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### REGULATORY OBSERVATION Resolution Plan

<b>RO Unique No.:</b>	RO-UKHPR1000-0042
<b>RO Title:</b>	Robust Demonstration of ALARP for Decommissioning of the UK HPR1000
<b>Technical Area(s)</b>	Radwaste, Decommissioning & Spent Fuel Management
<b>Revision:</b>	0
<b>Overall RO Closure Date (Planned):</b>	2021-02-28
<b>Linked RQ(s)</b>	RQ-UKHPR1000-0047, RQ-UKHPR1000-0105
<b>Linked RO(s)</b>	
<b>Related Technical Area(s)</b>	<ol style="list-style-type: none"> <li>1. Chemistry</li> <li>2. Civil Engineering</li> <li>5. Conventional Health &amp; Safety</li> <li>11. Human Factors</li> <li>13. Management of Safety Quality Assurance</li> <li>14. Mechanical Engineering</li> <li>16. Radiological Protection</li> <li>20. Structural Integrity</li> <li>21. Environmental</li> </ol>
<b>Other Related Documentation</b>	

#### Scope of Work

##### Background

*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)). During Step 4 of GDA of the UK HPR1000 reactor design, ONR is undertaking a detailed assessment of the design against our Safety Assessment Principles (SAPs.), to assess whether the proposed design ensures relevant risks will be reduced to ALARP. This assessment includes consideration of the risks associated with the decommissioning of the UK HPR1000 following cessation of electricity generation.*

Following assessment, ONR decided to issue Regulatory Observation (RO)-UKHPR1000-0042 "Robust Demonstration of ALARP for Decommissioning of the UK HPR1000". This places the following action: :

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- **A1: Robust ALARP demonstration for decommissioning of the UK HPR1000**

### **Scope of work**

GDA scope for decommissioning includes:

- the considerations for facilitating decommissioning;
- the development of the decommissioning strategy and preliminary decommissioning plan for the UK HPR1000;
- the demonstration that UK HPR1000 can be decommissioned using existing techniques, safely and with minimal impacts on the environment;
- the development of the decommissioning radioactive waste management proposal; and
- the disposability assessment of Higher Activity Waste (HAW) generated during decommissioning.

In addition, relevant ALARP and Best Available Technique (BAT) assessments are carried out to a level that is commensurate to GDA stage and scope.

The ALARP assessment aims to demonstrate that risks relevant to decommissioning have been reduced or be capable of being reduced to ALARP. This assessment is undertaken at a level that is commensurate to GDA stage and scope. Therefore, the scope of work for responding to this RO includes work to demonstrate that:

- main decommissioning risks/hazards and associated main reduction/control/mitigation measures have been identified; and
- the decommissioning risks are reduced to ALARP, commensurate to GDA stage and scope.


This includes the following three parts:

Part One (design for decommissioning): considers RGP/lessons learned from OPEX, and specific requirements derived from UK regulations to identify design requirements to facilitate decommissioning and reduce, to ALARP, the risks associated with decommissioning. These are then used to develop and/or improve the design of UK HPR1000.

Part Two (activities of decommissioning): considers currently available methods for decommissioning activities and demonstrates that implementation of these methods enables decommissioning of UK HPR1000, in a way that reduces risks to ALARP.

Part Three (Documenting ALARP demonstration): identifies and updates where relevant the reports which demonstrate at GDA phase, that the risks associated with decommissioning of UK HPR1000 are reduced to ALARP, commensurate to GDA stage and scope. A new report *ALARP demonstration for decommissioning of the UK HPR1000* will be developed and submitted to support the closure of this RO.

General Nuclear System Limited (GNSL) has reviewed RO-UKHPR1000-0042 and produced the Resolution Plan presented hereafter to address the regulatory expectations identified in Action 1, considering the above described scope. The Resolution Plan has been developed in accordance with the UK HPR1000 GDA project

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procedures and processes.

