REGULATORY OBSERVATION

REGULATOR TO COMPLETE

RO unique no.:	RO-UKHPR1000-0053
Revision:	1
Date sent:	19/11/2020
Acknowledgement required by:	10/12/2020
Agreement of Resolution Plan Required by:	10/12/2020
TRIM Ref:	2020/299347
Related RQ / RO No. and TRIM Ref: (if any)**:**	RQ-UKHPR100-1031 - 2020/241879
Observation title:	Provision of evidence to support bounding case justifications.
Lead technical topic: 12. Internal Hazards	**Related technical topic(s):** 2. Civil Engineering 8. External Hazards 9. Fault Studies 14. Mechanical Engineering 15. Probabilistic Safety Analysis 20. Structural Integrity

Regulatory Observation

Background

It is expected that during GDA the requesting party (herein referred to as RP) demonstrates through the provision of a safety case, that the risks to nuclear safety associated with internal hazards have been reduced to ALARP.

The safety case is required to provide sufficient articulation of the safety case claims, arguments and evidence to demonstrate that the internal hazards that pose a nuclear safety risk have been eliminated, minimised and mitigated, through the application of a robust hazard assessment process.

In order to achieve the above during GDA, it is considered essential that the RP provide adequate evidence to demonstrate that it has undertaken systematic identification of internal hazards and hazard scenarios, and that the analysis of such scenarios is underpinned by traceable evidence.

Step 4 of the GDA is where the evidence outlined above is subject to in-depth assessment to ensure the safety claims and arguments presented through the prior GDA steps are adequately substantiated on an evidential basis.

The RP has produced a number of reports presenting the bounding cases identified as representative of the internal hazards in the safeguard buildings, fuel building and the reactor building. ONR have assessed the merits of the bounding cases for each internal hazard identified. ONR are content that the approach undertaken is of adequately focuses on the key safety claims relating to divisional barriers, areas of multiple safety trains and impacts on HIC (high integrity component) systems, all areas that could challenge nuclear safety. The reports provide adequate coverage of internal hazards utilising a bounding case approach.

However, the reports do not identify the evidence underpinning the assessments presented, including the identification of hazards and justification of screening of hazard scenarios. They also lack narrative to explain, for example, how conclusions have been reached as to why the bounding cases identified are indeed bounding.

These shortfalls were raised with the RP in step 3, are captured within the step 3 assessment report [Ref. 1] and discussed with the RP in a number of engagements [Refs 2 to 9]. In addition, RQ-UKHPR1000-1031 [Ref 10] was raised looking for clarification of the internal hazards screening processes. Work is still underway on

this RQ, however the RQ does not address the provision of evidence, so although the RQ response will be important to demonstrate the adequacy of the internal hazards safety case, the issues within this RO will remain to be addressed.

The lack of transparency and traceability to the underpinning evidence of the internal hazards assessments presented by the RP is a potential regulatory shortfall. Thus, ONR is now seeking improved transparency for the relevant data used for the initial identification, screening and assessment of internal hazards. This will allow the RP to demonstrate the adequate application of its methodologies, and to justify the selection of the bounding cases.

Relevant Legislation, Standards and Guidance

ONR's Safety Assessment Principles (SAPs) [Ref. 11] contain specific guidance on the development of the internal hazards aspects of a nuclear safety case.

Paragraph 97 of the SAPs states:

The safety case process should also take into account how the different levels and types of documentation fit together to cover the full scope and content of the safety case. The needs of users should be addressed by ensuring that all descriptions and terms are easy to understand by the prime audience, all arguments are cogent and coherently developed, all references are easily accessible, and that all conclusions are fully supported, and follow logically from the arguments. The trail from claims through argument to evidence should be clear.

SAP EHA.1, identification and characterisation (of internal and external hazards), states that an effective process should be applied to identify and characterise all external and internal hazards that could affect the safety of the facility.

SAP EHA.14, Fire, explosion, missiles, toxic gases etc. - sources of harm, states that sources that could give rise to fire, explosion, missiles, toxic gas release, collapsing or falling loads, pipe failures, or internal and external flooding should be identified, quantified and analysed within the safety case.

Further guidance on ONR's expectations for the documentation of the identification and screening processes are detailed within the internal hazards technical assessment guide NS-TAST-GD-014 [Ref. 12] and the new nuclear power plant generic design assessment technical guidance [Ref. 13]. Both documents highlight that the safety case should demonstrate that the hazard identification process is rigorous and well documented such that adequate source data is available to support the safety case conclusions.

