

**Hitachi-GE Nuclear Energy, Ltd.**  
**UK ABWR GENERIC DESIGN ASSESSMENT**  
**Resolution Plan for RO-ABWR-0030**  
**Embedded C&I subsystems and smart devices**

<b>RO TITLE:</b>	Embedded C&I subsystems and smart devices	
<b>REVISION :</b>	0	
<b>Overall RO Closure Date (Planned):</b>	30 <sup>th</sup> June 2017	
<b>REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION</b>		
<b>Regulatory Queries</b>	-	
<b>Linked ROs</b>	-RO-ABWR-0008 Common cause failure of electrical distribution systems -RO-ABWR-0010 Design Basis Analysis of Essential Services and Support Systems	
<b>Other Documentation</b>	-	

<b>Scope of work :</b>
<p><b><u>Background</u></b></p> <p>The ONR have raised RO-ABWR-0030 in respect of the presence of C&amp;I equipment important to safety in plant that is not managed by C&amp;I specialist. ONR have identified that:</p> <p><i>Many support systems important for safety for the UK ABWR will have embedded control and instrumentation (C&amp;I) subsystems and smart devices. The correct operation of these will be critical for the achievement of the safety operation of the UK ABWR.</i></p> <p>Hitachi-GE's understanding of the RO is that it is seeking an explanation of how Hitachi-GE identifies such equipment and ensures that it is fit for purpose. Hitachi-GE recognise that this equipment might typically be found in mechanical plant, e.g. cranes (the control and overload etc protection equipment), electrical plant (sequencers and protection relays). These are systems whose Specification, Design and Procurement are not part of the C&amp;I teams scope and ONR are seeking an explanation of how C&amp;I specialists are involved in the Specification, Design and Procurement to ensure that the C&amp;I in the end system is the correct class of equipment has been designed in the appropriate way and its safety justification is adequate for the functions being performed.</p> <p><b><u>Scope of work</u></b></p> <p>Hitachi-GE will identify the potential use of embedded C&amp;I utilising smart technology for SC1 and SC2 systems, and will define and document a graded approach to the production excellence and independent confidence building of potential equipment. For use SMART devices (as defined in IEC 62671) a defined set of principles and approach for the justification will be developed. A demonstration of the approach will be conducted in a trial of justification method for a sample of potential devices.</p> <p>This Resolution Plan describes Hitachi-GE's current plan to address the RO; however, as the work develops it may be</p>

necessary to choose an alternative means to address the RO.

### **Description of work:**

Hitachi-GE will provide the following submissions for this RO:

#### RO-ABWR-0030.A1: List of Embedded C&I utilizing smart technology in SC1 or SC2 system

The RO action states that:

*Hitachi-GE are to derive a list of embedded SC1 and SC2 C&I systems which clearly identifies the use of smart devices based on the analysis of*

- *RO 8 and RO 10.*
- *Knowledge of the location of other sources of smart devices as sensors, actuators and variable speed drives used in SC1 and SC2 systems throughout the facility.*

*Resolution required by June 2015*

Hitachi-GE will identify and list where embedded C&I is planned or high likely to be used in class 1 and 2 systems delivering category A and B functions, i.e. SC1 and SC2 systems. The use, potential use, of SMART Devices (see IEC 62671 definition) in SC1 and SC2 systems will be identified from this list. The outcome of the regulatory observation 8 (RO8) and RO10 to identify support systems will be used to assist in this task. The list of embedded SC1 and SC2 C&I systems using smart devices will be reported to ONR.

In addition Hitachi-GE will introduce a process that requires other disciplines to inform the C&I team of their use/intended use of any embedded C&I in their systems.

