.”**

The acronym “FSAR” is added to modify “Section” and “Chapter” in references to the FSAR throughout the Bases. (DOC A003) (APOG Comment)

Rationale for additional changes proposed by NRC staff/preparer of GTST:

These changes are to correct grammatical errors in the bases.

The non-technical changes to the “Background” section of the Bases provide improved clarity, consistency, and operator usability.

The non-technical changes to the “ASA” section of the Bases provide improved clarity, consistency, and operator usability. The changes also remove excess detail. The detail is not consistent with general content reflected in NUREG-1431. Removal of this detail does not impact the information useful for compliance with the TS requirement.

The non-technical changes to the “Applicability” section of the Bases provide improved clarity, consistency, and operator usability.

DOC D09 made the Regulatory commitment to relocate the closure time to the Bases. Similarly, V.C. Summer TSU LAR proposes the same commitment to the Bases. Since each represented AP1000 Utility is committed to maintaining standardization, there currently is no rationale for an AP1000 STS that differs from the TSU LAR commitments and plant- specific Bases for VEGP. Additionally, there is no COL Item, and no Reviewer’s Note defining the use of the optional bracketed material. As such, this change to the “SRs” section of the Bases under the heading “SR 3.7.2.1” and “SR 3.7.2.2” is inappropriate. The TSTF-491-A changes to the SR Bases (to only reference document containing the MSIV closure time) are not adopted, based on APOG presentation preference expressed in DOC D09. The remaining changes to this paragraph are non-technical and provide improved clarity, consistency, and operator usability.

The non-technical changes to the “SRs” section of the Bases under the heading “SR 3.7.2.3” provide improved clarity, consistency, and operator usability.

The non-technical changes to the “References” section of the Bases provide improved clarity, consistency, and operator usability.

Since Bases references to FSAR Sections and Chapters are to an external document, it is appropriate to include the “FSAR” modifier.

VII. GTST Safety Evaluation

Technical Analysis:

DOC A094 revises GTS 3.7.2, “Main Steam Isolation Valves (MSIVs),” to STS 3.7.2, “Main Steam Line Flow Path Isolation Valves.” The STS 3.7.2 LCO statement is revised to state “Each of the following main steam line flow path isolation valves shall be OPERABLE:

a. Main steam isolation valves (MSIVs);
b. MSIV bypass valves;
c. Main steam line drain valves;
d. Turbine stop valves or turbine control valves;
e. Turbine bypass valves; and
f. Moisture separator reheater 2nd stage steam isolation valves.”

The GTS title does not match what the LCO statement actually specifies. The GTS 3.7.2 applies to more than just the MSIVs. It also includes the turbine stop valves, turbine bypass valves, and moisture separator 2nd stage steam isolation valves. Therefore, the title of GTS 3.7.2 is changed to more clearly identify what the actual LCO statement is covering. Furthermore, for clarity, all the required valves are now listed in the LCO statement. This change is made to provide clarification.

GTS 3.7.2 Required Action D.1 is revised from “steam flow path” to “main steam line flow path.” Also, GTS SR 3.7.2.2 is revised to add the word “required,” which is consistent with the wording of the LCO.

One MSIV is located in each main steam line outside of the containment. Closing the MSIVs isolates each steam generator from the others and isolates the turbine, steam bypass system and other auxiliary steam supplies from the steam generator. However, alternate downstream isolation valves are available (turbine stop, turbine control, turbine bypass, and moisture separator reheater 2nd stage steam isolation valves). Closing the alternate downstream isolation valves also isolates each steam generator from the others and isolates the turbine, steam bypass system and other auxiliary steam supplies from the steam generator. Therefore, changing the LCO from just focusing on the MSIVs to focusing on the entire steam line flow path provides alternatives to meet the LCO objective to protect the reactor core from damage following a high energy line break (HELB).

By isolating the steam flow from the secondary side of the steam generator the MSIVs and alternate downstream isolation valves prevent over cooling the reactor core following a HELB. By preventing core overcooling the MSIVs and alternate downstream isolation valves protect the reactor core from being damaged.

In addition, DOC M11 revises LCO 3.7.2 to include the MSIV bypass valves and main steam line drain valves as part of the LCO requirements, specifically: “b. MSIV bypass valves;” and “c. Main steam line drain valves.”

GTS 3.6.3 provides the requirement for the containment isolation valve function. Some of the valves that are containment isolation valves are also required to be operable to meet other safety related functions and these requirements are provided in separate LCOs. Thus, for certain containment isolation valves on closed systems, the same valve has two separate TS that cover its requirements. GTS 3.7.1 provides requirements for MSSVs, GTS 3.7.2 provides requirements for the MSIVs, GTS 3.7.3 provides requirements for the MFIVs, GTS 3.7.7

provides requirements for the startup feedwater isolation valves, and GTS 3.7.10 provides requirements for the power operated relief valve (PORV) block valves and SG blowdown isolation valves.

In lieu of including these valves in both GTS 3.6.3 and their individual Specification, GTS 3.6.3 is revised to exclude all closed system containment isolation valves. The remaining closed system containment isolation valves that are not covered by GTS 3.7.1, GTS 3.7.2, GTS 3.7.3, GTS 3.7.7, and GTS 3.7.10, are MSIV bypass valves and the main steam line drain valves. The requirements for these containment isolation valves are added to STS 3.7.2 with the other steam line flow path isolation valves. All of the moved containment isolation valves are associated with a closed system and they are the only closed system containment isolation valves. The individual Specifications where these valves are moved include the same or more restrictive requirements than GTS 3.6.3, or have been revised to include the requirements from GTS 3.6.3. Therefore, the LCO changes to GTS 3.6.3 and GTS 3.7.2 reflect no technical change for these moved valves.

The Applicability of GTS 3.7.2, which is Mode 1, and Modes 2, 3, and 4, except when steam flow is isolated is revised to be consistent with the Applicability of GTS 3.6.3, which is Modes 1, 2, 3, and 4. Thus, the proposed Applicability is consistent with GTS 3.6.3 Applicability for the MSIVs, MSIV bypass valves, and main steam line drain valves, which are moved from GTS 3.6.3. Therefore, the Applicability change also reflects no technical change for these moved valves. The impact of this Applicability change to the other valves addressed in GTS 3.7.2 is discussed in association with DOC M15.

For MSIV bypass valves or main steam line drain valves inoperability, the new Required Actions in STS 3.7.2 Action E are identical to those currently required in GTS 3.6.3 Action C. Since GTS 3.6.3 Action C is the Action applicable to the MSIV bypass valves and main steam line drain valves, this Action change reflects no technical change for these moved valves. Additionally, STS 3.7.2 Action E Required Actions include a Note stating “Penetration flow path(s) may be unisolated intermittently under administrative controls” and STS Condition E includes a Note stating “Separate Condition entry is allowed for each penetration flow path.” These Notes are included in STS 3.7.2 from GTS 3.6.3 Actions Notes 1 and 2, respectively, and therefore reflect no technical change. GTS 3.6.3 Actions Notes 3 and 4 do not apply to MSIV bypass valves and main steam line drain valves. These Notes ensure appropriate Actions are entered for any impacted supported system and GTS 3.6.1, “Containment,” Actions are entered when isolation valve leakage results in exceeding the overall containment leakage rate acceptance criteria. Since MSIV bypass valves and main steam line drain valves do not support any other TS required system and these valves have no associated containment leakage rate limit, GTS 3.6.3 Actions Notes 3 and 4 have no bearing on these valves. Therefore, these Notes are not included in STS 3.7.2. Based on the preceding evaluation, there is no impact on safety from moving the Action requirement for MSIV bypass valves and main steam line drain valves out of GTS 3.6.3 Action C and into STS 3.7.2 Action E.

The following compares the Actions for inoperable MSIVs in GTS 3.7.2 (Actions A, C, and D), to the Actions for inoperable MSIVs in GTS 3.6.3 (Action C). The more restrictive main steam flow path isolation Completion Time is in GTS/STS 3.7.2 Actions and may be as long as 22 hours based on the combination of:

- 8 hours to restore MSIV operability per Required Action A.1;
- 6 hours to be in Mode 2 if restoration not met per Required Action C.1; and
- 8 hours to isolate affected main steam line flow path if in Mode 2, 3, or 4, or after entering Mode 2 from Mode 1, per Required Action D.1.

In contrast, GTS 3.6.3 Required Action C.1 allows 72 hours to isolate the affected main steam line flow path and does not explicitly require the plant to be in Mode 2 (in up to 14 hours). However, GTS/STS 3.7.2 Required Actions do not include the restriction of GTS 3.6.3 Required Action C.1 that requires deactivating the inoperable MSIV in the closed position. Conversely, the GTS 3.6.3 Required Action C.2 periodic Completion Time of "Once per 31 days"—to verify that the MSIV is closed and deactivated—is less restrictive than the GTS 3.7.2 Required Action D.2 periodic Completion Time of "Once per 7 days"—to verify that the main steam line flow path is isolated— which is retained in STS 3.7.2 Action D. Specifying a more frequent main steam line flow path isolation verification in STS 3.7.2 adequately compensates for no longer specifying a requirement to deactivate the MSIV in the closed position. Additionally, STS 3.7.2 Action D does not contain the flexibility found in GTS 3.6.3 Required Action C.2 Notes allowing administrative means to verify flow path isolation. The flexibility of GTS 3.6.3 Actions Note 1 ("Penetration flow path(s) may be unisolated intermittently under administrative controls") is not applied for MSIVs in STS 3.7.2 Actions and the flexibility of GTS 3.6.3 Actions Note 2 ("Separate Condition entry is allowed for each penetration flow path") is only allowed by STS 3.7.2 in Modes 2, 3, and 4; therefore, overall, STS 3.7.2 specifies more restrictive Actions for inoperable MSIVs than GTS 3.6.3.