### Deliverable Description

#### **RO-UKHPR1000-0042.A1 –Robust ALARP demonstration for decommissioning of the UK HPR1000**

*In response to this Regulatory Observation Action (ROA), the RP should provide:*

- *A suitable and sufficient substantiation or justification (i.e. evidence) that the relevant risks associated with the decommissioning of the generic design of the UK HPR1000 are reduced to ALARP. The scope of this substantiation should be holistic and address all aspects associated with decommissioning relevant to the risks. The overall justification that relevant risks relating to decommissioning will be reduced to ALARP should balance health, safety and environmental aspects, in an optimised manner.*

*ONR notes that demonstration of ALARP for decommissioning for the UK HPR1000 will need to consider a range of technical topic areas, in addition to the decommissioning topic area, under which this RO is being raised.*

#### **Resolution Plan**

The below Resolution Plan presents the work that has been or is being undertaken to provide the requested ALARP demonstration and identifies the reports that have been or are being updated/produced as a result of this work and that will contain the details of the demonstration. This work will notably discuss RGP and provide a holistic assessment of risks, based on a graded approach, the intent being to ensure the protection of future generations by making design provisions as early as possible for ensuring the decommissioning of UK HPR1000 and related waste management are feasible, in a way that reduces risks to ALARP (and with minimal impacts on the environment and the public). The work is divided into three parts as follows:

#### **Part ONE – Design for Decommissioning**

To justify that the UK HPR1000 design has been developed with due consideration to facilitating decommissioning, and therefore that relevant risks associated with decommissioning of the UK HPR1000 are reduced to ALARP, commensurate to GDA stage and scope, the following works have been or are being carried out during GDA:

- 1) Collect the RGP/ applicable OPEX and associated lessons learned / specific requirements derived from UK regulations relevant to decommissioning. This is mainly documented in the two following reports that have already been submitted to ONR: *Analysis Report of Applicable Codes and Standards, OPEX on Decommissioning*.
- 2) Analyse these reports to identify the requirements for facilitating decommissioning, including those relevant to decommissioning risk reduction:

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- a) applicable to decommissioning (general requirements). This is documented in the report *General Requirements for Decommissioning of Nuclear Power Plants*, which was submitted to ONR in February 2020.
  - b) relevant to the design. This is documented in the report *Design Requirements for Facilitating Decommissioning*, which was submitted to ONR in April 2020.
- 3) List all the relevant requirements, RGP and OPEX and use them as input:
- a) to define the decommissioning strategy, decommissioning plan, waste management, etc.; and
  - b) to develop and/or improve the design of UK HPR1000.


The design (based on all design requirements from all relevant technical areas including decommissioning), has been reviewed against the requirements for facilitating decommissioning to check and demonstrate the design fulfils all relevant requirements, and where it is not the case, justification has been provided to demonstrate that the risk is acceptable and represents the best balance of all relevant requirements (e.g. health, safety (nuclear and conventional) and environmental aspects, throughout the lifecycle). This is documented in the report *Consistency Evaluation for Design of Facilitating Decommissioning* that is currently being updated to discuss RGP / OPEX more clearly and provide more evidence of design measures implemented to reduce potential risks. This report forms a key part of the ALARP demonstration for UK HPR1000 decommissioning. The update plan is provided in the GANTT chart in Appendix A

### **Part TWO - Activities of Decommissioning**

The main activities during decommissioning are identified in the UK HPR1000 decommissioning strategy and preliminary decommissioning plan, based on OPEX and RGP. These are expected to include (not limited to) decontamination, dismantling of equipment and buildings, and waste management. For decontamination and dismantling (equipment and buildings), currently available techniques have been identified and considered for application for UK HPR1000 decommissioning. For decommissioning waste management, an available strategy is developed for UK HPR1000 decommissioning based on current RGP to notably demonstrate that the waste generated during UK HPR1000 decommissioning can be safely managed and that the associated risks are reduced to ALARP, commensurate with GDA stage and scope. For all techniques relevant and applicable to UK HPR1000, main risks, hazards and impacts are identified based notably on worldwide relevant OPEX. The potential reduction/control/mitigation measures for these risks, hazards and impacts are identified and:

- the measures relevant to the GDA design are demonstrated to have been adequately considered and incorporated in the UK HPR1000.
- The measures relevant to site licensing phase are to be handed over to the future licensee as part of the safety case, as part of the transition to the future licensee, in line with the transition plan that is currently being developed.

Information on these aspects has been presented in the following deliverables that have been submitted to

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ONR in 2019 and 2020: *OPEX on Decommissioning, Preliminary Decommissioning Plan, Decontamination Processes and Techniques during Decommissioning, Preliminary Disassembly Program for the Main Equipment Decommissioning, Decommissioning Building Dismantling Proposal, Decommissioning Waste Management Proposal, Dismantling Example Analysis of Steam Generator.*

In response to the ROA, the following reports will be updated to provide more evidence and to more clearly demonstrate the risks associated with UK HPR1000 decommissioning main activities are reduced to ALARP, commensurate to GDA stage and scope:

- Preliminary Decommissioning Plan
- Decontamination Processes and Techniques during Decommissioning
- Preliminary Disassembly Program for the Main Equipment Decommissioning
- Decommissioning Building Dismantling Proposal and
- Decommissioning Waste Management Proposal.

