

**Westinghouse UK**  
**AP1000<sup>®</sup> PLANT GENERIC DESIGN ASSESSMENT**  
**Resolution Plan for GI-AP1000-ME-03**  
**Mechanical System Pipework Design**

MAIN ASSESSMENT AREA	RELATED ASSESSMENT AREA(S)	RESOLUTION PLAN REVISION	GDA ISSUE REVISION
Mechanical	Structural Integrity Radiation Protection Radwaste Environment Agency	4	0

<b>GDA ISSUE:</b>	Westinghouse is required to provide further justification for the pipework design of the <b>AP1000<sup>®</sup></b> plant for systems important to safety. In particular Westinghouse is required to justify that the <b>AP1000</b> plant system designs incorporate adequate isolation and drainage arrangements to enable all anticipated EMIT activities to be carried out in a safe and controlled manner.
<b>ACTION: GI-AP1000-ME-03.A1</b>	<p>Westinghouse shall generate the arguments and evidence to justify that each isolation that proposes to use pipe freezing technology is ALARP.</p> <p>Westinghouse's proposal to use pipe freezing technology to provide process isolation in support of their planned EMIT regime is considered not to be good engineering practice for the anticipated isolation requirements for a new reactor design, but rather a technology utilised to recover from a scenario that has not been generally predicted.</p> <p>ONR considers that good engineering practice for a new modern NPP incorporates adequate engineered arrangements for anticipated and planned process isolation to support EMIT activities.</p> <p>ONR's expectation is for Westinghouse to review their design and either revise their proposal in line with ONR expectations or demonstrate with appropriate arguments and evidence that the anticipated process isolations that propose the use of pipe freezing technology are ALARP. With agreement from the Regulator this action may be completed by alternative means.</p>

<p><b>ACTION: GI-AP1000-ME-03.A2</b></p>	<p>Westinghouse shall generate the arguments and evidence to justify that EMIT isolations that rely on single valve isolations are ALARP.</p> <p>The IRWST isolation is provided by a single isolation valve to undertake EMIT of the injection squib valves. This does not achieve ONR expectations when considering the IRWST has a capacity circa 2100m<sup>3</sup> and if the single isolation valve was to fail (in its isolation function) then a significant hazard would arise. The system design does not have any other provision to contain the fluid within the IRWST.</p> <p>ONR considers a system isolation first design choice is provided by a suitable valve arrangement, with double valve isolation being provided for systems that are subject to a significant pressure, or temperature, or where there is some other significant hazard e.g. a large volume of fluid is held back.</p> <p>ONR's expectation is for Westinghouse to review their design and either revise their proposal in line with ONR expectations or demonstrate with appropriate arguments and evidence that all anticipated isolations that propose to use single isolation that are the subject of either a significant pressure, temperature or some other significant hazard are ALARP.</p> <p>With agreement from the Regulator this action may be completed by alternative means.</p>
<p><b>ACTION: GI-AP1000-ME-03.A3</b></p>	<p>Westinghouse shall generate the arguments and evidence to justify that all process pipework designs are adequately engineered to provide drainage facilities to enable the anticipated EMIT activities to be carried out in a safe and controlled manner.</p> <p>Isolation of the motor operator valve to allow EMIT to be carried out on the 4th Stage Squib valves requires the downstream leg of fluid to be drained by ad hoc means i.e. splitting of flanges and use of temporary fluid collection containers. This is an example of the <b>AP1000</b> design not incorporating adequate engineered arrangements for carrying out anticipated EMIT in a safe and controlled manner.</p> <p>ONR considers that a system design should incorporate adequate engineered arrangements to enable the process pipework to be drained in a safe and controlled manner.</p> <p>ONR's expectation is for Westinghouse to review their design and either revise their proposal in line with ONR expectations or demonstrate with appropriate arguments and evidence that the <b>AP1000</b> design incorporates</p>

	adequate engineered drainage facilities to enable anticipated EMIT activities to be carried out in a safe and controlled manner. With agreement from the Regulator this action may be completed by alternative means.
<b>RELEVANT REFERENCE DOCUMENTATION RELATED TO GDA ISSUE</b>	
<b>Technical Queries</b>	TQ- <b>AP1000</b> -1062
<b>Regulatory Observations</b>	RO- <b>AP1000</b> -036
<b>Other Documentation</b>	Pipe Freezing for Maintenance Isolation  Squib Valve Concept and Design Substantiation  Step 4 - Mechanical Engineering Assessment of the Westinghouse <b>AP1000</b> Plant  SAPs – EMT series; TAGs - Maintenance, Inspection & Testing SSCs

<b>Scope of work:</b>
Westinghouse will provide a comprehensive review of the <b>AP1000</b> plant system designs to either justify that the systems incorporate adequate isolation and drainage arrangements to enable all anticipated EMIT activities to be carried out in a safe and controlled manner or, where warranted, will propose alternative design solutions.  This will include identifying the locations for the use of freeze seal technology and providing substantiating evidence or alternative solutions, identifying the locations of single valve isolation and providing justification that undertaking EMIT using the proposed isolation technique in the identified locations is ALARP or alternative solutions and identifying temporary drain locations and providing justification that the use of temporary drains for identified EMIT activities is ALARP or alternative solutions that are ALARP.

<b>Description of work:</b>
Westinghouse will be providing a separate document for each of the three GDA Issue actions as described below. The three documents will either provide sufficient arguments and evidence to justify that the use of freeze seal technology, the use of single valve isolation for identified EMIT activities and the use of temporary drain arrangements for identified EMIT activities are ALARP, or they will identify ALARP design solutions.  Westinghouse will resolve the GDA Issue actions in the following three phases:

- Assessment of each freeze seal application.
- Assessment of single valve EMIT isolations.
- Assessment of pipe work drainage features.