#### RO-ABWR-0030.A2: Topic Report on justification approach for embedded C&I systems and smart devices

The RO action states that:

*Hitachi-GE are to develop a topic report on their proposed approach to the assessment of the production excellence of all smart devices and to give recommendations to a future licensee on methods of independent confidence building.*

*Resolution required by April 2015*

Hitachi-GE (C&I team) will develop the principles of a graded approach to assessment of production excellence as part of the justification of the use of smart devices used in SC1 and SC2 systems. This approach will make use of information in IEC standard 62671 and 61508; the use of the latter is consistent with good practice developed in the UK CINIF research programme. A practical means of delivering an assessment of Production Excellence will be developed from these principles. Hitachi-GE will use current good practice to recommend what independent confidence building measures might be used to support the justification of smart devices used in SC1 and SC2 systems. The output from the two will be used to produce a methodology for the justification of smart devices to be used for UK-ABWR; this methodology will be graded by safety class of the application of the device. The output of this will be reported in a topic report on SMART devices (GA91-9201-0001-00046). In addition Hitachi-GE will

introduce a process by which the C&I team are involved in the selection of smart devices to be used in systems in the control of other disciplines. This process will formalise the position already in chapter 15.8 of the PCSR for electric (GA91-9101-0101-15008 Rev0). The process will also require that the C&I team be involved, in a graded manner, in the selection and development of any other C&I equipment in systems in the control of other disciplines.

RO-ABWR-0030.A3: Topic Report on trial of justification methods for examples at SC1 and SC2.

The RO action states that:

*From the outcome of action 2 Hitachi-GE are to develop a topic report demonstrating the viability of the production excellence and independent confidence building process by applying these methods to one SC1 and one SC2 devices taken from the list derived in action 1.*

*Resolution required by June 2017*

From the outcome of A2, Hitachi-GE will develop the scope of a trial of the methodology. The definition of the scope will include the devices, to be considered, the criteria for their selection, the extent of the justification of assessment of production excellence and independent confidence building measures to be undertaken and possible success criteria. On agreement of the scope the justification approach will be trialed by applying it to two devices one selected from each of SC1 and SC2. A report on the scope and criteria for the trial demonstrations will be prepared. Documents with the results of the trials will be reported.

**Summary of impact on GDA submissions:**

<b>GDA Submission Documents (Title / Document I.D.)</b>	<b>Related GDA RO actions</b>	<b>Submission Date to ONR</b>	<b>Potential Impact</b>
<b>Submitted Document</b>			
Generic PCSR Chapter 14 / GA91-9101-0101-14000 Rev. A	Action 1 Action 2	August 2015 (to submit Rev. B)	Revised to include the reference to the treatment of smart devices (and embedded C&I)
Generic PCSR other	Action 1 Action 2	August 2015 (to submit Rev. B)	To acknowledge the approach to the treatment of smart devices (and embedded C&I)
<b>Planned Submissions</b>			
The list of embedded SC1 and SC2 C&I systems using smart devices / TBD	Action 1	June 2015	---
Topic report on SMART devices / GA91-9201-0001-00046 Rev.0	Action 2	April 2015	---
A report on the scope and criteria for the trial demonstrations / TBD	Action 3	Sep 2015	---
A report on the results of the SC1 (class1) trial / TBD	Action 3	June 2017	---
A report on the results of the SC2 (class2) trial / TBD	Action 3	June 2017	---

GDA Submission Documents (Title / Document I.D.)	Related GDA RO actions	Submission Date to ONR	Potential Impact
<b>Planned Submissions</b>			
<p>Supplementary documentation produced as part of delivery of the RP</p> <p>S.1 The list of SC 1 and SC 2 systems with embedded C&amp;I / TBD</p> <p>S.2 A process that requires other disciplines to inform the C&amp;I team of their use/intended use of any embedded C&amp;I in their systems / TBD</p> <p>S.3 A process by which the C&amp;I team are involved in the selection of smart devices to be used in systems in the control of other disciplines / TBD</p> <p>S.4 A process by which the C&amp;I team be involved, in a graded manner, in the selection and development of any other C&amp;I equipment in systems in the control of other disciplines / TBD</p>	<p>Action 1 Action 2 Action 3</p>	<p>June 2015</p> <p>April 2015</p> <p>April 2015</p> <p>April 2015</p>	<p>---</p>

<b>Programme Milestones/ Schedule:</b>
See attached Gantt Chart (Table 1).

<b>Reference:</b>
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