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

Title: Changes Related to LCO 3.6.10, Vacuum Relief Valves

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-425, Rev. 3,	Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b
TSTF-479-A, Rev.0,	Changes to Reflect Revision of 10 CFR 50.55a

STS NUREGs Affected:

TSTF-425, Rev. 3:	NUREG-1430, 1431, 1432, 1433, 1434
TSTF-479-A, Rev.0:	NUREG-1430, 1431, 1432, 1433, 1434

NRC Approval Date:

TSTF-425, Rev. 3:	06-Jul-09
TSTF-479-A, Rev.0:	06-Dec-05

TSTF Classification:

TSTF-425, Rev. 3:	Technical Change
TSTF-479-A, 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:

None

RCOL COL Item Number and Title:

None

RCOL PTS Change Number and Title:

VEGP LAR DOC A083:	TS 3.6.10, Condition C Divided into Two Separate Conditions
VEGP LAR DOC A099:	TS 3.6.10, Condition C editorial change
VEGP LAR DOC M13:	Combined TS 3.6.6 and TS 3.6.7
VEGP LAR DOC L01:	Added SR for vacuum relief valve actuation

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.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-425 is deferred for future consideration.

TSTF-479-A has already been incorporated into the AP1000 GTS (DCD Revision 19). TSTF-479-A changes the reference to "ASME Boiler and Pressure Vessel Code" to "ASME OM Code" in the Inservice Testing Program. The AP1000 GTS (DCD Revision 19) includes theses changes in Section 5.5.3, Inservice Testing Program. TSTF-479-A removes reference to "Section XI" of the ASME Code from NUREG-1431 bases for Surveillance Requirement (SR) 3.6.12.1 and "References" section. The Bases for the AP1000 SR 3.6.10.2 already incorporates this change as "ASME OM code" and the "References" section of the Bases incorporates the change as, 'ASME OM Code, "Code for Operation and Maintenance of Nuclear Power Plants"'. TSTF-479-A 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)

Applicability statement is revised to correct the punctuation after "MODES 1, 2, 3, and 4." from a period to a comma.

Revise the "Background" section of the Bases, second and third paragraphs to clarify the location of the MOVs, add the number of MOVs that receive an ESF "open" signal on Containment Pressure-Low 2, add references to Table 3.3.8-1, and specify that isolation valve VFS-PL-V009 shares a containment penetration with the vacuum relief.

In addition to the APOG recommended changes to the "Applicable Safety Analyses" section of the Bases, the first paragraph is revised as follows:

> "Design of the vacuum relief system involves calculating the effect of **a** loss of **all** ac power ~~and an~~**with a low outside** ambient air temperature in combination with limited containment heating that reduces ~~the atmospheric~~**containment** temperature ~~(~~and ~~hence~~ pressure~~) inside containment~~ (Ref. 1). Conservative assumptions are used for relevant parameters in the calculation; for example, maximum inside containment temperature, minimum outside air temperature, maximum humidity, and maximum heat transfer coefficients (Ref. 1). The resulting containment pressure versus time is calculated, including the effect of the opening of the vacuum relief valves when their negative pressure setpoint is reached. It is also assumed that one ~~valve~~**vacuum relief flow path** fails to open."

Revise the "Actions" section of the Bases, under heading "C.1, C.2, and D.1", first paragraph, first sentence by changing "...Completion Time of Conditions A or B..." to "...Completion Time of Condition A or B..."

In the Bases, the references are renumbered to be in order of first appearance.

In the "Background" section of the Bases, the phrase "...containment recirculation cooling system (VCS)..." is revised to "...**C**ontainment **R**ecirculation **C**ooling **S**ystem (VCS)..." and "...containment air filtration system (VFS)..." is revised to "...**C**ontainment **A**ir **F**iltration **S**ystem (VFS)..."

APOG Recommended Changes to Improve the Bases

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

Revise the "Background" section of the Bases, second and third paragraphs as follows:

Second paragraph

"The containment pressure vessel contains two 100**%** ~~percent~~ capacity vacuum relief flow paths with a shared containment penetration that protect the containment from excessive external pressure loading. Each flow path outside containment ~~-~~contains a normally closed, motor-operated valve (MOV). The MOVs receive an **engineered safety features (**ESF**)** "open" signal on Containment Pressure-Low 2. The MOVs close on an ESF containment isolation signal, as well as on High-1 containment radioactivity. Each flow path ~~inside containment~~ contains a normally closed, self-actuated check valve..."

Third paragraph

"…If ~~the~~ VFS-PL-V009 is not closed, then the vacuum relief MOVs will automatically close to direct VFS…"

Revise the "Applicable Safety Analyses" section of the Bases, first paragraph as follows:

"...the effect of loss of ac power and a~~n~~ **low outside** ambient air temperature..."

