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

**Title: Changes Related to LCO 3.4.9, RCS Leakage Detection Instrumentation**

## 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-205-A, Rev 3, Revision of Channel Calibration, Channel Functional Test, and Related Definitions
TSTF-359-A, Rev 9, Increase Flexibility in MODE Restraints
TSTF-513-A, Rev 3, Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation

**STS NUREGs Affected:**

TSTF-205-A, Rev 3: NUREGs 1430, 1431, 1432, 1433, and 1434
TSTF-359-A, Rev 9: NUREGs 1430, 1431, 1432, 1433, and 1434
TSTF-513-A, Rev 3: NUREGs 1430, 1431, and 1432

**NRC Approval Date:**

TSTF-205-A, Rev 3: 13-Jan-99
TSTF-359-A, Rev 9: 12-May-03
TSTF-513-A, Rev 3: 03-Jan-11

**TSTF Classification:**

TSTF-205-A, Rev 3: Correct Specifications
TSTF-359-A, Rev 9: Technical Change
TSTF-513-A, 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:**

There are no Vogtle departures applicable to Specification 3.4.9.

**RCOL COL Item Number and Title:**

There are no Vogtle COL items applicable to Specification 3.4.9.

**RCOL PTS Change Number and Title:**

| | |
|---|---|
| VEGP LAR DOC A048: | Containment atmosphere F18 particulate monitor nomenclature update |
| VEGP LAR DOC A049: | Clarify SR statements |
| VEGP LAR DOC A050: | Clarify Condition D statement |

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

This section discusses changes: (1) that were applicable to previous designs, but are not to the current design; (2) that are already incorporated in the GTS; and (3) that are superseded by another change.

Questions have been raised regarding the Operability requirements for the RCS leakage detection instruments in Westinghouse Owners Group (WOG) plants. In particular, improvements in plant fuel integrity have resulted in a reduction of the Reactor Coolant System (RCS) activity. As a result, the containment atmosphere radioactivity (in particular gaseous) monitors may not be capable of promptly detecting an increase in RCS leakage. TSTF-513-A, Rev 3 revises the Bases to clearly define the RCS leakage detection instrumentation operability requirements and to modify the Actions to be taken when the containment atmosphere gaseous radioactivity monitor is the only operable monitor to require additional, more frequent monitoring of other indications of RCS leakage and to shorten the time allowed to restore another monitor to operable status.

The AP1000 RCS leakage detection equipment differs from the WOG detection equipment. As such, the Specification Actions are significantly different. In addition, the AP1000 design does not have gaseous radioactive monitors, therefore, TSTF-513-A does not apply to the AP1000 GTS. TSTF-513-A will not be discussed further in 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)

None

## V. Applicability

**Affected Generic Technical Specifications and Bases:**

Section 3.4.9 RCS Leakage Detection Instrumentation

**Changes to the Generic Technical Specifications and Bases:**

Equipment nomenclature is updated in the LCO statement, the Applicability Notes, and the Actions. (DOC A048)

The word “Required” is removed from Condition C and three SRs. This is consistent with the TS Writer's Guide (Reference 7). (DOC A049)

Condition Statement D is revised to be consistent with the TS Writer's Guide (Reference 7). (DOC A050)

GTS 3.4.9 Actions Table Note indicating that the provisions of LCO 3.0.4 are not applicable is removed. Points a, b, and c are added to LCO 3.0.4 and associated bases discussion regarding when entry into a higher MODE is permissible. The clarified statement of LCO 3.0.4 eliminates the need for many LCO 3.0.4 exceptions in many LCOs. Therefore, references to LCO 3.0.4 in other LCO Action Notes are eliminated or revised. (TSTF-359-A)

The Bases Actions Note discussion regarding LCO 3.0.4 is removed. (TSTF-359-A)

The bases discussion of SR 3.4.9.2 is revised to add clarity regarding a successful Channel Operational Test. This eliminates a current ambiguity and possible misinterpretation of Channel Calibration, Channel Functional Test, Actuation Logic Test, Channel Operational Test, Trip Actuating Device Operational Test, and Logic System Functional Test. (TSTF-205-A)