The overall impact on safety from moving the Action requirement for MSIVs out of GTS 3.6.3 is minimal. The more restrictive Actions of STS 3.7.2 to affect isolation result in achieving the appropriate compensatory measure and protection of public health and safety sooner and the more frequent verification adequately compensates for not requiring deenergization of the MSIVs. In the event that the flow path associated with MSIVs, MSIV bypass valves, or main steam line drain valves is not isolated, the default actions of GTS 3.6.3 Action D require being in Mode 3 within 6 hours and being in Mode 5 within 36 hours. To assure these requirements are maintained, STS 3.7.2 Required Action F.3 is added requiring the reactor to be in Mode 5 within 36 hours, which is consistent with GTS 3.6.3 Required Action D.2. This addition, in combination with STS 3.7.2 Required Action F.1 to be in Mode 3 within 6 hours provides consistent actions for the valves moved from GTS 3.6.3 into STS 3.7.2.

Two new SRs are added to STS 3.7.2: SR 3.7.2.3 and SR 3.7.2.4. SR 3.7.2.3 requires verification that the isolation time of each MSIV bypass valve and main steam line drain valve is within limits at a Frequency of in accordance with the Inservice Testing Program and SR 3.7.2.4 requires verification that each MSIV bypass valve and main steam line drain valve actuates to the isolation position on an actual or simulated actuation signal at a Frequency of 24 months. These SRs are consistent with GTS 3.6.3 SR 3.6.3.4 and SR 3.6.3.5. GTS 3.6.3 SRs 3.6.3.1, 3.6.3.2, and 3.6.3.3 are not applicable to MSIVs, MSIV bypass valves, or main steam line drain valves.

TSTF-491-A and DOC D09 relocate the required closure times for the MSIVs and alternate downstream isolation valves to a Licensee Controlled Document (LCD) such as the TS Bases. Changes to LCDs are subject to the 10 CFR 50.59 process. The 10 CFR 50.59 (reference 5) criteria provide adequate assurance that prior staff review and approval will be requested by the licensee for changes to the Bases with the potential to affect the safe operation of the plant. Furthermore, the MSIVs and alternate downstream isolation valves are subject to periodic testing and acceptance criteria in accordance with the Inservice Testing (IST) Program. Compliance with the IST Program is required by Section 5.5.3 of the AP1000 GTS and 10 CFR 50.55. The IST Program includes specific reference value baseline operating times for valves that are not subject to arbitrary changes.

10 CFR 50.36 requires the inclusion of the periodic testing of the MSIVs and alternate downstream isolation valves in the Surveillance Requirements not the actual closure time of the valves. TSTF-491-A change maintains the periodic testing requirements for MSIVs in accordance with 10 CFR 50.36 (Reference 4).

Based on the requirements of 10 CFR 50.36, 10 CFR 50.59 and IST Program, the staff concludes that relocating the MSIV and alternate downstream isolation valves closure times to the TS Bases is acceptable.

DOC M15 revises the Applicability to be MODES 1, 2, 3, and 4, with no exceptions. STS 3.7.2 Required Action F.3 is added to be in MODE 5 within 36 hours. When the unit is in Mode 2, 3, or 4, GTS 3.7.2 currently does not apply to the valves whose flow path is isolated. Thus, when a main steam flow path isolation valve (e.g., a turbine stop valve) is inoperable in Mode 2, 3, or 4, once the affected steam flow path is isolated as required by GTS 3.7.2 Required Action D.1, and LCO 3.7.2 would not apply and the periodic verification of GTS 3.7.2 Required Action D.2 would not be required.

Similar to the Applicability of GTS 3.6.3, the GTS 3.7.2 Applicability is changed to not provide an exception once the affected flow path is isolated. The main steam flow path isolation valves will remain required to be Operable in Modes 2, 3, and 4, even when the affected flow path is isolated. This change will ensure that the periodic verification of GTS 3.7.2 Required Action D.2 is performed as long as a valve in the affected flow path remains inoperable. This change is acceptable since it ensures the flow path is periodically verified to be in the post-accident state (i.e., isolated) anytime when in Mode 2, 3, and 4 with an associated isolation valve inoperable.

In addition, due to the Applicability change, STS 3.7.2 Required Action F.3 is added to be in Mode 5. This ensures that when conditions warrant, the Applicability of the LCO is exited. The Applicability change and addition of new Required Action F.3 for the MSIVs is discussed in association with DOC M11.

Condition D is modified by a Note that states “Separate Condition entry is allowed for each MSIV.” DOC L20 revises the term “MSIV” to “main steam line flow path.” GTS 3.7.2 requires various main steam line flow path isolation valves to be Operable. Included in these valves are not only the MSIVs, but also the turbine stop valves, turbine control valves, turbine bypass valves, and moisture separator reheater 2nd stage steam isolation valves. GTS 3.7.2 Action D provides the actions to be taken when these valves are inoperable in MODE 2, 3, or 4. Required Action D.1 requires the associated flow path to be isolated and Required Action D.2 requires a periodic verification that the flow path remains in this condition. The GTS 3.7.2 Note to Condition D only states that inoperable MSIVs have a separate Condition entry allowance.

However, since the Condition applies to all valves required by the LCO, not just the MSIVs, the manner in which the Note is written does not allow GTS 3.7.2 Required Actions D.1 and D.2 to be taken for each affected flow path associated with any valves other than the MSIVs. For example, if a turbine stop valve is inoperable and GTS 3.7.2 Required Action D.1 initially complied with (i.e., the affected flow path is isolated), if a second valve in another flow path (e.g., a turbine bypass valve) becomes inoperable, there is no allowed time to perform GTS 3.7.2 Required Action D.1 on this new affected flow path; the Required Action is immediately not met and GTS 3.7.2 Condition E must be entered.

The Note inserted by DOC L20 will allow a separate Condition entry for each main steam line flow path. GTS 3.7.2 Required Action D.1 adequately compensates for the inoperability of each valve, since it requires the affected flow path to be isolated. This places the valve in the assumed post-accident position. GTS 3.7.2 Required Action D.2 requires a periodic verification that the flow path remains isolated. Once isolated, the appropriate compensatory action is in place. Subsequent flow paths with inoperable valves are justified to be allowed appropriate Completion Times to isolate the affected flow path prior to requiring a unit shutdown in accordance with GTS 3.7.2 Action E. Providing this allowance minimizes the plant risk associated with imposing an unnecessary shutdown.

The remaining changes are editorial, clarifying, grammatical, or otherwise considered administrative. These changes do not affect the technical content, but improve the readability, implementation, and understanding of the requirements, and are therefore acceptable.

Having found that this GTST's proposed changes to the GTS and Bases are acceptable, the NRC staff concludes that AP1000 STS Subsection 3.7.2 is an acceptable model Specification for the AP1000 standard reactor design.

References to Previous NRC Safety Evaluation Reports (SERs):

TSTF-491-A: Federal Register, Volume 71, No. 193, Thursday, October 5, 2006, Notices

VIII. Review Information

Evaluator Comments:

None

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Review Information:

Availability for public review and comment on Revision 0 of this traveler approved by NRC staff on 5/19/2014.

APOG Comments (Ref. 13) and Resolutions:

1. (Internal # 3) Throughout the Bases, references to Sections and Chapters of the FSAR do not include the “FSAR” clarifier. Since these Section and Chapter references are to an external document, it is appropriate (DOC A003) to include the “FSAR” modifier. This is resolved by adding the FSAR modifier as appropriate.

2. (Internal # 6) The GTST sections often repeat VEGP LAR DOCs, which reference “existing” and “current” requirements. The inclusion in the GTST of references to “existing” and “current,” are not always valid in the context of the GTS. Each occurrence of “existing” and “current” should be revised to be clear and specific to GTS, MTS, or VEGP COL TS (or other), as appropriate. Noted ambiguities are corrected in the GTST body.

3. (Internal # 7) Section VII, GTST Safety Evaluation, inconsistently completes the subsection “References to Previous NRC Safety Evaluation Reports (SERs)” by citing the associated SE for VEGP 3&4 COL Amendment 13. It is not clear whether there is a substantive intended difference when omitting the SE citation. This is resolved by removing the SE citation in Section VII of the GTST and ensuring that appropriate references to the consistent citation of this reference in Section X of the GTST are made.

4. (Internal # 385) In GTST for Subsection 3.7.2, Section V, under the heading “Changes to GTS and Bases” discussion of DOC A095, says it affects GTS Conditions A, B, C, and D and their Required Actions. DOC A095 does not affect Condition A or its Required Action. Delete the reference to Condition A. This is resolved by making the recommended change. In addition, an editorial change is made to the fourth paragraph in the same GTST Section to revise “Conditions D Note” to “Condition D Note.”

5. (Internal # 386) In GTST for Subsection 3.7.2, Section VI, under the heading “Description of changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes” the discussion states that DOC A095 makes changes to GTS Conditions A, B, C, and D and their Required Actions. DOC A095 does not affect Condition A or its Required Action. Delete the reference to Condition A. This is resolved by making the recommended change.

