

REGULATORY OBSERVATION

REGULATOR TO COMPLETE

RO unique no.:	RO-UKHPR1000-0055
Revision:	1
Date sent:	19/11/2020
Acknowledgement required by:	10/12/2020
Agreement of Resolution Plan Required by:	10/12/2020
CM9 Ref:	2020/302194
Related RQ / RO No. and CM9 Ref: (if any):	RQ-832, 2020/165463
Observation title:	Consequential internal hazards resulting from seismic events
Lead technical topic:	Related technical topic(s)
12. Internal Hazards	8. External Hazards

Regulatory Observation

Background

The Fukushima-Daiichi accident demonstrated the importance of identifying, characterising and screening credible hazard combinations against which a design would then be adequately analysed. Consideration of hazard combinations is considered relevant good practice (RGP), and ONR's guidance expects duty-holders to consider credible hazard combinations within their nuclear safety cases.

The Requesting Party (RP) for the UK HPR1000 has identified earthquake as a potential initiator for a range of consequential internal hazards. The RP has analysed the reference design against these internal hazards and reported this on a building-by-building basis in a suite of Earthquake Safety Evaluation Reports [Ref 1- 8]. The RP's conclusions from the analysis are that the design is robust against consequential internal hazards that could arise from an earthquake initiator.

ONR has assessed the Earthquake Safety Evaluation Reports and considers there to be a number of shortfalls compared with RGP. This includes, but is not limited to:

- Hazard combination identification
- Screening criteria and application
- Lack of detail relating to the analysis including inputs, assumptions, process and procedures etc.
- Lack of an evidential basis to underpin the analysis results

ONR has discussed the adequacy of the Earthquake Safety Evaluation Reports with the RP at various level 4 meetings [Ref. 9, 10] and through various regulatory queries [Ref 11 to 14]. The RP has not provided sufficient details to date to adequately address these shortfalls to meet ONR's expectations.

Relevant Legislation, Standards and Guidance

ONR's safety assessment principles (SAPs') [Ref.15] and internal hazards TAG NS-TAST-GD-014 [Ref. 16] provide expectations for identification, characterisation and screening of hazards (including combinations), and analysis of the design against these hazards. ONR expects consequential internal hazards should be analysed against relevant good practice as defined in the guidance listed above, this includes those internal hazards initiated by external hazards. In this instance this RO is specifically concerned with consequential internal hazards arising and resulting from a seismic initiator. These expectations are captured within the following relevant SAPs; EHA. 1 and EHA. 14.

Regulatory Expectations

ONR's expectation is that the UKHPR1000 generic safety case should provide an adequate demonstration that the design is robust against consequential internal hazards resulting from an earthquake initiator and the risks are tolerable and or bound by existing load cases.

References

1. Earthquake Safety Evaluation Methodology Report, GHX00100053DOZJ03GN Rev. B, 27 March 2019.
2. Earthquake Safety Evaluation Report for Reactor Building (BRX), GHX86000006DOZJ03GN Rev. A, 25 April 2019
3. Earthquake Safety Evaluation Report for Fuel Building (BFX), GHX86000006DOZJ03GN Rev A, 25 April 2019.
4. Earthquake Safety Evaluation Report for Safeguard Buildings (BSA/BSB/BSC), GHX86000007DOZJ03GN Rev. A, 26 June 2019.
5. Earthquake Safety Evaluation Report for Nuclear Auxiliary Building and Radioactive Waste Treatment Building (BNX/BWX), GHX86000008DOZJ03GN Rev. A, 26 July 2019.
6. Earthquake Safety Evaluation Report for Extra Cooling System and Fire-fighting System Building (BEJ), GHX86000009DOZJ03GN Rev. A, 25 April 2019
7. Earthquake Safety Evaluation Report for Personnel Access Building (BPX), GHX86000010DOZJ03GN Rev. A, 02 July 2019
8. Earthquake Safety Evaluation Report for Emergency Diesel Generator Buildings and SBO Diesel Generator Buildings (BDA/B/C/U/V), GHX86000011DOZJ03GN Rev. A, 22 May 2019
9. ONR-NR-CR-20-316 - UK HPR1000 - Joint Level 4 External and Internal Hazards Meeting on Earthquake Safety Evaluation Reports and the Main Steam System - 22 July 2020, File Ref: 2020/230712
10. ONR-NR-CR-20-447 - UK HPR1000 - Generic Design Assessment - Joint External and Internal Hazards L4 meeting to discuss progress with the Earthquake Safety Evaluation Reports and hazard combinations - 7 September 2020, File Ref: 2020/270377
11. Queries Relating to the Earthquake Hazard Safety Evaluation Reports, RQ-UKHPR1000-0338
12. Regulatory Queries Resulting from Step 3 External Hazards Assessment, RQ-UKHPR1000-0619. CM9 2020/26720
13. RQ-UKHPR1000-0832, Queries relating to the earthquake safety evaluation reports, File Ref: 2020/165463
14. RQ-UKHPR1000-0832, Queries relating to the earthquake safety evaluation reports, File Ref: 2020/231021
15. Safety Assessment Principles for Nuclear Facilities. 2014 Edition Revision 1. January 2020. ONR. www.onr.org.uk/saps/saps2014.pdf
16. 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)

Regulatory Observation Actions

RO-UKHPR1000-0055.A1 – Demonstration, based on key examples, that the UK HPR1000 design is robust against consequential internal hazards initiated by an earthquake, and that results reported in the earthquake safety evaluation reports are underpinned by a robust evidential basis

In response to this action, the RP should provide:

- Documentation demonstrating that a detailed, comprehensive and systematic identification and characterisation of the consequential internal hazard loads to targets as a result of a design basis seismic event has been undertaken for:
 - Internal fire within Safeguard building C (BSC);
 - Dropped load analysis (including falling objects and swing loads) within the Fuel building (BFX) and Safeguard Building B (BSB);

- Documentation to demonstrate that the consequences from the identified loads on targets are bounded where appropriate by the existing hazard analysis, or where this is not the case provide justification why the risks are tolerable.

REQUESTING PARTY TO COMPLETE

Actual Acknowledgement date:

RP stated Resolution Plan agreement date: