

May 25, 2011

Technical Specifications Task Force (TSTF)
11921 Rockville Pike, Suite 100
Rockville, MD 20852

SUBJECT: REVIEW OF TRAVELER TSTF-523, REVISION 0, "GENERIC LETTER 2008-01,
MANAGING GAS ACCUMULATION" (TAC NO. ME4177)

Dear Members of the TSTF:

By letter dated June 29, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML101800175), you submitted Traveler TSTF-523, Revision 0, "Generic Letter 2008-01, Managing Gas Accumulation," to the U.S. Nuclear Regulatory Commission (NRC) staff for review and approval. By letter dated March 2, 2011 (ADAMS Accession No. ML110590872), TSTF-523 was accepted for review.

The NRC staff has determined that the changes to the Standard Technical Specifications (STS) proposed in the traveler are unacceptable. The NRC staff recognizes that the current surveillance requirements (SRs) for the emergency core cooling system (ECCS) do not provide sufficient detail with respect to gas accumulation in ECCS components, and need to be improved. Further, the existing Technical Specifications (TSs) and the proposed TSTF-523 do not address coverage of potentially affected systems consistent with industry system coverage provided in NEI 09-10, Revision 1. This includes systems identified in GL 2008-01, systems that affect safety that are susceptible to gas intrusion, or would cause a significant adverse consequence if gas intrusion were to go undetected, and support systems. The TSTF-523 proposal to remove the SRs from TSs would only exacerbate the situation.

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(c) requires, in part, that TS include SRs. The regulation at 10 CFR 50.36(c)(3) states that SRs are "...requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met." The STS currently include an SR for ensuring the system is full of water because the NRC staff has previously concluded that this is a necessary requirement to assure the adequate quality of the ECCS. Operating experience has further demonstrated the continued need for an SR to address gas accumulation.

TSTF-523 proposed changes to the content of STS which would remove the engineered safety features SRs for verifying that systems are capable of performing their specified safety function to mitigate a design-basis accident. Engineered safety feature system piping has often developed voids and pockets of entrained air. Air in pump suction piping can cause loss of pumps. Air in pump discharge piping can cause loss of the capability to inject the full water capacity into the reactor coolant system upon demand and can cause water hammers that result in loss of operability.

The technical justification for removal of the SR stated that the level of detail and complexity associated with a gas control program is appropriate for a Final Safety Analysis Report program. The NRC staff recognizes that the level of detail and complexity of an entrained gas

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control program are high. However, the high level of detail and the complexity for the program needed to manage entrained gas accumulation in system piping does not obviate the need for TS SRs that will assure the necessary quality of systems is maintained. In fact, recent trends in STS improvements have included complex programs like the Surveillance Frequency Control Program, the Risk-Informed Completion Time Program, and the Setpoint Control Program. Therefore, the NRC staff cannot support removing the SRs for the reasons cited by the industry. The NRC staff believes that removing the entrained gas SRs would not be in the interest of public safety.

Please revise the TSTF-523 proposal to contain changes that would allow the NRC staff to make determinations regarding the accumulation of gas in system components. A draft approach that the NRC staff would find acceptable is provided in the enclosure.

If you have any questions, please contact Michelle Honcharik at (301) 415-1774 or michelle.honcharik@nrc.gov.

Sincerely,

/RA/

John R. Jolicoeur, Chief
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 753

Enclosure:
Suggestions for TSTF Traveler Approach

cc w/encl: See next page

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Please revise the TSTF-523 proposal to contain changes that would allow the NRC staff to make determinations regarding the accumulation of gas in system components. A draft approach that the NRC staff would find acceptable is provided in the enclosure.

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Suggestions for TSTF Traveler Approach

