

<b>REGULATORY OBSERVATION</b>	
<b>REGULATOR TO COMPLETE</b>	
<b>RO unique no.:</b>	RO-ABWR-0056
<b>Date sent:</b>	06 <sup>th</sup> July 2015
<b>Acknowledgement required by:</b>	27th July 2015
<b>Agreement of Resolution Plan Required by:</b>	<i>To be determined by the Hitachi-GE Resolution Plan</i>
<b>Resolution of Regulatory Observation required by:</b>	<i>To be determined by the Hitachi-GE Resolution Plan</i>
<b>TRIM Ref.:</b>	2015/189425
<b>Related RQ / RO No. and TRIM Ref. (if any):</b>	RO-ABWR-0011, RO-ABWR-0037
<b>Observation title:</b>	Demonstration that adequate optioneering has been carried out for the removal of Spent Fuel from the Reactor Building.
<b>Technical area(s)</b> 15. Radwaste & Decommissioning	<b>Related technical area(s)</b> 1. Internal Hazards 2. Civil Engineering 4. PSA 5. Fault Studies 8. Fuel Design 10. Radiation Protection & (Level 3 PSA) 11. Mechanical Engineering 12. Structural Integrity 13. Human Factors 16. Conventional Safety & Decommissioning
<b>Regulatory Observation</b>	
<b>SUMMARY</b>	
<p>There is a need to show that for spent fuel removal out of the reactor building adequate optioneering has been carried out and that the approach being taken can demonstrate that the design reduces risks So Far As Is Reasonably Practicable (SFAIRP).</p> <p>The management of spent fuel from the reactor building is important given the potential risks posed to workers and members of the public by its inadequate execution. In particular addressing ONR's concerns about the consequences associated with high risk activities.</p> <p>The objective of this Regulatory Observation (RO) is to clearly define ONR's expectations for the demonstration of adequate optioneering. The response should be submitted to ONR by 31 July 2015.</p> <p>The scope of the optioneering required by this RO for the management of spent fuel covers the safe removal of spent fuel from the Spent Fuel Pool, loading the spent fuel into the transfer container and its export from the Reactor Building.</p> <p>Until this demonstration has been provided, which takes account of all relevant risks, ONR cannot form a judgement on whether the legal duty of controlling risks and reducing risks SFAIRP will be demonstrated in the spent fuel management safety case for UK ABWR.</p>	
<b>BACKGROUND</b>	
<p>Through Regulatory Observations RO-ABWR-0011 and RO-ABWR-0037, ONR has set out its requirement for a safety case to be provided for any building, system, process or activity on the UK ABWR site that could result in a person receiving a significant radiation dose or to the release of a significant quantity of radioactive material. The management of spent nuclear fuel and its export from the spent fuel pool is a clear example of where such a safety case is needed.</p> <p>ONR expects that a safety case should include an evaluation of the risks arising from faults in facilities by</p>	

using the techniques of design basis analysis, probabilistic safety analysis, and, if appropriate, severe accident analysis. However, it is not sufficient for Hitachi-GE to simply show compliance with identified risk targets and limits. It needs to demonstrate that the design has reduced risks SFAIRP. An important aspect of demonstrating that risks have been reduced SFAIRP is to use a rigorous optioneering process which has considered the full range of practicable solutions.

As a result, viable options have to be identified by the Requesting Parties to give the Regulators the required level of confidence that the operators can safely handle, store and dispose of spent fuel. A strategy/plan then needs to be developed to show that one of these options could be exploited and implemented. For spent fuel management the safety case will need to accommodate, or at least not preclude, likely future options. The safety case needs to consider all modes of operation, including the removal of spent fuel out of the spent fuel pool and out of the reactor building. The approach taken to the design of the reactor building in relation to spent fuel removal needs to demonstrate that it is ALARP. This will support a conclusion at the end of GDA that the management of spent fuel has been adequately addressed and that Hitachi-GE has implemented a robust design process and addressed issues in an organised way.

Without that evidence ONR is unable to judge whether the legal duty of controlling risks and reducing risks SFAIRP, also referred to, interchangeably, as ALARP, will be demonstrated.

This RO make's clear ONR's expectations regarding the demonstration of optioneering for the removal of spent fuel from the reactor building, this will form part of an ALARP justification. The work undertaken in response to this specific RO should be used or referenced as part of the broader requirements of RO-ABWR-0011 and RO-ABWR-0037 for a complete safety case for the UK ABWR.

#### **REGULATORY EXPECTATIONS.**

The objective of this RO is to define ONR's expectations for the demonstration of adequate optioneering for the export of spent fuel and the design of the associated infrastructure. The response should be submitted to ONR by 31 July 2015.

The management of spent fuel is an example of an activity where Hitachi-GE is able to influence and control the magnitude of the radiological hazards and their resultant risks posed by the UK ABWR design.

This RO is concerned with the approach taken to the management of spent fuel which includes:

- The import of equipment into the Reactor Building for the removal of spent fuel.
- Removal of the spent fuel out of the spent fuel pool.
- Loading of spent fuel into the transfer container
- The export of the spent fuel from the reactor building.