Revise the "LCO" section of the Bases, first paragraph, second sentence from "...Two 100-percent vacuum relief..." to "...Two 100% vacuum relief..."

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.6.10, Vacuum Relief Valves

Changes to the Generic Technical Specifications and Bases:

TS 3.6.10 is renumbered as 3.6.9. (DOC M13)

Applicability statement is revised to correct punctuation. (NRC staff proposed change)

An editorial change is made to the first condition statement of Condition C. The word "Conditions" is changed to "Condition" in the statement. (DOC A099)

Condition C is divided into two separate Conditions. The applicable MODES are added to Condition C entry statement. Required Action C.3 is moved to proposed Condition D and Completion Time is revised. The "Actions" section of the bases is revised to include Action D.1. (DOC A083)

A new SR and associated Frequency is added to TS 3.6.10. The SR is for verifying that vacuum relief valves actuate. (DOC L01)

The "Background" section of the Bases, second and third paragraphs are revised for clarity. (NRC staff proposed change)

The "Applicable Safety Analyses" section of the Bases, first paragraph is revised for clarity. (NRC staff proposed change)

The "Actions" section of the Bases, under heading "C.1, C.2, and D.1", first paragraph is revised from "...Completion Time of Conditions A or B..." to "...Completion Time of Condition A or B..." (NRC staff proposed change)

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

The "Background" section of the Bases, second and third paragraphs are revised by changing "100-percent" to "100%", defining "ESF" as "engineered safety features", deleting "inside containment", and deleting "the" from "...If the VSP-PL-V009..." (APOG Comment)

The "Applicable Safety Analyses" section of the Bases, first paragraph is revised by changing "ambient air temperature" to "low outside ambient temperature". (APOG Comment)

The "LCO" section of the Bases, first paragraph is revised by changing "100-percent" to "100%". (APOG Comment)

Throughout the Bases the references are renumbered to be in order of first appearance. (NRC staff proposed change)

In the "Background" section of the Bases, the phrase "...containment recirculation cooling system (VCS)..." is revised to "...**C**ontainment **R**ecirculation **C**ooling **S**ystem (VCS)..." and

"...containment air filtration system (VFS)..." is revised to "...**C**ontainment **A**ir **F**iltration **S**ystem (VFS)..." (NRC staff proposed change)

VI. Traveler Information

Description of TSTF changes:

None

Rationale for TSTF changes:

None

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

VEGP LAR DOC A083 adds Condition C to the specification and moves Required Action C.3 to the added Condition D. The Completion Time for Required Action C.3 is revised from 44 hours to 8 hours. The applicable MODEs are added to Condition C entry statements.

VEGP LAR DOC A099 revises the first condition statement of Condition C by changing "Conditions A or B not met" to "Condition A or B not met".

VEGP LAR DOC M13 renumbers TS 3.6.10 to TS 3.6.9

VEGP LAR DOC L01 adds a new SR and associated Frequency to TS 3.6.10. The new SR states "Verify each relief valve actuates to relieve vacuum on an actual or simulated signal." The SR Frequency is 24 months.

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

VEGP LAR DOC A083 divides Action C into two separate Actions, which is an editorial change. Adding the applicable MODEs to Condition C entry statements provides clarification.

VEGP LAR DOC A099 change to the first condition statement of Condition C is an editorial change.

VEGP LAR DOC M13 deletes TS 3.6.7 and subsequent sections are renumbered.

VEGP LAR DOC L01 addition of a new SR to TS 3.6.10 is due to deletion of SR 3.3.2.7. The equivalent requirement is included in the new SR for TS 3.6.10 with the same 24 month Frequency as the deleted SR 3.3.2.7.

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

The Applicability statement is revised by changing the period after "MODES 1, 2, 3, and 4." to a comma.

The "Background" section of the Bases, second and third paragraphs are revised for clarity.

The "Applicable Safety Analyses" section of the Bases, first paragraph is revised for clarity.

The “Actions” section of the Bases, under heading “C.1, C.2, and D.1”, first paragraph is revised from “...Completion Time of Conditions A or B...” to “...Completion Time of Condition A or B...”

Throughout the Bases the references are renumbered to be in order of first appearance.

In the “Background” section of the Bases, the phrase “...containment recirculation cooling system (VCS)...” is revised to “...**C**ontainment **R**ecirculation **C**ooling **S**ystem (VCS)...” and “...containment air filtration system (VFS)...” is revised to “...**C**ontainment **A**ir **F**iltration **S**ystem (VFS)...”

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

The “Background” section of the Bases, second and third paragraphs are revised by changing “100-percent” to “100%”, defining “ESF” as “engineered safety features”, deleting “inside containment”, and deleting “the” from “...If the VSP-PL-V009...” (APOG Comment)

The “Applicable Safety Analyses” section of the Bases, first paragraph is revised by changing “ambient air temperature” to “low outside ambient temperature”. (APOG Comment)

The “LCO” section of the Bases, first paragraph is revised by changing “100-percent” to “100%”. (APOG Comment)

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

The change to the Applicability statement is a correction to the punctuation.

