

**Hitachi-GE Nuclear Energy, Ltd.**  
**UK ABWR GENERIC DESIGN ASSESSMENT**  
**Resolution Plan for RO-ABWR-0031**  
**SSLC and Support System Architecture**

<b>RO TITLE:</b>	SSLC and Support System Architecture	
<b>REVISION :</b>	0	
<b>Overall RO Closure Date (Planned):</b>	30 <sup>th</sup> June 2015	
<b>REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION</b>		
<b>Regulatory Queries</b>	-	
<b>Linked ROs</b>	-	
<b>Other Documentation</b>	-	

<b>Scope of work :</b>
<p><b><u>Background</u></b></p> <p>The ONR have raised RO-ABWR-0031 in respect of the Safety System Logic and Control (SSLC) system that Hitachi-GE proposed in the PSR (GA91-9901-0001-00001 ; UK ABWR Generic Design Assessment Preliminary Safety Report on C&amp;I). ONR identify the purpose of the RO as follows:</p> <p><i>The purpose of this Regulatory Observation is to seek a safety justification for the architecture of the support systems actuated by the SSLC, particularly the fact that some of the essential safety feature (ESF) actuations are controlled by two divisions of equipment at the safety logic unit (SLU) level which contrast with higher level of SLU redundancy (three or four divisions) for other safety functions.</i></p> <p>Hitachi-GE's understanding of the RO is that it raises two matters 1) that some category A function appear to be present in only two of the four C&amp;I divisions and the C&amp;I redundancy is not maintained to the final actuator 2) the SSLC appears to perform category B &amp; C functions.</p> <p>The current SSLC has a C&amp;I architecture whose front end is four fold redundant this redundancy is maintained to the actuators of the RPS and MSIV mechanical equipment (rods and valves). The architecture for the ECCS/ESF reflects the three division arrangement of the mechanical equipment. In this case the controllers of the mechanical equipment in division N are dual redundant in C&amp;I division N following a vote on the four fold redundant front end. The part of the SSLC that controls not only the category A plant functions but also category B &amp; lower plant functions by the control units is constructed in a way that satisfied requirements of class 1. It is thought that the control units which Hitachi-GE is developing have the capacity to control these functions and those from the non-class 1 functions can in</p>

principle be separate.

### **Scope of Work**

Hitachi-GE will confirm the category of all plant functions that the SSLC is intended to perform based on the Fault Schedule definitely. The system constitution (class) will be shown to be suitable for the category of function. A document will be submitted describing the results.

The redundancy and presence of lower category functions in the SSLC will be justified or when appropriate a design change will be proposed. Documents will be submitted describing the results.

This Resolution Plan describes Hitachi-GE's current plan to address the RO; however, as the work develops, it may be necessary to choose an alternative means to address the RO.

### **Description of work:**

RO-ABWR-0031 Action 1 :

The RO action states that:

*Hitachi-GE should review and assign a safety functional category to all of the SSLC plant level functions. A list of safety function and category should be submitted to ONR for assessment.*

*Resolution required by January 2015*

Hitachi-GE will review and assign a safety functional category to all of the SSLC plant level functions, this will be based on the Fault Schedule. This work will be undertaken jointly by the C&I, Fault Studies and Plant Engineering teams. The work will use existing processes and IEC 61226 will be used to confirm the assignment of the functions to categories. A list of safety functions and their category will be submitted to ONR for assessment by 30th January 2015. The work will have 3 steps:

- (1) Identify the Safety Functions which are assigned by the Fault Studies
- (2) Establish the category of such Safety Functions assigned to the SSLC
- (3) Submit a list of safety functions and category to ONR

RO-ABWR-0031 Action 2 :

The RO action states that:

*Where the functions listed above are assigned to a category A safety function then ONR's expectation is that they are designed to follow an N+2 format consistent with the ECCS and therefore the SSLC and the systems it is actuating are modified accordingly. Where the functions are category B or lower then a safety justification should be provided why the SSLC is used for a lower safety functional category role. Where category B is required and two divisions or lower is retained then full justification that no failure in this reduced architecture (dual or single division) could interfere with the operation of the whole four divisional SSLC. Hitachi-GE should identify, and submit a document that describes any design changes that are required to comply with the expectations set out in the RO.*

*Resolution required by June 2015*

Hitachi-GE C&I team will undertake two pieces of work.

1] Hitachi-GE will examine the present SSLC system architecture and provide a justification of why the redundancy of the C&I is not maintained to the final actuator (pump / valve) in all cases. Hitachi-GE will also undertake a study to ensure the redundancy of the equipment delivering the category A functions is in compliance with ONR expectation.

If any shortfall is identified then:

- a) a justification of the shortfall will be sought; and
- b) an optioneering exercise will be undertaken to identify possible design changes to meet the N+2 expectation. A set of criteria will be established and a preferred option will be selected.

The results of the work will be reported to ONR and justification or preferred design change identified for ONR to assess.

2] Hitachi-GE will identify the lower category functions current assigned to the SSLC. Where such assignment is not in compliance with ONR expectation. Hitachi-GE will

- a) a justification of the reason why the safety function can be undertaken by the SSLC will be sought; and
- b) an engineering design exercise will be undertaken to isolate the equipment performing the safety functions from the SSLC .

The results of the work will be reported to ONR and justification or preferred design change identified for ONR to assess

Hitachi-GE will submit a document describing how the SSLC system is in compliance with ONR expectation by 30th June 2015.

The work will have 3 activities:

- (1) justification of why the redundancy of the C&I is not maintained to the final actuator (pump / valve) in all cases
- (2) justification / design change for N+2 redundancy for Category A function
- (3) justification / design change for lower Class functions currently assigned to the SSLC

**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)	Change to functional assignment
BSC C&I Architecture / GA91-9201-0002-00022 Rev. 0	Action 1 Action 2	August 2015	Change to functional assignment Change to architecture overall Change to Architecture SSLC
BSC on SSLC system / GA91-9201-0002-00073 Rev. 0	Action 1 Action 2	August 2015	Change to functional assignment Change to architecture SSLC Addition of justification
SSLC System Design Description / GA32-1001-0002-00001 Rev.0	Action 1 Action 2	TBD	Removal of functions and target systems assigned to SSLC
IEDs	Action 1 Action 2	TBD	Revised to include RP output Change as per BSC
<b>Planned Submissions</b>			
Support document describing a list of safety function and category / TBD	Action 1	January 2015	January 2015 submission delayed or subsequently revised to include RP output
Topic Report on Safety System Logic and Control / TBD	Action 2	June 2015	First issue due Dec 2014 delayed or revised in June 2015 to include RP output Addition of justification Change as per BSC
IBDs	Action 1 Action 2	TBD	Revised to include RP output Change as per BSC

**Programme Milestones/ Schedule:**

See attached Gantt Chart (Table 1).

**Reference:**

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Table 1 RO-ABWR-0031 Gantt Chart

C&I Resolution Plan for RO-ABWR-0031 (2014)				October				November				December			
				6	13	20	27	3	10	17	24	1	8	15	22
Level	Action Title	Start	Finish												
1	Preparation of Submissions and Closure of RO Actions	3-Nov-14	30-Jun-15												
1.1	RO Action 1	3-Nov-14	30-Jan-15												
1.2	RO Action 2	10-Dec-14	30-Jun-15												

C&I Resolution Plan for RO-ABWR-0031 (2015)				January				February				March				April				May				June				July				August				September				October				November				December			
				5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30
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