Hitachi-GE Nuclear Energy, Ltd.
UK ABWR GENERIC DESIGN ASSESSMENT
Resolution Plan for RO-ABWR-0021
(Limits and conditions of operation for Interim Dry Fuel Storage)

RO TITLE:	Limits and conditions of operation for Interim Dry Fuel Storage	
REVISION :	0	
Overall RO Closure Date (Planned):		30. Sep. 2015
REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION		
Regulatory Queries	RQ-ABWR-0071, " Fuel Degradation Mechanism Relevant to Spent Fuel Interim Storage"	
Linked ROs		
Other Documentation		

Scope of work :

Background

When LWR fuel is removed from the spent fuel pool and placed in an inert-gas canister for storage, the fuel cladding experiences an increase in temperature dependent on the fuel irradiation and the time spent in the spent fuel pool. Substantial increases in temperature affect the microstructure of the fuel cladding and cause hydrogen present in hydride precipitates to redisolve. Subsequently, as decay heat levels fall, the cladding temperatures tend to return to previous values and (depending on the cladding stress levels) hydride precipitates can reform with a less-favourable morphology. This can reduce the cladding hoop stress required for the progression of hydrogen-assisted cracking of the cladding.

The fuel cladding is an impontant barrier to the release of harmful fission products from the fuel and demonstration of the clad's continued integrity forms a significant part of meeting the requirement for multiple barriers to the release of activity to the environment. Loss of fuel integrity is likely to significantly increase the magintude of the task of spent fuel management.

Scope of Work

This resolution plan shows some actions and milestones for preparation of the limits and conditions of operation for the UK ABWR spent fuel interim dry storage.

This Resolution Plan describes Hitachi-GE's current plan to address the RO. As the work develops, we may choose alternative means to address the RO.

Description of work:

Action 1: Fuel failure mechanisms in dry storage

Hitachi-GE will report a review of the available information on the condition of relevant fuel after dry fuel storage, with particular reference to observations of cladding degradation. This task will include identification and quantification of potential degradation mechanisms active over the proposed life of the dry store.

Action 2: Basic model for fuel behaviour evaluation in dry storage

Hitachi-GE will report the state of modelling of fuel degradation mechanisms in dry fuel storage to determine the suitability of the available models to represent the effect of fuel pin temperature histories, irradiations and internal pressures on degradation processes. Details will be given of model qualification.

Action 3: Evaluation of fuel integrity and limit temperature in dry storage

Based on models, experience and suitable arguments, Hitachi-GE will propose and justify limits on fuel pin pressures, irradiations and temperatures to be used as design limits for dry fuel storage conditions and the fuel drying and handling processes.

Action 4: Preparation of the report

Hitachi-GE will provide a report to substantiate these limits by taking reasonable account of anticipated operational and fault transients in accordance with a suitable graded approach to safety justification.

Summary of impact on GDA submissions:

GDA Submission Document	Submission Date to ONR
Topic Report "GE14 Fuel Integrity Evaluation during Interim Storage" GA91-9201-0003-00200 (UE-GD-0253)	Rev.0, 31. Dec. 2014, Action1-3 Rev.1, 30 June 2015, Action4
Generic PCSR Chapter 11 : Reactor Core GA91-9101-0101-11000 (UE-GD-0182)	Rev.B, 21 Aug. 2015
Generic PCSR Chapter 32 : Spent Fuel Interim Storage GA91-9101-0101-32000 (FRE-GD-0008)	Rev.B, 13 Apr. 2015 Rev.C, 21 Aug. 2015

Programme Milestones/ Schedule:

See attached Gantt Chart (Table 1)

Reference:

Ref[1] "GE14 Fuel Integrity Evaluation during Interim Storage", GA91-9201-0003-00200 (UE-GD-0253)

Ref[2] "Generic PCSR Chapter 11 : Reactor Core ", GA91-9101-0101-11000 (UE-GD-0182)

Ref[3] "Generic PCSR Chapter 32 : Spent Fuel Interim Storage", GA91-9101-0101-32000 (FRE-GD-0008)

Table 1 RO-ABWR-0021 Gantt Chart