The editorial changes to the “Background” section of the Bases provide clarification.

The editorial changes to the “Applicable Safety Analyses” section of the Bases provide clarification.

Revising the “Actions” section of the Bases, under heading “C.1, C.2, and D.1” from “...Completion Time of Conditions A or B...” to “...Completion Time of Condition A or B...” is editorial.

Changing enumeration of references to be in order of first appearance is an editorial change.

Capitalizing the first letter of each word in the phrase for the acronym VCS and VFS is consistent with other uses and the Writer's Guide.

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

Revising the “Background” section of the Bases, second and third paragraphs provide improved clarity, consistency, and operator usability.

Revising the “Applicable Safety Analyses” section of the Bases, first paragraph provides additional clarifying information.

Revising the “LCO” section of the Bases, first paragraph by changing “100-percent” to “100%” is editorial change.

VII. GTST Safety Evaluation

Technical Analysis:

VEGP LAR DOC L01: GTS 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation," SR 3.3.2.7 ("Perform ACTUATION DEVICE TEST") and SR 3.3.2.8 ("Perform ACTUATION DEVICE TEST for squib valves") are deleted from GTS 3.3.2 and Table 3.3.2-1, Function 26.a, ESF Actuation Subsystem. The equivalent requirement (using phrasing generally consistent with NUREG-1431) is included in individual Specifications for the actuated devices with the same 24 month Frequency as the deleted SRs. The new SR added to TS 3.6.10 is due to deletion of SR 3.3.2.7. The equivalent requirement is included in the new SR for TS 3.6.10 and the same 24 month Frequency as the deleted SR 3.3.2.7. The bases for deleted SR 3.3.2.7 discusses performance of an actuation device test demonstrates that the actuated device responds to a simulated actuation signal. As such, Surveillances associated with the testing of the actuated equipment should be addressed in the actuated equipment Specifications, where failures of the surveillance would lead to entering the Actions for the inoperable actuated equipment. The change is less restrictive, but results in closer alignment with NUREG Standard TS presentation of actuated device testing.

VEGP LAR DOC A083 revises Action C, which provides the actions required to be taken when the vacuum relief flow path, containment inside to outside differential air temperature, or containment average air temperature is not restored to within the limit, as specified in Action A and B. Splitting the GTS Action C into two separate Actions is an editorial change. The actions required to be taken when the Required Action and associated Completion Time of Condition A or B are not met is not changed. If the unit is initially in Mode 1, 2, 3, or 4, then proposed Condition C is entered, which requires a unit shutdown to Mode 3 within 6 hours and to Mode 5 within 36 hours. This is the same as the GTS requirements. While the Required Action C.2 does not specify that an option is to be in Mode 6, it is always an option. It is not necessary to state that the unit can go to a lower Mode.

Once in Mode 5, proposed Condition D is entered. The actions required to be taken by proposed Condition C require a containment air flow path ≥ 6 inches in diameter to be opened within 8 hours. Currently, while 44 hours is allowed to open a containment air flow path ≥ 6 inches in diameter, the time starts upon entry into Condition C. Since proposed Condition D is not entered until after Mode 5 is reached, and the Required Action C.2 allows 36 hours for this, the proposed 8 hour Completion Time of Required Action D.1 allows no more time than is allowed in the GTS.

Other Changes: 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 3.6.9 is an acceptable model Specification for the AP1000 standard reactor design.

References to Previous NRC Safety Evaluation Reports (SERs):

None

VIII. Review Information

Evaluator Comments:

STS (NUREG-1431) 3.6.12 is equivalent to AP1000 GTS 3.6.10. NUREG-1431 SR 3.6.12.1 is equivalent to AP1000 SR 3.6.10.2.

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Review Information:

Availability for public review and comment on Revision 0 of this traveler approved by NRC staff on 5/23/2014.

APOG Comments (Ref. 7) and Resolutions:

1. (Internal #3) Throughout the Bases, references to Sections and Chapters of the FSAR do not include the “FSAR” modifier. 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 to every FSAR reference in the Bases.

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. This is resolved by making the APOG recommended changes to the GTST.

3. (Internal #13) The NRC approval of TSTF-425, and model safety evaluation provided in the CLIIP for TSTF-425, are generically applicable to any design’s Technical Specifications. As such, the replacement of certain Frequencies with a Surveillance Frequency Control Program should be included in the GTST for AP1000 STS NUREG.

   However, implementation in the AP1000 STS should not reflect optional (i.e., bracketed) material showing retention of fixed Surveillance Frequencies where relocation to a Surveillance Frequency Control Program is acceptable. Since each represented AP1000 Utility is committed to maintaining standardization, there is no rationale for an AP1000 STS that includes bracketed options.

