

REGULATORY OBSERVATION	
REGULATOR TO COMPLETE	
RO unique no.:	RO-UKHPR1000-0005
Revision:	0
Date sent:	26/10/18
Acknowledgement required by:	16/11/18
Agreement of Resolution Plan Required by:	30/11/18
TRIM Ref:	2018/348624
Related RQ / RO No. and TRIM Ref: (if any):	RQ-UKHPR1000-0044 (2018/36218) RQ-UKHPR1000-0046 (2018/36271) RQ-UKHPR1000-0107 (2018/175767)
Observation title:	Demonstration that the UK HPR1000 Design reduces the risks associated with radioactive waste management, so far as is reasonably practicable
Lead technical topic:	Related technical topic(s):
17. RadWaste, Decommissioning & Spent Fuel Management	1. Chemistry 5. Conventional Health & Safety 6. Cross Cutting 11. Human Factors 13. Management of Safety Quality Assurance 14. Mechanical Engineering 16. Radiological Protection 20. Structural Integrity 21. Environmental
Regulatory Observation	
Background	
<p>A key objective of the Generic Design Assessment (GDA) process is demonstrating compliance with the legal duty that the risks to human health arising from the operation of a power station based on the proposed design are reduced "So Far As Is Reasonably Practicable" (SFAIRP, noting this term is interchangeable with the term "As Low As Reasonably Practicable" (ALARP)). By the end of Step 4 of GDA ONR will undertake a detailed assessment of the design against our Safety Assessment Principles (Ref.1), to assess whether the proposed design ensures relevant risks are reduced to ALARP.</p> <p>During Step 2 of the GDA of the UK HPR1000 design, General Nuclear System Limited (GNS) submitted a Preliminary Safety Report (PSR), of which Chapter 23 (Ref.2) covers radioactive waste management and fuel storage, based on the design of the HPR1000 reactor being constructed at Fangchenggang nuclear power plant Unit 3 (HPR1000 (FCG3)).</p> <p>The information presented in Chapter 23 of the PSR did not provide sufficient recognition of the requirement to demonstrate that risks relevant to radioactive waste management (and management of spent nuclear fuel) will be reduced to ALARP, or adequate consideration of all relevant SAPs. ONR thus raised Regulatory Query RQ-UKHPR1000-0046 (Ref.3). The response to this RQ did not fully meet ONR's expectations in terms of the clarity of the work to be undertaken to demonstrate ALARP for radioactive waste management in future steps of GDA.</p> <p>Chapter 23 (Ref.2) recognised that differences exist between regulation and critical infrastructure in the UK and China relating to radioactive waste management, and that the design of the HPR1000 (FCG3) may need to be modified to meet UK regulatory expectations. ONR raised Regulatory Query RQ-UKHPR1000-0044 (Ref.4) to seek information on the basis of identification of the gaps/differences identified by the RP. This RQ sought information on the standards, guidance and regulatory expectations taken into account in identifying</p>	

the gaps, the reasoning used to decide how and why the gaps were identified and the work needed to address them. Whilst the response provided information on the methodology for identification of the gaps and relevant standards and guidance, it did not provide sufficient information to demonstrate that identification of gaps has been or will be comprehensive. It was clear that there is an ongoing process of “challenge” of the FCG3 design against UK practices for radioactive waste management and regulatory/policy expectations, which is welcome.

ONR raised RQ-UKHPR1000-0107 (Ref.5) to seek further information on the identification of gaps/differences between Chinese and UK practices in the management of solid radioactive wastes, the development of an Integrated Waste Strategy (IWS) and how addressing the gaps/differences will be incorporated into the generic design for the UK HPR1000 and the safety case. The response indicated that a small number of key differences relating to the management of Low Level Waste (LLW) and Intermediate Level Waste have been identified to date and a small number of potential design modifications have been identified.