6. (Internal # 387) In GTST for Subsection 3.7.2, Section VII, tenth paragraph, under the heading “Technical Analysis” the discussion of DOC M11 is incomplete. The VEGP LAR

discussed why TS 3.6.3 Actions Notes 3 and 4 were not applicable and not included in GTS 3.7.2. This information was not added by the NRC into this paragraph. (Note similar change is discussed in GTST 3.7.1.) For consistency, the statement from the VEGP LAR should be added. This is resolved by making the recommended change, including additional edits. Modify the paragraph as indicated (based on the following quote from Enclosure 1, Attachment 2, last paragraph on page "E1 Attachment 2 - 20" and continued on page"21" of VEGP TSU LAR 12-02):

> . . . These Notes are included in STS 3.7.2 from GTS 3.6.3 Actions Notes 1 and 2, respectively, and therefore reflect no technical change. GTS 3.6.3 Actions Notes 3 and 4 do not apply to MSIV bypass valves and main steam line drain valves ~~and are not included in STS 3.7.2~~**. These Notes ensure appropriate Actions are entered for any impacted supported system and GTS 3.6.1, "Containment," Actions are entered when isolation valve leakage results in exceeding the overall containment leakage rate acceptance criteria. Since MSIV bypass valves and main steam line drain valves do not support any other TS required system and these valves have no associated containment leakage rate limit, GTS 3.6.3 Actions Notes 3 and 4 have no bearing on these valves. Therefore, these Notes are not included in STS 3.7.2. Based on the preceding evaluation,** there is no impact on safety from moving the Action requirement for MSIV bypass valves and main steam line drain valves out of GTS 3.6.3 **Action C and into STS 3.7.2 Action E**.
>
> **<blank line>**
>
> **The following compares the** Actions for **inoperable** MSIVs ~~that are addressed~~ in GTS 3.7.2 **(**Actions A, C, and D**)**, ~~are compared~~ to **the Actions for inoperable MSIVs in** GTS 3.6.3 ~~Actions - Specifically GTS 3.6.3~~ **(**Action C**)**. The more restrictive **main steam line flow path** isolation **Completion Time** ~~time for MSIVs~~ is in **GTS/**STS 3.7.2 **Actions**, ~~which~~**and** may be as long as 22 hours based on the combination of:
>
> - 8 hour**s** ~~allowance of Required Action A.1~~ to restore **MSIV operability** per **Required Action A.1**;
> - 6 hours to be in Mode 2 if restoration not met per Required Action C.1; and
> - 8 hours to isolate **affected main steam line flow path if** ~~from when~~ in Mode 2, 3, or 4**, or after entering Mode 2 from Mode 1,** per Required Action D.1.
>
> In contrast, GTS 3.6.3 Required Action C.1 allows 72 hours to isolate **the affected main steam line flow path** and does not ~~impose the explicit requirement~~ **explicitly require the plant** to be in Mode 2 (in up to 14 hours). However, **GTS/**STS 3.7.2 Required Actions do not include the restriction~~s~~ of GTS 3.6.3 ~~current~~ Required Action C.1 that require**s** deactivating the **inoperable** MSIV in the closed position. Conversely, **the** GTS 3.6.3 Required Action C.2 periodic **Completion Time** ~~verification~~ of "Once per 31 days"—**to verify that the MSIV is closed and deactivated**—is less restrictive than the **GTS 3.7.2 Required Action D.2 periodic Completion Time of "Once per 7 days"—to verify that the main steam line flow path is isolated— which is retained in STS 3.7.2 Action D.** ~~More~~ **Specifying a more** frequent **main steam line flow path isolation** verification in STS 3.7.2 adequately compensates for ~~not imposing~~**no longer specifying** a requirement to deactivate the MSIV in the closed position. Additionally, STS 3.7.2 Action D does not contain the flexibility found in GTS 3.6.3 Required Action C.2 Notes allowing administrative means to verify flow path isolation. The flexibility of GTS 3.6.3 Actions

Note 1 (“Penetration flow path(s) may be unisolated intermittently under administrative controls”) is not applied for MSIVs in STS 3.7.2 Actions and the flexibility of GTS 3.6.3 Actions Note 2 (“Separate Condition entry is allowed for each penetration flow path”) is only allowed ~~in~~**by** STS 3.7.2 ~~for~~**in** Modes 2, 3, and 4; therefore**, overall,** STS 3.7.2 ~~imposes~~**specifies** more restrictive Actions **for inoperable MSIVs than GTS 3.6.3**.

7. (Internal # 388) Required Action B.1 has a change that adds “s” to the word “valve.” It should be “(s)” Change “s” to “(s)” This is resolved by making the recommended change.

8. (Internal # 389) In the “Background” section of the Bases, revise the first paragraph as follows:

   Each main steam line has one ~~safety related~~ MSIV **(which is safety related)** to isolate steam flow from the secondary side of the steam generators**, which may be required** following a high energy line break. ~~MSIV closure terminates flow from the unaffected (intact) steam generator.~~

   This non-technical change provides improved clarity, consistency, and operator usability. This is resolved by making the recommended change with additional edits. NRC staff does not agree with removing the second sentence. The NRC staff recommends editing the first and third paragraphs of the “Background” section of the Bases as follows:

   Each main steam line has one ~~safety related~~ MSIV**, which is safety related,** to isolate steam flow from the secondary side of the steam generators**, which may be required** following a high energy line break. MSIV closure terminates flow from the unaffected (intact) steam generator.

   The MSIVs, turbine stop and control valves, turbine bypass valves, and moisture separator reheater ~~2~~nd **2nd** stage steam isolation valves close on a ~~main~~ steam **line** isolation signal **from either of two Class 1E power divisions** generated ~~by~~ **on** ~~either low steam line pressure~~ **Steam Line Pressure - Low (Table 3.3.8-1 Function 24)**, ~~high~~ **Containment Pressure - High 2 (Function 2)**~~containment pressure~~, ~~Low Tcold~~ **T_{cold} - Low 2 (Function 11)**, or ~~high negative steam pressure rate~~**if below P-11 Setpoint, Steam Line Pressure - Negative Rate - High (Function 25)**. The MSIVs fail close~~d~~ on loss of control air ~~or actuation signal from either of two 1E power divisions~~.

9. (Internal # 390) In the “Background” section of the Bases, revise the fifth paragraph as follows (includes insertion of “FSAR” per comment # 3 and rearrangement of Reference list per comment # 402):

   A description of the MSIVs is found in ~~the~~**FSAR** Section 10.3 (Ref. 1). Descriptions for the turbine bypass valves, and moisture separator reheater ~~2~~nd**2nd** stage steam isolation valves are found in ~~the~~**FSAR** Section 10.4 (Ref. **2**~~6~~).

   This non-technical change provides improved clarity, consistency, and operator usability. This is resolved by making the recommended change.

10. (Internal # 391) In the “ASA” section of the Bases, revise the first paragraph as follows (includes insertion of “FSAR” per comment # 3 and rearrangement of Reference list per comment # 402):

The design basis of the MSIVs is established by the containment analysis for the large steam line break (SLB) inside containment, discussed in ~~the~~ **FSAR** Section 6.2 (Ref. ~~2~~**3**). It is also affected by the accident analysis of the SLB events presented in ~~the~~ **FSAR** Section 15.1 (Ref. ~~3~~**4**).

This non-technical change provides improved clarity, consistency, and operator usability. This is resolved by making the recommended change with additional edits. The NRC staff recommends editing the second, third, and fourth paragraphs of the "ASA" section of the Bases as follows for consistency with other APOG-proposed changes:

Design basis events of concern for containment analysis are SLB inside containment with the failure of the associated MSIV to close, or a main ~~feedline~~**feedwater line** break with the associated failure of a **main** ~~feedline~~**feedwater** isolation or control valve to close. At lower powers, the steam generator **secondary water** inventory and temperature are at their maximum, ~~maximizing~~**which conservatively maximizes** the analyzed mass and energy release**d** to the containment. Due to **the failure of the MSIV to close and the resulting** reverse flow ~~and failure of the MSIV to close~~, the additional mass and energy in the steam headers, downstream from the other MSIV, contribute to the total release **in containment**. With the most reactive **control** rod ~~cluster control assembly~~ assumed stuck in the fully withdrawn position, there is an increased possibility that the **resulting reactor coolant system (RCS) cooldown will cause the** core ~~will~~ **to** become critical and return to power. The core is ultimately shut down by the boric acid injection delivered by the Core Makeup Tanks (CMTs).

The accident analysis compares several different SLB events against different acceptance criteria. The large SLB outside containment upstream of the MSIV is limiting for offsite dose, although a break in this short section of main steam header **piping** has a very low probability. The large SLB inside containment at hot zero power is the limiting case for a post trip return to power. The analysis includes consideration of scenarios with offsite power available, and with a loss of offsite power. With offsite power available, the reactor coolant pumps continue to circulate coolant for a longer period through the steam generators, maximizing the ~~Reactor Coolant System~~**RCS** cooldown. The ~~reactor protection system~~**PMS** includes a safety related signal that initiates the coastdown of the reactor coolant pumps early in the large SLB transient **(trip of all reactor coolant pumps on CMT actuation)**. Therefore, there is very little difference in the predicted departure from nucleate boiling ratio between cases with and without offsite power. Significant single failures considered include failure of an MSIV to close.

The **four sets of** ~~non-safety related~~ turbine stop ~~or~~**and** control valves, in combination with the **six** turbine bypass **valves**, and **the two** moisture separator reheater ~~2nd~~**2nd** stage steam isolation valves, are assumed as a **non-safety related** backup to isolate the steam flow path given a single failure of an MSIV **to close**. The safety analyses do not differentiate between the availability of ~~the~~ **a** turbine stop valve ~~or~~**and** its **in-**series control valve. Either the turbine stop ~~valves~~**valve** or ~~its~~**its** associated turbine control valve**, in each of the four sets,** ~~are~~**is** required by this LCO to be OPERABLE. These valves, along with the turbine bypass, and moisture

separator reheater ~~2nd~~**2nd** stage steam isolation valves are considered as alternate downstream **isolation** valves.

11. (Internal # 392 and 393) In the “ASA” section of the Bases, revise the fifth paragraph as follows:

. . .

b. A break outside of containment, and upstream or downstream from the MSIVs~~, is not a containment pressurization concern~~. The uncontrolled blowdown of more than one steam generator . . .
c. Following a steam generator tube rupture~~.~~**.** ~~c~~**C**losure of the MSIVs . . .
d. ~~The MSIVs are also utilized during o~~**O**ther events such as a feedwater line break.~~; h~~**H**owever, these events . . .