   Consistent with TSTF-425 criteria, replace applicable Surveillance Frequencies with “In accordance with the Surveillance Frequency control Program” and add that Program as new AP1000 STS Specification 5.5.15.

   NRC Staff disagreed with implementing TSTF-425 in the initial version of the STS. Although the APOG thinks the analysis supporting this traveler is general enough to be applicable to AP1000, staff thinks an AP1000-specific proposal from APOG is needed to identify any GTS SRs that should be excluded. Also, with the adoption of a Surveillance Frequency Control Program (SFCP) in the AP1000 STS, bracketed Frequencies, which

provide a choice between the GTS Frequency and the SFCP Frequency, are needed because the NRC will use the AP1000 STS as a reference, and to be consistent with NUREG-1431, Rev. 4. APOG was requested to consider proposing an AP1000 version of TSTF-425 for a subsequent revision of the STS.

4. (Internal #380 and #381) Editorial change to the “Background” section of the Bases is recommended. These non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the APOG recommended changes and NRC staff proposed changes as follows:

> “The containment pressure vessel contains two 100**%**~~-percent~~ capacity vacuum relief flow paths with a shared containment penetration that protect the containment from excessive external pressure loading. Each flow path ~~outside containment~~ contains a normally closed, motor-operated valve (MOV) **outside containment**. The **two** MOVs receive an **engineered safety features (**ESF**)** “open” signal on Containment Pressure-Low 2 **(Table 3.3.8-1, Function 1)**. The**se** MOVs close on an ESF containment isolation signal, as well as on **Containment Radioactivity-**High~~-~~ 1 ~~containment radioactivity~~**(Table 3.3.8-1, Function 3)**. Each flow path ~~inside containment~~**also** contains a normally closed, self-actuated check valve inside containment that opens on a negative differential pressure of 0.2 psi. A vacuum relief flow path consists of one MOV and one check valve, and the shared containment penetration.
>
> The parallel vacuum relief MOVs are interlocked with the 16-inch containment purge discharge isolation valve inside containment, VFS-PL-V009, which shares the **vacuum relief** containment penetration. The vacuum relief MOVs are blocked from opening if VFS-PL-V009 is not closed. If ~~the~~ VFS-PL-V009 is not closed…”

5. (Internal #382) Additional clarifying information is included in the “Applicable Safety Analyses” section of the Bases, consistent with the TS being addressed. This is resolved by making the APOG recommended changes and NRC staff proposed changes as follows:

> “Design of the vacuum relief system involves calculating the effect of **a** loss of **all** ac power ~~and an~~**with a low outside** ambient air temperature in combination with limited containment heating that reduces ~~the atmospheric~~**containment** temperature ~~(~~and ~~hence~~ pressure~~) inside containment~~ (Ref. 1). Conservative assumptions are used for relevant parameters in the calculation; for example, maximum inside containment temperature, minimum outside air temperature, maximum humidity, and maximum heat transfer coefficients (Ref. 1). The resulting containment pressure versus time is calculated, including the effect of the opening of the vacuum relief valves when their negative pressure setpoint is reached. It is also assumed that one ~~valve~~**vacuum relief flow path** fails to open.”

6. (Internal #383) Editorial change to the “LCO” section of the Bases is recommended. These non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the APOG recommended change from “100-percent” to “100%”.

NRC Final Approval Date: 12/15/2015

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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. 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)

4. TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications," June 2005 (ML070660229).

5. 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)

6. 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).

7. 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 (ML 14265A493).

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.

3.6 CONTAINMENT SYSTEMS

3.6.~~10~~**9** Vacuum Relief Valves

LCO 3.6.~~10~~**9** Two vacuum relief flow paths shall be OPERABLE.

AND

Containment inside to outside differential air temperature shall be ≤ 90°F.

APPLICABILITY: MODES 1, 2, 3, and 4~~.~~**,**
MODES 5 and 6 without an open containment air flow path ≥ 6 inches in diameter.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One vacuum relief flow path inoperable.	A.1 Restore vacuum relief flow path to OPERABLE status.	72 hours
B. Containment inside to outside differential air temperature > 90°F.	B.1 Restore containment inside to outside differential air temperature to within limit.	8 hours
	OR	
	B.2 Reduce containment average temperature ≤ 80°F.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. Required Action and associated Completion Time of Conditions A or B not met **in MODE 1, 2, 3, or 4**. OR Both vacuum relief flow paths inoperable **in MODE 1, 2, 3, or 4**.	C.1 AND C.2 ~~AND~~ ~~C.3~~	Be in MODE 3. Be in MODE 5. ~~Open a containment air flow path ≥ 6 inches in diameter.~~	6 hours 36 hours ~~44 hours~~
D. Required Action and associated Completion Time of Condition A or B not met in MODE 5 or 6. **OR** **Both vacuum relief flow paths inoperable in MODE 5 or 6.**	**D.1**	**Open a containment air flow path ≥ 6 inches in diameter.**	**8 hours**