The plan to deliver these reports is provided in the GANTT chart.


### **Part THREE – Documenting ALARP demonstration**

In addition to the above identified reports that will each provide a part of the ALARP demonstration for UK HPR1000 decommissioning PCSR 24 V1, issued at the entry to Step 4, presented the summary of the holistic ALARP assessment for UK HPR1000 decommissioning (based on part One and Two above) and will be updated to V2 toward the end of GDA to improve this summary and incorporate all the work done during step 4.

In response to this ROA, it is proposed to produce a report *ALARP demonstration for decommissioning of the UK HPR1000*. This report will be submitted on October 15<sup>th</sup> 2020, and will include the following aspects:

- Scope: what will be covered and what will not (with justification for items excluded from this report), in line with the GDA scope report.
- Assumptions: presents all assumptions made in GDA that relate to the development of the holistic ALARP demonstration
- ALARP Methodology: - this provides a diagram and discussion of the overall approach for ALARP demonstration for decommissioning.
- Design for Decommissioning: Summarises design measures implemented to facilitate decommissioning, explaining how these minimise the risks to ALARP (as described in Part One of this Resolution Plan)
- Activities of Decommissioning: Summarises information on risk reduction to ALARP for the main decommissioning activities (As described in Part Two of this Resolution Plan)
- Forward action plan
- Conclusion
- References

This report will be the key input to update the section in PCSR24 V1 which presents the summary of the

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<p>holistic ALARP demonstration for decommissioning and produce PCSR24 V2.</p> <p>It is also noted that PCSR Chapter 33 will present the summary of the holistic ALARP assessment of the UK HPR1000 generic design, cross-referencing to the technical areas related holistic ALARP demonstrations.</p> <p>For all the reports outlined above as to be updated as part of the response to RO-UKHPR1000-0042.A1, the submission timescales are given in the Gantt Chart in Appendix A. A period to allow ONR consideration of the technical reports for the closure of the RO is included in the schedule.</p>			
<p><b>Impact on the GDA Submissions</b></p>			
<p>The information will be appropriately incorporated into V2 of relevant PCSR and PCER chapters, notably PCSR Chapter 24 and PCSR 33, PCER Chapter 3.</p> <p>The timescales to submit the reports that form part of the Resolution Plan are given in the Gantt Chart in Appendix A.</p>			
<p><b>Timetable and Milestone Programme Leading to the Deliverables</b></p>			
<p>Please see attached Gantt Chart in APPENDIX A.</p>			
<p><b>Reference</b></p>			
<p>NA.</p>			

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APPENDIX A RO-UKHPR1000-0042 Gantt Chart

	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec 20	Jan 20	Feb 20
<b>RO Action 1</b>										
Update of deliverable-[Consistency Evaluation for Design of Facilitating Decommissioning]										
Submission of deliverable-[Consistency Evaluation for Design of Facilitating Decommissioning]		▲								
Update of deliverable-[Decontamination Processes and Techniques during Decommissioning]										
Submission of deliverable-[Decontamination Processes and Techniques during Decommissioning]		▲								
Update of deliverable-[Preliminary Disassembly Program for the Main Equipment Decommissioning]										
Submission of deliverable-[Preliminary Disassembly Program for the Main Equipment Decommissioning]		▲								
Update of deliverable-[Decommissioning Building Dismantling Proposal]										
Submission of deliverable-[Decommissioning Building Dismantling Proposal]			▲							
Update of deliverable-[Decommissioning Waste Management Proposal]										
Submission of deliverable-[Decommissioning Waste Management Proposal]		▲								
Update of deliverable-[Preliminary Decommissioning Plan]										
Submission of deliverable-[Preliminary Decommissioning Plan]					▲					
Development of deliverable-[ ALARP Demonstration for Decommissioning of the UK HPR1000]										
Submission of deliverable-[ ALARP Demonstration for Decommissioning of the UK HPR1000]						▲				
<b>Assessment</b>										
Regulators Assessment										
Target RO Closure Date										▲