REGULATORY OBSERVATION

REGULATOR TO COMPLETE

RO unique no.:	RO-UKHPR1000-0019
Revision:	0
Date sent:	20/09/19
Acknowledgement required by:	11/10/19
Agreement of Resolution Plan Required by:	28/02/2020
CM9 Ref:	2019/250362
Related RQ / RO No. and CM9 Ref: (if any)**:**	RQ-UKHPR1000-0056, 2018/66485 RQ-UKHPR1000-0235, 2019/143046
Observation title:	Substantiation of Initiating Event Frequencies in the PSA

Lead technical topic:	**Related technical topic(s):**
15. Probabilistic Safety Analysis	9. Fault Studies

Regulatory Observation

Background

ONR expects the safety case for new reactors to include a suitable and sufficient Probabilistic Safety Analysis (PSA) that adequately represents the design of the facility, that is realistic and that uses relevant data that is suitably underpinned. To this end, ONR is seeking to gain confidence in the requesting party's (RP) plan and approach for the selection, grouping, screening of initiating events (IEs) and derivation of the frequencies assigned to IEs in the PSA for the UK HPR1000 generic design assessment (GDA).

This is an important issue because the level of risk estimated in PSA models depends significantly on the selection of the list of initiating events that have been considered, and on their frequency. If it has not been adequately demonstrated that the IEs considered in the PSA cover the majority of risks coming from the design, the usefulness of the PSA is limited. Likewise, if the frequencies assigned to the chosen IEs have not been adequately demonstrated, the results of the PSA may have large uncertainty.

Although the approach for selection, bounding and screening of IEs has been clearly explained in a number of submitted documents [1, 2 and 3] and responses to RQs [4 and 5] to ONR, this approach has not been demonstrated adequately to meet UK expectations or meets what ONR considers to be Regulatory Good Practice (RGP) in this area. In addition, the frequencies assigned to each IE have not been demonstrated to be justified and suitable for use in the UK HPR1000 PSA.

This regulatory observation has therefore been raised to:

- Explain ONR's regulatory expectations regarding IEs used in the PSA;
- Ensure that the RP provides a suitable and sufficient approach for choosing the list of IEs that will be modelled in the PSA in a manner that meets ONR's regulatory expectations;
- Ensure that the RP provides a suitable and sufficient plan for justifying that the assigned IE frequencies are appropriate and substantiated for use in the UK HPR1000 PSA; and
- Ensure that the requesting party provides a realistic plan for when this work will be completed during the GDA.

Relevant Legislation, Standards and Guidance

ONR Safety Assessment Principles (SAPs) [6] FA.12 and FA.13 expect that the PSA model includes all relevant initiating faults and is an adequate representation of the nuclear facility.

Fault analysis: PSA	Scope and extent	FA.12
PSA should cover all significant sources of radioactivity, all permitted operating states and all relevant initiating faults.		

Fault analysis: PSA	Adequate representation	FA.13
The PSA model should provide an adequate representation of the facility and/or site.		

Of particular relevance to this regulatory observation is SAPs paragraph 655, which states:

"*Best-estimate methods and data should be used as far as possible within the PSA and in particular for determining initiating event frequencies and in the supporting transient, accident progression, source term and radiological analyses. Where this is not practicable, conservative assumptions should be made and the sensitivity of the results to these assumptions should be established.*"

The ONR PSA Technical Assessment Guide (TAG) [7] provides further details of ONR's expectations for reliability data that is used as an input to the PSA models for the UK HPR1000, in particular Table A1-2.1.

Regulatory Expectations

ONR's regulatory expectations are that the PSA modelling and data which is used as the basis for the UK HPR1000 PSA should be appropriately justified and in line with the guidance noted above. In response, ONR would therefore expect the RP to provide information which should:

1. Demonstrate that the IE selection, grouping and screening methodologies and approaches used in the UK HPR1000 PSA are substantiated and appropriate for use in the UK HPR1000 PSA.
2. Demonstrate that the IE frequency derivation methodology and approach used in the UK HPR1000 PSA is substantiated and appropriate for use in the UK HPR1000 PSA.
3. Demonstrate that the IE frequencies used in the UK HPR1000 PSA are traceable to their source or origin; have been derived correctly in accordance with justified IEF derivation method/s selected by the RP and quality checked.

References

[1] *Internal Events Level 1 PSA*, 2018, CM9 2018/350941
[2] *Methodology of PIE Identification*, 2018, CM9 2018/181952
[3] *PIE List of UK HPR1000 of Internal Event (Except for Loss of Support System),* 2019, CM9 2019/187241
[4] RQ-UKHPR1000-0056, *Initiating Event List pre-screening/grouping and post-screening/grouping for FCG3*, CM9 2018/66485
[5] RQ-UKHPR1000-235, *Frequency Data for PIE Grouping,* CM9 2019/143046
[6] *Safety Assessment Principles for Nuclear Facilities*, 2014 Edition, Revision 0, Office for Nuclear Regulation, 2014. www.onr.org.uk/saps/saps2014.pdf
[7] *Nuclear Safety Technical Assessment Guide, Probabilistic Safety Assessment*, NS-TAST-GD-030 Revision 5, Office for Nuclear Regulation, 2016. www.onr.org.uk/operational/tech_asst_guides/index.htm

Regulatory Observation Actions

RO-UKHPR1000-0019.A1 – Demonstration of the Validity of the Approach for IE Selection, Grouping and Screening & IE Frequency Derivation

In response to this Regulatory Observation Action, GNS should:
- Provide an adequate justification to demonstrate that the the methods and approaches used to select, group and screen the list of IEs used in the UK HPR1000 PSA are suitable and sufficient for use in the safety case, and meet ONR's regulatory expectations.

Protective Marking (if required)

- Provide an adequate justification to demonstrate that the the methods and approaches used to derive the frequencies of the IEs used in the UK HPR1000 PSA are suitable and sufficient for use in the safety case, and meet ONR's regulatory expectations.
- Provide adequate substantiation to demonstrate that the frequencies assigned to the UK HPR1000 PSA IEs are suitable and sufficient for use in the safety case and meet ONR's regulatory expectations

Resolution required by '*to be determined by General Nuclear System Resolution Plan*'

REQUESTING PARTY TO COMPLETE	
Actual Acknowledgement date:	
RP stated Resolution Plan agreement date:	

Protective Marking (if required)