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| **GDA Regulatory Observation** | | |
| **REGULATOR TO COMPLETE** | | |
| **RO unique no.:** | RO-BWRX300-003 | |
| **Revision:** | Issue 1 | |
| **Date sent:** | 14/07/2025 | |
| **Acknowledgement required by:** | 04/08/2025 | |
| **Resolution Plan Agreement Required by:** | 01/09/2025 | |
| **Record Reference:** | ONRW-2126615823-7821 | |
| **Related RQ / RO No. and CM9 Ref:** (if any)**:** | RQ-01980 | |
| **Observation title:** | Design for Decommissioning | |
| **Lead technical topic:** | **Nuclear Liabilities Regulation** | |
| **REGULATORY OBSERVATION:** | | |
| This regulatory observation (RO) does not contain any export-controlled information.  **Background**  The objective of the Generic Design Assessment (GDA) is “to provide confidence that the proposed design is capable of being constructed, operated and decommissioned in accordance with the standards of safety, security and environmental protection required in GB" ‎[1]. As part of this, our expectation is that the Requesting Party (RP) demonstrates that the design has, and will be, developed in such a way as to facilitate decommissioning in accordance with UK and international guidance. In the specific context of a two-step GDA, my starting expectations (informed by that UK and international guidance) for what it is reasonable to expect an RP to provide are:  Concept design   * the concept design has been developed cognisant of the need to facilitate its eventual decommissioning; * there is an understanding of the specific features and requirements necessary to enable a high-level decommissioning strategy; * the timing and method of inserting these features and requirements into the detailed design are known; and   Management systems   * the requirements management system will adequately ensure that the identified requirements and features will ultimately be incorporated into the final design.   The Safety, Security, Safeguards and Environment cases (SSSE) ‎[2] submitted to ONR as part of Step 2 of the GDA by GE-Hitachi Nuclear Energy International LLC (UK Branch), the RP for the BWRX-300 GDA identifies various examples of good practice that will help minimise the decommissioning burden through a combination of material selection and localised design features. There is however, in my opinion, insufficient evidence that the concept design has been developed cognisant of an overall decommissioning strategy. I therefore raised RQ-01980 titled “Design for decommissioning” ‎[3] to which I received the formal response (M250181) on 13/06/2025 ‎[4].  I consider that the response provided sufficient evidence to demonstrate that the RP has a robust management system which is capable of ensuring that specified requirements are incorporated into the design. However, despite there being a small number of examples that provided limited evidence that decommissioning has been considered with respect to plant design, the submissions provided to ONR during the course of Step 2 to date do not provide a clear plan as to how the BWRX-300 design has been and will continue to develop in a way which means that decommissioning is considered at the appropriate design stage. I consider that there is still a shortfall in this area which would need additional work from the RP to resolve and so have raised this Regulatory Observation (RO).  **Relevant Standards and Guidance**  ONR publishes Safety Assessment Principles (SAPs) ‎[5] to assist inspectors in judging whether, in their opinion, the designer’s or dutyholder’s safety and security case satisfactorily demonstrates alignment to the requirements of the law. The principles are not intended to be prescriptive, and priority should be given to achieving an overall balance of safety and security. However, the SAPs themselves should be met so far as is reasonably practicable and adequate justification provided where they are not.  The following SAPs and international standards are particularly relevant to the potential shortfalls described above:  **ONR SAP DC.1: Design and operation**  “Facilities should be designed and operated so that they can be safely decommissioned.”  “828. Decommissioning and waste retrieval should be taken into account during the planning, design, construction and operational stages of a new facility or modifications of an existing facility, including: (a) design measures to minimise activation and contamination etc; (b) physical and procedural controls to prevent the spread of contamination; (c) control of activation; (d) design features to facilitate decommissioning and to reduce future dose uptake by decommissioning workers; (e) consideration of the implications for decommissioning when modifications to and experiments on the facility are proposed; (f) identification of reasonably practicable changes to the facility to facilitate or accelerate decommissioning; and (g) minimising the generation of radioactive waste.”  **IAEA SSR2/1 (Rev. 1) Safety of Nuclear Power Plants: Design ‎[6]**  “4.8. The design shall be such as to ensure that the generation of radioactive waste and discharges are kept to the minimum practicable in terms of both activity and volume, by means of appropriate design measures and operational and decommissioning practices.”  Requirement 12: Features to facilitate radioactive waste management and decommissioning  “Special consideration shall be given at the design stage of a nuclear power plant to the incorporation of features to facilitate radioactive waste management and the future decommissioning and dismantling of the plant.”  **IAEA SSG-47: Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities ‎[7]**  “7.5 At the design stage of a new facility, the designer or the licensee should ensure that decommissioning considerations are taken into account prior to application to the regulatory body for a design certification or for a construction license…”  “7.6. Relevant features and aspects that should be considered during the design stage of a facility to facilitate decommissioning, and which should not reduce but might enhance the safe operation and maintenance of the facility, include the following:  (a) Minimization of the number and size of contaminated areas to facilitate decontamination during decommissioning;  (b) Facilitation of access to SSCs, including compartmentalization of processes (e.g. through incorporation of hatches and large doors);  (d) Use of modular construction in order to facilitate the dismantling of SSCs;  (e) Separation and isolation of non-radioactive and radioactive components and systems, such as separation of electrical and mechanical components;  (f) Facilitation of the removal and/or decontamination of material or equipment, including by means of built-in decontamination mechanisms, such as protective coverings and liners in process cells and areas where liquids might be present;  (h) Design of the facility to avoid undesired accumulations of chemical or radioactive material, and utilization of processes for minimizing and/or reducing the volume of waste generated;  (i) Enabling of remote decontamination, maintenance and monitoring, where necessary;  (j) Enabling waste from operation or temporarily stored waste to be easily retrieved;  (k) Minimization of the use of hazardous substances that could result in mixed hazardous and radioactive waste;  (l) Consideration of the provision of defence in depth measures to reduce the risk of inadvertent releases of radioactive material;  (m) Identification of and reservation of locations for new facilities that might support decommissioning (i.e. new waste management facilities);  (n) Consideration of provisions for the installation of ‘test coupons’ to facilitate the radiological characterization of SSCs.”  **WENRA Report of Working Group of Waste and Decommissioning (V2.3, Jan 24) ‎[8]**  2.2.1 Safety issue: Facilitating decommissioning during design, construction and operational phase  DE-15:  “The licensee shall take account of the need to decommission a facility at the time it is being planned, designed, constructed and operated. Measures, including design features, contamination and activation control, shall be described and justified.”  **WENRA Safety of new NPP designs (March 2013) ‎[9]**  “O6. Radiation protection and waste management  Reducing as far as reasonably achievable by design provisions, for all operating states, decommissioning and dismantling activities:   * individual and collective doses for workers; * radioactive discharges to the environment; * quantity and activity of radioactive waste.”   **Regulatory Expectations**  My interpretation of the response to RQ-01980 (M250181) is that the RP will not develop the decommissioning sequencing and overall high-level decommissioning strategy until site-specific detailed design. These are however enablers to identifying features and requirements necessary to facilitate decommissioning and so should be included in planning and concept design. Doing so will avoid foreclosing specific options and maximise the overall benefits in terms of risk reduction. I therefore consider their absence from the current submission to be a shortfall against the previously highlighted guidance.  ONR would not necessarily expect a fully substantiated demonstration that decommissioning has been factored into design in Step 2 of GDA. It is also recognised that the RP may still be making design choices or making decisions regarding the timing of similar submissions to other regulators for BWRX-300 projects progressing on different timescales. ONR would also not request a ‘bespoke’ submissions solely for the UK. We share the RP’s aspirations to have standard design in multiple countries, supported as much as possible by common documentation. However, it is my opinion that this RO aligns to international guidance and the RP may wish to consider including submissions produced for other international regulators in response to the actions below in its resolution plan.  We are seeking assurances, through a resolution plan agreed in Step 2, on how the RP plans to address the RO actions identified below. Through either existing planned work or new work packages, please provide a description of suitable activities to address the points identified that includes, but is not limited to, the following:   * activities necessary to resolve the areas identified; * scope of the activities including the specific systems that will be considered; * standards and guidance to be applied; and * the timing of each activity in relation to design baselines and other key engineering milestones.   **References**   1. ONR-GDA-GD-006, *Guidance to Requesting Parties on the Generic Design Assessment (GDA) process for safety and security assessments of new Nuclear Power Plants (NPP) Guidance to requesting parties***, Office for Nuclear Regulation**, August 2024. 2. NEDC-34193P, *Revision A, BWRX-300 UK GDA Chapter 21 Decommissioning and End of Life Aspects (Rev. A)*, **GE Hitachi Nuclear Energy**, November 2024. 3. RQ-01980, *Design for decommissioning*, **Office for Nuclear Regulation**, April 2025. 4. GEH Letter M250181, *RQ-01980 Full Response*, **GE Hitachi**, June 2025. 5. Safety Assessment Principles for Nuclear Facilities, Office for Nuclear Regulation, January 2020. 6. SSR-2/1 (Rev. 1), *Safety of Nuclear Power Plants: Design,* **International Atomic Energy Agency**, 2016. 7. SSG-47, *Decommissioning of Nuclear Power Plants*, *Research Reactors and Other Nuclear Fuel Cycle Facilities*, **Internation Atomic Energy Agency**, 2018. 8. *Decommissioning Safety Reference Levels*, **WENRA Working Group of Waste and Decommissioning**, 2024. 9. *Safety of new NPP designs*, **WENRA Study by Reactor Harmonization Working Group**, 2013. | | |
| **REGULATORY OBSERVATION ACTIONS** | | |
| **RO-BWRX-300-003.A1 – Provisional disassembly plan**  In response to this RO Action, the RP should:  Capture, in an appropriate report, the activities and assessments which will result in a credible demonstration that nuclear safety risks arising from inadequate disassembly planning at the design stage have been mitigated and in a proportionate and graded way, any conventional safety, security and environmental protection issues.  Regulatory Expectations  In response to this action, we are seeking assurance that the RP understands how the reactor will be disassembled and that the design features that will be necessary to enable the disassembly strategy are identified and included in the design, such that risks to future operators are reduced as low as reasonably practicable. The report produced for this action can then be referenced from a future UK BWRX-300 safety case submission.  **RO-BWRX-300-003.A2 – BWRX-300 Decommissioning Enabling Design Features**  In response to this RO Action, the RP should:  Formally document the design feature requirements for inclusion in the detailed design (BL1) necessary to enable the production of the disassembly plan for Action 2 as well as any other requirements identified to facilitate decommissioning.  Regulatory Expectations  In response to this action, we are seeking confidence that the RP has considered the appropriate design features, during concept design, that will enable deconstruction such that future risks to operators are reduced as low as reasonably practicable.  Resolution required by '*to be determined by the RP’s Resolution Plan*' | | |
| **REQUESTING PARTY TO COMPLETE** | | |
| **Actual Acknowledgement date** (dd/mm/yy)**:** | |  |
| **RP stated Resolution Plan agreement date** (dd/mm/yy)**:** | |  |