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

Title: Changes Related to LCO 3.6.5, Containment Air Temperature

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-401-A, Rev. 0, Revise Incorrect Bases for Containment Air Temperature
TSTF-425, Rev. 3, Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b

STS NUREGs Affected:

TSTF-401-A, Rev. 0: NUREG-1430, 1431, 1432, 1433, 1434
TSTF-425, Rev. 3: NUREG-1430, 1431, 1432, 1433, 1434

NRC Approval Date:

TSTF-401-A, Rev. 0: 27-Mar-02
TSTF-425, Rev. 3: 06-Jul-09

TSTF Classification:

TSTF-401-A, Rev. 0: Bases Only Change
TSTF-425, Rev. 3: 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 A084: TS 3.6.5, Applicability Editorial Change
VEGP LAR DOC A083: TS 3.6.5, Condition B Divided into Two Separate Conditions
VEGP LAR DOC M12: SR 3.6.5.1 Frequency Change
VEGP LAR DOC M13: Incorporation of TS 3.6.7 into TS 3.6.6 and Deletion of TS 3.6.7

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.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-401-A revises the “Limiting Condition for Operation (LCO)” section of the Bases. The NUREG-1431 statement that the TSTF revises is “…peak accident temperature is maintained below the containment design temperature. As a result, the ability of containment to perform its design function is ensured.” and the equivalent statement in the AP1000 is “…peak accident temperature is computed to remain within acceptable limits. As a result, the ability of containment to perform its design function is ensured.” Although the statements differ, the TSTF changes are applicable to the AP1000 Specification.

TSTF-425 is deferred for future consideration.

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)

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)

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.6.5, Containment Air Temperature

Changes to the Generic Technical Specifications and Bases:

The “LCO” section of the Bases for Specification 3.6.5 is revised to incorporate TSTF-401-A. The “LCO” section of the Bases is revised to state that the temperature profile resulting from a DBA will not cause the containment structure to exceed its design temperature and that required safety related equipment within the containment will not exceed allowable operating temperatures.

Applicability statement for TS 3.6.5 is formatted meet requirements of TST-GG-05-01, subsection 2.5.4.b.1. (DOC A084)

Condition B is divided into two separate Conditions. Required Action B.2 is revised to only require placing the unit in Mode 5. Required Action B.3 is moved to proposed Condition C and Completion Time is revised. The “Actions” section of the bases is revised to include Action C.1. The applicable Condition and MODEs for Condition B are added to the entry statement. (DOC A083)

Frequency for SR 3.6.5.1 is revised from 24 hours to 12 hours. (DOC M12)

“Applicability” section of the Bases is revised. Reference to LCO 3.6.8 is revised to LCO 3.6.7. (DOC M13)

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:

TSTF-401-A revises the "LCO" section of the Bases from "…peak accident temperature is computed to remain within acceptable limits. As a result, the ability of containment to perform its design function is ensured." to "…accident temperature profile assures that the containment structural temperature is maintained below its design temperature and that required safety related equipment will continue to perform its function."

Rationale for TSTF changes:

TSTF-401-A: The peak containment air temperature exceeds the containment design temperature momentarily during the transient, but the containment vessel remains below the design temperature.

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

VEGP LAR DOC A084 adds the appropriate hanging indent to the "Applicability" statement.

VEGP LAR DOC A083 adds Condition C to the specification and moves Required Action B.3 to the added Condition C. The Completion Time for Required Action B.3 is revised from 44 hours to 8 hours. Required Action B.2 is revised to only require placing the unit in Mode 5, instead of Mode 5 or 6. The Condition and MODEs applicable to Condition B are added to the entry statement.

VEGP LAR DOC M12 revises the Frequency of SR 3.6.5.1 from 24 hours to 12 hours.

VEGP LAR DOC M13 revises the reference in the "Applicability" section of the bases from LCO 3.6.8 to LCO 3.6.7.

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

VEGP LAR DOC A084 is a reformatting change that provides consistency with TSTF-GG-05-01.