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.109.1	Verify containment inside to outside differential air temperature is ≤ 90°F.	12 hours
SR 3.6.109.2	Verify each vacuum relief flow path is OPERABLE in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.9.3	**Verify each vacuum relief valve actuates to relieve vacuum on an actual or simulated signal.**	**24 months**

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~10~~**9** Vacuum Relief Valves

BASES

BACKGROUND

The purpose of the vacuum relief lines is to protect the containment vessel from damage due to a negative pressure (that is, a lower pressure inside than outside). Excessive negative pressure inside containment can occur, if there is a loss of ac power (~~c~~**C**ontainment ~~r~~**R**ecirculation ~~c~~**C**ooling ~~s~~**S**ystem (VCS) containment heating not available, reactor trip decay heating only) with a differential (inside to outside) ambient temperature > 90°F. In this case, the relative low outside ambient temperature may cool containment faster than the available heat sources (primarily, reactor decay heat) can heat containment, resulting in a reduction of the containment temperature and pressure below the negative pressure design limit since normal non-safety-related pressure control means are not available due to loss of ac power. In addition, excessive negative pressure inside containment can occur, in the event of malfunction of the Containment Fan Coolers (~~c~~**C**ontainment ~~a~~**A**ir ~~f~~**F**iltration ~~s~~**S**ystem (VFS)) control, in combination with low outside ambient temperature, which reduces containment temperature.

The containment pressure vessel contains two 100**%**~~-percent~~ capacity vacuum relief flow paths with a shared containment penetration that protect the containment from excessive external pressure loading. Each flow path ~~outside containment~~ contains a normally closed, motor-operated valve (MOV) **outside containment**. The **two** MOVs receive an **engineered safety features (**ESF**)** "open" signal on Containment Pressure-Low 2 **(Table 3.3.8-1, Function 1)**. The**se** MOVs close on an ESF containment isolation signal, as well as on **Containment Radioactivity-**High~~-~~ 1 ~~containment radioactivity~~**(Table 3.3.8-1, Function 3)**. Each flow path ~~inside containment~~**also** contains a normally closed, self-actuated check valve inside containment that opens on a negative differential pressure of 0.2 psi. A vacuum relief flow path consists of one MOV and one check valve, and the shared containment penetration.

The parallel vacuum relief MOVs are interlocked with the 16-inch containment purge discharge isolation valve inside containment, VFS-PL-V009, which shares the **vacuum relief** containment penetration. The vacuum relief MOVs are blocked from opening if VFS-PL-V009 is not closed. If ~~the~~ VFS-PL-V009 is not closed, then the vacuum relief MOVs will automatically close to direct VFS purge exhaust through the normal VFS discharge flow path. However, if vacuum relief actuation is required,

BASES

BACKGROUND (continued)

the vacuum relief MOV actuation signal overrides the closing interlock with VFS-PL-V009 to allow the vacuum relief MOVs to open ensuring that the vacuum relief protection actuates. (Ref. ~~3~~**1**)

APPLICABLE SAFETY ANALYSES

Design of the vacuum relief system involves calculating the effect of **a** loss of **all** ac power ~~and an~~**with a low outside** ambient air temperature in combination with limited containment heating that reduces ~~the atmospheric~~**containment** temperature ~~(~~and ~~hence~~ pressure~~) inside containment~~ (Ref. ~~1~~**2**). Conservative assumptions are used for relevant parameters in the calculation; for example, maximum inside containment temperature, minimum outside air temperature, maximum humidity, and maximum heat transfer coefficients (Ref. ~~1~~**2**). The resulting containment pressure versus time is calculated, including the effect of the opening of the vacuum relief valves when their negative pressure setpoint is reached. It is also assumed that one ~~valve~~**vacuum relief flow path** fails to open.

The containment was designed for an external pressure load equivalent to 1.7 psid. The excessive containment cooling events were analyzed to determine the resulting reduction in containment pressure. The initial pressure condition used in this analysis was -0.2 psig. This resulted in a minimum pressure inside the containment less than the design load.

The applicable safety analyses results for the loss of ac power event bounds the analyses for the other external pressure load events described in the Bases for LCO 3.6.4, “Containment Pressure.”

The vacuum relief valves must also perform the containment isolation function **(as required by LCO 3.6.3, “Containment Isolation Valves”)** during a containment high pressure event. For this reason, the system is designed to take the full containment positive design pressure and the environmental conditions (temperature, pressure, humidity, radiation, chemical attack, and the like) associated with the containment DBA.