Until these gaps/differences are identified and incorporated into the design for the UK HPR1000, there will be insufficient information for ONR to reach a judgment on whether relevant risks associated with radioactive waste management will be ALARP. There is thus a potential regulatory shortfall which in ONR’s view requires work by GNS to resolve. In GDA such a potential shortfall is addressed by raising a Regulatory Observation (RO). This RO is being raised to:

- Articulate ONR’s regulatory expectations;
- Ensure that these gaps/differences are resolved in a satisfactory and timely manner during the GDA of the UK HPR1000;
- Obtain confidence and the necessary assurances that the risks associated with all elements of the design relevant to radioactive waste management, not just those affected by potential design modifications, are reduced to ALARP.

Relevant Legislation, Standards and Guidance

ONR’s SAPs (Reference 1) on radioactive waste management include a number of considerations relating to:

- RW.1 A strategy should be produced and implemented for the management of radioactive waste on a site;
- RW.2 The generation of radioactive waste should be prevented or, where this is not reasonably practicable, minimised in terms of quantity and activity;
- RW.3 The total quantity of radioactive waste accumulated on site at any time should be minimised so far as is reasonably practicable;
- RW.4 Radioactive waste should be characterised and segregated to facilitate its subsequent safe and effective management;
- RW.5 Radioactive waste should be stored in accordance with good engineering practice and in a passively safe condition;
- RW.6 Radiological hazards should be reduced systematically and progressively. The waste should be processed into a passive safe state as soon as is reasonably practicable;
- RW.7 Information that might be needed for the current and future safe management of radioactive waste should be recorded and preserved.

ONR has a specific Technical Assessment Guide (TAG) on radioactive waste management (Reference 6), which contains further information including fundamental expectations, policy considerations and refers to relevant international guidance. ONR and the Environment Agencies (EA, Scottish Environmental Protection Agency (SEPA) and Natural Resources Wales (NRW) have issued joint guidance to nuclear licensees on the management of higher activity waste on nuclear licensed sites *known as the “Joint Guidance” (Reference 7), which is relevant to the gaps/differences identified to date.

Relevant SAPs for containment and ventilation include:

- ECV.1 Radioactive material should be contained and the generation of radioactive waste through the spread of contamination by leakage should be prevented;
- ECV.2 Containment and associated systems should be designed to minimise radioactive releases to the environment in normal operation, fault and accident conditions.

This list is not intended to be exhaustive.

ONR's Technical Assessment Guide (TAG), Guidance on the demonstration of ALARP (Ref.8), recognises the possibility for conflict in the different regulatory application of ALARP by ONR and the application of Best Available Techniques (BAT) by the Environment Agency in nuclear safety and environmental protection, which is of relevance to radioactive waste management. The TAG states it is important that, during optioneering studies carried out, that adequate weighting is given to health and safety aspects so that an overall ALARP solution that balances health, safety and environmental aspects is reached in an optimised manner.

Regulatory Expectations

ONR's expectation is that the UK HPR1000 generic safety case should provide an adequate demonstration that risks relevant to radioactive waste management are reduced to As Low As Reasonably Practicable (ALARP). To achieve this, as part of the resolution of the RO, the RP will need to provide the following:

- A suitable and sufficient evaluation of the gaps/differences between UK practices/radioactive waste management infrastructure and the HPR1000 (FCG3) reference plant/Chinese radioactive waste management practices.
- For each of the gaps/differences identified a suitable and sufficient evaluation of options and identification of preferred options to address each gap/difference, taking due account of Relevant Good Practice (RGP) and operational experience and feedback (OPEX).
- A suitable and sufficient radioactive waste management strategy that meets the expectations of SAP RW.1, which incorporates the outcome of options evaluation to address the identified gaps/differences in radioactive waste management.
- A clear, written list of the UK HPR1000 Structures, Systems and Components (SSCs) which may be affected by and/or need to be modified to implement the preferred options identified to address the gaps/differences between UK practices/infrastructure and the HPR1000 (FCG3) generic design as they relate to radioactive waste management.
- A suitable and sufficient assessment of the impact of the modifications on the generic design for the UK HPR1000, and provision of suitable and sufficient substantiation or justification (i.e. evidence) that the relevant risks associated with the management of radioactive wastes are reduced to ALARP. The scope of this substantiation should address all aspects of radioactive waste management, not just those affected by potential design modifications to address gaps/differences between UK practice/infrastructure and the UK HPR1000 (FCG3) design and Chinese radioactive waste management practices. The justification that relevant risks are ALARP should take account of health, safety and environmental aspects in an optimised manner. The justification that relevant risks are reduced to ALARP will require consideration of technical disciplines other than radioactive waste management, for example chemistry, radiological protection and mechanical engineering.

