

**Oconee Nuclear Station, Units 1, 2, and 3, Subsequent License Renewal Application (SLRA)**  
**TRP 017: Flow-Accelerated Corrosion (FAC)**

#	SLRA Section	SLRA Page	Question / Issue	Why are we asking?
1	2.1.5	2-24	<p>SLRA Section 2.1.5 states, in part, "... the component type 'Piping and Piping Components' has been developed to represent piping and in-line piping components within the system that are susceptible to aging effects of wall thinning (due to erosion or flow accelerated corrosion) ..."</p> <p>The SLRA tables noted for the following systems that are susceptible to wall thinning due to FAC and/or erosion include AMR items for managing FAC and erosion for steel piping and piping components (pressure boundary and structural integrity intended functions), and erosion for stainless steel piping and piping components (pressure boundary and structural integrity intended functions).</p> <ul style="list-style-type: none"> <li>• Condensate System (Table 3.4.2-1)</li> <li>• Heater Drain System (Table 3.4.2-3)</li> <li>• Auxiliary Steam System (Table 3.4.2-7)</li> <li>• Main Steam System (Table 3.4.2-8)</li> </ul> <p>SLRA Tables 3.4.2-1 and 3.4.2-3 include gray cast iron pump casings and valve bodies exposed internally to treated water, and copper alloy valve bodies exposed internally to treated water.</p> <p>SLRA Table 3.4.2-7 includes gray cast iron valve bodies exposed internally to treated water, and copper alloy flexible connections and strainer bodies exposed internally to treated water.</p> <p>SLRA Table 3.4.2-8 includes copper alloy valve bodies exposed internally to treater water.</p>	<p>The NRC staff is seeking clarification on whether FAC and erosion are applicable aging effects for gray cast iron components, and whether erosion is an applicable aging effect for copper alloy and stainless steel components.</p>

			<p>SLRA Table 3.4.2-10 (Plant Heating System) includes AMR items for managing FAC and erosion for steel piping and piping components (pressure boundary and structural integrity intended functions). However, it does not include erosion for stainless steel piping and piping components (pressure boundary and structural integrity intended functions), even though the table includes stainless steel trap bodies and valve bodies exposed internally to treated water. In addition, SLRA Table 3.4.2-10 includes gray cast iron strainer bodies and trap bodies exposed internally to treated water, and copper alloy trap bodies and valve bodies exposed internally to treated water.</p> <p>For these systems, please discuss whether wall thinning due to FAC and erosion are applicable aging effects for the gray cast iron components, and whether wall thinning due to erosion is an applicable aging effect for the copper alloy components. In addition, please discuss why SLRA Table 3.4.2-10 did not include erosion for stainless steel piping and piping components (pressure boundary and structural integrity intended functions).</p>	
2	3.1	3-193	<p>SLRA Table 3.1.2-4 does not cite wall thinning due to erosion for the following steam generator components: steel auxiliary feedwater nozzle inlet header, main feedwater nozzle inlet headers, and steam outlet nozzle.</p> <p>Please discuss if erosion is an applicable aging effect for these components.</p>	The NRC staff is seeking clarification on if erosion is an applicable aging effect for the steel auxiliary feedwater nozzle inlet heater, main feedwater nozzle inlet headers, or steam outlet nozzle.
3	A2.8, B2.1.8	A-9, B-82	<p>SLRA Sections A2.8 and B2.1.8 reference CHECWORKS™ as the predictive analytical software used in the FAC program. The Oconee Nuclear Station Unit 1 Erosion Susceptibility Analysis Technical Report BP-2017-0041-TR-01</p>	The NRC staff is seeking clarification on the software products used in the Oconee FAC program and the software quality assurance classification for each of

