**Attachment 1**

**Open Item 3.5**: STPNOC needs to provide sufficient risk-informed justification for application of the categorization process to passive functions (i.e., structural integrity, pressure boundary) of safety-related SSCs. For example, the staff has determined that the categorization process is not sufficiently robust to support the requested exemption from ASME Section XI Inservice Inspection requirements.

**Response:**

Note: As used in this response, the term "component" includes items such as valves, pumps, vessels, and piping systems. It does not include supports, which are referred to separately.

STPNOC believes that its categorization process for the exemption is sufficiently robust for categorizing the pressure boundary and structural integrity functions. However, to resolve this open item, STPNOC agrees to provide the following enhancements to its process for categorizing those functions.

STPNOC has two risk-informed processes applicable to risk ranking the pressure boundary and structural integrity functions of SSCs. The first process is described in STPNOC's exemption request for plant SSCs (Categorization process). The second process involves risk-informed inservice inspection (RI-ISI), based upon an EPRI methodology (RI-ISI risk ranking process). This process has been endorsed by NRC Regulatory Guide 1.178, "An Approach for Plant-Specific Risk-Informed Decisionmaking: Inservice Inspection of Piping,"

STPNOC has obtained NRC approval for a relief request for RI-ISI of ASME Class 1 butt welded piping under Regulatory Guide 1.178. In addition, STPNOC has recently submitted a similar relief request for Class 1 socket welded piping and Class 2 piping. STPNOC currently has no plans to submit a relief request for RI-ISI for Class 3 piping.

STPNOC has conservatively evaluated the pressure boundary functions of systems under the categorization process. As evidence of the robustness of this process as applied to pressure boundary, STPNOC notes that, based on the categorizations performed to date, the following systems or portions of these systems (as well as the applicable components) are categorized as MSS or HSS for functions related to pressure boundary.

- Chemical & Volume Control
- Air starting system for the Standby Diesel Generator
- Lube oil system for the Standby Diesel Generator
- Feedwater
- Main Steam
- Reactor Coolant
- Residual Heat Removal
- Safety Injection
- Steam Generator Blowdown

STPNOC is proposing two different approaches with respect to enhancing the process for determining the risk of the pressure boundary function. The first approach applies to Class 1 or 2 components and utilizes a combination of the RI-ISI ranking and the categorization process pressure boundary risk. The second approach applies to Class 3 components and utilizes a methodology similar to RI-ISI risk ranking and combines it with the categorization process pressure boundary risk.

<u>STPNOC's Proposed Exemption for the Pressure Boundary of ASME Class 1 and 2 Components and Supports</u>

For determining the final pressure boundary risk of Class 1 and 2 components, STPNOC proposes to use the higher of the RI-ISI risk ranking or the categorization process pressure boundary risk. Since the RI-ISI process applies only to piping, STPNOC would utilize one of the following methods for determining the "RI-ISI" risk for components other than piping:

1) Assign such components the same pressure boundary risk as the associated section of piping. Where the associated piping has more than one risk (e.g., upstream and downstream of a valve), the higher risk will be used; or,

2) Perform a technical evaluation that supports a lower pressure boundary risk, based on such factors as differences in design features and/or degradation mechanisms that are less severe for these components than for the associated piping.

Supports would be assigned the same risk as the final pressure boundary risk of the associated component.

The following matrix summarizes STP's proposal with respect to pressure boundary risk for ASME Class 1 and 2 components:

| | | Categorization Process Pressure Boundary Risk | |
|---|---|---|---|
| | | **HSS/MSS** | **LSS/NRS** |
| **RI-ISI Risk Rank** | **High or Medium** | Final pressure boundary risk of component is High or Medium. Component and its support(s) are not subject to exemption. Piping welds are subject to RI-ISI, with a risk rank of High or Medium, as applicable | Final pressure boundary risk of component is High or Medium. Component and its support(s) are not subject to exemption for applications involving pressure boundary considerations, e.g., ASME Section XI requirements.. Piping welds are subject to RI-ISI, with a risk rank of High or Medium, as applicable. |
| | **Low** | Final pressure boundary risk of component is High or Medium. Component and its support(s) are not subject to exemption. Piping welds are subject to RI-ISI, with a risk rank of Low. | Final pressure boundary risk of component is Low. Component and its support(s) are subject to exemption for applications involving pressure boundary considerations, e.g., ASME Section XI requirements. |

The NRC has already determined that the RI-ISI process is sufficiently robust for risk ranking of passive functions (i.e., structural integrity and pressure boundary). In addition, STPNOC is not proposing (for purposes of the exemption) to categorize components lower than their RI-ISI risk ranking. Therefore, there is a sufficient technical justification for STPNOC's proposal to exempt Class 1 and 2 components, whose pressure boundary risk has been determined to be Low under the process described above, from special treatment requirements involving pressure boundary considerations, e.g., ASME Section XI requirements.

STPNOC has performed a comparison of the RI-ISI risk ranking of Class 1 and Class 2 piping against the categorization process pressure boundary risk of the associated systems. Results show that, with one exception, piping that is LSS or NRS under the categorization process is also risk ranked as Low under the RI-ISI methodology. The one exception is on the Auxiliary Feedwater (AF) system, where a small portion of the piping is assigned an RI-ISI risk of Medium compared to the categorization process pressure boundary risk of LSS. As indicated by the above matrix, that portion of the AF system will be assigned a pressure boundary risk of Medium and will not be subject to the exemption for applications involving pressure boundary considerations..

In order to provide additional assurance, STPNOC will perform periodic tests, up to and including tests that are equivalent to the Section XI tests, to ensure that the systems are fully intact and that sufficient safety margin is maintained. These tests will be performed on systems whose components have a final pressure boundary risk of Low under the process described above.

Thus, from a risk-informed perspective, STPNOC concludes that combining the categorization process pressure boundary risk and the RI-ISI risk adequately evaluates the safety significance of the passive functions, such as pressure boundary and structural integrity, of Class 1 and 2 components.

STPNOC's Proposed Exemption for ASME Class 3 Components and Supports

As discussed above, STPNOC is not planning to request relief to extend its RI-ISI risk ranking process to ASME Class 3 components. However, STPNOC proposes to utilize a similar risk-informed piping failure and consequence (RI-PFC) evaluation, to determine a risk ranking for the piping. The RI-PFC risk rank would be combined with the categorization process pressure boundary risk in a process similar to that proposed for Class 1 and 2 components.

The RI-PFC methodology will be used to determine a risk ranking for Class 3 piping systems (or portions of a system) by combining pipe rupture potential with the spatial effects consequences of piping pressure boundary failure in accordance with the following:

1) For pipe rupture potential, the evaluation would assign a rupture potential ranking to the system (or portion of the system) based on the type of degradation to which the piping is susceptible. Piping susceptible to a degradation mechanism(s) that would result in large inventory losses would be ranked High, that susceptible to a degradation mechanism(s) that would result in small inventory losses would be ranked Medium, and that with no known degradation mechanism would be ranked Low. This method of assigning rupture potential ranking is consistent with the EPRI RI-ISI methodology (see Section 3.4.2.5. of EPRI Topical Report TR-112657, Rev. B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure").

   Degradation mechanisms to be considered include thermal fatigue, erosion-cavitation, corrosion, and stress corrosion. Water hammer would not be considered as it is not a degradation mechanism and is not amenable to prevention through timely inspection. It is important to note that the EPRI RI-ISI methodology of determining pipe rupture potential focuses on the amount of potential inventory loss and does not evaluate the probability of occurrence of any particular degradation mechanism.

2) For spatial effects consequences, the evaluation would determine the consequences on core damage resulting from the impact of credible pressure boundary failures of Class 3 piping on adjacent safety significant SSCs. Credible pressure boundary piping failures are defined as postulated failure modes and resulting inventory loss rates and volumes, within system hydraulic limits, associated with the degradation mechanism(s) to which the piping is susceptible, up to and including failures that exceed the capabilities of the flood mitigation systems and/or make-up capabilities.

   This consequence evaluation would utilize published failure rate estimates for the cited degradation mechanisms in Class 3 piping systems in Westinghouse plants in determining the consequence ranking. For example, EPRI report TR-111880, "Piping System Failure Rates and Rupture Frequencies for Use in Risk Informed In-service Inspection Applications", Appendix A, provides failure rates in the range of 1.81E-5 to 4.32E-9 (units as specified) and rupture rates of 4.91E-7 to 1.54E-10 (units as specified) for these types of systems and degradation mechanisms. The use of piping failure and rupture probability data would tailor the consequence ranking for each system and its applicable damage mechanisms.

This evaluation would take advantage of studies already conducted for areas containing Class 2 piping outside containment, to the extent that these areas also contain Class 3 piping.

3) The failure potential and spatial effects consequence evaluations above would be combined to determine the RI-PFC risk rank for the piping using a similar matrix as was used in the RI-ISI program.

For determining the final pressure boundary risk of Class 3 components, STPNOC proposes to use the higher of the RI-PFC risk ranking or the categorization process pressure boundary risk . Since the RI-PFC process applies only to piping, STPNOC would utilize one of the following methods for determining the RI-PFC risk for components other than piping:

1) Assign such components the same pressure boundary risk as the associated section of piping. Where the associated piping has more than one risk (e.g., upstream and downstream of a valve), the higher risk will be used; or,

2) Perform a technical evaluation that supports a lower pressure boundary risk, based on such factors as differences in design features and/or degradation mechanisms that are less severe for these components than for the associated piping.

Supports would be assigned the same risk as the final pressure boundary risk of the associated component.

