September 4, 2012

TSTF-12-14
PROJ0753

Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Response to NRC Request for Supplemental Information and Withdrawal Regarding TSTF-534, Revision 0, "Clarify Application of Pressure Boundary Leakage Definition"

REFERENCE: Letter from Michelle Honcharik (NRC) to Technical Specifications Task Force dated June 6, 2012, "Supplemental Information Needed for Acceptance of Traveler TSTF-534, Revision 0, 'Clarify Application of Pressure Boundary Leakage Definition' (TAC Nos. ME7144 and ME7145)"

On September 19, 2011, The TSTF submitted Traveler TSTF-534, Revision 0, "Clarify Application of Pressure Boundary Leakage Definition," to the Nuclear Regulatory Commission for review (ADAMS Accession No. ML112620441).

In the referenced letter, the NRC requested additional information to enable the NRC staff to perform the requested review. The enclosure to this letter provides the requested information.

Due to recent industry events, the TSTF has decided to withdraw TSTF-534. However, we request that the NRC review the enclosed supplemental information and respond in writing in order to inform our consideration of a potential future resubmittal.

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Should you have any questions, please do not hesitate to contact us.

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Enclosure

cc: Robert Elliott, Technical Specifications Branch, NRC
Michelle Honcharik, Licensing Processes Branch, NRC

NRC Staff Comments Regarding TSTF-534

The regulation at Section 50.2 of the Title 10 of the *Code of Federal Regulations* (10 CFR), "Definitions," defines Reactor Coolant Pressure Boundary (RCPB) as follows:

> Reactor coolant pressure boundary means all those pressure-containing components of boiling and pressurized water-cooled nuclear power reactors, such as pressure vessels, piping, pumps, and valves, which are:
>
> (1) Part of the reactor coolant system, or
>
> (2) Connected to the reactor coolant system, up to and including any and all of the following:
>
> (i) The outermost containment isolation valve in system piping which penetrates primary reactor containment,
>
> (ii) The second of two valves normally closed during normal reactor operation in system piping which does not penetrate primary reactor containment,
>
> (iii) The reactor coolant system safety and relief valves.
>
> For nuclear power reactors of the direct cycle boiling water type, the reactor coolant system extends to and includes the outermost containment isolation valve in the main steam and feedwater piping.

Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," *Criterion 14—Reactor coolant pressure boundary*, states:

> The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

Regulatory Guide (RG) 1.45, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," Revision 1, states:

> RCPB leakage is leakage from a nonisolable fault in the material of an RCS [reactor coolant system] component, pipe wall (including welds), or vessel wall. Leakage from seals, gaskets, and mechanical connections (e.g., bolts, valve seals) is not considered RCPB leakage although these components are part of the RCPB, as defined in 10 CFR 50.2, "Definitions" (Ref. 2). Thus, RCPB leakage is indicative of degradation of pressure retaining components that could ultimately result in a loss of component structural integrity.

Proposed Change

> LEAKAGE (except primary to secondary LEAKAGE) through a nonisolable fault in an RCS component body, pipe wall, or vessel wall. *A fault in an RCS component body, pipe wall, or vessel wall is isolated if LEAKAGE through the isolation device is ≤ 0.5 gpm per nominal inch of valve size up to a maximum limit of 5 gpm.*

A limiting condition for operation (LCO) applicable to all operating reactors specifies no pressure boundary leakage. Therefore, a change to the definition of pressure boundary leakage redefines the LCO.

NRC Staff Comments

As indicated by the discussion in RG 1.45, RCPB leakage indicates an abnormal and unexpected condition that could ultimately result in a loss of component structural integrity. Leakage itself is indicative of a state that the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requires the operator to repair. Isolation of the leaking component does not resolve the condition involving unexpected material degradation of an ASME Class I [sic] component. Therefore, this modification of the LCO effectively allows operation for an unlimited time with unacceptable degradation affecting a Class I component. The change should be modified to lead to the timely repair of the component and to preclude unjustified mode changes prior to completion of the repair.

The proposed change requires no assessment of the safety-significance of the degradation. The proposed change should include a means of assessing the extent of the degraded condition and the operability of the RCPB before permitting further unrestricted operation. For example, a degraded in-core instrument tube may be indicative of a common condition affecting multiple tubes, and isolation of a single degraded tube would not prevent further degradation of the remaining tubes. The change should be modified to provide a limited action time to assess the safety significance and to establish criteria for continued operation related to the extent of the degradation.

The proposed change should also address future degradation of the RCPB as a result of the leakage. The change should provide a means for evaluating future degradation of the RCPB resulting from the leakage. Operating experience has shown that leakage rates much smaller than the proposed 5 GPM limit have caused significant RCPB degradation.

The proposed change should also assess the reliability of the isolation device relative to the size of the degradation. Operation with single device isolation may not be appropriate when the degraded area affects a large diameter pipe. For example, development of a circumferential crack in an excess letdown line weld may pose excessive risk if only isolated from the RCS by a single valve, and continued operation would then be inappropriate.

In addition, the proposed change only marginally addresses the qualification of any isolation device employed in the isolation of leakage. The change should be modified to specify the

precise qualification requirements of any isolation device, limit the size of the isolation device relative to the safety-significance of the degradation, and provide administrative controls related to the testing and the positioning of the isolation device.

TSTF Response

General Response

As stated in the justification for TSTF-534, the definition of "pressure boundary leakage" has existed in its current form since the mid-1970's in plant-specific Technical Specifications, Standard Technical Specifications, and Improved Standard Technical Specifications (ISTS). Pressure boundary leakage is defined as leakage through a nonisolable fault in a RCS component body, pipe wall, or vessel wall.

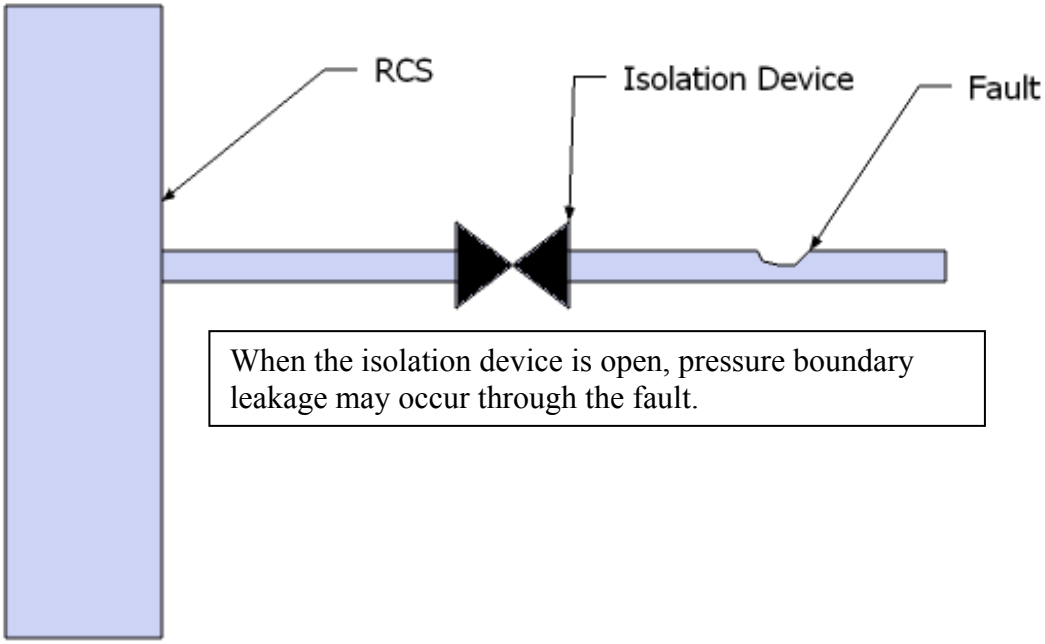
An important aspect of the definition is the term "nonisolable fault." As discussed in the TSTF-534 justification, no definition for the term could be found in any NRC documents, industry documents, or industry standards. Licensees are left with applying a "plain English" definition, that no isolation device exists to separate the fault from the RCS. Conversely, an "isolable fault" is when an isolation device exists to isolate the fault from the RCS. There are no restrictions in the plant-specific Technical Specifications or STS on what constitutes an acceptable isolation device.

Under the definition of pressure boundary leakage, leakage through a fault in an RCS component body, pipe wall, or vessel wall that is isolated from the RCS is not considered pressure boundary leakage. The proposed change does not change that aspect of the definition.

Recent NRC actions in two industry events lead to the proposed change. In both cases, the NRC concluded that any leakage past the device being used to isolate a fault in a RCS component body, pipe wall, or vessel wall (i.e., bypass leakage) resulted in the fault not being "isolable," even if the bypass leakage was negligible (miniscule) and within the designed bypass leakage of the device. This NRC position results in a decrease in plant safety as a plant shutdown (a transient) may be required for situations that present no risk to plant safety from the minimal bypass leakage past an isolation device.

The proposed change has no effect on the Technical Specifications allowance for continued operation within the Applicability with a fault in a RCS component body, pipe wall, or vessel wall that is isolated. The proposed change is limited to the situation in which a fault is isolated from the RCS and the device used to isolate the fault allows a small amount of bypass leakage.

It is important to note the distinction between pressure boundary leakage (i.e., leakage through a fault in a RCS component body, pipe wall, or vessel wall) and the proposed limit on isolation device bypass leakage. The following diagram illustrates this distinction.



The majority of the staff comments propose more restrictive requirements on aspects of the pressure boundary leakage definition and Technical Specifications Actions not affected by the proposed change, such as the evaluation of the fault. The NRC staff comments would replace the proposed change which clarifies a single word in the definition with an overhaul of the requirements that completely changes the treatment of pressure boundary leakage in the Technical Specifications. The additional changes requested by the NRC are outside the scope of the proposed change.

Response to Specific Comments

1. This modification of the LCO effectively allows operation for an unlimited time with unacceptable degradation affecting a Class 1 component. The change should be modified to lead to the timely repair of the component and to preclude unjustified mode changes prior to completion of the repair.

