Hitachi-GE Nuclear Energy, Ltd.
UK ABWR GENERIC DESIGN ASSESSMENT
Resolution Plan for RO-ABWR-0024
Hitachi-GE Nuclear Energy Ltd. Human Reliability Analysis - Error of Commission / misdiagnosis

RO TITLE:	Hitachi-GE Nuclear Energy Ltd. Human Reliability Analysis - Error of Commission / misdiagnosis	
REVISION :	1	
Overall RO Closure Date (Planned):		31.Oct.2015
REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION		
Regulatory Queries	RQ-ABWR-0141, 0147 and 0149	
Linked ROs	-	
Other Documentation	-	

Scope of work :

Background

During ONR's Step 2 assessment of the UK ABWR, the three Regulatory Queries (RQ) were raised related to Human Reliability Analysis (HRA). Those RQs were focussed on Hitachi-GE's approach to the treatment of Errors of Commission (EOC) and their impacts on safety. In the response to those RQs, Hitachi-GE stated its typical basic ideas as follows:

'additional negative impacts that cause new accident sequence are not modelled in the PSA because of the complexity of the impact on the sequence.'

'most current HRA material does not support the accurate and credible quantification of cognitive errors, and additional quantification and modelling in the PSA will be included in future revision if appropriate and valid tools can be found.'

ONR pointed out in this Regulatory Observation (RO) that those ideas are not consistent with ONR's expectations and modern good practices on the treatment of EOC, which casues a potentially significant project risk for Hitachi-GE delivering a successful GDA safety case within the desired timesclae. Therefore, Hitachi-GE is encouraged to consider the matters idetified this RO.

Scope of Work

This RO is related to HRA, especially Hitachi-GE's approached to the treatment of EOC and misdiagnosis. Hitachi-GE proposes its Resolution Plan to address ONR's obseravtions. This plan describes Hitachi-GE's current plan to address the RO. As the work develops, we may choose alternative means to address this RO.

Description of work:

Action # 1 *: Hitachi-GE is requested to consider the matters identified in this RO and furnish a Resolution Plan by 20 December 2014.*

Hitachi-GE's Resolution Plan is proposd in this submission.

Resolution Date:
ROA 1: 5 January 2015(upon plan submission)

Action # 2 *: Hitachi-GE needs to provide suitable and sufficient justification and analysis in the UK ABWR safety case for the treatment of important EOC and their impacts. This should include systematic assessment and modelling (qualitatively and quantitatively) of important EOC, including those EOC that have the potential to aggravate fault sequences and lead to new situations that are not modelled in the PSA. The PSA should quantify these errors (and sequences) and fully incorporate them to provide a best-estimate of the risk. Resolution required in line with the UK ABWR PSA programme timescales.*

Hitachi-GE proposes a phased approach to the qualitative and, where appropriate and valid, quantitative analysis (i.e. HEA/HRA) of EoCs and misdiagnosis opportunities:

- ROA 2(a): Select and justify a qualitative HEA method.
  Firstly, Hitachi-GE will select a qualitative analysis method that allows systematic identification of potential risk-significant EoCs/misdiagnoses. If necessary, the method will be adapted or any required new aspects of an existing method will be developed, and those modifications also justified.

- ROA 2(b): Perform qualitative analysis.
  Hitachi-GE will then perform the qualitative analyses defined in ROA 2(a).

- ROA 2(c): Define actions and their schedule for estimation of risk impact of non-screened HFEs.
  Hitachi-GE will define specific actions and their schedule in order to estimate the risk impact from the EoCs/misdiagnoses.

Resolution Date:
ROA 2(a): 31 March 2015 (report in Human Factors Methodology Plan (HFMP) Rev. C)
ROA 2(b): 30 June 2015 (report in Human Reliability Analysis Report (HRAR) Rev. C)
ROA 2(c): 31 July 2015 (report in a supporting document on PSA)
Note: Further actions and their schedules will be defined in ROA 2(c) according to the outcome of ROA 2(b).