## VI. Traveler Information

**Description of TSTF changes:**

AP1000 GTS LCO 3.0.4 is revised to allow entry into a MODE or other specified condition in the Applicability while relying on the associated ACTIONS, provided that there is a risk assessment performed which justifies the use of LCO 3.0.4, the ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time, or an NRC approved allowance is provided in the Specification to be entered. The current AP1000 GTS LCO 3.0.4 allows entry into a MODE or a specified condition in the Applicability, while relying on the associated ACTIONS, only if the ACTIONS permit continued operation in the MODE or other specified condition in the Applicability for a unlimited period of time, or if an NRC approved allowance is provided in the Specification to be entered. SR 3.0.4 is revised to reflect the concepts of the change to LCO 3.0.4. The applicability of LCO 3.0.4 and SR 3.0.4 is expanded to include transition into all MODES or other specified conditions in the Applicability, except when required to comply with ACTIONS or that are part of a shutdown of the unit. As a result, many LCO exceptions to LCO 3.0.4 can be eliminated or revised.

Problems have been identified with the ISTS definitions of Channel Calibration, Channel Functional Test, and related definitions. Revised definitions were developed for these terms and Bases statements have been added.

**Rationale for TSTF changes:**

TSTF-359-A reflects the allowances of LCO 3.0.4, which are based on NRC Generic Letter 87-09. GL 87-09 indicates that with respect to unnecessary restrictions on MODE changes, “Specification LCO 3.0.4 unduly restricts facility operation when conformance with Action Requirements provides an acceptable level of safety for continued operation. For an LCO that has Action Requirements permitting continued operation for an unlimited period of time, entry into an operation MODE or other specified condition of operation should be permitted in accordance with the Action Requirements." This is still overly restrictive. For example, the startup of a unit could be delayed due to the current restrictions of LCO 3.0.4. A single maintenance activity that is almost complete could cause significant delays and changes in a previously well thought out plan for returning the unit to service. In such situations, allowing the unit to enter the MODE or other specified condition in the Applicability would allow the work to be completed while reducing the likelihood of human error caused by expediting the completion of required Surveillances and maintenance activities. Therefore, application of TSTF-359-A to the AP1000 GTS provides necessary standardization and consistency to the use and application of LCO 3.0.4.

TSTF-205-A notes that a successful test of a channel relay and associated required contacts may be the verification of a single contact and that all contacts of the required device need not be tested provided the required channel contact is otherwise tested. The Bases of applicable Surveillances are modified to include this clarification of the acceptable methods of testing. This clarification is applied to all Channel Functional Tests, Channel Operational Tests, and TADOTs.

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

VEGP LAR DOC A048 revises LCO b, Applicability Note 1, Condition C, Required Action C.2, SR 3.4.9.1, SR 3.4.9.2, and SR 3.4.9.4 to specify the “containment atmosphere F18 particulate monitor.”

VEGP LAR DOC A049 deletes word “required” in Condition C, SR 3.4.9.1, SR 3.4.9.2 and SR 3.4.9.4.

VEGP LAR DOC A050 revises Condition D from “Required Action and associated Completion Time not met,” to “Required Action and associated Completion Time of Condition A, B, or C not met.”

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 8 and the Southern Nuclear Operating Company RAI Response in Reference 9.

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

All Plant TS changes are recommended to correct equipment nomenclature and provide consistency with the TS Writer's Guide (Reference 7).

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

Not Applicable

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

Not Applicable

## VII. GTST Safety Evaluation

**Technical Analysis:**

TSTF-359-A allows entry into a higher mode of operation, or other specified condition in the TS applicability, while relying on the TS conditions, and associated required actions and completion times, provided a risk assessment is performed to confirm the acceptability of that action. Technical specifications have taken advantage of risk technology as experience and capability have increased. The proposal revises STS LCO 3.0.4 and SR 3.0.4, and their application to the TS. New paragraphs (a), (b), and (c) are proposed for LCO 3.0.4.

The proposed LCO 3.0.4(a) retains the current allowance, permitting the mode change when the TS required actions allow indefinite operation.

The addition of LCO 3.0.4(b), which allows entry into a MODE or other specified condition in the Applicability while relying on ACTIONS based on a risk assessment, is reasonable based on many factors. The licensee, and particularly the licensee management, is always responsible for maintaining overall plant configuration and safety. Developments in the Maintenance Rule and other Industry/NRC initiatives (including the configuration risk management programs) enhance the tools available to licensees to assess the risk associated with various plant configurations. This change is a logical step of requiring licensees to assess the application of LCO 3.0.4 allowances in light of the newly available tools and information.