Excess detail is removed. The detail is not consistent with general content reflected in NUREG-1431. Removal of this detail does not impact the information useful for compliance with the TS requirement.This is resolved by making the recommended change with additional clarifying edits:

. . .

a. **A high**~~High~~ energy line break inside containment. In order to maximize the mass and energy release into containment, the analysis assumes that the MSIV in the affected steam generator remains open. For this accident scenario, steam is discharged into containment from both steam generators until the unaffected ~~loop~~**steam generator** MSIV closes. After MSIV closure, steam is discharged into containment only from the affected steam generator and from the residual steam in the main steam header downstream of the closed MSIV in the unaffected loop. Closure of the MSIV isolates the break from the unaffected steam generator.

b. A **steamline** break outside of containment, and upstream **of an MSIV** or downstream ~~from~~**of** the MSIVs~~, is not a containment pressurization concern~~. The uncontrolled blowdown of more than one steam generator must be prevented to limit the potential for **an** uncontrolled ~~Reactor Coolant System (RCS)~~ **RCS** cooldown and positive reactivity addition. Closure of the MSIVs or alternate downstream valves isolates the break, and limits the blowdown to a single steam generator.

c. ~~Following a~~**A** steam generator tube rupture**. Closure**~~, closure~~ of the MSIVs isolates the ruptured steam generator to minimize radiological releases.

d. ~~The MSIVs are also utilized during other~~ **Other** events such as a feedwater line break~~.; however~~ **However**, these events are less limiting so far as MSIV OPERABILITY is concerned.

12. (Internal # 394) In the “Applicability” section of the Bases, revise the first paragraph as follows:

. . . 2nd stage steam isolation valves must be OPERABLE in ~~MODES 1, and~~ MODES **1**, 2, 3, and 4, when there is significant mass and energy...

This non-technical change provides improved clarity, consistency, and operator usability. This is resolved by making the recommended change with additional edits:

> The MSIVs, MSIV bypass valves, main steam line drain valves, turbine stop or associated turbine control valves, turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves must be OPERABLE in ~~MODE 1 and~~ MODES **1,** 2, 3, and 4, when there is significant mass and energy...

13. (Internal # 395, 396, and 397) In the "SRs" section of the Bases, under the heading "SR 3.7.2.1," revise the first paragraph as follows (includes rearrangement of Reference list per comment # 402):

> This SR verifies that **MSIV**~~the~~ closure time ~~of each MSIV~~ **is ≤ 5.0 seconds,** on an actual or simulated actuation signal**. The MSIV isolation time** is ~~within the limit given in Reference 7 and is within that~~ assumed in the accident and containment analyses. ~~This SR also verifies the valve closure time is in accordance with the Inservice Testing Program.~~ This **Surveillance** ~~SR~~ is normally performed upon returning the unit to operation following a refueling outage. The MSIVs should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the MSIVs are not tested at power, they are exempt from the ASME OM Code (Ref. ~~8~~**6**) requirements during operation in MODE 1 or 2.

DOC D09 made the Regulatory commitment to relocate the closure time to the Bases. Similarly, V.C. Summer TSU LAR proposes the same commitment to the Bases. Since each represented AP1000 Utility is committed to maintaining standardization, there currently is no rationale for an AP1000 STS that differs from the TSU LAR commitments and plant- specific Bases for VEGP. Additionally, there is no COL Item, and no Reviewer's Note defining the use of the optional bracketed material. As such, this change is inappropriate. The TSTF-491-A changes to the SR Bases (to only reference document containing the MSIV closure time) are not adopted, based on APOG presentation preference expressed in DOC D09. The remaining portions of this change are non-technical and provide improved clarity, consistency, and operator usability. This is resolved by making the recommended change with additional edits:

> . . . As the MSIVs are not tested at power, they are exempt from the ASME OM Code (Ref. ~~8~~**6**) requirements during operation in MODE**S** 1 **and** ~~or~~ 2.

14. (Internal # 398, 399, and 401) In the "SRs" section of the Bases, under the heading "SR 3.7.2.2," revise the first paragraph as follows (includes rearrangement of Reference list per comment # 402):

> This SR verifies that the turbine stop, turbine control, turbine bypass, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves' closure time is **within the limit given in Reference 7**~~≤ 5.0 seconds,~~ **≤ 5.0 seconds,** on an actual or simulated actuation signal**.** These alternate downstream isolation valves must meet the MSIV isolation time assumed in the accident and containment analyses. **This SR also verifies the valve closure time is in accordance with the Inservice Testing Program.** This ~~Surveillance~~ **SRSurveillance** is normally performed upon returning the unit to operation following a refueling outage. The alternate downstream valves should not be tested at power, since even a part stroke exercise increases the risk of a

valve closure when the unit is generating power. As the alternate downstream valves are not tested at power, they are exempt from the ASME OM Code (Ref. ~~7~~**86**) requirements during operation in MODE 1 or 2.

DOC D09 made the Regulatory commitment to relocate the closure time to the Bases. Similarly, V.C. Summer TSU LAR proposes the same commitment to the Bases. Since each represented AP1000 Utility is committed to maintaining standardization, there currently is no rationale for an AP1000 STS that differs from the TSU LAR commitments and plant- specific Bases for VEGP. Additionally, there is no COL Item, and no Reviewer's Note defining the use of the optional bracketed material. As such, this change is inappropriate. The TSTF-491-A changes to the SR Bases (to only reference document containing the MSIV closure time) are not adopted, based on APOG presentation preference expressed in DOC D09. The remaining portions of this change are non-technical and provide improved clarity, consistency, and operator usability. This is resolved by making the recommended change with additional edits:

> . . . As the alternate downstream valves are not tested at power, they are exempt from the ASME OM Code (Ref. ~~8~~**6**) requirements during operation in MODE**S** 1 **and** ~~or~~ 2.

15. (Internal # 400) In the "SRs" section of the Bases, under the heading "SR 3.7.2.3," revise the first paragraph, last sentence as follows (includes insertion of "FSAR" per comment # 3 and rearrangement of Reference list per comment # 402):

> . . . The isolation times are specified in **FSAR** Section 6.2.3 (Ref. ~~9~~**7**) and Frequency of this SR is in accordance with the Inservice Testing Program.

This non-technical change provides improved clarity, consistency, and operator usability. This is resolved by making the recommended change.

16. (Internal # 402) In the "References" section of the Bases, revise the references as follows:

> 1. **FSAR** Section 10.3, "Main Steam System."
>
> **2. FSAR Section 10.4, "Other Features of Steam and Power Conversion Systems."**
>
> ~~2~~**3**. **FSAR** Section 6.2.1, "Containment Functional Design."
>
> ~~3~~**4**. **FSAR** Section 15.1, "Increase in Heat Removal by Secondary System."
>
> ~~4. Not used.~~
>
> 5. NUREG-138, Issue 1, "Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director NRR to NRR Staff."
>
> ~~6. Section 10.4, "Other Features of Steam and Power Conversion Systems."~~
>
> ~~7~~**6**. ASME OM Code, "Code for Operation and Maintenance of Nuclear Power Plants."
>
> **7**. **FSAR Section 6.2, "Containment Systems."**

This non-technical change provides improved clarity, consistency, and operator usability. This is resolved by making the recommended change.

NRC Final Approval Date: 6/25/2015

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IX. Evaluator Comments for Consideration in Finalizing Technical Specifications and Bases

None

X. References Used in GTST

1. AP1000 DCD, Revision 19, Section 16, “Technical Specifications,” June 2011 (ML11171A500).

2. Southern Nuclear Operating Company, Vogtle Electric Generating Plant, Units 3 and 4, Technical Specifications Upgrade License Amendment Request, February 24, 2011 (ML12065A057).

3. NRC Safety Evaluation (SE) for Amendment No. 13 to Combined License (COL) No. NPF-91 for Vogtle Electric Generating Plant (VEGP) Unit 3, and Amendment No. 13 to COL No. NPF-92 for VEGP Unit 4, September 9, 2013, ADAMS Package Accession No. ML13238A337, which contains:

ML13238A355	Cover Letter - Issuance of License Amendment No. 13 for Vogtle Units 3 and 4 (LAR 12-002).
ML13238A359	Enclosure 1 - Amendment No. 13 to COL No. NPF-91
ML13239A256	Enclosure 2 - Amendment No. 13 to COL No. NPF-92
ML13239A284	Enclosure 3 - Revised plant-specific TS pages (Attachment to Amendment No. 13)
ML13239A287	Enclosure 4 - Safety Evaluation (SE), and Attachment 1 - Acronyms
ML13239A288	SE Attachment 2 - Table A - Administrative Changes
ML13239A319	SE Attachment 3 - Table M - More Restrictive Changes
ML13239A333	SE Attachment 4 - Table R - Relocated Specifications
ML13239A331	SE Attachment 5 - Table D - Detail Removed Changes
ML13239A316	SE Attachment 6 - Table L - Less Restrictive Changes

   The following documents were subsequently issued to correct an administrative error in Enclosure 3:

ML13277A616	Letter - Correction To The Attachment (Replacement Pages) - Vogtle Electric Generating Plant Units 3 and 4-Issuance of Amendment Re: Technical Specifications Upgrade (LAR 12-002) (TAC No. RP9402)
ML13277A637	Enclosure 3 - Revised plant-specific TS pages (Attachment to Amendment No. 13) (corrected)

4. 10 CFR 50.36, “Technical Specifications.”

5. 10 CFR 50.59, “Changes , Tests, and Experiments.”

6. NRC SER for Beaver Valley Power Station (BVPS) Unit 2 Amendment # 137 issued 6/25/03 (TAC NO. MB5686).

7. NRC SER for BVPS License Amendment numbers 210 (Unit 1) and 88 (Unit 2) issued 1/20/98 (TAC NOS. M99671 and M99672).

8. Generic Letter 93-08, “Relocation of Technical Specification Tables of Instrument Response Time Limits,” dated 12/29/93.

9. Generic Letter 91-08, “Removal of Component Lists From Technical Specifications,” dated 5/6/91.

10. TSTF-GG-05-01, “Writer's Guide for Plant-Specific Improved Technical Specifications,” June 2005.

11. RAI Letter No. 01 Related to License Amendment Request (LAR) 12-002 for the Vogtle Electric Generating Plant Units 3 and 4 Combined Licenses, September 7, 2012 (ML12251A355).

