Office for Nuclear Regulation

ONR Assessment Report

# Generic Design Assessment of the BWRX-300 – Step 2 Assessment Report - Conventional Health & Safety

ONR Assessment Report

# Project Name: Generic Design Assessment of the BWRX-300 – Step 2

# Report Title: Step 2 Assessment of Conventional Health & Safety

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# Executive summary

In December 2024, the Office for Nuclear Regulation (ONR), together with the Environment Agency and Natural Resources Wales, began Step 2 of the Generic Design Assessment (GDA) of the BWRX-300 design on behalf of GE Vernova Hitachi Nuclear Energy International LLC, United Kingdom (UK) Requesting Party (RP).

This report presents the outcomes of my conventional health & safety assessment of the BWRX-300 design as part of Step 2 of the ONR GDA. This assessment is based upon the information presented in the RP's safety, security, safeguards and environment cases (SSSE), the associated revision 3 of the Design Reference Report and supporting documentation.

ONR's GDA process calls for an assessment of the RP's submissions, which increase in detail as the project progresses. The focus of my assessment in this Step was to support ONR's decision on the fundamental adequacy of the BWRX-300 design and safety, and the suitability of the methodologies, approaches, codes, standards and philosophies which form the building blocks for the design and generic safety, security and safeguards cases.

I targeted my assessment, in accordance with my assessment plan (ref. [1]), at the areas that were fundamental to the acceptability of the design and methods for deployment in Great Britan (GB), benchmarking my regulatory judgements against the expectations of the ONR's Safety Assessment Principles (SAPs), Technical Assessment Guides (TAGs), UK legislation and other guidance which ONR regards as relevant good practice, such as International Atomic Energy Agency (IAEA) safety, security and safeguards standards. Where appropriate, I have also considered how I could use relevant learning and regulatory conclusions from the UK ABWR GDA to inform my assessment of the BWRX-300.

I targeted the following aspects in my assessment of the BWRX-300 SSSE:

- The adequacy of the claims, sub-claims and arguments presented by the RP and how these demonstrate the way the RP will develop their safety case and evidence going forward.
- Whether the arrangements implemented by the RP are aligned with GB's regulatory expectations in relation to conventional health and safety for the effective control of significant risks throughout the lifecycle of the proposed nuclear power station.
- Demonstration of compliance with the Construction (Design and Management) Regulations 2015 (CDM) including standards and codes.
- The adequacy of the Designer's approach when undertaking design work to identify foreseeable risks and take appropriate measures to eliminate, reduce or control the risks during the design phase.
- The adequacy of the RP's recognition of risk including specific risks associated with the lifecycle of the plant.

- The RP's approach to take appropriate measures to eliminate, reduce or control the specific risks, or are reduced as low as reasonably practicable (ALARP).
- The RP's recognition for the need for personnel with skills, knowledge and experience at the right time during their development of the design.
- The RP's operational capability and its arrangements to maintain this capability.

Based upon my assessment, I have concluded the following:

- The RP recognises its legal responsibilities and has identified a high-level claim for the project that reflects these. The sub-claims and evidence to support the RP's claim, and demonstrate the safety case, have adequately been identified.
- The RP can meet GB regulatory expectations for nuclear site health and safety, including standards and codes at this fundamental stage of the GDA.
- The RP has arrangements to comply with GB legislation including CDM.
- The RP has identified particular risks that could injure workers and require detailed management.
- The RP has adequately considered organisational capability for Step 2 of GDA.
- The RP has demonstrated through documented submissions and monthly meetings (ref. [2]) that conventional health and safety has been adequately considered as part of the lifecycle of the BWRX-300 design.

Overall, based on my assessment to date I have not identified any fundamental NSHS shortfalls that could prevent ONR permissioning the construction of a power station based on the generic BWRX-300 design; noting that any decision to permission a BWRX-300 will require further assessment (in either a future Step 3 GDA or during site specific activities) of suitable and sufficient supporting evidence that can substantiate the claims and proposals made in the GDA Step 2 submissions.