The risk assessment may consider a variety of factors, but will focus on managing plant risk. Consideration would be given to the probability of completing restoration such that the requirements of the LCO would be met prior to the ACTIONS requiring that the Applicability be exited. The assessment may also establish appropriate compensatory measures to enhance safe and effective operations until restoration of compliance with the LCO. The proposed change would provide the flexibility of not restricting which MODES can be entered while relying on the ACTIONS, as do the current LCO 3.0.4 exceptions, but would add the requirement to assess the risks prior to making the MODE change when using LCO 3.0.4(b).

When an LCO is not met, the licensee must restore compliance with the LCO consistent with the requirements of the TS. This restoration may include corrective maintenance. 10CFR50.65 requires that licensees assess the effect equipment maintenance will have on the plant's capability to perform safety functions before beginning any maintenance activity on structures, systems, or components within the scope of the maintenance rule. Plant procedures must be in place to implement 10 CFR 50.65(a)(4) to address the situation where entering a mode or other specified condition in the applicability is contemplated with plant equipment inoperable. Such plant procedures typically follow the guidance in NUMARC 93-01, Section 11, as revised in February 2000 and endorsed by NRC RG 1.182.

The LCO 3.0.4(b) allowance does not apply to values and parameters of the TSs that have their own respective LCOs (e.g., Reactor Coolant System Specific Activity), but instead those values and parameters are addressed by LCO 3.0.4(c). The LCO 3.0.4(c) allowances apply to parameters and values which have been previously approved by the NRC in a plant’s specific TS. The licensee will provide in their TS Bases a discussion and list of each NRC-approved, LCO 3.0.4(c)-specific value and parameter allowance. The risk assessments performed to justify the use of LCO 3.0.4(b) usually only consider systems and components. For this reason, LCO 3.0.4(c) is typically applied to Specifications which describe values and parameters (e.g., [Containment Air Temperature, Containment Pressure, Moderator Temperature Coefficient]), and may be applied to other Specifications based on NRC plant-specific approval. The TS

values and parameters, for which mode transition allowances apply, will have a note that states LCO 3.0.4(c) is applicable.

Accident analyses presented in the UFSAR do not address the effects of the plant being in ACTIONS. The accident analyses assume that the necessary equipment is available and then, in most cases, assumes the single most limiting active failure occurs. It is this assumption that leads to limiting the length of Completion Times in order to minimize the length of time that the plant is not within the initial conditions of the accident analysis. This change does not affect the Completion Times. Therefore, this proposal would not affect the accident analyses and is therefore acceptable.

The revised definitions eliminate a current ambiguity and possible misinterpretation of Channel Calibration, Channel Functional Test, Actuation Logic Test, Channel Operational Test, Trip Actuating Device Operational Test, and Logic System Functional Test. The current definitions use phrases similar to “required sensor, alarm, interlock, display and trip functions,” and “required relays and contacts, trip units, solid state logic elements, etc.” There is ambiguity in the application of the word “required” and whether the list is inclusive or representative. Therefore, this list has been replaced with phrases similar to, "all devices in the channel required for channel OPERABILITY." This clarifies the use of the word “required” and makes clear that the components that are required to be tested or calibrated are only those that are necessary for the channel to perform its safety function. The list of components is eliminated from the definition. These changes will clarify the requirements and allow for consistent application of the definitions, tests, and calibrations.

The revised CHANNEL FUNCTIONAL TEST definition does not address the method of the testing of all of the required channel devices. A successful test of a channel relay and associated required contacts may be the verification of a single contact and that all contacts of the required device need not be tested provided the required channel contact is otherwise tested. The Bases of applicable Surveillances are modified to include this clarification of the acceptable methods of testing. This clarification is applied to all Channel Functional Tests, Channel Operational Tests, and TADOTs.

In the Bases of the SRs a statement is added to indicate that, “A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable [CHANNEL FUNCTIONAL TEST / CHANNEL OPERATIONAL TEST / TADOT] of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.” This statement is necessary to clarify what verification is required to support a successful test. This Bases statement to address the specifics of how the tests as defined may be performed is appropriate and acceptable because: 1) the entire scope of the required test is still being performed - only the acceptance criteria is modified to require verification of a certain portion of the instrument functions to have a successful test, and 2) all portions of the scope of the required test required for OPERABILITY are being tested, and 3) provision for the acceptance of the verification of change of the state of a single contact of the relay as desired by the NRC.