12. Southern Nuclear Operating Company, Vogtle Electric Generating Plant, Units 3 and 4, Response to Request for Additional Information Letter No. 01 Related to License Amendment Request LAR-12-002, ND-12-2015, October 04, 2012 (ML12286A363 and ML12286A360)

13. APOG-2014-008, APOG (AP1000 Utilities) Comments on AP1000 Standardized Technical Specifications (STS) Generic Technical Specification Travelers (GTSTs), Docket ID NRC-2014-0147, September 22, 2014 (ML14265A493).

XI. MARKUP of the Applicable GTS Subsection for Preparation of the STS NUREG

The entire section of the Specifications and the Bases associated with this GTST is presented next.

Changes to the Specifications and Bases are denoted as follows: Deleted portions are marked in strikethrough red font, and inserted portions in bold blue font.

3.7 PLANT SYSTEMS

3.7.2 Main Steam **Line Flow Path** Isolation Valves ~~(MSIVs)~~

LCO 3.7.2 **Each of the following** ~~The minimum combination of valves required for~~ **main** steam **line** flow **path** isolation **valves** shall be OPERABLE**;**~~.~~

a. Main steam isolation valves (MSIVs);

b. MSIV bypass valves;

c. Main steam line drain valves;

d. Turbine stop valves or turbine control valves;

e. Turbine bypass valves; and

f. Moisture separator reheater 2nd stage steam isolation valves.

APPLICABILITY: MODE**S** 1, **2, 3, and 4.**
~~MODES 2, 3, and 4 except when steam flow is isolated.~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One MSIV inoperable in MODE 1.	A.1 Restore valve to OPERABLE status.	8 hours
B. One or more of the turbine stop valves and ~~its~~ associated turbine control valve**s**, turbine bypass valves, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 1.	B.1 Restore valve**(s)** to OPERABLE status.	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Two MSIVs inoperable in MODE 1. OR One MSIV inoperable and one or more of the turbine stop valves and ~~its~~ associated turbine control valve**s**, ~~all~~ turbine bypass valves, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 1. OR Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 2.	6 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D ----------NOTE---------- Separate Condition entry is allowed for each **main steam line flow path** ~~MSIV~~. ---------- One or two MSIVs inoperable in MODE 2, 3, or 4. OR One or more of the turbine stop valves and ~~its~~ associated turbine control valve**s**, ~~all~~ turbine bypass valves, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 2, 3, or 4.	D.1 Isolate **affected** ~~associated~~ **main** steam **line** flow path. AND D.2 Verify **affected main steam line** flow path **is isolated** ~~remains closed~~.	8 hours Once per 7 days
E. ----------NOTE---------- Separate Condition entry is allowed for each penetration flow path. ---------- One or more MSIV bypass or main steam line drain valves inoperable.	**----------NOTE---------- Penetration flow path(s) may be unisolated intermittently under administrative controls. ----------** **E.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.** **AND**	**72 hours**

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. (continued)	**E.2**	**----------NOTES----------** **1. Isolation devices in high radiation areas may be verified by use of administrative means.** **2. Isolation devices that are locked, sealed, or otherwise secured may be verified by administrative means.** **----------** **Verify the affected penetration flow path is isolated.**	**Once per 31 days**
F~~E~~. Required Action and associated Completion Time of Condition D **or E** not met.	**F**~~E~~.1	Be in MODE 3.	6 hours
	AND		
	F~~E~~.2	Be in MODE 4 with the Reactor Coolant System (RCS) cooling provided by the Normal Residual Heat Removal System (RNS).	24 hours
	AND		
	F.3	**Be in MODE 5.**	**36 hours**

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.2.1	----------NOTE---------- Only required to be performed prior to entry into MODE 2. ---------- Verify MSIV closure time ~~≤ 5 seconds~~ **is within limits** on an actual or simulated actuation signal.	In accordance with the Inservice Testing Program
SR 3.7.2.2	----------NOTE---------- Only required to be performed prior to entry into MODE 2. ---------- Verify **required** turbine stop, turbine control, turbine bypass, and moisture separator reheater 2nd stage steam isolation valves' closure time ~~≤ 5 seconds~~ **is within limits** on an actual or simulated actuation signal.	In accordance with the Inservice Testing Program
SR 3.7.2.3	**Verify the isolation time of each MSIV bypass valve and main steam line drain isolation valve is within limits.**	**In accordance with the Inservice Testing Program**
SR 3.7.2.4	**Verify each MSIV bypass valve and main steam line drain isolation valve actuates to the isolation position on an actual or simulated actuation signal.**	**24 months**

B 3.7 PLANT SYSTEMS

B 3.7.2 Main Steam **Line Flow Path** Isolation Valves ~~(MSIVs)~~

BASES

BACKGROUND

Each main steam line has one ~~safety related~~ MSIV**, which is safety related,** to isolate steam flow from the secondary side of the steam generators**, which may be required** following a high energy line break. MSIV closure terminates flow from the unaffected (intact) steam generator.

One MSIV is located in each main steam line outside containment. The MSIVs are downstream from the main steam safety valves (MSSVs). Downstream from the MSIVs, main steam enters the high pressure turbine through four stop valves and four governing control valves. Closing the MSIVs isolates each steam generator from the other and isolates the turbine bypass system, and other steam supplies from the steam generator.

The MSIVs, turbine stop and control valves, turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves close on a ~~main~~ steam **line** isolation signal **from either of two Class 1E power divisions** generated ~~by~~ **on** ~~either low steam line pressure~~ **Steam Line Pressure - Low (Table 3.3.8-1 Function 24)**, ~~high~~ **Containment Pressure - High 2 (Function 2)**~~containment pressure~~, ~~Low Tcold~~ **T_{cold} - Low 2 (Function 11)**, or ~~high negative steam pressure rate~~**if below P-11 Setpoint, Steam Line Pressure - Negative Rate - High (Function 25)**. The MSIVs fail close~~d~~ on loss of control air ~~or actuation signal from either of two 1E power divisions~~.

Each MSIV has an MSIV bypass valve. Although these bypass valves are normally closed, they receive the same emergency closure signal as do their associated MSIVs. The MSIVs may also be actuated manually.

A description of the MSIVs is found in the **FSAR** Section 10.3 (Ref. 1). Descriptions for the turbine bypass valves, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves are found in the **FSAR** Section 10.4 (Ref. **2**~~6~~).

APPLICABLE SAFETY ANALYSES

The design basis of the MSIVs is established by the containment analysis for the large steam line break (SLB) inside containment, discussed in ~~the~~ **FSAR** Section 6.2 (Ref. **3**~~2~~). It is also affected by the accident analysis of the SLB events presented in ~~the~~ **FSAR** Section 15.1

BASES

APPLICABLE SAFETY ANALYSES (continued)

(Ref. **4**~~3~~). The design precludes the blowdown of more than one steam generator, assuming a single active component failure (e.g., the failure of one MSIV to close on demand).

Design basis events of concern for containment analysis are SLB inside containment with the failure of the associated MSIV to close, or a main **feedwater line** ~~feedline~~ break with the associated failure of a **main feedwater** ~~feedline~~ isolation or control valve to close. At lower powers, the steam generator **secondary water** inventory and temperature are at their maximum, **which conservatively maximizes** ~~maximizing~~ the analyzed mass and energy release to the containment. Due to **the failure of the MSIV to close and the resulting** reverse flow ~~and failure of the MSIV to close~~, the additional mass and energy in the steam headers, downstream from the other MSIV, contribute to the total release **in containment**. With the most reactive **control** rod ~~cluster control assembly~~ assumed stuck in the fully withdrawn position, there is an increased possibility that the **resulting reactor coolant system (RCS) cooldown will cause the** core **to** ~~will~~ become critical and return to power. The core is ultimately shut down by the boric acid injection delivered by the Core Makeup Tanks (CMTs).

The accident analysis compares several different SLB events against different acceptance criteria. The large SLB outside containment upstream of the MSIV is limiting for offsite dose, although a break in this short section of main steam header **piping** has a very low probability. The large SLB inside containment at hot zero power is the limiting case for a post trip return to power. The analysis includes consideration of scenarios with offsite power available, and with a loss of offsite power. With offsite power available, the reactor coolant pumps continue to circulate coolant for a longer period through the steam generators, maximizing the **RCS** ~~Reactor Coolant System~~ cooldown. The **PMS** ~~reactor protection system~~ includes a safety related signal that initiates the coastdown of the reactor coolant pumps early in the large SLB transient **(trip of all reactor coolant pumps on CMT actuation)**. Therefore, there is very little difference in the predicted departure from nucleate boiling ratio between cases with and without offsite power. Significant single failures considered include failure of an MSIV to close.

The **four sets of** ~~non-safety related~~ turbine stop **and** ~~or~~ control valves, in combination with the **six** turbine bypass **valves**, and **the two** moisture separator reheater **2nd** ~~2nd~~ stage steam isolation valves, are assumed as a **non-safety related** backup to isolate the steam flow path given a

BASES

APPLICABLE SAFETY ANALYSES (continued)

single failure of an MSIV **to close**. The safety analyses do not differentiate between the availability of **a** ~~the~~ turbine stop valve **and** ~~or~~ its **in-**series control valve. Either the turbine stop valve~~s~~ or its associated turbine control valve**, in each of the four sets, is** ~~are~~ required by this LCO to be OPERABLE. These valves, along with the turbine bypass, and moisture separator reheater **2nd** ~~2nd~~ stage steam isolation valves are considered as alternate downstream **isolation** valves.