Class 3 components inside containment are excluded from this process because components inside containment are designed to operate in a harsh environment and any spatial effects from postulated pressure boundary failures of Class 3 components inside containment are already bounded by existing analyses. Additionally, Class 3 systems typically are not high energy systems and their failure would not cause any concerns related to pipe whip or jet impingement (or the piping design already includes appropriate protective measures). Therefore, these components (and their supports) would be assigned a final pressure boundary risk equivalent to their categorization process pressure boundary risk. Those that have a final pressure boundary risk of Low or NRS would be subject to the exemption for applications involving pressure boundary considerations, e.g., ASME Section XI requirements.

The following matrix summarizes STP's proposal with respect to pressure boundary risk for ASME Class 3 components outside containment:

| | **Categorization Process Pressure Boundary Risk** | |
|---|---|---|
| | **HSS/MSS** | **LSS/NRS** |

| | | | |
|---|---|---|---|
| **RI-PFC Risk Rank** | **High or Medium** | Final pressure boundary risk of component is High or Medium. Component and its support(s) are not subject to exemption. | Final pressure boundary risk of component is High or Medium. Component and its support(s) are not subject to exemption for applications involving pressure boundary considerations, e.g., ASME Section XI requirements. |
| | **Low or NRS** | Final pressure boundary risk of component is High or Medium. Component and its support(s) are not subject to exemption. | Final pressure boundary risk of component is Low or NRS. Component and its support(s) are subject to exemption for applications involving pressure boundary considerations, e.g., ASME Section XI requirements. |

In order to provide additional assurance, STPNOC will perform periodic tests, up to and including tests that are equivalent to the Section XI tests, to ensure that the systems are fully intact and that sufficient safety margin is maintained. These tests will be performed on systems whose components have a final pressure boundary risk of Low or NRS under the process described above.

STPNOC provides the following additional justification to support our position that the process described above is sufficiently robust to support its application to passive functions for Class 3 components.

STPNOC's categorization process evaluates the risk significance of individual SSCs using PRA insights and deterministic insights. All SSCs undergo the deterministic review process, and those SSCs modeled in the PRA also undergo the PRA categorization process. In the deterministic categorization process, the pressure boundary function is explicitly categorized. For each fluid system that has been reviewed under this process, the system function of maintaining pressure boundary has been evaluated for risk significance by the Working Group using the process described in the exemption request. This process includes the assessment of the five critical questions. SSCs whose failure could compromise the pressure boundary function were then assigned the same category as the function.

As detailed in the description of the deterministic process, the critical questions are answered based on the impact and probability of the failure. Operational and historical data has shown that passive failures occur much less frequently than active failures. For example, EPRI report TR-110381, Risk-Based Snubber Inspection and Testing Guidelines, which was referenced in our response to RAI 19, states that dynamic testing has demonstrated that, structurally, ASME-designed valves and piping are inherently robust. This is consistent with historical data and indicates that catastrophic passive failures of ASME systems are highly unlikely. Systems or portions of systems that contain Class 3 components and where the pressure boundary function was categorized as LSS are typically not classified as high energy systems. For Class 3 components in such systems, credible leakage would not have a significant impact on system or plant operation. Pressure boundary failures are typically evidenced by small leaks that can quickly be detected, mitigated, and corrected. In addition, EPRI report TR-111880, Piping System Failure Rates and Rupture Frequencies for Use in

Risk-Informed In-service Inspection Applications, provides experience data and conclusions that support STPNOC's evaluation of the risk significance of pressure boundary. The probability of component rupture in an ASME Class 3 system is very unlikely, and the probability of such a rupture occurring at the same time as a safety system being demanded to support accident or transient mitigation is even more remote and is not credible. This was taken into account during the categorization of the pressure boundary function and its supporting components. Therefore, there is a sound basis for categorizing the pressure boundary function of most Class 3 components as LSS or NRS.

The categorization process does not explicitly assign a category to the structural integrity function of components. However, consideration of the probability and impact of structural integrity failure is inherent in the component performance and reliability data (both STP and industry) used during the categorization process. Passive failures of selected pressure boundary components are also included in the PRA as initiating events, based on their impact on the plant and the frequency of occurrence. Additionally, spatial interaction analyses for internal flooding scenarios are also included. The PRA results show that internal floods are not dominant scenarios to either core damage or large early release. Furthermore, other types of spatial interactions are not important for Class 3 components. In particular, most Class 3 systems are not high-energy systems. For those systems that are not high energy, pipe whip and jet impingement are not a significant concern, and a postulated rupture of the system would not result in a harsh environment. Finally, Section 3.6.1.3.2 of the Updated Final Safety Analysis Report for STP identifies various design features that are in place to protect other systems from the effects of pipe failures, including separation of piping from other safety systems, use of barriers and shields, and use of piping restraints. Based upon all of the above, it is apparent that, from a risk-informed perspective, the importance of Class 3 components is limited to the pressure boundary function, not structural integrity.

Thus, from a risk-informed perspective, STPNOC concludes that, with the additional evaluations described above, its categorization process adequately evaluates the safety significance of the passive functions, such as pressure boundary and structural integrity, of Class 3 components.