

<b>REGULATORY OBSERVATION</b>	
<b>REGULATOR TO COMPLETE</b>	
<b>RO unique no.:</b>	RO-ABWR-0021
<b>Date sent:</b>	October 3 2014
<b>Acknowledgement required by:</b>	<i>October 30 2014</i>
<b>Agreement of Resolution Plan Required by:</b>	<i>November 30 2014</i>
<b>Resolution of Regulatory Observation required by:</b>	<i>In accordance with HGNE delivery programme, but in sufficient time to permit assessment and follow up within GDA Step 3.</i>
<b>TRIM Ref.:</b>	2014/239995
<b>Related RQ / RO No. and TRIM Ref. (if any):</b>	
<b>Observation title:</b>	Limits and conditions of operation for Interim Dry Fuel Storage
<b>Technical area(s)</b> Fuel Design	<b>Related technical area(s)</b> Fault Studies Rad. Waste
<b><i>Regulatory Observation</i></b>	
<b>Summary</b>	
<p>This RO requires Hitachi-GE to define and substantiate by deterministic analysis, a set of and conditions of operation that will ensure the integrity of fuel cladding irradiated in accordance with the design of the UK ABWR and transferred to dry fuel storage after a suitable period of cooling.</p>	
<b>Background</b>	
<p>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.</p> <p>Substantial increases in temperature affect the microstructure of the fuel cladding and cause hydrogen present in hydride precipitates to redissolve. 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.</p> <p>The fuel cladding is an important 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 magnitude of the task of spent fuel management.</p> <p>ONR expects that the Hitachi-GE will demonstrate that as far as reasonably practicable, limits and conditions of operation have been developed for the fuel to prevent fuel cladding failure in dry storage.</p> <p>This particular aspect of the interim spent fuel safety case requires significant technical work and therefore warrants its own Regulatory Observation.</p>	
<b><i>Regulatory Observation Actions</i></b>	
<p>Action 1: 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 should</p>	

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include identification and quantification of potential degradation mechanisms active over the proposed life of the dry store.

Action 2: 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 should be given of model qualification.

Action 3: Based on models, experience and suitable arguments, 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: 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.

**REQUESTING PARTY TO COMPLETE**

**Actual Acknowledgement date:**

**RP stated Resolution Plan agreement date:**