1. Change the technical specification (TS) surveillance requirement (SR) 3.5.2.3 from "[Verify ECCS piping full of water]" to "Verify that system gas¹ volumes are within limits in accordance with the Gas Management Program."
2. Add a corresponding TS Bases section that states: "The system piping can be considered sufficiently filled with water so that the surveillance requirement is met if the licensee can acceptably conclude through an operability determination that there is a reasonable expectation that the system in question can perform its specified safety function. If an operability determination has not been made, then the system piping must contain no voids to reasonably ensure that the specified safety function can be performed."
3. Change the SR 3.5.2.3 surveillance frequency from "[31 days]" to "In accordance with the Gas Management Program."
4. NEI 09-10, Revision 1, "Guidelines for Effective Prevention and Management of System Gas Accumulation" (Agencywide Documents Access and Management System Package Accession No. ML110030892), states: "The approach identified in this document is intended to ensure that the fluid systems susceptible to gas accumulation are operated and maintained within their design bases and remain ready to perform their intended design basis function when required. It is expected that systems will be designed, operated, and maintained in a manner to prevent accumulation of gas. Where accumulated gas cannot be reasonably prevented, engineering technical evaluations must account for the presence of such gas and its impact on system performance. Systems considered within the scope of this program are those fluid systems that are necessary to reasonably ensure continued core cooling and prevention of significant release of radioactive material. This list of systems will include affected safety related systems and should consider non-safety related systems as appropriate." In-scope systems include but are not necessarily limited to those identified in GL 2008-01, systems that affect safety that are susceptible to gas intrusion or would cause a significant adverse consequence if gas intrusion were to go undetected, and support systems. Consistent with NEI 09-10, Revision 1, add SRs similar to SR 3.5.2.3 to other system TSs.
5. Add a TS Section 5.X titled "Gas Management Program." Section 5.X should be similar to the following:

Surveillance requirements shall be as specified in a document that has been approved by the NRC.

This approach has the advantage that licensees may use a generic document or a plant-specific document provided the document has been approved by the NRC. Adoption of revisions to the generic document is envisioned to be optional. Further, modification of the document does not require a license amendment, although it does require NRC approval.

¹ "Gas" as used here includes air, nitrogen, hydrogen, water vapor, or any other void that results in a failure to be in a water-solid condition.

6. A document that the NRC will consider approving may be similar to the following draft:

1 Purpose

This document provides surveillance frequency requirements that are acceptable to the NRC to reasonably ensure that the fluid systems susceptible to gas accumulation are operated and maintained within their design bases and remain ready to perform their intended design basis function when required.

2 Monitoring of Systems and Support Systems to Reasonably Ensure Safety

The scheduled surveillance frequency shall be every 31 days unless it has been modified in accord with either (1) conditions that allow the time between surveillances to be increased or (2) conditions that require a shorter time between surveillances. These conditions are discussed below.

If three sequential surveillances have established that the amount of gas at a surveillance location will reasonably be expected to remain below half of the quantity that would jeopardize operability until the next planned surveillance or the location has remained free of gas, then the scheduled time between surveillances may be increased without prior NRC approval if one of the following two items is applicable:

- a. All potential sources of gas are monitored and trended and applicable parameters remain within acceptable² specified limits. Monitoring should include but not be limited to such items as accumulator level and pressure, reactor coolant system leakage, system piping pressure, system piping temperature versus saturation temperature, volume control tank pressure for unanticipated pressure drops, reactor coolant pump seal return flow rate for unanticipated increases, level in tanks that are provided to ensure systems are full, and level in tanks (if any) that are provided to accumulate gas from piping high points. Further, monitoring of locations where outgassing may occur when liquid passes from a high pressure region to one at lower pressure should be considered.
- b. The piping is maintained at a pressure higher than that of any potential source of gas in-leakage, such as some of the emergency core cooling system discharge piping in some Westinghouse 3-loop designs, and no locations exist where outgassing may cause gas to accumulate during operation.

Potential sources of gas that should also be considered include such items as failure of level instruments to indicate correct level, leakage through one or a series of closed valves (including vent valves), vortexing, design deficiencies that may result in gas intrusion during accidents, keep-full system malfunctions, leaks in hydraulic dampeners, cooling of an isolated section of piping that may cause a pressure decrease, and operations where gas accumulation has an increased likelihood of occurring such as midloop operation.

² Use of "acceptable" in the remainder of this document generally means that the determination has been accomplished using a method that has been approved by the NRC. It is not necessary that the NRC pre-determine that the item is acceptable.

Any location that has the potential for a gas volume to be formed shall be assumed to have an acceptance criterion of zero gas unless an acceptable criterion has been determined for that location.

Monitoring is not required for those potential void locations where the maximum potential accumulated gas void volume has been evaluated using an acceptable method and determined to not challenge system operability based on one half of the maximum acceptable void volume, location, Froude number, or other acceptable technical basis. Further, monitoring is not required for a potential void location bounded by another monitored potential void location in the same piping segment. However, any potential gas volume in unmonitored locations must be acceptably evaluated with respect to its potential contribution to the overall system response if gas accumulates in other locations. The evaluation must be documented and the total potential gas volume from such a location reduces the overall system acceptance criteria for that pipe segment. The process could require additional monitoring for these locations if gas is found at the bounding monitored potential void location.