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.

**References to Previous NRC Safety Evaluation Reports (SERs):**

TSTF-359-A: Federal Register /Vol. 68, No. 65 / Friday, April 4, 2003 /Notices
VEGP LAR SER (Reference 3)

## 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 Friday, May 16, 2014.

**NRC Final Approval Date:**

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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 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.”

5. NUMARC 93-01, Section 11, Revision 4, “Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” December 2010 (ML110050227).

6. NRC Regulatory Guide 1.182, “Assessing and Managing Risk before Maintenance Activities at Nuclear Power Plants,” May 2000 (ML003699426).

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

8. 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).

9. 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)

## XI. MARKUP of the Applicable GTS Section 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.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 RCS Leakage Detection Instrumentation

LCO 3.4.9 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Two containment sump level channels; **and**

b. One containment atmosphere **F18 particulate** ~~radioactivity~~ monitor ~~(F18 particulate)~~.

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

ACTIONS

~~NOTE~~

~~LCO 3.0.4 is not applicable.~~

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One required containment sump channel inoperable. | A.1 Verify that the volume input per day to the containment sump does not change (+ or -) more than 10 gallons or 33% of the volume input (whichever is greater). The volume used for comparison will be the value taken during the first day following the entrance into this CONDITION. | Once per 24 hours |
| | AND | |
| | A.2 Restore two containment sump channels to OPERABLE status. | 14 days |

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| B. Two required containment sump channels inoperable. | B.1 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.7.1. | Once per 24 hours |
| | AND | |
| | B.2 Restore one containment sump channel to OPERABLE status. | 72 hours |
| C. ~~Required~~ **C**ontainment atmosphere **F18 particulate** ~~radioactivity~~ monitor inoperable. | C.1.1 Analyze grab samples of containment atmosphere. | Once per 24 hours |
| | OR | |
| | C.1.2 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.7.1. | Once per 24 hours |
| | AND | |
| | C.2 Restore containment atmosphere **F18 particulate** ~~radioactivity~~ monitor to OPERABLE status. | 30 days |

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| D. Required Action and associated Completion Time **of Condition A, B, or C** not met. | D.1 Be in MODE 3.<br><br>AND<br><br>D.2 Be in MODE 5 | 6 hours<br><br><br><br>36 hours |
| E. All required monitors inoperable. | E.1 Enter LCO 3.0.3. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.9.1 | Perform a CHANNEL CHECK of ~~required~~ containment atmosphere **F18 particulate** ~~radioactivity~~ monitor. | 12 hours |
| SR 3.4.9.2 | Perform a COT of ~~required~~ containment atmosphere **F18 particulate** ~~radioactivity~~ monitor. | 92 days |
| SR 3.4.9.3 | Perform a CHANNEL CALIBRATION of required containment sump monitor. | 24 months |
| SR 3.4.9.4 | Perform a CHANNEL CALIBRATION of ~~required~~ containment atmosphere **F18 particulate** ~~radioactivity~~ monitor. | 24 months |

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.9 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of Appendix A to 10CFR50 (Ref. 1) requires means for detecting, and, to the extent practical, identifying the source of RCS LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting LEAKAGE detection systems.

LEAKAGE detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE.

Industry practice has shown that water flow changes of 0.5 gpm can be readily detected in contained volumes by monitoring changes in water level, in flow rate, or in the operating frequency of a pump. The containment sump used to collect unidentified LEAKAGE, is instrumented to alarm for increases of 0.5 gpm in the normal flow rates. This sensitivity is acceptable for detecting increases in unidentified LEAKAGE. Note that the containment sump level instruments are also used to identify leakage from the main steam lines inside containment. Since there is not another method to identify steam line leakage in a short time frame, two sump level sensors are required to be OPERABLE. The containment water level sensors (LCO 3.3.~~3~~**17**) provide a diverse backup method that can detect a 0.5 gpm leak within 3.5 days.

The reactor coolant contains radioactivity that, when released to the containment, can be detected by radiation monitoring instrumentation. Reactor coolant radioactivity used for leak detection is the decay of F18. The production of F18 is proportional to the reactor power level. F18 becomes a particulate after leaving the RCS, and it is used for leak detection. Instrument sensitivities for particulate monitoring are practical for these LEAKAGE detection systems. The Radiation Monitoring System includes monitoring F18 particulate activity to provide leak detection.