The impacts and options available to mitigate the identified risks may be outside of the spent fuel safety-case area, and should be demonstrated elsewhere (for example, shielding provisions). ONR would expect that adequate optioneering has been carried out to allow Hitachi-GE to demonstrate that the overall plant risks have been reduced SFAIRP, by whatever appropriate means.

#### **Further guidance on ONR's expectations is provided below:**

NS-TAST-GD-081 [1] contains more specific detailed guidance on ONR's expectations in relation to the management of spent fuel. ONR's expectations with respect to demonstrating ALARP are also given in NS-TAST-GD-005 [2]. The Health and Safety Executive (HSE) has also published (online) a suite of guidance on ALARP [3-5].

ONR expect Hitachi-GE to take due account of the principles and guidance set out in these documents when undertaking optioneering, which will be used in their ALARP demonstration for the spent fuel safety-case and approach taken to the management spent fuel removal for UK ABWR. More specifically, ONR would expect Hitachi-GE to include the following:

- a) **Relevant Good Practice (RGP):** ONR expects Hitachi-GE to apply RGP as a minimum. 'Relevant' means it should be appropriate to the activity and associated risks, and should be up to date. ONR will

form a judgement by comparing Hitachi-GE's proposed approach to spent fuel removal against RGP and good design principles.

As a guide, Hitachi-GE should aim and compare against levels of safety that are known to have been achieved in other designs. ONR expect that UK ABWR would not give rise to a risk level greater than that achieved by the existing practice for comparable functions. Where others are achieving a higher standard, ONR will challenge Hitachi-GE whether this standard is, in effect, good practice.

Common practice may not necessarily be good practice or reduce risks to ALARP and Hitachi-GE should not assume that it does. What is good practice may cease to be relevant with the passage of time and new technology may make a higher standard reasonably practicable.

- b) **Options and optioneering:** For UK ABWR a selection amongst options for removal of spent fuel from the reactor building is required.

An effective approach for demonstrating that risks are ALARP is to start with the safest option within the range of practicable solutions. This option should be chosen by Hitachi-GE unless they can show it is not reasonably practicable; in which case attention should pass to the next safest option. ONR will form a judgement as to whether the approach taken to spent fuel removal from the reactor building presented for UK ABWR reduces risks ALARP. This will include knowledge of relevant good practice in the area, ONR's consideration of other possible options, and our judgement of the arguments and evidence presented in Hitachi-GE's case.

To aid transparency in the ALARP demonstration, ONR would expect Hitachi-GE to record the range of options considered and discarded.

Thought should also be given to the robustness of the conclusions from the optioneering with respect to uncertainties and to any assumptions employed in the demonstration. Where a case uses quantitative methods, sensitivity studies to test the robustness of the arguments should be provided.

#### References:

- [1] Technical Assessment Guides, Safety Aspects Specific to Storage of Spent Nuclear Fuel, NS-TAST-GD-081, Revision 1, ONR,
- [2] Technical Assessment Guides, Guidance on the Demonstration of ALARP, NS-TAST-GD-005, Revision 6, ONR, September 2013.
- [3] Principles and Guidelines to Assist HSE in its Judgements that Dutyholders have Reduced Risk as Low as Reasonably Practicable.
- [4] Policy and Guidance on Reducing Risks as Low as Reasonably Practicable in Design.
- [5] HSE Principles for Cost Benefit Analysis in Support of ALARP Decisions.

#### **Regulatory Observation Actions**

**RO-ABWR-0056.A1** – *Hitachi-GE to provide a robust demonstration to show that adequate optioneering has been undertaken for the management of the loaded or empty transfer container for spent fuel.*

*This will include the following activities:*

1. *The import of equipment into the Reactor Building for the removal of spent fuel.*
2. *Removal of the spent fuel out of the spent fuel pool.*
3. *The export of the spent fuel from the Reactor building*

**Resolution required by:** *See resolution plan*

**RO-ABWR-0056.A2** – *Hitachi-GE to provide a robust demonstration to show that adequate optioneering has been undertaken for the loading of spent fuel into the transfer container.*

*This will include the following activities:*

1. *Loading of spent fuel into the transfer container*

**Resolution required by:** See resolution plan

Through these actions Hitachi-GE should provide a robust demonstration for the methods chosen for the removal of spent fuel from the reactor building for UK ABWR, which demonstrates that:

1. The option chosen reduces risks SFAIRP;
2. A process of optimisation has been followed which can be demonstrated to ONR in a transparent manner, and forms part of the safety case for UK ABWR.

ONR would expect such a response to include a clear description of:

3. What the risks are that are being mitigated, including likelihood and consequences of high risk activities.
4. What measures are in place to mitigate these risks, including the adoption of relevant good practice measures;
5. What options, or range of options, could be applied to further mitigate these risks; and
6. A demonstration of whether these options are reasonably practicable to implement or not.

ONR expect that the requirements given above, in addition to those in relevant ONR guidance, as referenced in this RO, will be included in the submission provided in response to this Action.

ONR recognise that some of the detailed supporting evidence that underpins the conclusions of this demonstration may not be available in a timescale compatible with this RO, however we would expect details of key supporting evidence (i.e. those which could materially change the conclusions) to be available, where reasonably practicable, along with details of other supporting evidence during later steps in GDA.

**REQUESTING PARTY TO COMPLETE**

**Actual Acknowledgement date:**

**RP stated Resolution Plan agreement date:**