The monitoring methodology shall be documented. The documentation should include an assessment of the monitoring methodology accuracy and a justification of why the accuracy is sufficient to support a determination of operability.

Failure to meet a gas volume acceptance criterion shall require (1) immediate entry into the corrective action program (CAP), (2) an immediate operability determination, and (3) a decreased scheduled time between surveillances that is sufficiently short to reasonably ensure that the affected locations will remain within acceptance criteria until the cause of the failure is corrected.

3 Surveillances Associated with Outage and Maintenance

Any system maintenance activity that will result in a reduction in fluid inventory of a fluid system in the scope of gas accumulation management should be evaluated to determine the required fill, vent, and verification inspection. The work processes should include provision for engineering review and evaluation of such evolutions. If the specific evolution has been previously evaluated and the fill, vent, and verification requirement identified, then engineering review could be limited to verifying applicability.

Some of the potential sources of gas that are of concern with outage and maintenance practices are the same as identified above. Others that should be considered include procedure errors, failure to follow procedures, ineffective fill and vent, system draining, and realignments.

Locations potentially affected by outages or maintenance operations are to be purged of gas and/or surveyed upon completion of the activity and established to have no gas volumes that exceed one half of the gas volume acceptance criteria. An independent surveillance of potentially affected locations and adjoining locations should be accomplished within 31 days. The acceptance criteria for this second surveillance are that one half of the gas volume acceptance criteria will not be exceeded and no significant gas accumulation will have occurred since the first surveillance that was conducted upon completion of the activity. Startup of selected pumps and observation of the transient discharge pressure is an acceptable second surveillance of pump discharge piping if (1) this test was conducted previously with verification that the observed transient was consistent with the previously determined volume, (2) the second surveillance established, within the sensitivity of the test, that no gas accumulated since the first test, and (3) gas volumes are less than half the gas volume acceptance criteria.

4 Accessible Versus Non-Accessible Locations and Surveillance Requirements

All locations are considered to be accessible unless actual environmental conditions constitute a hazard to personnel or are such that conducting the surveillance in the specific locations will result in an unacceptable dose. Surveillance locations in a posted high radiation area are considered to be accessible if the surveillance(s) can be conducted without exceeding an acceptable dose with respect to as low as reasonably achievable considerations. For example, suppose six surveillance locations are in a high radiation area and five can be completed with minimal exposure to radiation. The locations where the five surveillances are to be conducted are accessible. Consideration of such aspects as high environmental temperatures or local high temperatures that constitute a burn hazard also apply to determination of non-accessibility.

Surveillance is required for all locations of concern unless it is determined that the surveillance is not necessary to reasonably ensure operability. Where surveillance is not practical, alternative methods, such as use of remote monitoring equipment, should be developed. However, the NRC staff will consider more flexibility in determination of operability for non-accessible locations with respect to consideration of such aspects as the likelihood that gas can accumulate in the locations of concern in contrast to the impact of gas at those locations.

5 Surveillance Methods

Surveillance methods shall provide sufficient accuracy to (1) reasonably allow a comparison of measured void volumes with acceptance criteria and (2) provide trending information including extrapolation to the next scheduled surveillance to reasonably ensure void volumes will remain with acceptance criteria. Ultrasonic test (UT) methods typically provide two or three significant figures and are acceptable. Level instrumentation in tanks located above high points to remove gas from high points is usually acceptable. Volume determination using venting methods is often qualitative and may be inadequate. This is often reflected in use of UT following venting to confirm the gas quantity that was removed. If used, venting methods for volume determination must be established to provide an acceptable accuracy to meet the above requirements.

6 Other Considerations

Surveillances shall be conducted more frequently when industry operating experience indicates that existing surveillance frequency may be inadequate to reasonably ensure operability. Items that may require more frequent surveillances include discovery of a gas intrusion mechanism not previously addressed, events that result in system inoperability or loss of system functionality, gas intrusion events during lower modes of operation that were not previously considered, gas intrusion events in different systems, and events that required more frequent monitoring.

Where acceptably justified, flushing gas from system components by high water flow rates (dynamic venting) is acceptable as an alternate to performing a UT or venting surveillance.

Event history has shown that a licensee may have experienced no gas accumulation issues at specific locations for years and then gas suddenly appears. Consequently, although absence of gas in experience provides insights, it is not sufficient justification for relaxing surveillance frequency unless qualified by in-depth confirmation that potential gas sources are not active. Hence, consideration that all potential sources of gas are monitored and trended and applicable parameters remain within specified limits is applied when assessing an increase in time between surveillances.