Regulatory Expectations

The RP should provide sufficient evidence and justification to demonstrate it has undertaken comprehensive and systematic hazard identification, screening and bounding scenario definition. This evidence is necessary to support the narrative, justification and conclusions drawn in the analysis of the various bounding cases documented within the internal hazard analysis reports.

It is ONR's expectation that a robust audit trail be in place that clearly links the source data reviewed by the RP as part of its internal hazard identification, screening and analysis, to the documents that present the bounding cases. ONR expects the RP to provide appropriate narrative to enable such traceability. These are important to provide confidence in the robustness of the internal hazards aspects of the safety case.

Examples of source data evidence could include (list not exhaustive):

- Site plans, rooms layouts, section drawings and system plans identifying key systems and hazard sources e.g. high energy sources, flammable inventories and key safety features and components e.g. segregation barriers, restraints, etc.
- Room 'data-sheets' documenting hazardous inventories, structures, systems and components that supports the hazard identification and characterisation exercises.
- 'Safety-divisional' plans highlighting key segregation features ensuring delivery of safety functions.
- Supplementary design reports, supporting calculations and technical drawings for nuclear safety structures

In summary, ONR expects all the data and evidence underpinning the internal hazards analyses to be traceable and available.

References

1. ONR-NR-AN-19-004 - UK HPR1000 - GDA Step 3 Assessment Note - Internal Hazards, File Ref: 2019/293364
2. ONR Presentation - Summary of ST3 Assessment Note and Focus for ST4 - L4 Meeting 14th November 2019, File Ref: 2019/327256
3. Meeting No 11 - ONR Presentation - Agenda Item 1 - Step 3 Assessment Summary and Step 4 plan overview - 10th March 2020, File Ref: 2020/77891
4. Meeting No 11 - ONR Presentation - Agenda Item 2 - Safety Case Expectations Version 2 - 10th March 2020, File Ref: 2020/77897
5. ONR, Meeting No.18 - Summary of IH initial findings on the BSX HEPF report - 28th May 2020, File Ref: 2020/171571
6. Meeting No.21 ONR High Level Comments on Safeguard Building Submissions and Preliminary comments on RO-UKHPR1000-0046 Resolution Plan, File Ref: 2020/207379
7. ONR-NR-CR-19-346 - UK HPR1000 - GDA Step 3 Internal Hazards Interaction No.6 - 14 November 2019, File Ref: 2019/345225
8. ONR-NR-CR-20-146 - UK HPR1000 - Step 4 Internal Hazards Meeting No.18 - 28 May 2020, File Ref: 2020/171938
9. ONR-NR-CR-20-248 - UK HPR1000 - GDA Step 4 Internal Hazards Level 4 Meeting No.21 - 3 July 2020, File Ref: 2020/203474
10. RQ-UKHPR1000-1031, IH Query to confirm the use of the 3D model process as an input in to IH assessments, File Ref: 2020/241879
11. Safety Assessment Principles for Nuclear Facilities. 2014 Edition, Revision 1. (January 2020). ONR. www.onr.org.uk/saps/saps2014.pdf
12. Technical Assessment Guide - Internal Hazards NS-TAST-GD-014 Revision 6. ONR. November 2019 (http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-014.pdf).
13. New Nuclear Power Plants: Generic Design Assessment Technical Guidance, ONR-GDA-GD-007, May 2019

Regulatory Observation Actions

RO-UKHPR1000-0053.A1 – Confirmation based on key examples that the UK HPR1000 internal hazards safety case is evidence-based

In response to this Regulatory Observation Action, the RP should provide:

- Documentation demonstrating that it has undertaken comprehensive and systematic hazard identification and screening in the reactor building.
- Evidence documenting the collection of information and data (eg, where apropriate, through the interrogation of source information such as the 3D model) for the identification and screening of internal hazards, and for the assessment of the identified internal hazard scenarios in the reactor building.
- Transparency on how the information/data has been used, i.e. the links between such evidence and the bounding cases identified as representative of the internal hazards in the reactor building (and submitted to ONR).
- Sufficient explanation to justify that the bounding cases identified as representative of the internal hazards in the the reactor building (and submitted to ONR) are indeed bounding.

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:	