

**Hitachi-GE Nuclear Energy, Ltd.**  
**UK ABWR GENERIC DESIGN ASSESSMENT**  
**Resolution Plan for RO-ABWR-0002**  
**CRD Penetration Design**

<b>RO TITLE:</b>	CRD Penetration Design	
<b>REVISION :</b>	2	
<b>Overall RO Closure Date (Planned):</b>	Date (29. Sep. 2017)	
<b>REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION</b>		
<b>Regulatory Queries</b>		
<b>Linked ROs</b>		
<b>Other Documentation</b>	ONR Document RO-ABWR-0002, "CRD Penetration Design", Issue 01. Hitachi-GE Document RD-GD-0025, "CRD Design Justification Report", Issue 1. Hitachi-GE Document RD-GD-0020, "RPV Topic Report", Issue 0.	

**Scope of work :**

RO-ABWR-0002 was raised to request assurance from Hitachi-GE that the design of the Control Rod Drive (CRD) penetrations in the UK ABWR is well founded and can be assured for the 60 year design life of these components. In raising the RO, the ONR also sought more detailed information of this aspect of the UK ABWR design. The RO also usefully clarified the Regulatory Expectations for the demonstration of structural integrity for RPV pressure boundary components.

The CRD Design Justification Report was written during Step 3 to address the issues raised by the RO. This report was intended to describe: -

- 1) the basis of the design,
- 2) evidence to demonstrate that the design is in accordance with the requirements of the design code,
- 3) the manufacturing philosophy and the achievement of high quality,
- 4) the approach to in-manufacturing inspection and the design for inspectability,
- 5) the basis for material selection and the approach to minimize the risk of through life degradation
- 6) and, so far as is practicable, an outline of the in-service inspection of this component.

The document was also intended to outline Hitachi-GE's operational experience with penetrations of this type in the ABWR and relevant experience in other BWR plant.

During Step 3 of the GDA process ONR acknowledged the good progress made by Hitachi-GE in producing the CRD Design justification Report. However, it was not deemed appropriate for ONR to close the RO because, since the report had been produced during Step 3, the full evidence behind the design decisions made had not yet been presented.

The RO was up-issued by mutual consent between ONR and Hitachi-GE in order to request the appropriate evidence during Step 4. Actions were clarified and are detailed below.

Action 1.1:

*HGNE should provide evidence of operational experience (OPEX) from plants worldwide operating with this design of CRD, or substantially similar designs. This should include:*

- Incidences of degradation
- Incidences of failure
- OPEX on inspection (e.g. ease of application, and confidence in results)

– *Manufacturing OPEX*

Action 1.2:

*HGNE should provide evidence that the stress states are suitable for minimising the potential for through-life degradation.*

- *Limiting locations should be identified.*
- *Likelihood of degradation for the limiting locations should be assessed*

Action 1.3:

*Identify where the demonstration of suitable materials choices has been made.*

**Description of work:**

The information provided in the CRD Design Justification Report prepared in Step 3 was largely successful in addressing the ONR requirements. Therefore, the CRD Design Justification Report will be up-issued during Step 4 to address the actions above, introducing the necessary evidence where appropriate. Written comments and feedback on the CRD Design Justification Report received from the ONR during the latter part of Step 3 and early part of Step 4 will also be addressed.

The evidence contained in the CRD Design Justification Report will continue to be incorporated in to the PCSR as a Level 3 supporting document. A summary of this report will be included in the RPV Topic Report produced during Step 4 of the GDA.

**Summary of impact on GDA submissions:**

<b>GDA Submission Documents</b>	<b>C/U</b>	<b>Related GDA RO Actions(s)</b>	<b>Submission Date to ONR</b>
PSCR (Step 4)	U	N/A	TBC
RPV Topic Report (Step 4)	U	N/A	TBC

**Programme Milestones/ Schedule:**

See attached Gantt Chart (Table 1).

**Reference:**

None

Table 1 RO-ABWR-0002 Rev.1 Gantt Chart

Resolution Plan for RO-ABWR-0002				2014												2015												2016												2017																							
Level	Action Title	Start (Plan)	Finish (Plan)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12												
1	Regulator's issue of RO	1-Feb-14	30-Jun-14	[Green bar from Feb 1 to Jun 30, 2014]																																																											
1.1	ONR Issue RO	1-Feb-14	31-Mar-14	[Green bar from Feb 1 to Mar 31, 2014]																																																											
1.2	Hitachi-GE acknowledge RO & issue Resolution Plan	1-Apr-14	12-May-14	[Green bar from Apr 1 to May 12, 2014]																																																											
1.3	Regulators confirm credibility of Resolution Plan	12-May-14	27-May-14													[Green bar from May 12 to May 27, 2014]																																															
1.4	Regulators publish RO and Resolution Plan	28-May-14	30-Jun-14													[Green bar from May 28 to Jun 30, 2014]																																															
1.5	ONR Issue RO Rev.1 (add Action 1.1, 1.2, 1.3)	27-Aug-15	25-Mar-16																									[Green bar from Aug 27, 2015 to Mar 25, 2016]																																			
1.6	Hitachi-GE acknowledge RO Rev.1 & issue modified Resolution Plan	25-Mar-16	10-Jun-16																									[Green bar from Mar 25, 2016 to Jun 10, 2016]																																			
1.7	Regulators confirm credibility of modified Resolution Plan	10-Jun-16	17-Jun-16																																					[Green bar from Jun 10 to Jun 17, 2016]																							
1.8	Regulators publish RO Rev.1 and modified Resolution Plan	17-Jun-16	30-Jun-16																																					[Green bar from Jun 17 to Jun 30, 2016]																							
2	Preparation of Submission and Closure of RO Actions	1-Jul-14	28-Sep-17																																					[Green bar from Jul 1, 2014 to Sep 28, 2017]																							
3	Regulator's Closure of RO																																																														
3.1	Regulator's Assessment	2-Feb-15	28-Sep-17													[Green bar from Feb 2, 2015 to Sep 28, 2017]																																															
3.2	Regulator's publication of RO closure letter	29-Sep-17	29-Sep-17																																					[Green bar at Sep 29, 2017]																							