BASES

APPLICABLE SAFETY ANALYSES

The need to evaluate the severity of an alarm or an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary. The system response times and sensitivities are described in Chapter 15 (Ref. 3).

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring RCS LEAKAGE into the containment area is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE provides quantitative information to the operators, allowing them to take corrective action should a leak occur.

RCS LEAKAGE detection instrumentation satisfies Criterion 1 of 10 CFR 50.36(c)(2)(ii).

LCO

One method of protecting against large RCS LEAKAGE derives from the ability of instruments to rapidly detect extremely small leaks. This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide a high degree of confidence that small leaks are detected in time to allow actions to place the plant in a safe condition, when RCS LEAKAGE indicates possible RCPB degradation.

The LCO is satisfied when monitors of diverse measurement means are available. Thus, ~~the~~ **two** containment sump level monitor**s**, in combination with ~~an~~ **a containment atmosphere** F18 particulate ~~radioactivity~~ monitor, provides an acceptable minimum. Containment sump level monitoring is performed by **two of the** three redundant, seismically qualified level instruments. The LCO note clarifies that if LEAKAGE is prevented from draining to the sump, its level change measurements made by OPERABLE sump level instruments will not be valid for quantifying the LEAKAGE.

BASES

APPLICABILITY

Because of elevated RCS temperature and pressure in MODES 1, 2, 3, and 4, RCS LEAKAGE detection instrumentation is required to be OPERABLE.

In MODE 5 or 6, the temperature is ≤ 200°F and pressure is maintained low or at atmospheric pressure. Since the temperatures and pressures are lower than those for MODES 1, 2, 3, and 4, the likelihood of LEAKAGE and crack propagation are much smaller. Therefore, the requirements of this LCO are not applicable in MODES 5 and 6.

Containment sump level monitoring is a valid method for detecting LEAKAGE in MODES 1, 2, 3, and 4. The containment atmosphere F18 particulate radioactivity LEAKAGE measurement during MODE 1 is valid only for reactor power > 20% RTP. RCS inventory monitoring via the pressurizer level changes is valid in MODES 1, 2, 3, and 4 only when RCS conditions are stable, i.e., temperature is constant, pressure is constant, no makeup and no letdown.

The containment sump level change method of detecting leaks during MODES 1, 2, 3, and 4 is not valid while containment purge occurs or within 2 hours after the end of containment purge.

The containment atmosphere F18 particulate radioactivity LEAKAGE measurement during MODE 1 is not valid while containment purge occurs or within 2 hours after the end of containment purge.

The containment sump level change method of detecting leaks during MODES 1, 2, 3, and 4 is not valid during extremely cold outside ambient conditions when frost is forming on the interior of the containment vessel.

ACTIONS

~~The actions are modified by a Note that indicates that the provisions of LCO 3.0.4 are not applicable. As a result, a MODE change is allowed when leakage detection channels are inoperable. This allowance is provided because in each condition other instrumentation is available to monitor for RCS LEAKAGE.~~

BASES

ACTIONS (continued)

A.1 and A.2

With one of the two required containment sump level channels inoperable, the one remaining OPERABLE channel is sufficient for RCS leakage monitoring since the containment radiation provides a method to monitor RCS leakage. However, that is not the case for the steam line leakage monitoring. The remaining OPERABLE sump level monitor is adequate as long as it continues to operate properly. Continuing plant operation is expected to result in containment sump level indication increases and in periodic operation of the containment sump pump. Therefore, proper operation of the one remaining sump level sensor is verified by the operators checking the volume input to the sump (as determined by the sump level changes and discharges from the containment) to determine that it does not change significantly. A significant change is considered to be ±10 gallons per day or 33% (whichever is greater) of the volume input for the first 24 hours after this Condition is entered. The containment sump level instruments are capable of detecting a volume change of less than 2 gallons. The containment water level sensors also provide a diverse backup that can detect a 0.5 gpm leak within 3.5 days.

Restoration of two sump channels to OPERABLE status is required to regain the function in a Completion Time of 14 days after the monitor's failure. This time is acceptable, considering the frequency and adequacy of the monitoring of the change in integrated sump discharge required by Action A.1.

B.1 and B.2

With two of the two required containment sump level channels inoperable, no other form of sampling can provide the equivalent information; however, the containment atmosphere F18 particulate radioactivity monitor will provide indications of changes in LEAKAGE. Together with the atmosphere monitor, the periodic surveillance for RCS inventory balance, SR 3.4.7.1, must be performed at an increased frequency of 24 hours to provide information that is adequate to detect LEAKAGE. A Note is added allowing that SR 3.4.7.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

ACTIONS (continued)

Restoration of one sump channel to OPERABLE status is required to regain the function in a Completion Time of 72 hours after the monitor's failure. This time is acceptable, considering the frequency and adequacy of the RCS inventory balance required by Action A.1.

C.1.1, C.1.2, and C.2

With the **containment atmosphere** F18 particulate ~~containment atmosphere radioactivity~~ monitoring instrumentation channel inoperable, alternative action is required. Either grab samples of the containment atmosphere must be taken and analyzed or RCS inventory balanced, in accordance with SR 3.4.7.1, to provide alternate periodic information.

With a sample obtained and analyzed or an RCS inventory balance performed every 24 hours, the reactor may be operated for up to 30 days to allow restoration of the radioactivity monitor.

The 24 hours interval for grab samples or RCS inventory balance provides periodic information that is adequate to detect LEAKAGE. A Note is added allowing that SR 3.4.7.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, and makeup and letdown). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established. The 30 day Completion Time recognizes at least one other form of leak detection is available.

D.1 and D.2

If a Required Action of Condition A, B or C cannot be met within the required Completion Time, the reactor must be brought to a MODE 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 without challenging plant systems.

BASES

ACTIONS (continued)

E.1

With all required monitors inoperable, no automatic means of monitoring leakage is available and plant shutdown in accordance with LCO 3.0.3 is required.

SURVEILLANCE REQUIREMENTS

SR 3.4.9.1

SR 3.4.9.1 requires the performance of a CHANNEL CHECK of the containment atmosphere F18 particulate ~~radioactivity~~ monitor. The check gives reasonable confidence that the channel is operating properly. The Frequency of 12 hours is based on instrument reliability and risk and is reasonable for detecting off normal conditions.

SR 3.4.9.2

SR 3.4.9.2 requires the performance of a CHANNEL OPERATIONAL TEST (COT) on the **containment** atmosphere F18 particulate ~~radioactivity~~ monitor. The test ensures that the monitor can perform its function in the desired manner. **A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL OPERATIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.** The test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency of 92 days considers risks and instrument reliability, and operating experience has shown that it is proper for detecting degradation.

SR 3.4.9.3 and SR 3.4.9.4

These SRs require the performance of a CHANNEL CALIBRATION for each of the **required** RCS Leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of 24 months is a typical refueling cycle and considers channel reliability. Again, operating experience has proven that this Frequency is acceptable.

BASES

REFERENCES

1. 10 CFR 50, Appendix A, Section IV, GDC 30.

2. Regulatory Guide 1.45, “Reactor Coolant Pressure Boundary LEAKAGE Detection Systems,” U.S. Nuclear Regulatory Commission.

3. Chapter 15, “Accident Analysis.”

## 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.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 RCS Leakage Detection Instrumentation

LCO 3.4.9 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Two containment sump level channels; and

b. One containment atmosphere F18 particulate monitor .

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

ACTIONS

| CONDITION | REQUIRED ACTION | | COMPLETION TIME |
|---|---|---|---|
| A. One required containment sump channel inoperable. | A.1 | Verify that the volume input per day to the containment sump does not change (+ or -) more than 10 gallons or 33% of the volume input (whichever is greater). The volume used for comparison will be the value taken during the first day following the entrance into this CONDITION. | Once per 24 hours |
| | AND | | |
| | A.2 | Restore two containment sump channels to OPERABLE status. | 14 days |

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| B. Two required containment sump channels inoperable. | B.1 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.7.1. | Once per 24 hours |
| | AND | |
| | B.2 Restore one containment sump channel to OPERABLE status. | 72 hours |
| C. Containment atmosphere F18 particulate monitor inoperable. | C.1.1 Analyze grab samples of containment atmosphere. | Once per 24 hours |
| | OR | |
| | C.1.2 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.7.1. | Once per 24 hours |
| | AND | |
| | C.2 Restore containment atmosphere F18 particulate monitor to OPERABLE status. | 30 days |
| D. Required Action and associated Completion Time of Condition A, B, or C not met. | D.1 Be in MODE 3. | 6 hours |
| | AND | |

