

**Hitachi-GE Nuclear Energy, Ltd.**  
**UK ABWR GENERIC DESIGN ASSESSMENT**  
**Resolution Plan for RO-ABWR-0049**  
**(Mechanical Engineering – Dropped Load Countermeasures)**

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| <b>RO TITLE:</b>   | Mechanical Engineering – Dropped Load Countermeasures |  |
| <b>REVISION :</b>  | 1   |  |
| <b>Overall RO Closure Date (Planned):</b>                        | 11 Sep 2015   |  |
| <b>REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION</b> |   |  |
| <b>Regulatory Queries</b>  | RQ-ABWR-0001<br>RQ-ABWR-0264                          |  |
| <b>Linked ROs</b>  | RO-ABWR-0050  |  |
| <b>Other Documentation</b>                                       | -   |  |

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| <b>Scope of work :</b>  |
| <p>This Regulatory Observation (RO) has been raised due to ONR concerns regarding lifting of Main Steam Isolation Valves (MSIVs) and Safety Relief Valves (SRVs) for maintenance, and because ONR do not consider that the responses to RQ-ABWR-0001 and RQ-ABWR-0264 provide an adequate level of assurance of understanding of UK legislation requirements.</p> <p>The objective of the RO is to ensure the UK ABWR lifting sequences are aligned to UK legislation requirements and have been optioneered to reduce the risks So Far As Is Reasonably Practicable (SFAIRP).</p> <p>The regulatory expectations are that:</p> <ol style="list-style-type: none"> <li>1. The applicable UK legislation requirements associated with lifting sequences are identified, reviewed and understood.</li> <li>2. A review is undertaken of all lifting sequences important to safety (both during normal operations and planned maintenance) against the UK legislation requirements to: <ol style="list-style-type: none"> <li>a. Reduce the risks due to the operation of lifting equipment SFAIRP (a requirement of UK legislation (Health &amp; Safety at Work etc. Act 1974)) and to secure an ALARP design basis</li> <li>b. The expectations of ONR’s SAPs are met</li> <li>c. The expectations of UK relevant good practice are met</li> </ol> </li> <li>3. An auditable trail is generated to the safety claims, supporting arguments and substantiation evidence</li> </ol> <p>As well as the Mechanical Engineering discipline, this RO is also relevant to:</p> <ul style="list-style-type: none"> <li>• Internal hazards</li> <li>• Conventional safety</li> <li>• Civil engineering</li> </ul> |

- Human factors

This Resolution Plan describes Hitachi-GE's current plan to address the RO. However as the work develops an alternative means to addressing the RO may be adopted, if appropriate.

## Description of work:

The actions to be undertaken to resolve the RO are as follows:

### **ACTION#1: Generation of a Resolution Plan**

Actions requested by the Regulator as stated in the RO:

*1. Generate a resolution plan that will:*

- a. present its detailed strategy to demonstrate the UK ABWR lifting sequences are aligned with UK legislation and are optioneered to be ALARP;*
- b. define and scope the planned activities;*
- c. include a controlled programme identifying: planned activities; deliverables; milestones; timescales and resource requirements; and*
- d. provide the audit trail to demonstrate the UK ABWR lifting sequences hazards and risks have been reduced SFAIRP and demonstrate the lifting sequences are ALARP.*

### Hitachi-GE's actions

The primary relevant UK legislation is identified as:

- The Nuclear Installations Act 1965
- Health and Safety at Work Act 1974
- The Lifting Operations and Lifting Equipment Regulations 1998
- The Management of Health and Safety at Work Regulations 1999
- The Supply of Machinery (Safety) Regulations 2008 as amended 2011

A fundamental requirement of this legislation is that risk assessments should be undertaken for all lifting operations in order to ensure that the risks associated with the operations are understood and actions are taken to ensure that the risks are reduced SFAIRP.