VEGP LAR DOC A083 divides Action B into two separate Actions, which is an editorial change. Removing Mode 6 from Required Action B.2 as an option is editorial, going to a lower Mode is always an option. Adding the Condition and MODEs applicable to Condition B entry statement provides clarification.

VEGP LAR DOC M12 revision to the Frequency of SR 3.6.5.1 provides consistency with the containment pressure surveillance, GTS SR 3.6.4.1, and with GTS SR 3.6.10.1.

VEGP LAR DOC M13 change to the reference in the "Applicability" section of the bases is an editorial change due to the combining TS 3.6.6 and TS 3.6.7 into a single new TS 3.6.6.

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

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:

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:

TSTF-401-A clarifies a statement in the ISTS Bases for the containment air temperature LCO to indicate that an initial temperature consistent with the LCO assures that the temperature profile resulting from a DBA will not cause the containment structure to exceed its design temperature and that required safety related equipment within the containment will not exceed allowable operating temperatures.

The GTS LCO Bases states that the peak accident temperature is computed to remain within acceptable limits. The typical accident analysis shows that the peak containment air temperature resulting from a steam line break exceeds the containment design temperature momentarily during the transient. As discussed in 10 CFR 50.49, the basis for containment temperature is to ensure the performance of safety related equipment. The typical steam line break analysis identifies that the time interval during which the containment air temperature exceeds the containment design temperature is a short duration such that the equipment surface temperature (including the structure) remained below the design temperature.

VEGP LAR DOC A083 revises Action B, which provides the actions required to be taken when the containment average air temperature is not restored to within the limit in 8 hours, as specified in Action A. Splitting the GTS Action B 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 are not met is not changed. If the unit is initially in Mode 1, 2, 3, or 4, then proposed Condition B 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 proposed Required Action B.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 C is entered. The actions required to be taken by proposed Condition C require the containment equipment hatch or containment airlock to be opened within 8 hours. Currently, while 44 hours is allowed to open the containment equipment hatch or containment airlock, the time starts upon entry into Condition B. Since proposed Condition C is not entered until after Mode 5 is reached, and the proposed Required Action B.2 allows 36 hours for this, the proposed 8 hour Completion Time of Required Action C.1 allows no more time than is currently allowed.

VEGP LAR DOC M12 GTS SR 3.6.5.1 verifies average containment air temperature is within limit. This changes the Frequency for performing this verification from 24 hours to 12 hours. The proposed Frequency is consistent with the containment pressure surveillance, GTS SR 3.6.4.1, and with GTS SR 3.6.10.1, which requires verification of containment inside and outside differential temperature to be within the specified limit. This change is more restrictive since the Surveillance is proposed to be performed more frequently.

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 3.6.5 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:

None

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Review Information:

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

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 #355) Next to last paragraph in Section VII of the GTST references VEGP LAR DOC “M13.” This should be DOC “M12”. Change “M13” to “M12”. This is resolved by correcting the referenced “VEGP LAR DOC M13” to “VEGP LAR DOC M12” in Section VII, GTST Safety Evaluation.

NRC Final Approval Date: 5/12/2015

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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 (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.

3.6 CONTAINMENT SYSTEMS

3.6.5 Containment Air Temperature

LCO 3.6.5 Containment average air temperature shall be ≤ 120°F.

APPLICABILITY: MODES 1, 2, 3, and 4,
MODES 5 and 6 with both containment equipment hatches and both containment airlocks closed.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Containment average air temperature not within limit.	A.1 Restore containment average air temperature to within limit.	8 hours
B. Required Action and associated Completion Time **of Condition A** not met **in MODE 1, 2, 3, or 4**.	B.1 Be in MODE 3. AND B.2 Be in MODE 5~~ or 6~~. ~~AND~~ ~~B.3 Open containment equipment hatch or containment airlock.~~	6 hours 36 hours ~~44 hours~~
C. Required Action and associated Completion Time of Condition A not met in MODE 5 or 6.	**C.1 Open containment equipment hatch or containment airlock.**	**8 hours**

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	Verify containment average air temperature is within limit.	~~24~~**12** hours

B 3.6 CONTAINMENT SYSTEMS

B 3.6.5 Containment Air Temperature

BASES

BACKGROUND

The containment structure serves to contain radioactive material that may be released from the reactor core following a Design Basis Accident (DBA). The containment average air temperature is limited during normal operation to preserve the initial conditions assumed in the accident analyses for a loss of coolant accident (LOCA) or steam line break (SLB).