The Regulatory Observation Actions (ROAs) given below are structured in such a way as to enable provision of this information in a logical and step-wise manner, to facilitate ONR's assessment as GDA progresses. This will also be of benefit to the Requesting Part in terms of being able to plan and implement the work necessary in a stepwise manner.

References

- [1] *Safety Assessment Principles for Nuclear Facilities*, 2014 Edition, Revision 0, Office for Nuclear Regulation, 2014.
- [2] *Preliminary Safety Report, Chapter 23, Radioactive Waste Management and Fuel Storage*, HPR/GDA/PSR/0023, Revision 000, General Nuclear System Ltd, October 2017.
- [3] RQ-UKHPR1000-0046, January 2018, TRIM reference 2018/36271.
- [4] RQ-UKHPR1000-0044, January 2018, TRIM reference 2018/36218.
- [5] RQ-UKHPR1000-0107, May 2018, TRIM reference 2018/175767.
- [6] *Nuclear Safety Technical Assessment Guide Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed Sites*, NS-TAST-GD-024, Revision 5, Office for Nuclear Regulation, August 2016.
- [7] *The management of higher activity radioactive waste on nuclear licensed sites*, Revision 2, February 2015, ONR, NRW, SEPA and EA, February 2015.
- [8] *Nuclear Safety Technical Assessment Guide, Guidance on the demonstration of ALARP*, NS-TAST-GD-005 Revision 8, Office for Nuclear Regulation, July 2017.

Regulatory Observation Actions**RO-UKHPR1000-0005.A1 – Evaluation of gaps/differences between UK practices and the HPR1000 (FCG3) design/Chinese practices in radioactive waste management**

In response to this ROA, GNS should provide:

A suitable and sufficient evaluation of the gaps/differences between UK practices/radioactive waste management infrastructure and the HPR1000 (FCG3) reference plant/Chinese radioactive waste management practices. ONR would expect GNS to:

- Identify Relevant Good Practice (RGP) and Operational Experience and Feedback (OEF) used to identify gaps and differences between UK practices/infrastructure (for gaseous, liquid and solid radioactive wastes) and the HPR1000 (FCG3) design/Chinese practices relating to radioactive waste management;
- Identify all relevant gaps and differences between UK practices/infrastructure and the HPR1000 (FCG3) design/Chinese practices relating to the management of gaseous, liquid and solid radioactive wastes.

The response to this ROA may be combined with any other ROA under this RO, if deemed appropriate.

Resolution required by: *To be determined by General Nuclear System Resolution Plan.*

RO-UKHPR1000-0005.A2 – Evaluation and identification of options to address gaps/differences between UK practices and the HPR1000 (FCG3) design/Chinese practices in radioactive waste management

In response to this ROA, and based on the outcome of the work to address ROA A1 under this RO, the Requesting Party should provide a suitable and sufficient evaluation of options for addressing each of the gaps/differences identified under Action A and to identify preferred options to address each gap/difference. This evaluation should take into account the ultimate objective of demonstrating that the relevant risks associated with the management of radioactive wastes to be produced as a result of operation of the UK HPR1000 will be reduced to ALARP.