   Response
   The proposed change does not alter the current Technical Specifications definition which allows continued operation within the Applicability with an isolated fault in a RCS component body, pipe wall, or vessel wall. The proposed change only clarifies the definition of "isolable" to recognize that valves and other isolation devices are designed to allow some minimal bypass leakage without compromising the function of the device.

   However, there are other regulatory requirements which compel the licensee to assess and correct a degraded RCS component. 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," Criterion XVI, "Corrective Action," states:

> "Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management."

As stated in the NRC staff comments, leakage itself is indicative of a state that the ASME Boiler and Pressure Vessel Code requires the operator to repair. Regulation 10 CFR 50.55a requires licensees to follow the ASME Code.

Many plant-specific Technical Specifications that have not been converted to the ISTS contain a specification on structural integrity, which states that the structural integrity of all ASME Code Class 1, 2, and 3 components must be maintained at all times. If an ASME Code Class 1 component does not have structural integrity, it must be restored or isolated prior to heatup (i.e., prior to entering the mode of applicability). This specification was relocated from plant's Technical Specifications to licensee controlled documents as it was duplicative of the 10 CFR 50.55a requirement to comply with the ASME Code. As a result, the requirement for Class 1 components to have structural integrity remains for all operating plants, including plants with ISTS.

Therefore, it is unnecessary to modify the proposed change to require timely repair of the component or to preclude mode changes prior to completion of the repair, as such a requirement would be duplicative of regulations.

2. The proposed change requires no assessment of the safety-significance of the degradation. The proposed change should include a means of assessing the extent of the degraded condition and the operability of the RCPB before permitting further unrestricted operation.

   The change should be modified to provide a limited action time to assess the safety significance and to establish criteria for continued operation related to the extent of the degradation.

   <u>Response</u>
   As discussed above, the proposed change has no effect on either the existing pressure boundary leakage definition wording or the associated Technical Specification Actions with respect to the presence of a fault in a RCS component. However, an assessment of the fault is required by 10 CFR 50, Appendix B, Criterion XVI, as discussed above. Furthermore, all degraded or nonconforming conditions must be assessed for their effect on systems required to be Operable by the Technical Specifications as discussed in the NRC Inspection Manual, Part 9900 Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety."

Therefore, it is unnecessary for the Technical Specifications to require an assessment of the safety significance of the degradation as such an assessment is already required by NRC regulations. It is also unnecessary to add Technical Specification requirements to assess Operability as the Technical Specifications and NRC guidance already require Operability assessments of degraded or nonconforming conditions.

3. The proposed change should also address future degradation of the RCPB as a result of the leakage.

   Response
   Under the proposed change, a small amount of isolation device bypass leakage is allowed. This bypass leakage may pass through the fault to the associated building atmosphere (e.g., containment or auxiliary building) or to another system. The purpose of the isolation device is to prevent further degradation of the fault and minimize the potential for further RCPB degradation. The device has isolated the fault from the RCS, effectively removing it from the RCPB and preventing further RCPB degradation.

   The proposed bypass leakage limit is the same as that allowed through valves that isolate the high-pressure RCS from low pressure systems (i.e., ISTS NUREG-1430, NUREG-1431, and NUREG-1432 LCO 3.4.14, NUREG-1433 LCO 3.4.5, and NUREG-1434 LCO 3.4.6, all titled, "RCS Pressure Isolation Valve (PIV) Leakage.") As stated in the ISTS Bases for these specifications, "The RCS PIV Leakage LCO allows RCS high pressure operation when leakage through these valves exists in amounts that do not compromise safety."

   The proposed leakage limit is consistent with the ASME Operations and Maintenance (OM) Code. In the 2009 edition, it is documented in Subsection ITSC, ITSC-3630, "Leakage Rate for Other than Containment Isolation Valves," Paragraph e, "Analysis of Leakage Rates."

   Therefore, the small amount of bypass leakage that would be allowed by the proposed change would not result in additional degradation of the RCPB.

4. The proposed change should also assess the reliability of the isolation device relative to the size of the degradation. Operation with single device isolation may not be appropriate when the degraded area affects a large diameter pipe.

   [T]he proposed change only marginally addresses the qualification of any isolation device employed in the isolation of leakage. The change should be modified to specify the precise qualification requirements of any isolation device, limit the size of the isolation device relative to the safety-significance of the degradation, and provide administrative controls related to the testing and the positioning of the isolation device.

   Response
   The current definition of pressure boundary leakage does not specify the number, type, or qualification of the allowed isolation device. The proposed change imposes a new qualification requirement of maximum bypass leakage for the isolation device. This maximum leakage rate is the same limit imposed on valves other than containment isolation

valves by the ASME OM Code, as discussed in the response to Comment 3, and on valves that isolate low pressure systems from the RCS. This restriction is sufficient to address the operational concerns. There is no demonstrated safety benefit for imposing additional restrictions on the isolation device and such restrictions are beyond the scope of the proposed change.