Hitachi-GE Nuclear Energy, Ltd.
UK ABWR GENERIC DESIGN ASSESSMENT
Resolution Plan for RO-ABWR-0008
Common cause failure of electrical distribution Systems

RO TITLE:	Common cause failure of electrical distribution Systems	
REVISION :	0	
Overall RO Closure Date (Planned):		24.Dec.2015
REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION		
Regulatory Queries	-	
Linked ROs	-	
Other Documentation	'Topic Report for Fault Assessment' (Document No. UE-GD-0071)	

Scope of work :

Electrical power supplies on a nuclear power plant (NPP) are dependent on the source of power. For the UK Advanced Boiling Water Reactor (ABWR) can be the national grid, emergency diesel generators, battery systems and the diverse back-up building diesel generators. However, they are also dependent on the transmission and distribution of electrical power within the NPP site.

Hitachi-GE will undertake design basis analysis of a range of major common cause failures (CCFs) of key systems involved in the distribution of power within the generic UK ABWR site. Hitachi-GE will analyse the impact of the CCF of switchboards and static conversion equipment (an example of the latter is equipment that converts alternating current to direct current). Hitachi-GE will provide the topic report which includes the procedure to approach electrical CCFs and the result of the evaluation of CCF and will describe the overview in the revised PCSR at an appropriate time.

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

Description of work:

RO-ABWR-0008.A1: List of electrical distribution CCFs

Hitachi-GE shall clearly identify the used status of each composed element of the electrical power sources.

Then, Hitachi-GE shall identify the common cause failures due to common equipment and common voltage levels, and will make a list of those major loads which will be affect by each CCF.

Hitachi-GE will identify bounding faults for each of these failures.

Hitachi-GE has already explained the outline of the above approach at the April 16th, 2014 workshop and draft result at May 12th, 2014 workshop.
Hitachi-GE will complete the identification of the electrical CCFs by the end of December 2014 and will complete fault schedule by the end of March 2015.

RO-ABWR-0008.A2: Design basis analysis of electrical distribution CCFs

Hitachi-GE will conduct transient analysis for the Bounding faults identified in Action 1 and will then verify items, such as adaptability of the evaluation criteria, diversity against common cause failure and a validation in the time requirement for batteries and diesel generators.

In the Fault Schedule, Hitachi-GE will identify protective functions for each fault.
Hitachi-GE will provide transient analysis for each bounding fault, either using existing analyses or by performing new analyses as required. In this analyses, for each essential function, Hitachi-GE will consider the actions of the major safety functions (Category Class A1), the backup functions (A2 and so on), and will verify that those designs remain justifiable. Furthermore, Hitachi-GE will perform these analyses in accordance with SAP FA.6, considering all appropriate conditions such as the worst case operational condition (equipment structures, etc.), simultaneous occurrence of an initial fault and other faults, and a single failure criteria and so on.

Hitachi-GE has already explained the outline of this approach at the April 16th, 2014 workshop.
Hitachi-GE will complete this Action by the end of June, 2015.

Hitachi-GE will incorporate the results of Actions 1 and 2 into the revision of the 'Topic Report for Fault Assessment' (Document No. UE-GD-0071).
In addition, if the considerations should result in adding new bounding faults, Hitachi-GE shall incorporate them into a revision of the 'Topic Report for DSA.'

RO-ABWR-0008.A3: PSA for electrical distribution CCFs

Hitachi-GE will propose additions to the Level 1 PSA topic report to incorporate CCF models for the failures in the electrical distribution and static conversion equipment by October 2014.

These additions will include inter alia:

- Additional initiating events corresponding to CCFs in the electrical distribution and static conversion equipment, where such events are not currently covered by the existing PSA models
- An explanation of grouping of these initiating events (if any) with justification; an explanation of how event trees will be developed for these initiating events, taking into account any dependencies between mitigating

systems and the initiating events themselves; and how data will be generated for the event tree analysis

· A justification of the initiating event frequencies used in the PSA corresponding to these CCF events

Summary of impact on GDA submissions:

GDA Submission Documents	Related GDA RO Action(s)	Submission Date to ONR
'Topic Report for Fault Assessment' (UE-GD-0071)	RO.A1-A2	30th June 2015

Programme Milestones/ Schedule:

See attached Gant Chart (Table 1).

Reference:

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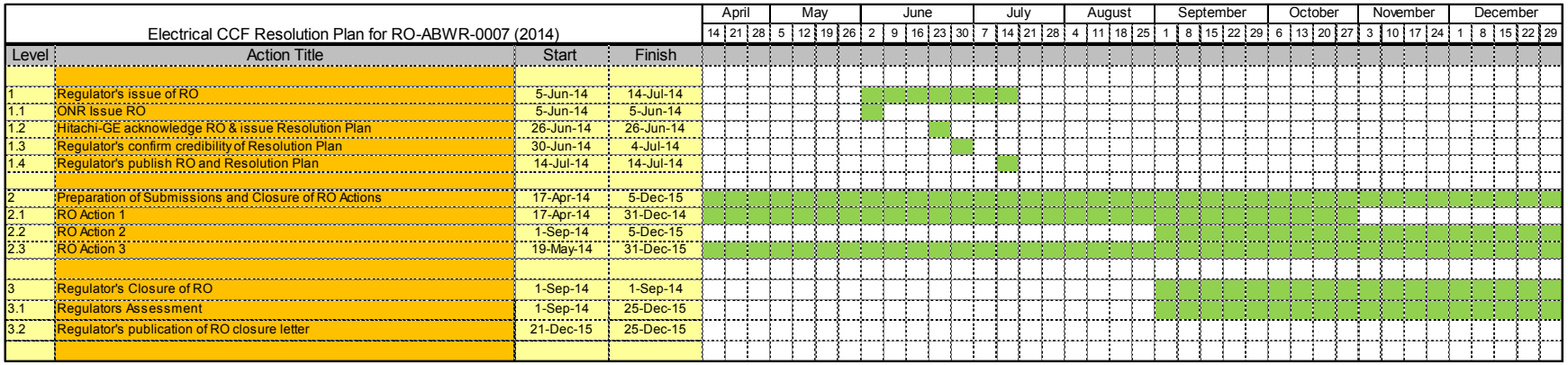
Table 1 RO-ABWR-0008 Gantt Chart

Electrical CCF Resolution Plan for RO-ABWR-0007 (2014)

Level	Action Title	Start	Finish
1	Regulator's issue of RO	5-Jun-14	14-Jul-14
1.1	ONR issue RO	5-Jun-14	5-Jun-14
1.2	Hitachi-GE acknowledge RO & issue Resolution Plan	26-Jun-14	26-Jun-14
1.3	Regulator's confirm credibility of Resolution Plan	30-Jun-14	4-Jul-14
1.4	Regulator's publish RO and Resolution Plan	14-Jul-14	14-Jul-14
2	Preparation of Submissions and Closure of RO Actions	17-Apr-14	5-Dec-15
2.1	RO Action 1	17-Apr-14	31-Dec-14
2.2	RO Action 2	1-Sep-14	5-Dec-15
2.3	RO Action 3	19-May-14	31-Dec-15
3	Regulator's Closure of RO	1-Sep-14	1-Sep-14
3.1	Regulators Assessment	1-Sep-14	25-Dec-15
3.2	Regulator's publication of RO closure letter	21-Dec-15	25-Dec-15



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