

Hitachi-GE Nuclear Energy, Ltd.
UK ABWR GENERIC DESIGN ASSESSMENT
Resolution Plan for RO-ABWR-0059
Provision of Water Cooling for the RCCV Drywell Head of the UK
ABWR

RO TITLE:	Provision of Water Cooling for the RCCV Drywell Head of the UK ABWR	
REVISION :	0	
Overall RO Closure Date (Planned):	26 February 2016	
REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION		
Regulatory Queries	-	
Linked ROs	-	
Other Documentation	-	

Scope of work :
<p>Background</p> <p>The stresses due to cooling of the Drywell Head were evaluated using conservative inputs; water temperatures an internal pressure and temperatures.</p> <p>In response to ONR, Hitachi GE has undertaken additional work to establish the limiting location and magnitude of the stresses[1]. The assessment demonstrates that the results are below the allowable values. However, the current DW head design does not include Post Weld Heat Treatment (PWHT) of the structural welds above the flange region. Residual stresses make a significant contribution to the results. As a consequence under the combination of loadings arising from the internal pressure, the stress transient and non-stress relieved welds the margin between the results and the allowable values is significantly reduced.</p> <p>There would be increased confidence in the structural integrity of the DW head under severe accident conditions if the overall result from the combination of the residual and thermal stress is reduced. HGNE's current approach does not give full consideration to potential options.</p> <p>There are a number of options available to reduce risk, ONR expects Hitachi GE to consider these options or their combination and to show the risks to delivery of the containment function have been reduced SFAIRP.</p> <p>Scope of Work</p> <p>The response to this RO is the delivery of ALARP discussion on the Provision of Water Cooling for the RCCV Drywell Head of the UK ABWR in GDA. This Resolution Plan shows some of the actions and milestones for preparation and delivery of ALARP discussion on the Provision of Water Cooling for the RCCV Drywell Head of the UK ABWR. The detailed programme of work is shown as below.</p>

Description of work:

RO-ABWR-0059.A1 : HGNE to provide a robust justification to demonstrate the structural integrity and hence achievement of the containment function for the DW head under external cooling during severe accident conditions.

- 1. HGNE to identify options to secure the DW head containment function and hence afford additional protection to workers and the public under external cooling during a severe accident;**
- 2. HGNE to evaluate the benefits and dis-benefits associated with those options;**
- 3. HGNE to provide a robust demonstration to justify whether or not it is reasonably practicable to implement one or more options to show that the risks relating to the structural integrity of the DW head under external cooling during severe accident conditions are reduced SFAIRP.**

The UK ABWR considers a lot of countermeasures for severe accident. For example, if all ECCS injections are lost, operators try to depressurize the reactor pressure vessel and then inject water using FLSS or FLSR. In that case, water level in the core is recovered and the core is cooled again. In that case, an accident is terminated without heating up of the DW head. Even if alternative core injection using FLSS or FLSR fail and RPV failure occurs, alternative PCV spray is conducted to mitigate overpressure and overtemperature of the containment. In that case, an accident will also be terminated without heating up of the DW head [2].

Therefore, Hitachi-GE thinks that D/W head cooling by the reactor well injection is not indispensable but it is one of further safety increasing measures in severe accident. As high level discussions on the countermeasures for core and containment cooling has already been described in the ALARP document [3], we will focus on the discussion related to the structural integrity of the D/W head and detailed water injection procedure in this RO.

Hitachi-GE will take the following actions for the above requests.

- Hitachi-GE will show the discussion on why our SA countermeasures for Drywell Head are reasonably practicable.

1) Approach of design optioneering (Action 2.1)

Consideration of methods / technologies for SA countermeasures against the over temperature failure of the containment

- Point of view of the system
- Point of view of the operation
- Point of view of the hardware
- Combination of the above

High level discussion of the countermeasures for the over temperature protection will be provided as a response to RO-ABWR-0023 by the end of August.

2) Assessment of design options (Action 2.2)

Evaluation of the benefits and dis-benefits associated with design options

3) Assessment of selected design options (Action 2.3)

Robust demonstration to justify whether or not it is reasonably practicable to implement one or more options to show that the risks relating to the structural integrity of the DW head under external cooling during severe accident conditions are reduced SFAIRP.

Summary of impact on GDA submissions:GDA Submission DocumentSubmission Date to ONR

ALARP Discussion Report on the Provision of Water Cooling for the RCCV Drywell
Head of the UK ABWR

26 February, 2016

Programme Milestones/ Schedule:

See attached Gantt Chart (Table 1).

Reference:

Ref[1] RQ-ABWR-0358 Clarification of the Structural Integrity analysis of the drywell head, 25th February 2015.

Ref[2] Hitachi-GE Nuclear Energy, Ltd., "Topic Report on Severe Accident Phenomena and Severe Accident Analysis", GA91-9201-0001-00024, AE-GD-0102 Rev.D, December 2014

Ref[3] Hitachi-GE Nuclear Energy, Ltd., "ALARP Discussion on Passive Methods of Core or Containment Cooling", GA91-9201-0003-00706, AE-GD-0398 Rev.0, May 2015

Table 1 RO-ABWR-0059 Gantt Chart