# List of abbreviations

| | |
|---|---|
| ACOP | Approved Code of Practice |
| ALARP | As low As Reasonably Practicable |
| ABWR | Advanced Boiler Water Reactor |
| BAT | Best Available Techniques |
| BWR | Boiling Water Reactor |
| CDM | Construction (Design and Management) |
| CHS | Conventional Health and Safety |
| CNSC | Canadian Nuclear Safety Commission |
| DAC | Design Acceptance Confirmation |
| DRR | Design Reference Report |
| EA | Environment Agency |
| FAP | Forward Action Plan |
| GB | Great Britain |
| GDA | Generic Design Assessment |
| GVHA | GE Vernova Hitachi Nuclear Energy Americas LLC |
| HSE | Health and Safety Executive |
| HSG | Health and Safety Guidance |
| HSWA | Health and Safety at Work etc. Act 1974 |
| IAEA | International Atomic Energy Agency |
| ICE | Institute of Civil Engineering |
| MDSL | Master Document Submission List |
| MHSWR | The Management of Health and Safety at Work Regulations 1999 |
| MSQA | Management of Safety and Quality Assurance |
| NPP | Nuclear Power Plant |
| NRC | Nuclear Regulatory Commission |
| NSHS | Nuclear Site Health & Safety |
| ONR | Office for Nuclear Regulation |
| OPEX | Operational Experience |
| PA | Protected Area(s) |
| PC | Principal Contractor |
| PD | Principal Designer |
| PSA | Probabilistic Safety Assessment |
| PSAR | Preliminary Safety Analysis Report |
| PSR | Preliminary Safety Report |
| PUWER | Provision and use of Work Equipment Regulations 1998 |
| RGP | Relevant Good Practice |
| RP | Requesting Party |
| RQ | Regulatory Query |
| SSSE | Safety, Security, Safeguards and Environment Cases |
| SMR | Small Modular Reactor |
| SSCs | Structures, Systems and Components |
| SAP | Safety Assessment Principle(s) |
| SFAIRP | So far as is reasonably practicable |
| SQEP | Suitably Qualified and Experienced Personnel |
| SSC | Structure, System and Component |

| | |
|---|---|
| TAG | Technical Assessment Guide(s) (ONR) |
| TSC | Technical Support Contractor |
| UK | United Kingdom |
| US | United States of America |
| WENRA | Western European Nuclear Regulators' Association |

# Contents

# 1. Introduction

1. This report presents the outcome of my nuclear site health and safety assessment of the BWRX-300 design as part of Step 2 of the Office for Nuclear Regulation (ONR) Generic Design Assessment (GDA). My assessment is based upon the information presented in the Safety, Security, Safeguards and Environment cases (SSSE) head document [3], specifically chapters (refs. [4], [5], [6], [7]), the associated revision of the Design Reference Report (DRR) (ref. [8]) and supporting documentation.

2. My assessment was undertaken in accordance with the requirements of the ONR's Management System and follows ONR's guidance on the mechanics of assessment, NS-TAST-GD-096 (ref. [9]) and ONR's risk informed, targeted engagements (RITE) guidance (ref. [10]. The ONR Safety Assessment Principles (SAPs) (ref. [11]) together with supporting Technical Assessment Guides (TAGs) (ref. [12]), have been used as the basis for this assessment.

3. This is a major report (as per ONR's guidance, NS-TAST-GD-108 (ref. [13]).

## 1.1. Background

4. The ONR's GDA process (ref. [14]) calls for an assessment of the Requesting Party's (RP) submissions with the assessments increasing in detail as the project progresses. This GDA will be finishing at Step 2 of the GDA process. For the purposes of the GDA, GE Vernova Hitachi Nuclear Energy International LLC United Kingdom (UK) Branch is the RP. GE Vernova Hitachi Nuclear Energy Americas LLC (GVHA) is a provider of advanced reactors and nuclear services and is the designer of the BWRX-300. GVHA is headquartered in Wilmington, North Carolina, United States of America (US).

5. In Step 1, and for the majority of Step 2, the RP was known as GE-Hitachi Nuclear Energy International LLC, UK Branch, and GVHA as GE-Hitachi Nuclear Energy Americas LLC. The entities formally changed names in October 2025 and July 2025 respectively. The majority of the submissions provided by the RP during GDA were produced prior to the name change, and thus the reference titles in Section 6 of this report reflect this.

