

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	-	3	0

GDA ISSUE:	Fatigue Analysis of ASME III Class 1 Piping.
ACTION: GI-AP1000-SI-02.A1	<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"> • 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. • Provide adequate responses to any questions arising from assessment by ONR of documents submitted. <p>With agreement from the Regulator this action may be completed by alternative means.</p>
RELEVANT REFERENCE DOCUMENTATION RELATED TO GDA ISSUE	
Technical Queries	TQ-AP1000-1137
Regulatory Observations	RO-AP1000-26.A2
Other Documentation	APP-RCS-PLR-040 APP-GW-P0C-020 APP-PL02-Z0-001

Scope of work:
<p>The key activities which will need to be completed to close this GDA Issue are:</p> <ul style="list-style-type: none"> • 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.

Description of work:
<p>AP1000® 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 had been provided in response to TQ-AP1000-1137. It has since been updated. An updated methodology description will be provided together with the fatigue analyses. The piping fatigue analysis requires a</p>

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 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. Westinghouse will make all ASME Class 1 piping fatigue analyses available for review.

The deliverables for the resolution of this issue will be:

- Updated methodology for performing **AP1000** fatigue analysis
- Piping fatigue analyses calculations for all ASME Class 1 pipework larger than 1” (2.54 cm) nominal diameter (available for review)

Schedule/ programme milestones:

Please see the following page for the schedule.

Activity Name	2015									2016											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
UK Generic Design Assessment (GDA) Resolution Plans (51)																					
STRUCTURAL INTEGRITY																					
SI.02 Fatigue Analysis-Resolution Plan																					
SI.02 Fatigue Analysis Calc Notes/Data																					
Fatigue Analysis Methodology Road Map - Submit to ONR																					
Fatigue Analysis Methodology Road Map - ONR Review of Submittal																					
Fatigue Analysis Calcs (11) - Available for ONR Review																					
ONR Selected Fatigue Analysis Calcs - ONR Review (If Required)																					

Methodology:

The fatigue analysis is completed in accordance with ASME Section III. The general **AP1000** methodology for performing the piping fatigue analysis was outlined in APP-GW-POC-020, which was provided in response to TQ-**AP1000**-1137. It has since been updated. The updated methodology will be provided and the piping fatigue analysis calculations will be available for review.

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.