The MSIVs serve a safety related function and remain open during power operation. These valves operate under the following situations:

a. **A high** ~~High~~ energy line break inside containment. In order to maximize the mass and energy release into containment, the analysis assumes that the MSIV in the affected steam generator remains open. For this accident scenario, steam is discharged into containment from both steam generators until the unaffected **steam generator** ~~loop~~ MSIV closes. After MSIV closure, steam is discharged into containment only from the affected steam generator and from the residual steam in the main steam header downstream of the closed MSIV in the unaffected loop. Closure of the MSIV isolates the break from the unaffected steam generator.

b. A **steamline** break outside of containment, and upstream **of an MSIV** or downstream **of** ~~from~~ the MSIVs~~, is not a containment pressurization concern~~. The uncontrolled blowdown of more than one steam generator must be prevented to limit the potential for **an** uncontrolled ~~Reactor Coolant System (~~RCS~~)~~ cooldown and positive reactivity addition. Closure of the MSIVs or alternate downstream valves isolates the break, and limits the blowdown to a single steam generator.

c. **A** ~~Following a~~ steam generator tube rupture**.**~~,~~ **Closure** ~~closure~~ of the MSIVs isolates the ruptured steam generator to minimize radiological releases.

d. **Other** ~~The MSIVs are also utilized during other~~ events such as a feedwater line break**.**~~;~~ **However,** ~~however,~~ these events are less limiting so far as MSIV OPERABILITY is concerned.

BASES

APPLICABLE SAFETY ANALYSES (continued)

In addition, the MSIV bypass valves and main steam line drain valves are containment isolation valves and support the assumptions related to minimizing the loss of inventory and establishing the containment boundary during major accidents. Therefore, the safety analysis of any event requiring isolation of containment is applicable to the MSIV bypass valves and main steam line drain isolation valves.

~~The MSIVs and the alternate downstream valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).~~

Following an SLB and main steam isolation signal, the analyses assume continued steam loss through the **main** steam line ~~condensate~~ drain lines, turbine gland seal system, and the main steam to auxiliary steam header which supplies the auxiliary steam line to the deaerator. Since these valves are not assumed for steam isolation **to mitigate an SLB**, they do not satisfy the 10 CFR 50.36(c)(2)(ii) criteria**; however, main steam line drain isolation valves satisfy the 10 CFR 50.36(c)(2)(ii) criteria for containment isolation as discussed above**.

The MSIVs, the alternate downstream valves, the MSIV bypass valves, and the main steam line drain valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO requires **the minimum combination of valves for isolation of each main steam line flow path to be OPERABLE. This requires that one MSIV in each of the two main steam line flow paths be OPERABLE and requires MSIV bypass valves and main steam line drain valves to** ~~that one MSIV in each of the two steam lines~~ be OPERABLE. The MSIVs are considered OPERABLE when their isolation times are within limits, and they close on an isolation actuation signal.

This LCO **also** requires ~~that~~ four turbine stop valves or **the** ~~their~~ associated turbine control valve**s**, six turbine bypass valves, and two moisture separator reheater 2nd stage steam isolation valves be OPERABLE. A valve is considered OPERABLE when its isolation time is within the safety analysis isolation time limit of 5 seconds and it closes on an MSIV actuation signal. ~~The turbine bypass valves are alternatively considered OPERABLE when closed and administratively maintained closed with automatic actuation blocked as appropriate.~~

BASES

LCO (continued)

This LCO provides assurance that the MSIVs will perform their design safety function to mitigate the consequences of accidents that could result in offsite exposures comparable to the 10 CFR 50.34 limits or the NRC staff approved licensing basis.

This LCO provides assurance that the design and performance of the alternate downstream valves are compatible with the accident conditions for which they are called upon to function (Ref. 5).

APPLICABILITY

The MSIVs, **MSIV bypass valves, main steam line drain valves,** turbine stop or associated turbine control valves, turbine bypass valves, and moisture separator reheater **2nd** ~~2nd~~ stage steam isolation valves must be OPERABLE in ~~MODE 1 and~~ MODES **1,** 2, 3, and 4, ~~except when steam flow is isolated~~ when there is significant mass and energy in the RCS and steam generators **and where a DBA could cause a release of radioactive material to containment**. ~~Therefore, these valves must be OPERABLE or closed. When these valves are closed, they are already performing their required function.~~

In MODE 5 or 6, the steam generators do not contain much energy because their temperature is below the boiling point of water; therefore, the MSIVs and alternate downstream valves are not required for isolation of potential high energy secondary system pipe breaks in these MODES.

ACTIONS

A.1

With one MSIV inoperable in MODE 1, action must be taken to restore OPERABLE status within 8 hours. Some repairs to the valves can be made with the plant hot. The 8 hour Completion Time is reasonable considering the low probability of an accident occurring during this time period that would require a closure of these valves. With a single MSIV inoperable, the safety function, isolation of the **main** steam **line** flow path, is provided by the OPERABLE alternate downstream valves, but cannot accommodate a single failure. The assumptions and criteria of the accident analyses are preserved by the ability to automatically isolate the steam flow path.

BASES

ACTIONS (continued)

The 8 hour Completion Time is greater than that normally allowed for containment isolation valves because the MSIVs are valves that isolate a closed system penetrating containment. These valves differ from other containment isolation valves in that the closed system provides a positive means for containment isolation.

B.1

With any number of the turbine stop valves and the associated turbine control valve**s**, turbine bypass **valves**, or moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves inoperable in MODE 1, action must be taken to restore **the inoperable valve(s) to** OPERABLE status within 72 hours. Some repairs to the valves can be made with the plant hot. The 72 hour Completion Time is reasonable considering the low probability of an accident occurring during this time period that would require a closure of these valves. With the backup isolation valves inoperable, the safety function, isolation of the **main** steam **line** flow path, is provided by the remaining OPERABLE valves, but cannot accommodate a single failure. The assumptions and criteria of the accident analyses are preserved by the ability to automatically isolate the steam flow path.

C.1

With two MSIVs inoperable in MODE 1 or one MSIV and an alternate downstream valve inoperable or if the valves cannot be restored to OPERABLE status in accordance with Required Action A.1 or B.1, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in MODE 2 within 6 hours and Condition D would be entered. The Completion Time is reasonable, based on operating experience, to reach MODE 2 in an orderly manner and without challenging unit systems.

D.1 and D.2

Condition D is modified by a Note indicating that a separate Condition entry is allowed for each **main steam line flow path** ~~MSIV~~.

With one or two MSIVs inoperable or any number of turbine stop valves and the associated turbine control valves, turbine bypass, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 2, 3, or 4, the inoperable valve(s) may either be restored to OPERABLE status or the affected main steam line flow

BASES

ACTIONS (continued)

path isolated. When isolated, the main steam line flow path is in the condition ~~Since the MSIVs are required to be OPERABLE in MODES 2, 3, and 4, the inoperable MSIVs may either be restored to OPERABLE status or closed. When closed, the MSIVs are already in the position~~ required by the assumptions in the safety analysis.

The 8 hour Completion Time is consistent with that allowed in Condition A, and conservative considering the reduced energy in the steam generators in MODES 2, 3, and 4.

For inoperable **main steam line flow path isolation valves** ~~MSIVs~~ that cannot be restored to OPERABLE status within the specified Completion Time but **whose affected flow paths are isolated, these isolated flow paths must be verified to be continually isolated** ~~were closed, these inoperable valves must be verified to be continually closed~~ on a periodic basis. This is necessary to ensure that the assumptions in the safety analyses remain valid. The 7 day Completion Time is based on engineering judgment, and is considered reasonable in view of MSIV status indications available in the control room and other administrative controls which ensure that these valves will continue to be closed.

E.1 and E.2

With one or more MSIV bypass or main steam line drain valves inoperable, the inoperable valve must be restored to OPERABLE status or the affected penetration must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and deactivated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration flow path. Required Action E.1 must be completed within the 72 hour Completion Time. The specified time period is reasonable considering the relative stability of the closed system (hence, reliability) to act as a penetration isolation boundary and the relative importance of maintaining containment integrity during MODES 1, 2, 3, and 4. In the event that the affected penetration is isolated in accordance with Required Action E.1, the affected penetration must be verified to be isolated on a periodic basis. This periodic verification is necessary to assure leak tightness of containment and that containment penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for

BASES

ACTIONS (continued)

verifying that each affected penetration flow path is isolated is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low.

Condition E is modified by a Note indicating that separate Condition entry is allowed for each penetration flow path. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable containment isolation valve. Complying with the Required Actions may allow for continued operation, and subsequent inoperable containment isolation valves are governed by subsequent Condition entry and application of associated Required Actions.

The Required Actions are modified by a Note allowing containment penetration flow paths to be unisolated intermittently under administrative control. These administrative controls consist of stationing a dedicated operator at the valve controls, who is in continuous communication with the control room. In this way, the penetration can be rapidly isolated when a need for containment isolation is indicated.

Required Action E.2 is modified by two Notes. Note 1 applies to valves and blind flanges located in high radiation areas, and allows these devices to be verified closed by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted. Note 2 applies to isolation devices that are locked, sealed, or otherwise secured in position and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is small.

BASES

ACTIONS (continued)

F~~E~~.1**, F.2,** and **F**~~E~~.3~~2~~

If the **main steam line flow path isolation valves** ~~MSIVs~~ cannot be restored to OPERABLE status or **affected flow paths isolated** ~~closed~~ within the associated Completion Times of Condition D **or E**, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the plant must be placed in at least MODE 3 within 6 hours, ~~and~~ in MODE 4 with normal residual heat removal system in service within 24 hours**, and in MODE 5 within 36 hours**. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from MODE 2 conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1

This SR verifies that MSIV closure time is ≤ 5.0 seconds, on an actual or simulated actuation signal. The MSIV isolation time is assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage. The MSIVs should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the MSIVs are not tested at power, they are exempt from the ASME OM Code (Ref. ~~7~~**6**) requirements during operation in MODE**S** 1 ~~or~~**and** 2.

The Frequency is in accordance with the Inservice Testing Program.

This test is conducted in MODE 3 with the unit at operating temperature and pressure. This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. This allows a delay of testing until MODE 3, to establish conditions consistent with those under which the acceptance criterion was generated.

