

**Westinghouse UK**  
**AP1000® GENERIC DESIGN ASSESSMENT**  
**Resolution Plan for GI-AP1000-EE-01**  
**PCSR Presentation of Claims, Arguments and Evidence**

MAIN ASSESSMENT AREA	RELATED ASSESSMENT AREA(S)	RESOLUTION PLAN REVISION	GDA ISSUE REVISION
Electrical	-	3	0

<b>GDA ISSUE:</b>	<p>Westinghouse is required to produce, within the PCSR, the claims arguments and evidence to substantiate the design of the complete plant electrical distribution system. The claims made for the electrical system need to be related to the overall safety claims for the plant. Chapter 18 of the PCSR does not meet the above requirements to demonstrate the safety and integrity of the design of the electrical distribution system. Clear safety claims are not presented and there is no structure of arguments and evidence to substantiate the design.</p>
<b>ACTION: GI-AP1000-EE-01.A1</b>	<p>Westinghouse is required to produce a revised PCSR Chapter 18 to substantiate the design of the complete plant electrical distribution system. This needs to incorporate a structure of claims, arguments and evidence to demonstrate that the electrical system fully meets the requirements of its safety role as specified in the other chapters of the PCSR. ONR's expectations are that the PCSR should provide a rigorous justification for the completeness of the electrical power distribution system to perform its safety role. The current issue of Chapter 18 does not meet our regulatory expectations as follows:</p> <ul style="list-style-type: none"> <li>• The PCSR does not provide a clear justification of the safety of the <b>AP1000®</b> electrical distribution system. References to other sections of the PCSR do not provide any detail to relate to the overall plant safety claims.</li> <li>• There is no clear structure of claims, arguments and evidence and it is difficult to determine what the actual safety claims are due to a considerable degree of ambiguity.</li> <li>• The electrical chapter of the PCSR principally addresses the reactor; the cooling ponds are not adequately covered.</li> <li>• The description of each constituent part of the electrical system has been presented as a Safety Assessment Principles (SAP) compliance</li> </ul>

	<p>document. The PCSR needs to consider the complete system and needs to substantiate this design rather than only addressing SAP compliance.</p> <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>	
<b>Regulatory Observations</b>	RO- <b>AP1000</b> -077
<b>Other Documentation</b>	<ul style="list-style-type: none"> <li>• UKP-GW-GL-793, Rev. 0, “<b>AP1000</b> Pre-Construction Safety Report”, March 2011</li> <li>• UKP-GW-GL-065, Rev. 1 “UK <b>AP1000</b> Electrical Equipment Maintenance”, December 2010</li> </ul>

<b>Scope of work:</b>
<p>ONR requests that Chapter 18 (Electrical Power Systems) of the <b>AP1000</b> Pre-Construction Safety Report (PCSR) be revised to better substantiate the safety and integrity of the <b>AP1000</b> electrical distribution system design. Specifically, ONR has reported that the PCSR does not provide clear safety claims and there is no structure to the arguments and evidence to substantiate the design. Westinghouse will create a separate new Basis of Safety Case document that describes the claims, arguments and evidence and complements the PCSR. Westinghouse will consider common cause failures when discussing the safety claims in the Basis of Safety Case document. In addition to the GDA Issue, Westinghouse and ONR had more detailed discussions about the PCSR during GDA Level 4 meetings.</p>

<b>Description of work:</b>
<p>Technical discussions in the Electrical Assessment area were held during GDA Level 4 meetings between Westinghouse and ONR on 11 – 12 January 2011 and on 4 – 5 May 2011. It was agreed at these meetings that Westinghouse will revise Chapter 18 of the PCSR (Electrical Power Systems) based on observations provided by ONR at these meetings. High level observations on Chapter 18 of the PCSR are as follows:</p> <ol style="list-style-type: none"> <li>1. The PCSR Electrical chapter does not provide a clear justification for the safety case for the <b>AP1000</b> electrical system. A greater level of detail is expected by ONR.</li> <li>2. The structure of claims, arguments and evidence in the PCSR electrical chapter is not clear.</li> <li>3. Electrical support for the systems used for spent fuel pool cooling is not adequately covered. The PCSR will need to be revised to substantiate the reliability claims of the active cooling systems.</li> <li>4. The ability to perform maintenance of the electrical equipment is not adequately covered. A greater level of detail is expected by ONR concerning the ability of certain pieces of electrical equipment to be taken out of service for maintenance</li> </ol>

during operations at power as well as during shutdown periods. Considerations will centre around the power requirements needed for operations, refueling, core offloads and maintaining spent fuel cooling. This will require revision of the UK **AP1000** Electrical Equipment Maintenance document (UKP-GW-GL-065) as well as the PCSR.

5. The requirements of the battery systems in relation to safe reactor shutdown is not clear.

PSA input will be required to substantiate the PCSR claims, in particular those associated with electrical equipment maintenance and electrical support for spent fuel pool cooling. Westinghouse PSA engineers will work with the appropriate systems and equipment engineers to ensure that the appropriate PSA input is included. The PSA input will include risk importance factors from taking equipment out of service for maintenance.

Resolution of other GDA Issues in other technical areas will affect the input to the electrical safety case and this resolution plan. Specifically, the resolution of the following GDA Issues are anticipated to provide input to the electrical safety case:

- GI-**AP1000**-FS-01 (Spent Fuel Pool Safety Case)
- GI-**AP1000**-C&I-01 (DAS - Adequacy of Safety Case)
- GI-**AP1000**-C&I-02 (DAS – Adequacy of Architecture)
- GI-**AP1000**-C&I-05 (SMART Devices – Justification for Use)

To be clear, this resolution plan does not cover resolution of these other GDA Issues, but acknowledges that their resolution will affect input to the electrical safety case.