6. In the UK, the RP has been supported by its supply chain partner, Amentum, who has assisted the RP in the development of the UK-specific chapters of the SSSE and other technical documents for the GDA.

7. In January 2024 ONR, together with the Environment Agency and Natural Resources Wales began Step 1 of this two-Step GDA for the generic BWRX-300 design.

8. Step 1 is the preparatory part of the design assessment process and is associated with initiation of the project and preparation for technical assessment in Step 2. Step 1 completed in December 2024. Step 2 is the first substantive technical assessment Step it began in December 2024 and will complete in December 2025.

9. The RP has stated that, currently, it has no plans to undertake Step 3 of GDA and obtain a Design Acceptance Confirmation (DAC). It anticipates that any further assessment by the UK regulators of the BWRX-300 design will be on site-specific basis and with a future licensee.

10. The focus of ONR's assessment in Step 2 was:

- The fundamental adequacy of the design and safety, security and safeguards cases; and
- The suitability of the methodologies, approaches, codes, standards and philosophies which form the building blocks for the design and cases.

11. The objective is to undertake an assessment of the design against regulatory expectations to identify any fundamental safety, security or safeguards shortfalls that could prevent ONR permissioning the construction of a power station based on the design.

12. Prior to the start of Step 2 I prepared a detailed Assessment Plan for Nuclear Site Health and Safety (ref. [1]). This has formed the basis of my assessment and was also shared with the RP to maximise openness and transparency. It should be noted that although ONR regulates and refers to this topic as nuclear site health & safety, the RP uses the term conventional health & safety. Throughout this assessment report where I refer to the RP and its documentation, I use conventional health and safety, however when referring to ONR's regulation I use the term nuclear site health and safety (NSHS).

13. The phrases as low as reasonably practicable (ALARP) and so far as is reasonably practicable (SFAIRP) are used within this assessment report. ALARP is used in nuclear safety and SFAIRP in NSHS or conventional health and safety. For the purposes of this assessment, these have the same meaning.

14. This report is one of a series of assessments which support ONR's overall judgements at the end of Step 2 which are recorded in the Step 2 Summary Report (ref. [15]) and published on the regulators' website.

## 1.2. Scope

15. The assessment documented in this report is based upon the SSSE for the BWRX-300 (refs. [3], [4], [5], [6], [7], [16], [17], [18], [19], [20], [21], [22], [23],

[24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42], [43], [44], [45], [46], [47]).

16. The RP's GDA scope was agreed between the regulators and the RP during Step 1, this is documented in an overall Scope of Generic Design Assessment report (ref. [48]). This is further supported by its DRR (ref. [8]) and the Master Document Submission List (MDSL) (ref. [49]). The GDA scope report documents the submissions provided in each topic area during Step 2 and also provides a brief overview of the physical and functional scope of the Nuclear Power Plant (NPP) that is proposed for consideration in the GDA. The DRR (ref. [8]) provides a list of the systems, structures and components (SSCs) which are included in the scope of the GDA, and their relevant GDA reference design documents.

17. The RP has stated it does not have any current plans to undertake GDA beyond Step 2. This has defined the boundaries of the GDA and therefore of my own assessment.

18. The GDA scope includes the Power Block (comprising the reactor building, turbine building, control building, radwaste building, service building, reactor auxiliary structures) and Protected Areas (PA) as well as the balance of plant. It includes all modes of operation.

19. The regulatory conclusions from GDA apply to everything that is within the GDA scope. However, ONR does not assess everything within it, or all matters to the same level of detail. This applies equally to my own assessment, and I have followed ONR's guidance on the mechanics of assessment, NS-TAST-GD-096 (ref. [9]) and ONR's guidance on Risk Informed, Targeted Engagements (ref. [10]).

20. As appropriate for Step 2 of GDA, information has not been submitted for all aspects within the GDA Scope during Step 2. The following aspects of the SSSE are therefore out of scope of this assessment:

- All matters that relate to Step 3 detailed design; and
- All matters not identified in the Step 2 assessment scope;

21. My assessment of the RP's submission has considered the following aspects:

- alignment with Great Britain (GB) regulatory expectations;
- compliance with Construction (Design and Management) Regulations (CDM) 2015;
- use the hierarchy of control to eliminate risk so far as is reasonably practicable;

- identification of particular risks in design phase related to construction workers;
- modularisation of the design to reduce risk ALARP;
- organisational capability including interfaces with other disciplines; and
- consideration (by the RP) of the need for personnel to have skills, knowledge and experience relative to their role.