			<p>references FAC Manager. In addition, the NRC staff did not identify the quality assurance classification for CHECWORKS™ or FAC Manager.</p> <p>Please discuss if software products other than CHECWORKS™ and FAC Manager are used in the Oconee FAC program. Provide the software quality assurance classification and the bases for the classification for each software product used in the Oconee FAC program. In addition, discuss whether validation and verification and error notification are included for each of the software products used. If they are, please identify the procedures these activities are documented in.</p>	<p>the software products used, including if validation and verification and error notification are performed.</p>
4	A2.8, B2.1.8	A-9, B-82	<p>SLRA Section A2.8 states, in part, "... (e) evaluating inspection data against acceptance criteria to determine the need for <u>corrective actions including</u> (emphasis added) inspection sample expansion, repairs, or replacements, and to schedule future inspections;..." SLRA Section B2.1.8 states, in part, "... (e) evaluating <u>and trending</u> (emphasis added) inspection data to determine the need for inspection sample expansion, repairs, or replacements, and to schedule future inspections;..."</p> <p>Please discuss what appears to be a discrepancy between the two sections.</p>	<p>The NRC staff is seeking clarification on what appears to be a discrepancy in the language regarding evaluating inspection data in SLRA Sections A2.8 and B2.1.8.</p>
5	B2.1.8	B-82	<p>SLRA Section B2.1.8 states, "The <i>Flow-Accelerated Corrosion</i> AMP is an existing condition monitoring program that manages wall thinning caused by flow-accelerated corrosion in carbon steel piping and piping components exposed to reactor coolant, steam, and treated water environments." However, neither FAC nor erosion were identified as applicable aging effects for carbon steel piping and piping components exposed to reactor coolant. The staff notes that Revision 1 of SLR-ONS-AMPR-</p>	<p>The NRC staff is seeking clarification on which components exposed to reactor coolant are susceptible to FAC and/or erosion, and clarification on the environments components that are susceptible to FAC and/or erosion are exposed to.</p>

			<p>XI.M17, "Flow-Accelerated Corrosion AMP Evaluation Report," makes the same statement.</p> <p>The NRC staff notes that the FAC program manages wall thinning due to FAC for the steel steam generator main feedwater nozzle inlet headers exposed internally to secondary feedwater. The staff also notes that the FAC program manages wall thinning due to erosion for stainless steel piping and piping components exposed internally to treated borated water in the High Pressure Injection System.</p> <p>In addition, depending on the response to Breakout Question #1 above, the FAC program may manage wall thinning caused by FAC and erosion for gray cast iron components and erosion for copper alloy components.</p> <p>Please identify which components exposed to reactor coolant are susceptible to FAC and/or erosion and identify the environments components that are susceptible to FAC and/or erosion are exposed to.</p>	
6	B2.1.8	B-82	<p>SLRA Section B2.1.8 states, "Flow-accelerated corrosion inspections and inspections performed for wall thinning caused by mechanisms other than flow-accelerated corrosion that do not meet acceptance criteria are evaluated in accordance with the corrective action program." However, the "Corrective Actions" program element in AMP XI.M17 is not limited to wall thinning caused by mechanisms other than FAC. Results related to wall thinning due to FAC and mechanisms other than FAC that do not meet the acceptance criteria are to be addressed in the corrective action program.</p> <p>Please confirm that results related to wall thinning due to FAC that do not meet acceptance</p>	<p>The NRC staff is seeking clarification on whether results related to wall thinning due to FAC that do not meet acceptance criteria will also be addressed in the corrective action program</p>

			criteria will also be addressed in the corrective action program.	
7	B2.1.8	B-82	<p>The SLRA states that the Oconee FAC program, with one enhancement, is consistent with AMP XI.M17 in GALL-SLR. SLRA Section B2.1.8 provides a description of Oconee's FAC program. While SLR-ONS-AMPR-XI.M17 addresses many of the following areas, the NRC staff noted they are not included in the SLRA description of the FAC program.</p> <ul style="list-style-type: none"> <li>• Opportunistic visual inspections of internal surfaces conducted during routine maintenance activities</li> <li>• Nondestructive examination methods, such as ultrasonic testing and/or radiographic testing, to quantify the extent of wall thinning</li> <li>• Inspections are performed by personnel qualified in accordance with site procedures and programs</li> <li>• Inspection results are evaluated to determine if assumptions in the extent-of-condition review remain valid</li> <li>• If degradation associated with infrequent operational alignment, such as surveillances or pump starts/stops, then trending activities may need to consider the number or duration of these occurrences</li> <li>• Periodic wall thickness measurements of replacement components may be required and should continue until the effectiveness of corrective actions has been confirmed</li> <li>• Components are suitable for continued service if calculations determine that the predicted wall thickness at the next scheduled inspection will meet the minimum allowable wall thickness</li> <li>• A conservative safety factor is applied to the predicted wear rate determination to account for uncertainties in the wear rate calculations</li> </ul>	The purpose of this question is to ensure consistency with the 10 program elements of AMP XI.M17 in GALL-SLR.

			<p>and UT measurements (should not be less than 1.1)</p> <ul style="list-style-type: none"> <li>• Replaced components should remain in the inspection program because FAC-resistant materials do not protect against erosion mechanisms</li> <li>• When carbon steel piping components are replaced with FAC-resistant material, the susceptible components immediately downstream should be monitored to identify any increased wear due to the “entrance effect”</li> </ul>	
8			<p>Section 4.1 of SLR-ONS-AMPR-XI.M17 states, in part, “... FAC-susceptible components such as pumps, valve bodies, and heat exchangers...” However, the NRC staff notes that no AMR items to manage FAC and/or erosion of heat exchangers is included in the SLRA. In addition, it is unclear if “piping and piping components” is being used to represent heat exchangers.</p> <p>Please confirm if the Oconee FAC program manages wall thinning due to FAC and/or erosion of heat exchangers and, if it does, how is it represented in the SLRA?</p>	<p>The NRC staff is seeking clarification on whether the Oconee FAC program manages wall thinning due to FAC and/or erosion for heat exchangers.</p>
9	3.3.2.1.41	3-397, 3-867	<p>The Oconee Nuclear Station Unit 1 Erosion Susceptibility Analysis (ESA) Technical Report BP-2017-0041-TR-01 states that the Vacuum System is susceptible to erosion. However, SLRA Section 3.3.2.1.41 does not identify wall thinning as an applicable aging effect or the FAC program to manage wall thinning. In addition, SLRA Table 3.3.2-41 does not include AMR items for managing wall thinning by the FAC program.</p> <p>Please confirm whether wall thinning due to FAC and/or erosion are applicable aging effects for the Vacuum System.</p>	<p>The NRC staff is seeking clarification on whether wall thinning due to FAC and/or erosion are applicable aging effects for the Vacuum System.</p>

10			<p>Section 4.7 of SLR-ONS-AMPR-XI.M17 states, "The effectiveness of these corrective actions is verified by performing baseline wall thickness measurements followed by re-inspections within three cycles to establish a new wear rate." However, Section 5.13 of Revision 5 of AD-EG-ALL-1610, "Flow Accelerated Corrosion Implementation," states, "Follow-up inspections to previously baselined components should NOT extend past 5 cycles."</p> <p>Please confirm when re-inspections will occur after the baseline inspection following corrective actions.</p>	<p>The NRC staff is seeking clarification on when re-inspections will occur after the baseline inspection following corrective actions.</p>
11			<p>On the portal, under Flow Accelerated Corrosion – Implementing Documents, Revision 5 of AD-EG-ALL-1610 is provided. However, under Flow Accelerated Corrosion – Markups, Revision 4 of AD-EG-ALL-1610 is provided as a markup.</p> <p>Please address the discrepancy in the revision number.</p>	<p>The NRC staff is seeking clarification on which revision of AD-EG-ALL-1610 will be revised.</p>