

<b>REGULATORY OBSERVATION</b>	
<b>REGULATOR TO COMPLETE</b>	
<b>RO unique no.:</b>	RO-ABWR-0065
<b>Date sent:</b>	20th October 2015
<b>Acknowledgement required by:</b>	10th November 2015
<b>Agreement of Resolution Plan Required by:</b>	15th November 2015
<b>Resolution of Regulatory Observation required by:</b>	31st January 2016
<b>TRIM Ref.:</b>	2015/390786
<b>Related RQ / RO No. and TRIM Ref. (if any):</b>	RO-ABWR-0015, RO-ABWR-0016, RO-ABWR-0017, RO-ABWR-0054, RQ-ABWR-0506 and Subsequent Draft RO
<b>Observation title:</b>	Demonstration of adequate design and implementation of inherently safe techniques and structures to minimise radiation dose rates via through wall penetrations during all operating modes and for the lifetime of the facility, whilst being cognisant of design requirements relating to other discipline areas.
<b>Technical area(s)</b> 10. Radiation Protection & (Level 3 PSA) 15. Radwaste & Decommissioning	<b>Related technical area(s)</b> 1. Internal Hazards 2. Civil Engineering 5. Fault Studies 6. Control & Instrumentation 7. Electrical Power Supply 11. Mechanical Engineering 12. Structural Integrity 16. Conventional Safety & Decommissioning 19. Fire Safety 21. Generic Environmental Permitting
<b><i>Regulatory Observation</i></b>	
<p>During Step 3 of GDA, ONR's review has identified a number of shortfalls in the Hitachi-GE proposed solution for the replacement of "Lead Wool" as circumferential shielding material around pipework penetrations through shielding walls. These shortfalls relate to the proposed solution for those penetrations where lead wool was to be used and also to the perceived lack of an integrated approach to the design of penetrations which would demonstrate that exposures would be reduced so far as low as is reasonably practicable. It should be noted that the design of penetrations through shield walls needs to take account of other hazard potentials and potentially competing requirements from other specialisms. It should also be noted that this RO requires the consideration of all operating modes and for the lifetime of the facility.</p> <p>An important area for shielding design is the specification for management of through wall penetrations to minimise and or prevent - shine paths for radiations into areas of lower zone classification thereby increasing the general or local radiation dose rate in the adjacent area. This can impact both routine and non-routine activities within the area. It is important to ensure these penetrations are adequately designed to either remove the potential for elevated dose rates in adjacent areas or to minimise this to a level that is considered ALARP. Since this is a cross cutting issue it is important to note that a number of disciplines/specialisms and their associated hazards need to be considered when addressing this RO. Such hazards include: poor quality working atmosphere including oxygen depletion, airborne contamination, both radiological and contamination through the adequate management of the HVAC systems and local extract arrangements; fire prevention and control through adequate compartmentalisation; and the impact on those services which require penetrations such as: electrical, C&amp;I, HVAC and finally the Civil Engineering requirements of the Civil Structure itself.</p> <p>Through wall penetrations in the Japanese ABWR utilise lead wool as a means of ensuring that the radiation shine path is blocked. There is a potential that the lead can become contaminated and this material is usually difficult to dispose of when contaminated. Lead wool is not used in the UK for modern facilities and a number of other solutions can be applied to reducing dose from through wall penetrations. This issue was last</p>	

discussed with Hitachi-GE in April 2015 (Ref: 2015/169882).

The objective of this RO is to:

- a) State ONR's expectations related to the design for Shielding Penetrations
- b) Request Hitachi-GE to demonstrate how it will implement a design approach that meets ONR expectations for the design of the UKABWR

This RO is cross cutting and multidisciplinary and linked with other ROs raised in the UKABWR GDA process. The response to this RO, in conjunction with the other ROs ultimately needs to show that the design of the UKAWBR and associated facilities have controlled risks SFAIRP (So Far As Is Reasonably Practicable) to ensure that the risks and associated radiation exposures are ALARP (As Low As Is Reasonably Practicable). This RO may have impacts on other technical areas and on submissions already provide or scheduled to be submitted to ONR or EA for example in radwaste and Decommissioning and Mechanical Engineering.

ONRs expectation is that the design should be inherently safe. ONR is aware of technology used routinely to aid in ensuring that structural penetrations are at 90 degree angles to (such as walls and floors) are designed in such a way that radiation is blocked from leaving one room and entering another whilst providing inherently safe structures. This technology colloquially known as "Joggle Boxes" is in routine use and therefore it is considered relevant good practice (RGP). The use of such technology also reduces the need for maintenance.

**The SAPs Require Good Engineering principles to be applied specifically:**

**EKP1 Inherent Safety which states "The underpinning safety aim for any nuclear facility should be an inherently safety design, consistent with the operational purposes of the facility.**

**EKP2: 'The sensitivity of the facility to potential faults should be minimised.'**

**EKP3: 'Nuclear facilities should be designed and operated so that defence in depth against potentially significant faults or failures is achieved by the provision of multiple independent barriers to fault progression**

### **Regulatory Observation Actions**

#### **RO-ABWR-0065.A1**

*Hitachi-GE to provide a Resolution Plan detailing the process to be followed and how it intends to comply with the remaining actions*

**Resolution required by 'to be determined by Hitachi-GE Resolution Plan'**

#### **RO-ABWR-0065.A2**

*Hitachi-GE to Identify the number, location and configuration of penetrations through shielding structures within the UK ABWR generic design*

**Resolution required by 'to be determined by Hitachi-GE Resolution Plan'**

#### **RO-ABWR-0065.A3**

*Hitachi-GE to Identify the nature (i.e. radiation, type(s) and level of hazard posed by each penetration from the relevant radiation sources.*

**Resolution required by 'to be determined by Hitachi-GE Resolution Plan'**

#### **RO-ABWR-0065.A4**

*Hitachi-GE to Identify any potential competing requirements in relation to the penetrations identified*

**Resolution required by 'to be determined by Hitachi-GE Resolution Plan'**

#### **RO-ABWR-0065.A5**

NOT PROTECTIVELY MARKED

*Hitachi-GE to Identify a range of solutions which could be applied to the identified penetrations based on the results of the previous actions.*

**Resolution required by 'to be determined by Hitachi-GE Resolution Plan'**

**RO-ABWR-0065.A6**

*Hitachi-GE to report to ONR on the output of the previous actions*

**Resolution required by 'to be determined by Hitachi-GE Resolution Plan'**

**RO-ABWR-0065.A7**

*Hitachi-GE revise all relevant documentation including the PCSR accordingly to reflect the output of this RO*

**Resolution required by 'to be determined by Hitachi-GE Resolution Plan'**

**REQUESTING PARTY TO COMPLETE**

**Actual Acknowledgement date:**

**RP stated Resolution Plan agreement date:**