ONR would expect GNS to provide a proportionate evaluation of options and identification of preferred options which takes into account:

- The response to ROA Action A1 under this RO;
- A suitable and sufficient methodology/methodologies for evaluating options to address each identified gap/difference in radioactive waste management and that takes into account the balance of health, safety and environmental factors in an optimised manner;
- RGP and OEF in the management of gaseous, liquid and solid radioactive wastes and in the evaluation of options;
- The UK requirement to demonstrate that, overall, relevant risks are reduced to ALARP.

The response to this ROA may be combined with any other ROA under this RO, if deemed appropriate.

Resolution required by: *To be determined by General Nuclear System Resolution Plan.*

RO-UKHPR1000-0005.A3 – Production of a radioactive waste management strategy

In response to this ROA, and based on the outcome of the work to address ROA A1 and A2 under this RO, GNS should provide a suitable and sufficient radioactive waste management strategy that meets the expectations of SAP RW.1 and which incorporates the outcome of options evaluation undertaken in ROA A2 to address the identified gaps/differences in radioactive waste management resulting from the work to address ROA A1. ONR would expect GNS to provide an adequate radioactive waste management strategy, taking into account:

- The responses to ROA A1 and A2 under this RO;
- RGP and OEF in the production of radioactive waste management strategies;
- The regulatory expectations set out in SAP RW.1.

The response to this ROA may be combined with any other ROA under this RO, if deemed appropriate.

Resolution required by: *To be determined by General Nuclear System Resolution Plan.*

RO-UKHPR1000-0005.A4 – List of UK HPR1000 Structures, Systems and Components (SSCs) modified and/or affected by addressing gaps/differences between UK practices and the HPR1000 (FCG3) generic design/Chinese practices in radioactive waste management

In response to this ROA, and based on the outcome of the work to respond to ROA A1 and A2 under this RO, GNS should identify all Structures, Systems and Components (SSCs) that will need to be modified and those that may otherwise be affected by implementation of the preferred options for addressing the gaps/differences between UK practices/infrastructure and the HPR1000 (FCG3) generic design as they relate to radioactive waste management. ONR would expect GNS to provide a clear list, based on a proportionate consideration of the SSCs, that takes into account:

- Any modifications to SSCs and thus to the generic design of the UK HPR1000 needed to implement the preferred options identified as a result of completion of the work under ROA A2;
- Identification of those SSCs which do not need to be modified of themselves but which may be affected by modifications to SSCs to implement the preferred options identified under ROA A2, in terms of possible changes to relevant risks as a result of implementation of the modifications;
- GNS’s strategies, plans and timescales to address modifications to SSCs in the UK HPR1000 generic design during GDA identified as a result of completion of the work under ROA A2.

The response to this ROA may be combined with any other ROA under this RO, if deemed appropriate.

Resolution required by: *To be determined by General Nuclear System Resolution Plan.*

RO-UKHPR1000-0005.A5 – ALARP justification for radioactive waste management for the UK HPR1000

In response to this ROA, and based on the outcome of the work to respond to ROA A1 and A2, GNS should provide:

- A suitable and sufficient assessment of the impact on the generic safety case of the modifications to the generic design for the UK HPR1000 necessary to address gaps/differences between UK practice/infrastructure and the UK HPR1000 (FCG3) design and Chinese radioactive waste management practices.
- A suitable and sufficient substantiation or justification (i.e. evidence) that the relevant risks associated with the management of radioactive wastes that would arise as a result of operation of the generic design of the UK HPR1000 will be reduced to ALARP. The scope of this substantiation should be holistic and address all aspects associated with radioactive waste management relevant to the risks, not just those affected by the modifications necessary to address gaps/differences between UK practice/infrastructure and the UK HPR1000 (FCG3) design and Chinese radioactive waste management practices. The overall justification that relevant risks relating to radioactive waste management are ALARP should balance health, safety and environmental aspects in an optimised manner.

ONR notes that justification of ALARP for radioactive waste management for the UK HPR1000 will need to consider a range of technical topic areas in addition to the radioactive waste management topic area under which this RO is being raised.

The response to this ROA may be combined with any other ROA under this RO, if deemed appropriate.

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: