

**Westinghouse UK**  
**AP1000® GENERIC DESIGN ASSESSMENT**  
**Resolution Plan for GI-AP1000-SI-02**  
**Fatigue Analysis**

MAIN ASSESSMENT AREA	RELATED ASSESSMENT AREA(S)	RESOLUTION PLAN REVISION	GDA ISSUE REVISION
Structural Integrity	-	1	0

<b>GDA ISSUE:</b>	Fatigue Analysis of ASME III Class 1 Piping.
<b>ACTION: GI-AP1000-SI-02.A1</b>	<p>Provide sufficient evidence to show that ASME III Class 1 pipework has an adequate fatigue life for the 60 year design life of the reactor.</p> <p>Activities by Westinghouse should comprise:</p> <ul style="list-style-type: none"> <li>• Provide sufficient evidence to show that ASME III Class 1 pipework has an adequate fatigue life for the 60 year design life of the reactor.</li> <li>• Provide adequate responses to any questions arising from assessment by ONR of documents submitted.</li> </ul> <p>With agreement from the Regulator this action may be completed by alternative means.</p>

<b>RELEVANT REFERENCE DOCUMENTATION RELATED TO GDA ISSUE</b>	
<b>Technical Queries</b>	TQ-AP1000-1137
<b>Regulatory Observations</b>	RO-AP1000-26.A2
<b>Other Documentation</b>	APP-RCS-PLR-040 APP-GW-POC-020 APP-PL02-Z0-001

<b>Scope of work:</b>
<p>The key activities which will need to be completed to close this GDA Issue are:</p> <ul style="list-style-type: none"> <li>• Provide sufficient evidence to show that ASME III Class 1 pipework has an adequate fatigue life for the 60 year design life of the reactor.</li> </ul>

<b>Description of work:</b>
<p><b>AP1000®</b> design criteria requires fatigue analysis to be completed for all ASME class 1 pipework larger than 1" (2.54 cm) nominal diameter. The ASME Class 1 Piping Design Specification (APP-PL02-Z0-001) requires that all ASME Class 1 piping have fatigue analysis that demonstrates a fatigue usage factor of less than 1 based on a 60 year design life. The methodology for performing this analysis has been provided in response to TQ-AP1000-1137. The piping fatigue analysis requires a series of analyses and design details to be completed in advance of performing the analysis to calculate the fatigue usage factor. As such, it is Westinghouse practice to undertake this analysis late in the design process once the required</p>

inputs have been finalised. This approach eliminates the need for unnecessary iteration of the analysis.

ONR has indicated that they require all ASME Class 1 piping fatigue analysis to be complete in order to close this issue. Since much of this work is not finalised until late in overall design and delivery process, Westinghouse's recommendation was to provide the assessment for the pressuriser surge line and the pressuriser spray lines to resolve this issue. These specific lines were selected as a representative sample based on RO-**AP1000**-26.A2, industry experience, and geometric configurations. The surge line has historically been a line of interest as a result of the potential for thermal stratification in the line, and the pressuriser spray lines were selected due to their unique geometry and the relative severity and number of thermal transients that these lines experience. However, Westinghouse will provide the remaining calculations as they are finalised.

**Schedule/ programme milestones:**

Because all Resolution Plan start dates are subject to future contract placements, dates are presently undefined; therefore schedule dates have been anonymised for consistency. Actual dates will be inserted when contracts are placed.

ID	Task Name	Duration	Y1												
			M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
1	<b>GI-AP1000-SI.02 Resolution Plan</b>	<b>271 days</b>													
2	<b>Action 1: ASME Class 1 Fatigue Analysis</b>	<b>271 days</b>													
3	Finalize Surge Line Fatigue Analysis	115 days													
4	Finalize Pressurizer Spray Line Fatigue Ana	115 days													
5	Finalize Remaining Class 1 Piping Fatigue A	226 days													
6	ND Review & WEC Support	155 days													

Project: Simple Resolution Plan Date: Thu 16/06/11	Task		Milestone		External Tasks	
	Split		Summary		External Milestone	
	Progress		Project Summary		Deadline	

**Methodology:**

The fatigue analysis is completed in accordance with ASME Section III. The general **AP1000** methodology for performing the piping fatigue analysis is outlined in APP-GW-POC-020, which was provided in response to TQ-**AP1000**-1137.

**Justification of adequacy:**

Adequacy is achieved by demonstration a fatigue usage factor of less than 1 based on a 60 year design life.

Timely closure of the actions defined in this Issue will be reached through maintaining quality interaction with ONR and using existing processes to assure closure of open items.

**Impact assessment:**

The impact related to the resolution of this Issue on previous GDA submittals will be minimal. It has always been an **AP1000** design requirement to demonstrate that the end of life fatigue usage factor is less than unity. The PCSR and supporting component safety report already contain the requirement regarding the fatigue usage factor for the ASME Class 1 piping. Therefore, no change to the PCSR or the component safety report for the Class 1 piping will be required as a result of this GDA Issue.

As an existing design requirement, the closure of this issue should not require design changes. This issue will be closed by providing the supporting analysis to demonstrate that the fatigue usage factors are less than unity.