The containment average air temperature limit is derived from the input conditions used in the containment functional analyses and the containment structure external pressure analyses. This LCO ensures that initial conditions assumed in the analysis of containment response to a DBA are not violated during plant operations. The total amount of energy to be removed from containment by the passive containment cooling system during post accident conditions is dependent upon the energy released to the containment due to the event, as well as the initial containment temperature and pressure. The higher the initial temperature, the more energy that must be removed, resulting in higher peak containment pressure and temperature. Exceeding containment design pressure may result in leakage greater than that assumed in the accident analysis. Operation with containment temperature in excess of the LCO limit violates an initial condition assumed in the accident analysis.

APPLICABLE SAFETY ANALYSES

Containment average air temperature is an initial condition used in the DBA analyses that establishes the containment environmental qualification operating envelope for both pressure and temperature. The limit for containment average air temperature ensures that operation is maintained within the assumptions used in the DBA analyses for containment (Ref. 1).

The limiting DBAs considered relative to containment OPERABILITY are the LOCA and SLB. The DBA LOCA and SLB are analyzed using computer codes designed to predict the resultant containment pressure transients. No two DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment Engineered Safety Feature (ESF) systems, assuming the loss of one Class 1E Engineered Safety Features Actuation Cabinet (ESFAC) Division, which is the worst case single active failure, resulting

BASES

APPLICABLE SAFETY ANALYSES (continued)

in one Passive Containment Cooling System flow path being rendered inoperable.

The limiting DBA for the maximum peak containment air temperature is a LOCA or SLB. The initial containment average air temperature assumed in the design basis analyses (Ref. 1) is 120°F.

The DBA temperature transients are used to establish the environmental qualification operating envelope for containment. The basis of the containment environmental qualification temperature envelope is to ensure the performance of safety related equipment inside containment (Ref. 2). The containment vessel design temperature is 300°F. The containment vessel temperature remains below 300°F for DBAs. Therefore, it is concluded that the calculated transient containment air temperature is acceptable for the DBAs.

The temperature limit is also used in the depressurization analyses to ensure that the minimum pressure limit is maintained following an inadvertent actuation of the Passive Containment Cooling System (Ref. 1).

The containment is designed for an external pressure load equivalent to 1.7 psid. The limiting negative pressure transient is a loss of all ac power sources coincident with extreme cold weather conditions, which cool the external surface of the containment vessel. The initial containment average air temperature condition used in this analysis is 120°F. This resulted in a minimum pressure inside containment, as illustrated in Reference 1, which is less than the design load.

The containment pressure transient is sensitive to the initial air mass in containment and, therefore, to the initial containment air temperature. The limiting DBA for establishing the maximum peak containment internal pressure is an SLB or LOCA. The temperature limit is used in the DBA analyses to ensure that in the event of an accident the maximum containment internal pressure will not be exceeded.

Containment average air temperature satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

During a DBA, with an initial containment average air temperature less than or equal to the LCO temperature limit, the resultant **accident temperature profile assures that the containment structural temperature is maintained below its design temperature and that required safety related equipment will continue to perform its function.**~~peak accident temperature is computed to remain within acceptable limits. As a result, the ability of containment to perform its design function is ensured.~~

The LCO establishes the maximum containment average air temperature initial condition required for the excessive cooling analysis. If the containment average 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, 2, 3, and 4, a DBA could cause a release of radioactive material to containment. In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, maintaining containment average air temperature within the limit is not required in MODE 5 or 6 for a DBA LOCA or SLB.

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 MODES 5 and 6, a containment equipment hatch or airlock 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, maintaining containment average air temperature within the limit is essential to ensure initial conditions assumed in the cooling events in MODES 1 through 4 and in MODES 5 and 6 with both containment equipment hatches and both containment airlocks closed.