SR 3.7.2.2

This SR verifies that the turbine stop, turbine control, turbine bypass, and moisture separator reheater ~~2nd~~ **2nd** stage steam isolation valves' closure time is ≤ 5.0 seconds, on an actual or simulated actuation signal. These alternate downstream isolation valves must meet the MSIV isolation time assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a

BASES

SURVEILLANCE REQUIREMENTS (continued)

refueling outage. The alternate downstream valves should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the alternate downstream valves are not tested at power, they are exempt from the ASME OM Code (Ref. ~~7~~**6**) requirements during operation in MODE**S** 1 ~~or~~**and** 2.

The Frequency is in accordance with the Inservice Testing Program.

This test is conducted in MODE 3 with the unit at operating temperature and pressure. This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. This allows a delay of testing until MODE 3, to establish conditions consistent with those under which the acceptance criterion was generated.

SR 3.7.2.3

Verifying that the isolation time of each MSIV bypass and steam line drain valve is within limits is required to demonstrate OPERABILITY. The isolation time test ensures that the valve will isolate in a time period less than or equal to that assumed in the safety analysis. The isolation times are specified in FSAR Section 6.2.3 (Ref. 7) and Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.7.2.4

This SR ensures that each MSIV bypass and steam line drain valve will actuate to its isolation position on an actual or simulated actuation signal. The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function. The 24 month Frequency is based on the need to perform this Surveillance during periods in which the plant is shutdown for refueling to prevent any upsets of plant operation.

BASES

REFERENCES

1. **FSAR** Section 10.3, “Main Steam System.”

2. FSAR Section 10.4, “Other Features of Steam and Power Conversion Systems.”

3~~2~~. **FSAR** Section 6.2.1, “Containment Functional Design.”

4~~3~~. **FSAR** Section 15.1, “Increase in Heat Removal by Secondary System.”

~~4. Not used.~~

5. NUREG-138, Issue 1, “Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director NRR to NRR Staff.”

~~6. FSAR Section 10.4, “Other Features of Steam and Power Conversion Systems.”~~

6~~7~~. ASME OM Code, “Code for Operation and Maintenance of Nuclear Power Plants.”

7. FSAR Section 6.2, “Containment Systems.”

XII. Applicable STS Subsection After Incorporation of this GTST's Modifications

The entire subsection of the Specifications and the Bases associated with this GTST, following incorporation of the modifications, is presented next.

3.7 PLANT SYSTEMS

3.7.2 Main Steam Line Flow Path Isolation Valves

LCO 3.7.2 Each of the following main steam line flow path isolation valves shall be OPERABLE;

a. Main steam isolation valves (MSIVs);

b. MSIV bypass valves;

c. Main steam line drain valves;

d. Turbine stop valves or turbine control valves;

e. Turbine bypass valves; and

f. Moisture separator reheater 2nd stage steam isolation valves.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One MSIV inoperable in MODE 1.	A.1 Restore valve to OPERABLE status.	8 hours
B. One or more of the turbine stop valves and associated turbine control valves, turbine bypass valves, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 1.	B.1 Restore valve(s) to OPERABLE status.	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Two MSIVs inoperable in MODE 1. OR One MSIV inoperable and one or more of the turbine stop valves and associated turbine control valves, turbine bypass valves, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 1. OR Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 2.	6 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D ----------NOTE---------- Separate Condition entry is allowed for each main steam line flow path. ---------- One or two MSIVs inoperable in MODE 2, 3, or 4. OR One or more of the turbine stop valves and associated turbine control valves, turbine bypass valves, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 2, 3, or 4.	D.1 Isolate affected main steam line flow path. AND D.2 Verify affected main steam line flow path is isolated.	8 hours Once per 7 days
E. ----------NOTE---------- Separate Condition entry is allowed for each penetration flow path. ---------- One or more MSIV bypass or main steam line drain valves inoperable.	----------NOTE---------- Penetration flow path(s) may be unisolated intermittently under administrative controls. ---------- E.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange. AND	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. (continued)	E.2	----------NOTES---------- 1. Isolation devices in high radiation areas may be verified by use of administrative means. 2. Isolation devices that are locked, sealed, or otherwise secured may be verified by administrative means. ---------- Verify the affected penetration flow path is isolated.	Once per 31 days
F. Required Action and associated Completion Time of Condition D or E not met.	F.1	Be in MODE 3.	6 hours
	AND		
	F.2	Be in MODE 4 with the Reactor Coolant System (RCS) cooling provided by the Normal Residual Heat Removal System (RNS).	24 hours
	AND		
	F.3	Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.2.1	----------NOTE---------- Only required to be performed prior to entry into MODE 2. ---------- Verify MSIV closure time is within limits on an actual or simulated actuation signal.	In accordance with the Inservice Testing Program
SR 3.7.2.2	----------NOTE---------- Only required to be performed prior to entry into MODE 2. ---------- Verify required turbine stop, turbine control, turbine bypass, and moisture separator reheater 2nd stage steam isolation valves' closure time is within limits on an actual or simulated actuation signal.	In accordance with the Inservice Testing Program
SR 3.7.2.3	Verify the isolation time of each MSIV bypass valve and main steam line drain isolation valve is within limits.	In accordance with the Inservice Testing Program
SR 3.7.2.4	Verify each MSIV bypass valve and main steam line drain isolation valve actuates to the isolation position on an actual or simulated actuation signal.	24 months

B 3.7 PLANT SYSTEMS

B 3.7.2 Main Steam Line Flow Path Isolation Valves

BASES

BACKGROUND

Each main steam line has one MSIV, which is safety related, to isolate steam flow from the secondary side of the steam generators, which may be required following a high energy line break. MSIV closure terminates flow from the unaffected (intact) steam generator.

One MSIV is located in each main steam line outside containment. The MSIVs are downstream from the main steam safety valves (MSSVs). Downstream from the MSIVs, main steam enters the high pressure turbine through four stop valves and four governing control valves. Closing the MSIVs isolates each steam generator from the other and isolates the turbine bypass system, and other steam supplies from the steam generator.

The MSIVs, turbine stop and control valves, turbine bypass valves, and moisture separator reheater 2nd stage steam isolation valves close on a steam line isolation signal from either of two Class 1E power divisions generated on Steam Line Pressure - Low (Table 3.3.8-1 Function 24), Containment Pressure - High 2 (Function 2), T_{cold} - Low 2 (Function 11), or if below P-11 Setpoint, Steam Line Pressure - Negative Rate - High (Function 25). The MSIVs fail close on loss of control air.

Each MSIV has an MSIV bypass valve. Although these bypass valves are normally closed, they receive the same emergency closure signal as do their associated MSIVs. The MSIVs may also be actuated manually.

A description of the MSIVs is found in the FSAR Section 10.3 (Ref. 1). Descriptions for the turbine bypass valves, and moisture separator reheater 2nd stage steam isolation valves are found in the FSAR Section 10.4 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The design basis of the MSIVs is established by the containment analysis for the large steam line break (SLB) inside containment, discussed in FSAR Section 6.2 (Ref. 3). It is also affected by the accident analysis of the SLB events presented in FSAR Section 15.1 (Ref. 4). The design precludes the blowdown of more than one steam generator, assuming a single active component failure (e.g., the failure of one MSIV to close on demand).

BASES

APPLICABLE SAFETY ANALYSES (continued)

Design basis events of concern for containment analysis are SLB inside containment with the failure of the associated MSIV to close, or a main feedwater line break with the associated failure of a main feedwater isolation or control valve to close. At lower powers, the steam generator secondary water inventory and temperature are at their maximum, which conservatively maximizes the analyzed mass and energy release to the containment. Due to the failure of the MSIV to close and the resulting reverse flow, the additional mass and energy in the steam headers, downstream from the other MSIV, contribute to the total release in containment. With the most reactive control rod assumed stuck in the fully withdrawn position, there is an increased possibility that the resulting reactor coolant system (RCS) cooldown will cause the core to become critical and return to power. The core is ultimately shut down by the boric acid injection delivered by the Core Makeup Tanks (CMTs).

The accident analysis compares several different SLB events against different acceptance criteria. The large SLB outside containment upstream of the MSIV is limiting for offsite dose, although a break in this short section of main steam header piping has a very low probability. The large SLB inside containment at hot zero power is the limiting case for a post trip return to power. The analysis includes consideration of scenarios with offsite power available, and with a loss of offsite power. With offsite power available, the reactor coolant pumps continue to circulate coolant for a longer period through the steam generators, maximizing the RCS cooldown. The PMS includes a safety related signal that initiates the coastdown of the reactor coolant pumps early in the large SLB transient (trip of all reactor coolant pumps on CMT actuation). Therefore, there is very little difference in the predicted departure from nucleate boiling ratio between cases with and without offsite power. Significant single failures considered include failure of an MSIV to close.

The four sets of turbine stop and control valves, in combination with the six turbine bypass valves, and the two moisture separator reheater 2nd stage steam isolation valves, are assumed as a non-safety related backup to isolate the steam flow path given a single failure of an MSIV to close. The safety analyses do not differentiate between the availability of a turbine stop valve and its in-series control valve. Either the turbine stop valve or its associated turbine control valve, in each of the four sets, is required by this LCO to be OPERABLE. These valves, along with the turbine bypass, and moisture separator reheater 2nd stage steam isolation valves are considered as alternate downstream isolation valves.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The MSIVs serve a safety related function and remain open during power operation. These valves operate under the following situations:

a. A high energy line break inside containment. In order to maximize the mass and energy release into containment, the analysis assumes that the MSIV in the affected steam generator remains open. For this accident scenario, steam is discharged into containment from both steam generators until the unaffected steam generator MSIV closes. After MSIV closure, steam is discharged into containment only from the affected steam generator and from the residual steam in the main steam header downstream of the closed MSIV in the unaffected loop. Closure of the MSIV isolates the break from the unaffected steam generator.

b. A steamline break outside of containment, and upstream of an MSIV or downstream of the MSIVs. The uncontrolled blowdown of more than one steam generator must be prevented to limit the potential for an uncontrolled RCS cooldown and positive reactivity addition. Closure of the MSIVs or alternate downstream valves isolates the break, and limits the blowdown to a single steam generator.

c. A steam generator tube rupture. Closure of the MSIVs isolates the ruptured steam generator to minimize radiological releases.

d. Other events such as a feedwater line break. However, these events are less limiting so far as MSIV OPERABILITY is concerned.