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| D. (continued) | D.2 Be in MODE 5 | 36 hours |
| E. All required monitors inoperable. | E.1 Enter LCO 3.0.3. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.4.9.1 | Perform a CHANNEL CHECK of containment atmosphere F18 particulate monitor. | 12 hours |
| SR 3.4.9.2 | Perform a COT of containment atmosphere F18 particulate monitor. | 92 days |
| SR 3.4.9.3 | Perform a CHANNEL CALIBRATION of required containment sump monitor. | 24 months |
| SR 3.4.9.4 | Perform a CHANNEL CALIBRATION of containment atmosphere F18 particulate monitor. | 24 months |

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.9 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of Appendix A to 10CFR50 (Ref. 1) requires means for detecting, and, to the extent practical, identifying the source of RCS LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting LEAKAGE detection systems.

LEAKAGE detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE.

Industry practice has shown that water flow changes of 0.5 gpm can be readily detected in contained volumes by monitoring changes in water level, in flow rate, or in the operating frequency of a pump. The containment sump used to collect unidentified LEAKAGE, is instrumented to alarm for increases of 0.5 gpm in the normal flow rates. This sensitivity is acceptable for detecting increases in unidentified LEAKAGE. Note that the containment sump level instruments are also used to identify leakage from the main steam lines inside containment. Since there is not another method to identify steam line leakage in a short time frame, two sump level sensors are required to be OPERABLE. The containment water level sensors (LCO 3.3.17) provide a diverse backup method that can detect a 0.5 gpm leak within 3.5 days.

The reactor coolant contains radioactivity that, when released to the containment, can be detected by radiation monitoring instrumentation. Reactor coolant radioactivity used for leak detection is the decay of F18. The production of F18 is proportional to the reactor power level. F18 becomes a particulate after leaving the RCS, and it is used for leak detection. Instrument sensitivities for particulate monitoring are practical for these LEAKAGE detection systems. The Radiation Monitoring System includes monitoring F18 particulate activity to provide leak detection.

BASES

APPLICABLE SAFETY ANALYSES

The need to evaluate the severity of an alarm or an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary. The system response times and sensitivities are described in Chapter 15 (Ref. 3).

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring RCS LEAKAGE into the containment area is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE provides quantitative information to the operators, allowing them to take corrective action should a leak occur.

RCS LEAKAGE detection instrumentation satisfies Criterion 1 of 10 CFR 50.36(c)(2)(ii).

LCO

One method of protecting against large RCS LEAKAGE derives from the ability of instruments to rapidly detect extremely small leaks. This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide a high degree of confidence that small leaks are detected in time to allow actions to place the plant in a safe condition, when RCS LEAKAGE indicates possible RCPB degradation.

The LCO is satisfied when monitors of diverse measurement means are available. Thus, two containment sump level monitors, in combination with a containment atmosphere F18 particulate monitor, provides an acceptable minimum. Containment sump level monitoring is performed by two of the three redundant, seismically qualified level instruments. The LCO note clarifies that if LEAKAGE is prevented from draining to the sump, its level change measurements made by OPERABLE sump level instruments will not be valid for quantifying the LEAKAGE.

APPLICABILITY

Because of elevated RCS temperature and pressure in MODES 1, 2, 3, and 4, RCS LEAKAGE detection instrumentation is required to be OPERABLE.

In MODE 5 or 6, the temperature is ≤ 200°F and pressure is maintained low or at atmospheric pressure. Since the temperatures and pressures are lower than those for MODES 1, 2, 3, and 4, the likelihood of LEAKAGE and crack propagation are much smaller. Therefore, the requirements of this LCO are not applicable in MODES 5 and 6.

BASES

APPLICABILITY (continued)

Containment sump level monitoring is a valid method for detecting LEAKAGE in MODES 1, 2, 3, and 4. The containment atmosphere F18 particulate radioactivity LEAKAGE measurement during MODE 1 is valid only for reactor power > 20% RTP. RCS inventory monitoring via the pressurizer level changes is valid in MODES 1, 2, 3, and 4 only when RCS conditions are stable, i.e., temperature is constant, pressure is constant, no makeup and no letdown.

The containment sump level change method of detecting leaks during MODES 1, 2, 3, and 4 is not valid while containment purge occurs or within 2 hours after the end of containment purge.

The containment atmosphere F18 particulate radioactivity LEAKAGE measurement during MODE 1 is not valid while containment purge occurs or within 2 hours after the end of containment purge.