ACTIONS

A.1

When containment average air temperature is not within the limit of the LCO, it must be restored to within its limit within 8 hours. This Required Action is necessary to return operation to within the bounds of the containment analysis. The 8 hour Completion Time is acceptable considering the sensitivity of the conservative analysis to variations in this parameter, and provides sufficient time to correct minor problems.

BASES

ACTIONS (continued)

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

If the containment average air temperature cannot be restored to within its limit within the required Completion Time, the plant must be placed in a condition in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

~~In~~**Once in** MODE 5 or 6, **Required Action C.1 requires that** a containment equipment hatch or a containment airlock shall be opened within ~~44~~**8** hours ~~from Condition entry~~. Opening of a hatch or an airlock is necessary to provide the required vacuum relief path in the event of a low pressure event if the average air temperature initial condition is not met. The allowed Completion Time is reasonable for opening a hatch or an airlock in an orderly manner. **In addition, the manner in which the containment equipment hatch or containment airlock is opened must comply with the requirements of LCO 3.6.7, "Containment Penetrations."**

SURVEILLANCE REQUIREMENTS

SR 3.6.5.1

Verifying that the containment average air temperature is within the LCO limit ensures that containment operation remains within the limits assumed for the containment analyses. In order to determine the containment average air temperature, a weighted average is calculated using measurements taken at locations within the containment selected to provide a representative sample of the associated containment atmosphere. The ~~24~~**12** hour Frequency of this Surveillance Requirement is considered acceptable based on observed slow rates of temperature increase within containment as a result of environmental heat sources (due to the large volume of containment). Furthermore, the ~~24~~**12** hour Frequency is considered adequate in view of other indications available in the main control room, including alarms, to alert the operator to an abnormal containment temperature condition.

BASES

REFERENCES

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

2. 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for 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

3.6.5 Containment Air Temperature

LCO 3.6.5 Containment average air temperature shall be ≤ 120°F.

APPLICABILITY: MODES 1, 2, 3, and 4,
MODES 5 and 6 with both containment equipment hatches and both containment airlocks closed.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Containment average air temperature not within limit.	A.1 Restore containment average air temperature to within limit.	8 hours
B. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, 3, or 4.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours
C. Required Action and associated Completion Time of Condition A not met in MODE 5 or 6.	C.1 Open containment equipment hatch or containment airlock.	8 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	Verify containment average air temperature is within limit.	12 hours

B 3.6 CONTAINMENT SYSTEMS

B 3.6.5 Containment Air Temperature

BASES

BACKGROUND

The containment structure serves to contain radioactive material that may be released from the reactor core following a Design Basis Accident (DBA). The containment average air temperature is limited during normal operation to preserve the initial conditions assumed in the accident analyses for a loss of coolant accident (LOCA) or steam line break (SLB).

The containment average air temperature limit is derived from the input conditions used in the containment functional analyses and the containment structure external pressure analyses. This LCO ensures that initial conditions assumed in the analysis of containment response to a DBA are not violated during plant operations. The total amount of energy to be removed from containment by the passive containment cooling system during post accident conditions is dependent upon the energy released to the containment due to the event, as well as the initial containment temperature and pressure. The higher the initial temperature, the more energy that must be removed, resulting in higher peak containment pressure and temperature. Exceeding containment design pressure may result in leakage greater than that assumed in the accident analysis. Operation with containment temperature in excess of the LCO limit violates an initial condition assumed in the accident analysis.

APPLICABLE SAFETY ANALYSES

Containment average air temperature is an initial condition used in the DBA analyses that establishes the containment environmental qualification operating envelope for both pressure and temperature. The limit for containment average air temperature ensures that operation is maintained within the assumptions used in the DBA analyses for containment (Ref. 1).

The limiting DBAs considered relative to containment OPERABILITY are the LOCA and SLB. The DBA LOCA and SLB are analyzed using computer codes designed to predict the resultant containment pressure transients. No two DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment Engineered Safety Feature (ESF) systems, assuming the loss of one Class 1E Engineered Safety Features Actuation Cabinet (ESFAC) Division, which is the worst case single active failure, resulting

BASES

APPLICABLE SAFETY ANALYSES (continued)

in one Passive Containment Cooling System flow path being rendered inoperable.