Action # 3 *: Hitachi-GE is expected to provide a robust justification for the choice of its HRA methods and HEP data, taking into account the above and noting UK regulatory expectations in the regards as cited in SAP EHF.10 (paragraph 390: "The selection and application of probability data for human errors should be……..justified and its relevance for the task and context demonstrated"). If SPAR-H is to be used, sensitivity studies using another HRA method should be conducted. Alternatively, Hitachi-GE may wish to justify why EOC have no significant safety impacts and that tasks with decision-making and diagnosis do not have a cognitive error potential with an impact on safety. Resolution required in line with the UK ABWR PSA programme timescales.*

Hitachi-GE will justify the methods and data upon final selection of the tool(s) to be used; Hitachi-GE will also justify the HFEs/alternative paths selected as bounding for inclusion in the analysis and the sequences to be modelled following the qualitative analysis (ROA 2(b)).

Any measures that prevent or mitigate incorrect actions at any point in a fault sequence, thereby minimising or eliminating the impact of EoC/misdiagnosis on that sequence/correct actions will also be identified as appropriate for significant sequences.

This will be reported in:

- an update to the HFMP (methods and basic HEP data (if applicable)) (as per ROA 2(a))
- HRAR Rev. C (HFEs selected as bounding and alternative paths to be modelled) (as per ROA 2(b)).

Resolution Date:

ROA 3: As per RO Action # 2.

***Action # 4** : Given the intricacies and simplistic nature of SPAR-H and its lack of application in UK NPP safety cases to date, Hitachi-GE should explain the familiarity and experience of its assessors regarding use and application of SPAR-H in this context and its technical basis. Resolution required by 20 December 2014.*

SPAR-H has several elements to it, including base HEP values for a generic "misdiagnosis" error and a generic "action" error. It also includes a table that provides adjustment factors for basic HEPs to account for the impact of PIFs. To clarify its limited use of SPAR-H concepts, Hitachi-GE notes the following:

- Misdiagnosis essentially consists of two error elements: if the operator does not correctly understand the scenario, he may fail to do the correct actions necessary/claimed to mitigate the fault. He may do nothing instead or he may (but not necessarily) do the wrong action believing a different fault condition to exist (i.e. EoC due to misdiagnosis). The SPAR-H misdiagnosis value is not being used to do the detailed modelling of EoCs due to misdiagnosis HFEs. It is being used simply to give a value for omitting to perform the remaining task steps of the correct action due to misdiagnosis, because there is no such value in THERP. 1E-02 is considered suitably conservative for that element of the misdiagnosis error.
- The PIFs and adjustment factors within SPAR-H have also been chosen to apply to the THERP nominal HEPs chosen for error quantification. The use of these pre-determined multipliers provides a consistent, repeatable and traceable adjustment of THERP basic HEPs to account for the impact of PIFs.The applicability of these adjustment factors to THERP base data is due to the fact that SPAR-H was developed from THERP and uses the same principles and PIF considerations that are described within the main body of THERP underpinning the tables. Hitachi-GE HF Experts are experienced in applying both HEART EPCs and adjusting THERP base HEPs to account for PIFs; as such the use of a standardised look-up table for PIF adjustment factors is well-within the capabilities of the HRA team members, and the table makes the analysis easier and more consistent.

Resolution Date:

ROA 4: 5 January 2015(in response as above)

Summary of impact on GDA submissions:

GDA Submission Document	Submission Date to ONR
Human Factors Methodology Plan (GA91-9201-0001-00033)	Rev. C, 31st March 2015, Action #2, #3
Human Reliability Analysis Report (GA91-9201-0001-00041)	Rev. C, 30th June 2015, Action #2, #3
A supporting document on PSA (TBD)	31st July 2015, Action #2, #3

Programme Milestones/ Schedule:

See attached Gantt Chart (Table 1).

Reference:

N/A

Table 1 RO-ABWR-0024 Gantt Chart