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 has two risk-informed categorization processes applicable to the pressure boundary and structural integrity functions of SSCs. The first categorization process is the process described in STPNOC’s exemption request for plant SSCs (GQA categorization process). The second is a risk ranking process established in conjunction with the NRC-approved relief request for risk-informed inservice inspection (RI-ISI) for ASME Class 1 piping under NRC Regulatory Guide 1.178, "An Approach for Plant-Specific Risk-Informed Decisionmaking: Inservice Inspection of Piping,"

The RI-ISI risk ranking process is based upon the EPRI methodology for RI-ISI. STPNOC has recently submitted a similar relief request based on this EPRI methodology for risk informing the ISI program for Class 1 socket welded piping and Class 2 piping under Regulatory Guide 1.178. STPNOC currently has no plans to submit a relief request for RI-ISI for Class 3 piping.

STPNOC has conservatively categorized the pressure boundary functions of systems under the GQA 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 increasing the robustness of the pressure boundary risk categorization. The first approach applies to Class 1 or 2 components and utilizes a combination of the RI-ISI ranking and the GQA pressure boundary risk. The second approach applies to Class 3 components and utilizes a methodology similar to RI-ISI and combines it with the GQA pressure boundary risk.

STPNOC's Proposed Exemption for ASME Class 1 and 2 Components and Supports

For determining the pressure boundary risk of Class 1 and 2 components, STPNOC proposes to use the higher of the RI-ISI risk ranking or the GQA categorization for the pressure boundary function. 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; 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:

		GQA Pressure Boundary Categorization	
		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. 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 GQA categorization for the pressure boundary function of the associated systems. Results show that, with one exception, piping that is LSS or NRS under the GQA 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 GQA 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.

In order to provide additional assurance for Low systems, STPNOC will perform periodic tests, up to and including the Section XI equivalent 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 GQA categorization process and the RI-ISI risk ranking process adequately evaluates the safety significance of the passive functions, such as pressure boundary and structural integrity, of Class 1 and 2 components.

<u>STPNOC's Proposed Exemption for ASME Class 3 Components and Supports</u>

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 GQA pressure boundary categorization in a process similar to that proposed for Class 1 and 2 components.

The RI-PFC methodology would consist of an evaluation of the failure frequency and spatial effects consequences of piping pressure boundary failure in accordance with the following:

1) For failure frequency determinations, the evaluation would consider the extent to which degradation mechanisms exist that could result in credible pressure boundary failures of the piping, up to and including failures that present challenges to flood mitigation systems and/or make-up capabilities. Such degradation mechanisms include thermal fatigue, erosion-cavitation, corrosion, and stress corrosion. Water hammer would not be considered as it is not a degradation mechanism and would not be amenable to prevention through timely inspection.

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

piping. Factors such as failure mechanisms and pipe size would be evaluated in determining the consequences.

3) The failure frequency and 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 GQA categorization for the pressure boundary function. 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; 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. Therefore, these components (and their supports) would be assigned a final pressure boundary risk equivalent to their GQA 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:

		GQA Pressure Boundary Categorization	
		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.
	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 for Low or NRS systems, STPNOC will perform periodic tests, up to and including the Section XI equivalent 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.

Notwithstanding the specific pressure boundary risk evaluations discussed above, STPNOC provides the following additional justification to support our position that the categorization process is sufficiently robust to support its application to passive functions for Class 3 components, given their lower safety significance.

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 GQA 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. 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 low probability of component rupture was taken into account during the categorization of the pressure boundary function and its supporting components.

Class 3 components in systems or portions of systems where the pressure boundary function was categorized as LSS are typically not classified as high energy. For such components, credible leakage would not have a significant impact on system or plant operation. Typically, there are means for make-up to the system. Additionally, reliability in this area has been good. Component pressure boundary failures, when they occur, exhibit themselves primarily as leaks rather than ruptures. These leaks would quickly become evident during routine operator rounds, system engineer walkdowns, or other visual or system performance indication. 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. Therefore, there is a sound basis for categorizing the pressure boundary function of most Class 3 components as LSS or NRS.

The exemption 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 addition, 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. Furthermore, the probability of a rupture of a Class 3 system at the same time as a safety system being demanded to support accident or transient mitigation is very remote and not credible. 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. Therefore, there is no technical basis for requiring the exemption categorization process to explicitly account for structural integrity failures of passive components.

Finally, as noted above, with one exception involving a portion of the AFW system, the category assigned to the pressure boundary function under the exemption categorization process is the same as or higher than the category assigned to the associated piping under the NRC-approved RI-ISI risk ranking process for STP. This is a further indication of the robustness of the exemption categorization process, as applied to both pressure boundary and structural integrity functions.

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