The vacuum relief valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO establishes the maximum containment temperature initial condition and the minimum equipment required to accomplish the vacuum relief function following excessive containment cooling events (Ref. ~~1~~**2**). Two 100**%**~~ percent~~ vacuum relief flow paths are required to be

BASES

LCO (continued)

OPERABLE to ensure that at least one is available, assuming one or both valves in the other flow path fail to open. A vacuum relief flow path is OPERABLE if the MOV opens on an ESF open signal and the self-actuated check valves open on a negative differential pressure of 0.2 psi.

The containment inside to outside differential air temperature limit of ≤ 90°F ensures that the initial condition for the excessive cooling analysis is met. If the differential air temperature exceeds the limit, the containment vacuum relief capacity of one flow path may not be adequate to ensure the containment pressure meets the negative pressure design limit.

APPLICABILITY

In MODES 1 through 6, the potential exists for excessive containment cooling events to produce a negative containment pressure below the design limit. However, in MODE 5 or 6, a containment air flow path may be opened (LCO 3.6.~~8~~**7**, Containment Penetrations), providing a vacuum relief path that is sufficient to preclude a negative containment pressure below the design limit.

Therefore, the vacuum relief flow paths are required to be OPERABLE in MODES 1 through 4 and in MODES 5 and 6 without an open containment air flow path ≥ 6 inches in diameter. With a 6 inch diameter or equivalent containment air flow path, the vacuum relief function is not needed to mitigate a low pressure event.

ACTIONS

A.1

When one of the required vacuum relief flow paths is inoperable, the inoperable flow path must be restored to OPERABLE status within 72 hours. The specified time period is consistent with other LCOs for the loss of one train of a system required to mitigate the consequences of a LOCA or other DBA.

BASES

ACTIONS (continued)

B.1 and B.2

If the containment inside to outside differential air temperature is > 90°F, then the differential air temperature shall be restored to within the limit within 8 hours. The 8-hour Completion Time is reasonable, considering that limit is based on a worst case condition and the time needed to reduce the containment temperature while controlling pressure within limits of LCO 3.6.4, Containment Pressure.

If the differential temperature cannot be restored, Required Action B.2 provides an alternate requirement. Reduction of the containment average temperature to ≤ 80°F provides an initial condition for excessive cooling events that ensures the vacuum relief system capacity is sufficient (Ref. ~~1~~**2**).

C.1, C.2, and ~~C.3~~**D.1**

If the Required Action and associated Completion Time of Condition~~s~~ A or B are not met **in MODE 1, 2, 3, or 4,** or both vacuum relief flow paths are inoperable **in MODE 1, 2, 3, or 4**, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

Once ~~I~~in MODE 5 or 6, **Required Action D.1 requires that** a containment air flow path ≥ 6 inches in diameter shall be opened within ~~44~~**8** hours~~ from Condition entry~~. Any flow path (or paths) with an area equivalent to 6 inches in diameter is adequate to provide the necessary air flow.

The primary means of opening a containment air flow path is by establishing a VFS air flow path into containment. Manual actuation and maintenance as necessary to open a purge supply, purge exhaust, or vacuum relief flow path are available means to open a containment air flow path. In addition, opening of a spare penetration is an acceptable means to provide the necessary flow path. Opening of an equipment hatch or a containment airlock is acceptable. Containment air flow paths opened must comply with LCO 3.6.~~8~~**7**, **"**Containment Penetrations.**"**

BASES

ACTIONS (continued)

The ~~4~~4**8** hour Completion Time is reasonable for opening a containment air flow path in an orderly manner.

SURVEILLANCE REQUIREMENTS

SR 3.6.~~10~~**9**.1

Verification that the containment inside to outside differential air temperature is ≤ 90°F is required every 12 hours. The containment inside to outside differential air temperature is the difference between the outside ambient air temperature (measured by the site meteorological instrumentation or equivalent) and the inside containment average air temperature (measured using the same instrumentation as used for SR 3.6.5.1).

The Frequency is based on the normally stable containment average air temperature and the relatively small outside ambient air temperature changes within this time.

SR 3.6.~~10~~**9**.2

This SR cites the Inservice Testing Program, which establishes the requirement that inservice testing of the ASME Code Class 1, 2, and 3 valves shall be performed in accordance with the ASME OM Code (Ref. ~~2~~**3**). Therefore, SR Frequency is governed by the Inservice Testing Program.

SR 3.6.9.3

This SR ensures that each vacuum relief motor operated valve will actuate to the open 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 Frequency of 24 months 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 operations.

BASES

REFERENCES

1. ~~Subsection 6.2.1.1.4, "External Pressure Analysis."~~**FSAR Subsection 9.4.7, "Containment Air Filtration System."**

2. ~~ASME OM Code, "Code for Operation and Maintenance of Nuclear Power Plants."~~**FSAR Subsection 6.2.1.1.4, "External Pressure Analysis."**

3. ~~Subsection 9.4.7, "Containment Air Filtration System."~~**ASME OM Code, "Code for Operation and Maintenance of Nuclear Power Plants."**

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.

3.6 CONTAINMENT SYSTEMS

3.6.9 Vacuum Relief Valves

LCO 3.6.9 Two vacuum relief flow paths shall be OPERABLE.

AND

Containment inside to outside differential air temperature shall be ≤ 90°F.

APPLICABILITY: MODES 1, 2, 3, and 4,
MODES 5 and 6 without an open containment air flow path ≥ 6 inches in diameter.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One vacuum relief flow path inoperable.	A.1 Restore vacuum relief flow path to OPERABLE status.	72 hours
B. Containment inside to outside differential air temperature > 90°F.	B.1 Restore containment inside to outside differential air temperature to within limit.	8 hours
	OR	
	B.2 Reduce containment average temperature ≤ 80°F.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, 3, or 4. <u>OR</u> Both vacuum relief flow paths inoperable in MODE 1, 2, 3, or 4.	C.1 Be in MODE 3. <u>AND</u> C.2 Be in MODE 5.	6 hours 36 hours
D. Required Action and associated Completion Time of Condition A or B not met in MODE 5 or 6. <u>OR</u> Both vacuum relief flow paths inoperable in MODE 5 or 6.	D.1 Open a containment air flow path ≥ 6 inches in diameter.	8 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.9.1	Verify containment inside to outside differential air temperature is ≤ 90°F.	12 hours
SR 3.6.9.2	Verify each vacuum relief flow path is OPERABLE in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.9.3	Verify each vacuum relief valve actuates to relieve vacuum on an actual or simulated signal.	24 months

B 3.6 CONTAINMENT SYSTEMS

B 3.6.9 Vacuum Relief Valves

BASES

BACKGROUND

The purpose of the vacuum relief lines is to protect the containment vessel from damage due to a negative pressure (that is, a lower pressure inside than outside). Excessive negative pressure inside containment can occur, if there is a loss of ac power (Containment Recirculation Cooling System (VCS) containment heating not available, reactor trip decay heating only) with a differential (inside to outside) ambient temperature > 90°F. In this case, the relative low outside ambient temperature may cool containment faster than the available heat sources (primarily, reactor decay heat) can heat containment, resulting in a reduction of the containment temperature and pressure below the negative pressure design limit since normal non-safety-related pressure control means are not available due to loss of ac power. In addition, excessive negative pressure inside containment can occur, in the event of malfunction of the Containment Fan Coolers (Containment Air Filtration System (VFS)) control, in combination with low outside ambient temperature, which reduces containment temperature.

The containment pressure vessel contains two 100% capacity vacuum relief flow paths with a shared containment penetration that protect the containment from excessive external pressure loading. Each flow path contains a normally closed, motor-operated valve (MOV) outside containment. The two MOVs receive an engineered safety features (ESF) “open” signal on Containment Pressure-Low 2 (Table 3.3.8-1, Function 1). These MOVs close on an ESF containment isolation signal, as well as on Containment Radioactivity-High 1 (Table 3.3.8-1, Function 3). Each flow path also contains a normally closed, self-actuated check valve inside containment that opens on a negative differential pressure of 0.2 psi. A vacuum relief flow path consists of one MOV and one check valve, and the shared containment penetration.

The parallel vacuum relief MOVs are interlocked with the 16-inch containment purge discharge isolation valve inside containment, VFS-PL-V009, which shares the vacuum relief containment penetration. The vacuum relief MOVs are blocked from opening if VFS-PL-V009 is not closed. If VFS-PL-V009 is not closed, then the vacuum relief MOVs will automatically close to direct VFS purge exhaust through the normal VFS discharge flow path. However, if vacuum relief actuation is required, the vacuum relief MOV actuation signal overrides the closing interlock with

BASES

BACKGROUND (continued)

VFS-PL-V009 to allow the vacuum relief MOVs to open ensuring that the vacuum relief protection actuates. (Ref. 1)

APPLICABLE SAFETY ANALYSES

Design of the vacuum relief system involves calculating the effect of a loss of all ac power with a low outside ambient air temperature in combination with limited containment heating that reduces containment temperature and pressure (Ref. 2). Conservative assumptions are used for relevant parameters in the calculation; for example, maximum inside containment temperature, minimum outside air temperature, maximum humidity, and maximum heat transfer coefficients (Ref. 2). The resulting containment pressure versus time is calculated, including the effect of the opening of the vacuum relief valves when their negative pressure setpoint is reached. It is also assumed that one vacuum relief flow path fails to open.

The containment was designed for an external pressure load equivalent to 1.7 psid. The excessive containment cooling events were analyzed to determine the resulting reduction in containment pressure. The initial pressure condition used in this analysis was -0.2 psig. This resulted in a minimum pressure inside the containment less than the design load.

The applicable safety analyses results for the loss of ac power event bounds the analyses for the other external pressure load events described in the Bases for LCO 3.6.4, “Containment Pressure.”

The vacuum relief valves must also perform the containment isolation function (as required by LCO 3.6.3, “Containment Isolation Valves”) during a containment high pressure event. For this reason, the system is designed to take the full containment positive design pressure and the environmental conditions (temperature, pressure, humidity, radiation, chemical attack, and the like) associated with the containment DBA.

The vacuum relief valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO establishes the maximum containment temperature initial condition and the minimum equipment required to accomplish the vacuum relief function following excessive containment cooling events (Ref. 2). Two 100% vacuum relief flow paths are required to be OPERABLE to ensure that at least one is available, assuming one or both valves in the other flow path fail to open. A vacuum relief flow path

LCO (continued)

is OPERABLE if the MOV opens on an ESF open signal and the self-actuated check valves open on a negative differential pressure of 0.2 psi.

The containment inside to outside differential air temperature limit of ≤ 90°F ensures that the initial condition for the excessive cooling analysis is met. If the differential air temperature exceeds the limit, the containment vacuum relief capacity of one flow path may not be adequate to ensure the containment pressure meets the negative pressure design limit.

APPLICABILITY

In MODES 1 through 6, the potential exists for excessive containment cooling events to produce a negative containment pressure below the design limit. However, in MODE 5 or 6, a containment air flow path may be opened (LCO 3.6.7, Containment Penetrations), providing a vacuum relief path that is sufficient to preclude a negative containment pressure below the design limit.

Therefore, the vacuum relief flow paths are required to be OPERABLE in MODES 1 through 4 and in MODES 5 and 6 without an open containment air flow path ≥ 6 inches in diameter. With a 6 inch diameter or equivalent containment air flow path, the vacuum relief function is not needed to mitigate a low pressure event.

ACTIONS

A.1

When one of the required vacuum relief flow paths is inoperable, the inoperable flow path must be restored to OPERABLE status within 72 hours. The specified time period is consistent with other LCOs for the loss of one train of a system required to mitigate the consequences of a LOCA or other DBA.

B.1 and B.2

If the containment inside to outside differential air temperature is > 90°F, then the differential air temperature shall be restored to within the limit within 8 hours. The 8-hour Completion Time is reasonable, considering that limit is based on a worst case condition and the time needed to reduce the containment temperature while controlling pressure within limits of LCO 3.6.4, Containment Pressure.

BASES

ACTIONS (continued)

If the differential temperature cannot be restored, Required Action B.2 provides an alternate requirement. Reduction of the containment average temperature to ≤ 80°F provides an initial condition for excessive cooling events that ensures the vacuum relief system capacity is sufficient (Ref. 2).

C.1, C.2, and D.1

If the Required Action and associated Completion Time of Condition A or B are not met in MODE 1, 2, 3, or 4, or both vacuum relief flow paths are inoperable in MODE 1, 2, 3, or 4, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

Once in MODE 5 or 6, Required Action D.1 requires that a containment air flow path ≥ 6 inches in diameter shall be opened within 8 hours. Any flow path (or paths) with an area equivalent to 6 inches in diameter is adequate to provide the necessary air flow.

The primary means of opening a containment air flow path is by establishing a VFS air flow path into containment. Manual actuation and maintenance as necessary to open a purge supply, purge exhaust, or vacuum relief flow path are available means to open a containment air flow path. In addition, opening of a spare penetration is an acceptable means to provide the necessary flow path. Opening of an equipment hatch or a containment airlock is acceptable. Containment air flow paths opened must comply with LCO 3.6.7, "Containment Penetrations."

The 8 hour Completion Time is reasonable for opening a containment air flow path in an orderly manner.

SURVEILLANCE REQUIREMENTS

SR 3.6.9.1

Verification that the containment inside to outside differential air temperature is ≤ 90°F is required every 12 hours. The containment inside to outside differential air temperature is the difference between the outside ambient air temperature (measured by the site meteorological instrumentation or equivalent) and the inside containment average air

BASES

SURVEILLANCE REQUIREMENTS (continued)

temperature (measured using the same instrumentation as used for SR 3.6.5.1).

The Frequency is based on the normally stable containment average air temperature and the relatively small outside ambient air temperature changes within this time.

SR 3.6.9.2

This SR cites the Inservice Testing Program, which establishes the requirement that inservice testing of the ASME Code Class 1, 2, and 3 valves shall be performed in accordance with the ASME OM Code (Ref. 3). Therefore, SR Frequency is governed by the Inservice Testing Program.

SR 3.6.9.3

This SR ensures that each vacuum relief motor operated valve will actuate to the open 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 Frequency of 24 months 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 operations.

REFERENCES

1. FSAR Subsection 9.4.7, “Containment Air Filtration System.”

2. FSAR Subsection 6.2.1.1.4, “External Pressure Analysis.”

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