In addition, the MSIV bypass valves and main steam line drain valves are containment isolation valves and support the assumptions related to minimizing the loss of inventory and establishing the containment boundary during major accidents. Therefore, the safety analysis of any event requiring isolation of containment is applicable to the MSIV bypass valves and main steam line drain isolation valves.

Following an SLB and main steam isolation signal, the analyses assume continued steam loss through the main steam line drain lines, turbine gland seal system, and the main steam to auxiliary steam header which supplies the auxiliary steam line to the deaerator. Since these valves are not assumed for steam isolation to mitigate an SLB, they do not satisfy the 10 CFR 50.36(c)(2)(ii) criteria; however, main steam line drain isolation valves satisfy the 10 CFR 50.36(c)(2)(ii) criteria for containment isolation as discussed above.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The MSIVs, the alternate downstream valves, the MSIV bypass valves, and the main steam line drain valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO requires the minimum combination of valves for isolation of each main steam line flow path to be OPERABLE. This requires that one MSIV in each of the two main steam line flow paths be OPERABLE and requires MSIV bypass valves and main steam line drain valves to be OPERABLE. The MSIVs are considered OPERABLE when their isolation times are within limits, and they close on an isolation actuation signal.

This LCO also requires four turbine stop valves or the associated turbine control valves, six turbine bypass valves, and two moisture separator reheater 2nd stage steam isolation valves be OPERABLE. A valve is considered OPERABLE when its isolation time is within the safety analysis isolation time limit of 5 seconds and it closes on an MSIV actuation signal.

This LCO provides assurance that the MSIVs will perform their design safety function to mitigate the consequences of accidents that could result in offsite exposures comparable to the 10 CFR 50.34 limits or the NRC staff approved licensing basis.

This LCO provides assurance that the design and performance of the alternate downstream valves are compatible with the accident conditions for which they are called upon to function (Ref. 5).

APPLICABILITY

The MSIVs, MSIV bypass valves, main steam line drain valves, turbine stop or associated turbine control valves, turbine bypass valves, and moisture separator reheater 2nd stage steam isolation valves must be OPERABLE in MODES 1, 2, 3, and 4, when there is significant mass and energy in the RCS and steam generators and where a DBA could cause a release of radioactive material to containment.

In MODE 5 or 6, the steam generators do not contain much energy because their temperature is below the boiling point of water; therefore, the MSIVs and alternate downstream valves are not required for isolation of potential high energy secondary system pipe breaks in these MODES.

BASES

ACTIONS

A.1

With one MSIV inoperable in MODE 1, action must be taken to restore OPERABLE status within 8 hours. Some repairs to the valves can be made with the plant hot. The 8 hour Completion Time is reasonable considering the low probability of an accident occurring during this time period that would require a closure of these valves. With a single MSIV inoperable, the safety function, isolation of the main steam line flow path, is provided by the OPERABLE alternate downstream valves, but cannot accommodate a single failure. The assumptions and criteria of the accident analyses are preserved by the ability to automatically isolate the steam flow path.

The 8 hour Completion Time is greater than that normally allowed for containment isolation valves because the MSIVs are valves that isolate a closed system penetrating containment. These valves differ from other containment isolation valves in that the closed system provides a positive means for containment isolation.

B.1

With any number of the turbine stop valves and the associated turbine control valves, turbine bypass valves, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 1, action must be taken to restore the inoperable valve(s) to OPERABLE status within 72 hours. Some repairs to the valves can be made with the plant hot. The 72 hour Completion Time is reasonable considering the low probability of an accident occurring during this time period that would require a closure of these valves. With the backup isolation valves inoperable, the safety function, isolation of the main steam line flow path, is provided by the remaining OPERABLE valves, but cannot accommodate a single failure. The assumptions and criteria of the accident analyses are preserved by the ability to automatically isolate the steam flow path.

C.1

With two MSIVs inoperable in MODE 1 or one MSIV and an alternate downstream valve inoperable or if the valves cannot be restored to OPERABLE status in accordance with Required Action A.1 or B.1, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in MODE 2 within 6 hours and Condition D would be entered. The Completion Time is reasonable, based on operating experience, to reach MODE 2 in an orderly manner and without challenging unit systems.

BASES

ACTIONS (continued)

D.1 and D.2

Condition D is modified by a Note indicating that a separate Condition entry is allowed for each main steam line flow path.

With one or two MSIVs inoperable or any number of turbine stop valves and the associated turbine control valves, turbine bypass, or moisture separator reheater 2nd stage steam isolation valves inoperable in MODE 2, 3, or 4, the inoperable valve(s) may either be restored to OPERABLE status or the affected main steam line flow path isolated. When isolated, the main steam line flow path is in the condition required by the assumptions in the safety analysis.

The 8 hour Completion Time is consistent with that allowed in Condition A, and conservative considering the reduced energy in the steam generators in MODES 2, 3, and 4.

For inoperable main steam line flow path isolation valves that cannot be restored to OPERABLE status within the specified Completion Time but whose affected flow paths are isolated, these isolated flow paths must be verified to be continually isolated on a periodic basis. This is necessary to ensure that the assumptions in the safety analyses remain valid. The 7 day Completion Time is based on engineering judgment, and is considered reasonable in view of MSIV status indications available in the control room and other administrative controls which ensure that these valves will continue to be closed.

E.1 and E.2

With one or more MSIV bypass or main steam line drain valves inoperable, the inoperable valve must be restored to OPERABLE status or the affected penetration must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and deactivated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration flow path. Required Action E.1 must be completed within the 72 hour Completion Time. The specified time period is reasonable considering the relative stability of the closed system (hence, reliability) to act as a penetration isolation boundary and the relative importance of maintaining containment integrity during MODES 1, 2, 3, and 4. In the event that the affected penetration is

ACTIONS (continued)

isolated in accordance with Required Action E.1, the affected penetration must be verified to be isolated on a periodic basis. This periodic verification is necessary to assure leak tightness of containment and that containment penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for verifying that each affected penetration flow path is isolated is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low.

Condition E is modified by a Note indicating that separate Condition entry is allowed for each penetration flow path. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable containment isolation valve. Complying with the Required Actions may allow for continued operation, and subsequent inoperable containment isolation valves are governed by subsequent Condition entry and application of associated Required Actions.

The Required Actions are modified by a Note allowing containment penetration flow paths to be unisolated intermittently under administrative control. These administrative controls consist of stationing a dedicated operator at the valve controls, who is in continuous communication with the control room. In this way, the penetration can be rapidly isolated when a need for containment isolation is indicated.

Required Action E.2 is modified by two Notes. Note 1 applies to valves and blind flanges located in high radiation areas, and allows these devices to be verified closed by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted. Note 2 applies to isolation devices that are locked, sealed, or otherwise secured in position and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is small.

BASES

ACTIONS (continued)

F.1, F.2, and F.3

If the main steam line flow path isolation valves cannot be restored to OPERABLE status or affected flow paths isolated within the associated Completion Times of Condition D or E, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the plant must be placed in at least MODE 3 within 6 hours, in MODE 4 with normal residual heat removal system in service within 24 hours, and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from MODE 2 conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1

This SR verifies that MSIV closure time is ≤ 5.0 seconds, on an actual or simulated actuation signal. The MSIV isolation time is assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage. The MSIVs should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the MSIVs are not tested at power, they are exempt from the ASME OM Code (Ref. 6) requirements during operation in MODES 1 and 2.

The Frequency is in accordance with the Inservice Testing Program.

This test is conducted in MODE 3 with the unit at operating temperature and pressure. This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. This allows a delay of testing until MODE 3, to establish conditions consistent with those under which the acceptance criterion was generated.

SR 3.7.2.2

This SR verifies that the turbine stop, turbine control, turbine bypass, and moisture separator reheater 2nd stage steam isolation valves' closure time is ≤ 5.0 seconds, on an actual or simulated actuation signal. These alternate downstream isolation valves must meet the MSIV isolation time assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a

BASES

SURVEILLANCE REQUIREMENTS (continued)

refueling outage. The alternate downstream valves should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the alternate downstream valves are not tested at power, they are exempt from the ASME OM Code (Ref. 6) requirements during operation in MODES 1 and 2.

The Frequency is in accordance with the Inservice Testing Program.

This test is conducted in MODE 3 with the unit at operating temperature and pressure. This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. This allows a delay of testing until MODE 3, to establish conditions consistent with those under which the acceptance criterion was generated.

SR 3.7.2.3

Verifying that the isolation time of each MSIV bypass and steam line drain valve is within limits is required to demonstrate OPERABILITY. The isolation time test ensures that the valve will isolate in a time period less than or equal to that assumed in the safety analysis. The isolation times are specified in FSAR Section 6.2.3 (Ref. 7) and Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.7.2.4

This SR ensures that each MSIV bypass and steam line drain valve will actuate to its isolation position on an actual or simulated actuation signal. The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function. The 24 month Frequency is based on the need to perform this Surveillance during periods in which the plant is shutdown for refueling to prevent any upsets of plant operation.

REFERENCES

1. FSAR Section 10.3, “Main Steam System.”

2. FSAR Section 10.4, “Other Features of Steam and Power Conversion Systems.”

3. FSAR Section 6.2.1, “Containment Functional Design.”

BASES

REFERENCES (continued)

4. FSAR Section 15.1, “Increase in Heat Removal by Secondary System.”

5. NUREG-138, Issue 1, “Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director NRR to NRR Staff.”

6. ASME OM Code, “Code for Operation and Maintenance of Nuclear Power Plants.”

7. FSAR Section 6.2, “Containment Systems.”