

Hitachi-GE Nuclear Energy, Ltd.
UK ABWR GENERIC DESIGN ASSESSMENT
Resolution Plan for RO-ABWR-0039
UK Learning from the Fukushima Dai-ichi Events

RO TITLE:	UK Learning from the Fukushima Dai-ichi Events	
REVISION :	1	
Overall RO Closure Date (Planned):	1st July 2016	
REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION		
Regulatory Queries	RQ-ABWR-0666, RQ-ABWR-0667	
Linked ROs	None	
Other Documentation	Applicability of the HM Chief Inspector's Recommendations and ONR's Stress Test Findings to UK ABWR Design (GA91-9201-0003-00868/AE-GD-0505 Rev.0)	

Scope of work :

In March 2011, the East Coast of Japan was devastated by a magnitude 9 earthquake followed an hour later by a tsunami which, in places, reached 14m high as it crossed the coastline. Four reactors of the 6 unit Fukushima Dai-ichi plant were severely affected by this combined event, which was more severe than their design basis. For the first several hours after the event, the reactor safety systems performed well and kept the units in a safe condition. However, after this, operators were unable to restore power supplies and cooling leading eventually to core damage, fuel damage in the spent fuel pools and other failures.

UK learning in the months after the event concentrated on a number of high level concerns:

- The margins available in the design of UK stations to cope with external events beyond the design basis,
- The response of the plant to combinations of loss of power and cooling, and
- Accident management provisions to cope with these severe accident cases

This was a similar approach to that taken in Japan.

Hitachi-GE will particularly concentrate on these high level concerns in its review of the UK ABWR design in response to this RO. Hitachi-GE understands that the purpose of this Regulatory Observation on (RO) is to document how all relevant learning from the events at Fukushima Dai-ichi for the design of the UK ABWR (as specified in ONR's GDA guidance) has been considered or will be considered. Hitachi-GE understands that this RO is targeted at specific UK learning as represented by the recommendations of the then ONR Chief Inspector (Reference 1 and 2) and the responses of other UK licensees to these requirements, which may constitute examples of relevant good practice. In addition, IAEA's observations and lessons (Reference 7) are included as a target of this RO.

This RO requests the Requesting Party to identify the relevant UK and IAEA learning from the Fukushima Dai-ichi events and requests the Requesting Party to demonstrate that this learning has been fully incorporated into the design of the UK plant. Further, the Requesting party is also requested to identify the interfaces between the designer and the potential future nuclear site licensee in addressing the relevant UK and IAEA learning from the Fukushima Dai-ichi events

This Resolution Plan describes Hitachi-GE's current plan to address the RO however as the work develops there may be a need to select alternative means to address the RO, through agreement with the regulators.

Description of work:

RO-ABWR-0039.A1: Response to the HM Chief Inspector's Recommendations

- a) Hitachi-GE are requested to clearly identify and report which of the HM Chief Inspector's Recommendations are relevant to the design of the UK ABWR plant.***
- b) Once the Recommendations which are relevant to the design of the UK ABWR have been identified, Hitachi-GE is requested to provide a written response detailing how the relevant Recommendations have been / will be addressed within the design of the UK ABWR. If modifications or further analysis is requested to fully address the intent of the HM Chief Inspector's Recommendations a schedule of further work should be provided.***

Hitachi-GE will produce a table showing which of the Chief Inspector's recommendations are relevant to UK ABWR. The recommendations will be assessed to list the applicable items to UK ABWR design. This table will form the basis of a report based on Reference 3 that gives details of how the relevant recommendations are or will be incorporated into the design of UK ABWR or otherwise taken into account. Where the recommendation will be considered after GDA during site licensing, this will be clearly stated in the arrangements between the requesting Party and the Licensee. Where recommendations have not been explicitly addressed, a schedule of work will be presented showing when they will be addressed. This schedule will form part of the resolution of this RO.

RO-ABWR-0039.A2: Response to the outcomes of the European stress test reports

- a) Hitachi-GE are requested to clearly identify and report which of ONR's Stress Test Findings, other Licensee's Considerations and recommendations from the European peer review are relevant to the design of the UK ABWR plant .***
- b) Once the outcomes which are relevant to the design of the UK ABWR have been identified, Hitachi-GE is requested to provide a written response detailing how the relevant Findings, Considerations and European peer review Recommendations have been / will be addressed within the design of the UK ABWR. If modifications or further analysis is requested to fully address the intent of outcomes a schedule of further work should be provided.***

Hitachi-GE will undertake a review of ONR's Stress Test Findings (Reference 4 and 5), the European Peer Review of the ENSREG Stress Tests (Reference 6) and the Stress Test findings of other UK licensees to identify recommendations and other outcomes that might be applicable to UK ABWR. The Stress Test Findings from other UK licensees will include those from the Stress Test reports for:

EdF Energy Nuclear Generation Ltd: Hinkley Point B, Heysham A, Heysham B, Hunterston B, Torness, Harlepool, Sizewell B and Dungeness B

Magnox Ltd: Hinkley Point A, Oldbury, Trawsfynydd, Wylfa, Hunterston A, Sizewell A, Bradwell and Dungeness A

Sellafield Ltd: Sellafield and Calder Hall and Capenhurst

DRSL: Dounreay

Hitachi-GE will also consider the responses by NNB GenCo for EPR and the Westinghouse resolution plan for the corresponding GDA Issue for AP1000 concerning lessons learned from Fukushima.

Information will be added to the report identified in Action A1 to give details of how the relevant recommendations are or will be incorporated into the design of UK ABWR and reference to the relevant section(s) of the PCSR or topic report that demonstrates how this has been addressed or otherwise taken into account will be provided. Where the recommendation will be considered after GDA during site licensing, this will be clearly stated in the arrangements between the requesting Party and the Licensee. Where recommendations

have not been explicitly addressed, a schedule of work will be presented showing when they will be addressed. This schedule will form part of the resolution of this RO.

RO-ABWR-0039.A3: Response to the IAEA's observations and lessons

- a) **Hitachi-GE are requested to clearly identify and report which of the lessons /observations from the IAEA Director General's report on the Fukushima Dai-ichi Accident are relevant to the design of the UK ABWR plant.**
- b) **Once the observations /lessons which are relevant to the design of the UK ABWR have been identified, Hitachi-GE is requested to provide a written response detailing how the relevant observations and lessons have been / will be addressed within the design of the UK ABWR. If modifications or further analysis is requested to fully address the intent of the IAEA's observations/lessons a schedule of further work should be provided.**

Hitachi-GE will undertake a review of IAEA Findings (Reference 7) to identify recommendations and other outcomes that might be applicable to UK ABWR. Information will be added to the report identified in Action A1 to give details of how the relevant recommendations are or will be incorporated into the design of UK ABWR and reference to the relevant section(s) of the PCSR or topic report that demonstrates how this has been addressed or otherwise taken into account will be provided. Where the recommendation will be considered after GDA during site licensing, this will be clearly stated in the arrangements between the requesting Party and the Licensee. Where recommendations have not been explicitly addressed, a schedule of work will be presented showing when they will be addressed. This schedule will form part of the resolution of this RO.

Summary of impact on GDA submissions:

<u>Related RO Actions</u>	<u>GDA Submission Document Title</u>	<u>Document ID (Document No.)</u>	<u>Submission Date to the Regulators</u>
ROA1	Applicability of the HM Chief Inspector's Recommendations and ONR's Stress Test Findings to UK ABWR Design	GA91-9201-0003-00868 (AE-GD-0505 Rev.0)	31-Aug-2015
ROA2	Applicability of the HM Chief Inspector's Recommendations and ONR's Stress Test Findings to UK ABWR Design	GA91-9201-0003-00868 (AE-GD-0505 Rev.0)	31-Aug-2015
ROA3	Applicability of the HM Chief Inspector's Recommendations and ONR's Stress Test Findings to UK ABWR Design	GA91-9201-0003-00868 (AE-GD-0505 Rev.1)	1-Jul-2016

Programme Milestones/ Schedule:

See attached Gantt Chart (Table 1)

References:

1. Office for Nuclear Regulation, "Japanese earthquake and tsunami: Implications for the UK Nuclear Industry – Interim Report", ONR-FR-REP-11-001 Revision 3 (web version), May 2011
2. Office for Nuclear Regulation, "Japanese earthquake and tsunami: Implications for the UK Nuclear Industry – Final Report", ONR-FR-REP-11-002 Revision 2, September 2011
3. Hitachi-GE Nuclear Energy, Ltd., "Resilience of design against Fukushima type events", GA91-9901-0014-00001, XE-GD-0084 Rev.A, October 2013
4. Office for Nuclear Regulation, "European Council Stress Tests for UK nuclear power plants – National Final Report", ONR-ECST-REP-11-002 Revision 0, December 2011
5. Office for Nuclear Regulation, "Stress Tests for UK non-Power Generating Nuclear Facilities – Final Report", ONR-UKST-REP-12-001 Revision 1, May 2012
6. European Nuclear Safety Regulators Group, "Post-Fukushima accident - Peer review country report – Stress tests performed on European nuclear power plants"
7. International Atomic Energy Agency, "The Fukushima Daiichi Accident", August 2015, STI/PUB/1710

Table 1 RO-ABWR-0039 Gantt Chart