To meet this requirement the following actions will be undertaken:

1. Lifting schedules will be developed for the UK ABWR major buildings to identify all lifting equipment and all loads to be lifted by each item of lifting equipment. For GDA, priority will be given to developing the lifting schedules for the Reactor Building (R/B), Turbine Building (T/B) and Radwaste Building (Rw/B), as these are the most significant to nuclear safety. Other buildings do not contain radioactive material and any nuclear safety related systems within them are operated in divisions such that failure of a system in one building will not result in failure to deliver the associated nuclear safety function.
2. For each load, the mass, the lifting route and height, safety classification, and the status of reactor

operations at the time of the lift will be identified, along with a list of SSCs in the vicinity which could be affected by a dropped load or load collision, and their safety classification and division.

3. The information in the lifting schedule will be used to identify the lifting operations with potential nuclear safety implications, so that priority can be given to demonstrating that the associated risks are ALARP.
4. A risk assessment and optioneering will be conducted for lifts of MSIVs and SRVs, and lifts undertaken in the RHR Pump Room, and a programme will be developed for all other required risk assessments, taking into account the following:
  - The likelihood of a dropped load/collision (this will be influenced by the design of the lifting device and lifting attachments, the number of lifting operations and how the lifting operation is controlled)
  - Potential effects of dropped load/load collision on SSCs in the vicinity
  - Potential effects of dropped load/load collision on the load itself
  - Potential hazards to personnel (for the purpose of GDA, this part of the assessment will focus on those hazards influenced by the plant layout, lifting route and the generic type of lifting device used)
5. Where risks to safety classified SSCs or to personnel are identified, alternative options for the lifting plan, plant layout or equipment design will be identified and reviewed, taking into account Relevant Good Practice, to determine the ALARP solution for that particular lifting operation. This process will be fully documented and auditable.
6. The lifting schedules for buildings other than R/B, T/B and Rw/B will be provided after Step 4.

The following deliverables will be produced to close out this RO:

- Lifting schedules for the R/B, T/B and Rw/B
- A programme of work for the documentation of the lifting risk assessments required to be undertaken as part of GDA
- Risk assessments for lifts of MSIVs and SRVs, and lifts undertaken in the RHR Pump Room

#### **ACTION#2: Progress updates**

Action requested by the Regulator as stated in the RO:

2. *Provide progress updates to ONR through the planned GDA engagements*

At each planned GDA engagement an update will be provided to ONR identifying progress made in undertaking the work identified under Action#1 and in developing the deliverables.

#### **ACTION#3: Deliverables to ONR**

Action requested by the Regulator as stated in the RO:

3. *Make available to ONR activity deliverables, conclusions and recommendations*

The deliverables identified above will be made available to ONR in accordance with the attached programme.

#### **ACTION#4: Design changes and updated documentation**

Actions requested by the Regulator as stated in the RO:

4. *If appropriate:*
  - a. *raise design changes; and*

*b. update the UK ABWR safety case, system designs and substantiation.*

*5. Make available any appropriate updated documents and substantiation for ONR assessment*

It is recognised that the risk assessment and ALARP optioneering process described under Action#1 may result in changes being required to equipment design or plant layout. Where this is the case, the requirement for the design change will be fully documented and the design and safety case documentation required to be updated will be identified in order that the required updates can be planned and implemented.

Resources

- 1) Hitachi-GE ME CE IH CS team, the engineering and design sections involved
- 2) UK Consultancy for specific areas

**Summary of impact on GDA submissions:**

See attached Gantt Chart (Table 1).

**Programme Milestones/ Schedule:**

See attached Gantt Chart (Table 1).

**Reference:**

| Ref. | Document Title  | Document ID          | Rev. |
|------|---|----------------------|------|
| 1    | Detailed Gantt Chart for UK ABWR Resolution Plan<br>(Corresponding to RO-ABWR-0049) | GA91-9201-0005-00053 | 1    |