The limiting DBA for the maximum peak containment air temperature is a LOCA or SLB. The initial containment average air temperature assumed in the design basis analyses (Ref. 1) is 120°F.

The DBA temperature transients are used to establish the environmental qualification operating envelope for containment. The basis of the containment environmental qualification temperature envelope is to ensure the performance of safety related equipment inside containment (Ref. 2). The containment vessel design temperature is 300°F. The containment vessel temperature remains below 300°F for DBAs. Therefore, it is concluded that the calculated transient containment air temperature is acceptable for the DBAs.

The temperature limit is also used in the depressurization analyses to ensure that the minimum pressure limit is maintained following an inadvertent actuation of the Passive Containment Cooling System (Ref. 1).

The containment is designed for an external pressure load equivalent to 1.7 psid. The limiting negative pressure transient is a loss of all ac power sources coincident with extreme cold weather conditions, which cool the external surface of the containment vessel. The initial containment average air temperature condition used in this analysis is 120°F. This resulted in a minimum pressure inside containment, as illustrated in Reference 1, which is less than the design load.

The containment pressure transient is sensitive to the initial air mass in containment and, therefore, to the initial containment air temperature. The limiting DBA for establishing the maximum peak containment internal pressure is an SLB or LOCA. The temperature limit is used in the DBA analyses to ensure that in the event of an accident the maximum containment internal pressure will not be exceeded.

Containment average air temperature satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

During a DBA, with an initial containment average air temperature less than or equal to the LCO temperature limit, the resultant accident temperature profile assures that the containment structural temperature is maintained below its design temperature and that required safety related equipment will continue to perform its function.

The LCO establishes the maximum containment average air temperature initial condition required for the excessive cooling analysis. If the containment average 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, 2, 3, and 4, a DBA could cause a release of radioactive material to containment. In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, maintaining containment average air temperature within the limit is not required in MODE 5 or 6 for a DBA LOCA or SLB.

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 MODES 5 and 6, a containment equipment hatch or airlock 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, maintaining containment average air temperature within the limit is essential to ensure initial conditions assumed in the cooling events in MODES 1 through 4 and in MODES 5 and 6 with both containment equipment hatches and both containment airlocks closed.

ACTIONS

A.1

When containment average air temperature is not within the limit of the LCO, it must be restored to within its limit within 8 hours. This Required Action is necessary to return operation to within the bounds of the containment analysis. The 8 hour Completion Time is acceptable considering the sensitivity of the conservative analysis to variations in this parameter, and provides sufficient time to correct minor problems.

BASES

ACTIONS (continued)

B.1, B.2, and C.1

If the containment average air temperature cannot be restored to within its limit within the required Completion Time, the plant must be placed in a condition in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

Once in MODE 5 or 6, Required Action C.1 requires that a containment equipment hatch or a containment airlock shall be opened within 8 hours. Opening of a hatch or an airlock is necessary to provide the required vacuum relief path in the event of a low pressure event if the average air temperature initial condition is not met. The allowed Completion Time is reasonable for opening a hatch or an airlock in an orderly manner. In addition, the manner in which the containment equipment hatch or containment airlock is opened must comply with the requirements of LCO 3.6.7, “Containment Penetrations.”

SURVEILLANCE REQUIREMENTS

SR 3.6.5.1

Verifying that the containment average air temperature is within the LCO limit ensures that containment operation remains within the limits assumed for the containment analyses. In order to determine the containment average air temperature, a weighted average is calculated using measurements taken at locations within the containment selected to provide a representative sample of the associated containment atmosphere. The 12 hour Frequency of this Surveillance Requirement is considered acceptable based on observed slow rates of temperature increase within containment as a result of environmental heat sources (due to the large volume of containment). Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the main control room, including alarms, to alert the operator to an abnormal containment temperature condition.

BASES

REFERENCES

1. FSAR Section 6.2, “Containment Systems.”

2. 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants.”