#### **Action A-1 – Assessment of each freeze seal application**

Westinghouse will first identify and tabulate the planned location of each valve and respective freeze seal. For each identified location, Westinghouse will:

- Develop screening criteria to align Westinghouse and ONR expectations on scope of work and present to ONR at the start of the process to reduce risk. The scope of this screening process applies to all SSCs attracting a safety classification.
- Collect evidence and reasoning for use of freeze seals.
- Identify the likely frequency of freeze seal application.
- Confirm that the freeze seal location meets application criteria.
- Identify alternative isolation options.
- Define ALARP criteria including but not limited to:
  - Comparison with relevant good practice.
  - Implications of radiological protection on the proposed methods.
  - Implications to the plant integrity on the proposed methods.
  - Management and implications of radioactive waste associated with the proposed methods.
- Provide an ALARP justification for each freeze seal location.
- Summarise the ALARP justification for choice of freeze seals or conclude that there is an ALARP alternative design.

A document will be submitted to the ONR providing the above information. Once an agreement is reached with ONR on the ALARP assessment and the associated conclusions, Westinghouse will implement as appropriate.

#### **Action A-2 – Assessment of single valve EMIT isolations**

Westinghouse will first identify and tabulate each situation where EMIT will rely on single

valve isolation. For each identified situation, Westinghouse will:

- Develop screening criteria to align Westinghouse and ONR expectations on scope of work and present to ONR at the start of the process to reduce risk. The scope of this screening process applies to all SSCs attracting a safety classification.
- Identify alternative isolation options.
- Identify the frequency of required isolation for EMIT.
- Define ALARP criteria for assessing each “single valve” location including but not limited to:
  - Comparison with relevant good practice.
  - Implications of radiological protection on the proposed methods.
  - Management and implications of radioactive waste associated with the proposed methods.
- Perform ALARP assessment for each “single valve” location.
- Summarise the ALARP justification for not installing additional isolation valves or conclude that there is an ALARP alternative design.

A document will be submitted to the ONR providing the above information. Once an agreement is reached with ONR on the ALARP assessment and the associated conclusions, Westinghouse will implement as appropriate.

### **Action A-3 – Assessment of pipe work drainage features**

Westinghouse will first identify all system drain locations and then tabulate the planned locations for temporary drain lines. For each identified location, Westinghouse will:

- Develop screening criteria to align Westinghouse and ONR expectations on scope of work and present to ONR at the start of the process to reduce risk. The scope of this screening process applies to all SSCs attracting a safety classification.
- Identify alternatives to temporary drains.
- Collect evidence and reasoning for use of temporary drains (temporary modifications).
- Identify the likely frequency of use of temporary drains.

- Define ALARP criteria for use of temporary drains including but not limited to:
  - Comparison with relevant good practice.
  - Implications of radiological protection on the proposed methods.
  - Implications to the plant integrity on the proposed methods.
  - Management and implications of radioactive waste associated with the proposed methods.
- Provide an ALARP justification for each drain.
- Summarise the ALARP justification for use of temporary drain or conclude that there is an ALARP alternative design.

A document will be submitted to the ONR providing the above information. Once an agreement is reached with ONR on the ALARP assessment and the associated conclusions, Westinghouse will implement as appropriate.

**Schedule/ programme milestones:**

Please see the following page for the schedule.

#	Activity Name	2016												017	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Jan
1	<b>BL5 11202015-UK Generic Design Assessment (GDA) Resolution Plans (51)</b>														
2	<b>MECHANICAL ENGINEERING</b>														
3	<b>ME.03 EMIT &amp; Systems Isolation Arrangements-Resolution Plan</b>														
4	<b>ME.03 UKP-GW-GL-102: AP1000® Plant Assessment of Freeze Seals (A1)</b>														
5	UKP-GW-GL-102: Freeze Seal-Submit to ONR														
6	UKP-GW-GL-102: Freeze Seal-ONR Review of Submittal														
7	<b>ME.03 UKP-GW-GL-103: AP1000® Plant Assessment of Single Valve EMIT Isolations (A2)</b>														
8	UKP-GW-GL-103: Single Isolation Valve-Submit to ONR														
9	UKP-GW-GL-103: Single Isolation Valve-ONR Review of Submittal														
10	<b>ME.03 UKP-GW-GL-104: AP1000® Plant Assessment of Pipe Work Drainage Features (A3)</b>														
11	UKP-GW-GL-104: Pipe Drainage-Submit to ONR														
12	UKP-GW-GL-104: Pipe Drainage-ONR Review of Submittal														

**Methodology:**

As listed in the Description of Work.

**Justification of adequacy:**

The three documents that will be provided by Westinghouse will thoroughly cover the respective topics discussed above. The work will follow the general format of:

1. Identification of the locations for freeze seal use, single valve isolation or the use of temporary drains, with screening criteria used to ensure Westinghouse and ONR are in alignment on scope of identification and present to ONR at the start of the process to reduce risk. The scope of this screening process applies to all SSCs attracting a safety classification.
2. Collection of evidence and reasoning for the existing design solution.
3. Definition of design alternatives.
4. Definition of ALARP criteria.
5. Completion of ALARP study to compare and contrast design options.
6. Recommendation of design solution alternatives if appropriate.

ALARP arguments identifying and comparing alternatives will substantiate the **AP1000** plant system designs related to isolation and drainage arrangements to enable all anticipated EMIT activities to be carried out in a safe and controlled manner or will provide arguments for proposed, alternative design solutions.

**Impact assessment:**

The following documents are anticipated to be effected:

- Master Submission List
- Roadmap