The containment sump level change method of detecting leaks during MODES 1, 2, 3, and 4 is not valid during extremely cold outside ambient conditions when frost is forming on the interior of the containment vessel.

ACTIONS

A.1 and A.2

With one of the two required containment sump level channels inoperable, the one remaining OPERABLE channel is sufficient for RCS leakage monitoring since the containment radiation provides a method to monitor RCS leakage. However, that is not the case for the steam line leakage monitoring. The remaining OPERABLE sump level monitor is adequate as long as it continues to operate properly. Continuing plant operation is expected to result in containment sump level indication increases and in periodic operation of the containment sump pump. Therefore, proper operation of the one remaining sump level sensor is verified by the operators checking the volume input to the sump (as determined by the sump level changes and discharges from the containment) to determine that it does not change significantly. A significant change is considered to be ±10 gallons per day or 33% (whichever is greater) of the volume input for the first 24 hours after this Condition is entered. The containment sump level instruments are capable of detecting a volume change of less than 2 gallons. The containment water level sensors also provide a diverse backup that can detect a 0.5 gpm leak within 3.5 days.

BASES

ACTIONS (continued)

Restoration of two sump channels to OPERABLE status is required to regain the function in a Completion Time of 14 days after the monitor's failure. This time is acceptable, considering the frequency and adequacy of the monitoring of the change in integrated sump discharge required by Action A.1.

B.1 and B.2

With two of the two required containment sump level channels inoperable, no other form of sampling can provide the equivalent information; however, the containment atmosphere F18 particulate radioactivity monitor will provide indications of changes in LEAKAGE. Together with the atmosphere monitor, the periodic surveillance for RCS inventory balance, SR 3.4.7.1, must be performed at an increased frequency of 24 hours to provide information that is adequate to detect LEAKAGE. A Note is added allowing that SR 3.4.7.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Restoration of one sump channel to OPERABLE status is required to regain the function in a Completion Time of 72 hours after the monitor's failure. This time is acceptable, considering the frequency and adequacy of the RCS inventory balance required by Action A.1.

C.1.1, C.1.2, and C.2

With the containment atmosphere F18 particulate monitoring instrumentation channel inoperable, alternative action is required. Either grab samples of the containment atmosphere must be taken and analyzed or RCS inventory balanced, in accordance with SR 3.4.7.1, to provide alternate periodic information.

With a sample obtained and analyzed or an RCS inventory balance performed every 24 hours, the reactor may be operated for up to 30 days to allow restoration of the radioactivity monitor.

BASES

ACTIONS (continued)

The 24 hours interval for grab samples or RCS inventory balance provides periodic information that is adequate to detect LEAKAGE. A Note is added allowing that SR 3.4.7.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, and makeup and letdown). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established. The 30 day Completion Time recognizes at least one other form of leak detection is available.

D.1 and D.2

If a Required Action of Condition A, B or C cannot be met within the required Completion Time, the reactor must be brought to a MODE 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 without challenging plant systems.

E.1

With all required monitors inoperable, no automatic means of monitoring leakage is available and plant shutdown in accordance with LCO 3.0.3 is required.

SURVEILLANCE REQUIREMENTS

SR 3.4.9.1

SR 3.4.9.1 requires the performance of a CHANNEL CHECK of the containment atmosphere F18 particulate monitor. The check gives reasonable confidence that the channel is operating properly. The Frequency of 12 hours is based on instrument reliability and risk and is reasonable for detecting off normal conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.9.2

SR 3.4.9.2 requires the performance of a CHANNEL OPERATIONAL TEST (COT) on the containment atmosphere F18 particulate monitor. The test ensures that the monitor can perform its function in the desired manner. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL OPERATIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency of 92 days considers risks and instrument reliability, and operating experience has shown that it is proper for detecting degradation.

SR 3.4.9.3 and SR 3.4.9.4

These SRs require the performance of a CHANNEL CALIBRATION for each of the required RCS Leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of 24 months is a typical refueling cycle and considers channel reliability. Again, operating experience has proven that this Frequency is acceptable.

REFERENCES

1. 10 CFR 50, Appendix A, Section IV, GDC 30.
2. Regulatory Guide 1.45, “Reactor Coolant Pressure Boundary LEAKAGE Detection Systems,” U.S. Nuclear Regulatory Commission.
3. Chapter 15, “Accident Analysis.”