The deliverables to ONR to resolve this GDA Issue are as follows:

- Outline of the revised PCSR electrical chapter including a table of contents showing the higher level section titles, a listing of the electrical claims and how they will be supported, examples of how the structure of the final document will look, format of the final document, etc.
- List of references that will go into the completed PCSR electrical chapter
- Outline of the Electrical support of SFP Cooling to be placed in the revised PCSR electrical chapter
- Revised Electrical support of SFP Cooling discussion in the PCSR electrical chapter consistent with the resolution of GI-**AP1000**-FS-01
- The Maintenance Document will be formatted to demonstrate that electrical equipment can be adequately maintained while complying with the safety case.
- Revised UK **AP1000** Electrical Equipment Maintenance document (UKP-GW-GL-065)
- Revised discussion in the PCSR electrical chapter about the required minimum electrical equipment availability to support for maintenance activities consistent with the revised UK **AP1000** Electrical Equipment Maintenance document
- Revised battery discussion in the PCSR electrical chapter providing a more accurate discussion of the batteries role in shutting down the plant
- Revised DAS discussion substantiating the Electrical support of DAS consistent with the resolution of GI-**AP1000**-C&I-01 and GI-**AP1000**-C&I-02
- Revised Software Verification and Validation of software supporting electrical equipment consistent with the resolution of GI-**AP1000**-C&I-05

- Revised agreed draft of the PCSR electrical chapter
- Initial outline of the Basis of Safety Case document that supplements chapter 18 of the PCSR
- Completed Basis of Safety Case document

Each of the above deliverables will require interim reviews and discussions with ONR and documented agreement, where appropriate.

#### **Schedule/ programme milestones:**

The programme milestones will be the draft documents, Westinghouse/ONR meetings/teleconferences and documented agreement of the deliverables:

- Outline of the revised PCSR electrical chapter including a table of contents showing the higher level section titles, a listing of the electrical claims and how they will be supported, examples of how the structure of the final document will look, format of the final document, etc.
- List of references that will go into the completed PCSR electrical chapter
- Outline of the Electrical support of SFP Cooling to be placed in the revised PCSR electrical chapter
- Revised Electrical support of SFP Cooling discussion in the PCSR electrical chapter consistent with the resolution of GI-**AP1000**-FS-01
- Maintenance Document will be formatted to demonstrate that electrical equipment can be adequately maintained while complying with the safety case.
- Revised UK **AP1000** Electrical Equipment Maintenance document (UKP-GW-GL-065)
- Revised discussion in the PCSR electrical chapter about the required minimum electrical equipment availability to support for maintenance activities consistent with the revised UK **AP1000** Electrical Equipment Maintenance document
- Revised battery discussion in the PCSR electrical chapter providing a more accurate discussion of the batteries role in shutting down the plant
- Revised DAS discussion substantiating the Electrical support of DAS consistent with the resolution of GI-**AP1000**-C&I-01 and GI-**AP1000**-C&I-02
- Revised Software Verification and Validation of software supporting electrical equipment consistent with the resolution of GI-**AP1000**-C&I-05
- Revised agreed draft of Chapter 18 of the PCSR electrical chapter
- Initial outline of the Basis of Safety Case document that supplements chapter 18 of the PCSR
- Completed Basis of Safety Case document

Please see the following page for the schedule.

#	Activity Name	2015												2016								
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	<b>BL5 11202015-UK Generic Design Assessment (GDA) Resolution Plans (51)</b>																					
2	<b>ELECTRICAL ENGINEERING</b>																					
3	<b>EE.01 PCSR Presentation of Claims Arguments &amp; Evidence-Resolution Plan</b>																					
4	<b>EE.01 Maintenance Philosophy document (UKP-GW-GL-065 Rev. 2)</b>																					
5	Maintenance Philosophy Document (UKP-GW-GL-065 Rev. 2) - Submit to ONR																					
6	Maintenance Philosophy Document (UKP-GW-GL-065 Rev. 2) - ONR Review of Submittal																					
7	<b>EE.01 Maintenance Philosophy document (UKP-GW-GL-065 Rev. 3)</b>																					
8	Maintenance Philosophy Document (UKP-GW-GL-065 Rev. 3) - Submit to ONR																					
9	Maintenance Philosophy Document (UKP-GW-GL-065 Rev. 3) - ONR Review of Submittal																					
10	<b>EE.01 BSC - Basis of Safety Case</b>																					
11	<b>EE.01 Outline of BSC</b>																					
12	BSC Outline-Submit to ONR																					
13	BSC Outline-ONR Review of Submittal																					
14	<b>EE.01 BSC - Basis of Safety Case FINAL Document</b>																					
15	BSC - Basis of Safety Case FINAL Document - Submit to ONR for Review																					
16	BSC - Basis of Safety Case FINAL Document-ONR Review of Submittal																					
17	<b>EE.01 PCSR (Chapter 18)</b>																					
18	<b>EE.01 PCSR-Chapter 18 Final Doc. (DRAFT #1)</b>																					
19	PCSR-Chapter 18 Final Doc. (DRAFT #1)-Submit to ONR																					
20	PCSR-Chapter 18 Final Doc. (DRAFT #1)-ONR Review of Submittal																					

**Methodology:**

Revised documents will be drafted and reviewed with ONR. Once agreement is established between Westinghouse and ONR for the deliverables documentation of the agreement will be provided.

**Justification of adequacy:**

The process for resolution of this GDA Issue includes deliverables and milestones agreed between Westinghouse and ONR.

**Impact assessment:**

The PCSR electrical chapter (Chapter 18) and the UK **AP1000** Electrical Equipment Maintenance document (UKP-GW-GL-065) will be revised to reflect the outcome of this GDA issue resolution.