# 2. Assessment standards and interfaces

22. The primary goal of the GDA Step 2 assessment is to reach an independent and informed judgment on the adequacy of the RP's SSSE for the reactor technology being assessed.

23. ONR has a range of internal guidance to enable inspectors to undertake a proportionate and consistent assessment of such cases. This section identifies the standards which have been considered in this assessment. This section also identifies the key interfaces with other technical topic areas.

## 2.1. Standards

24. The ONR Safety Assessment Principles (SAPs) (ref. [11]) constitute the regulatory principles against which the RP's case is judged. As stated in the SAPs, the principles relate only to nuclear safety, radiation protection and radioactive waste management. The SAPs exclude conventional hazards associated with a nuclear facility, except where they have a direct effect on nuclear safety or radioactive waste management. The SAPs have been used in accordance with the above for my Step 2 assessment of the BWRX-300. My NSHS assessment has principally applied GB legislative requirements, specifically, the Health and Safety at Work etc. Act 1974 and supporting Regulations. These regulations are listed in Appendix 2, and together with relevant Approved Codes of Practice (ACOPs), HSE and industry guidance formed the basis for my assessment.

25. The International Atomic Energy Agency (IAEA) safety standards (ref. [50]) and nuclear security series (ref. [51]) are a cornerstone of the global nuclear safety and security regime. They provide a framework of fundamental principles, requirements and guidance. They are applicable, as relevant, throughout the entire lifetime of facilities and activities.

26. Furthermore, ONR is a member of the Western European Nuclear Regulators Association (WENRA). WENRA has developed Reference Levels (ref. [52]), which represent good practices for existing nuclear power plants, and Safety Objectives for new reactors (ref. [53]).

27. The key guidance utilised in my assessment is identified below and referenced where appropriate within Section 4 of this report. Relevant good practice, where applicable, has also been cited within the body of this report.

### 2.1.1. Safety Assessment Principles (SAPs)

28. A list of the SAPs considered in this assessment is recorded in Appendix 1. GB legislation such as the Construction (Design and Management) 2015 Regulations (CDM) has been the key benchmark standard in my assessment.

### 2.1.2. Technical Assessment Guides (TAGs)

29. The following TAGs have been considered and used as part of this assessment:

- NS-TAST-GD-096 - Guidance on Mechanics of Assessment (ref. [54])
- NS-TAST-GD-005 – Regulating Duties to Reduce Risks ALARP (ref. [55])
- NS-TAST-GD-051 – The Purpose, Scope and Content of Safety Cases (ref. [56])
- NS-TAST-GD-026 – Decommissioning (ref. [57])

### 2.1.3. National and international standards and guidance

30. The following national standards and guidance have been used as part of this assessment:

- HSE, Managing Health and Safety in Construction (L153) (ref. [58])
- ICE, Guidance for Design Risk Management (ref. [59])
- HSE, Workplace Health, Safety and Welfare (L24) (ref. [60])
- HSE, Safe Work in Confined Spaces (L101) (ref. [61])

## 2.2. Integration with other assessment topics

31. To deliver the assessment scope described above I have worked closely with several other disciplines to inform my assessment. Similarly, other disciplines have sought input from my assessment. These interactions are key to the success of GDA to prevent or mitigate any gaps, duplications or inconsistencies in ONR's assessment.

32. The key interactions with other topic areas were:

- Life Fire Safety - to provide NSHS support to the consideration of using manually operated hatches to ensure floor compartmentation;
- Human Factors - to discuss risks to workers in confined areas, accessibility and Personal Protective Equipment (PPE), to ensure that operator tasks have been assessed with NSHS considerations;
- Management of safety and quality assurance (MSQA) with respect to considering if materials and equipment used comply with GB legislation, GB standards and regulatory expectations; and

- Mechanical engineering, civil engineering and structural engineering - to discuss the modular design and the application of the principles of prevention in the design phase to reduce risks ALARP.

## 2.3. Use of technical support contractors

33. During Step 2 I have not engaged any Technical Support Contractors (TSCs) to support my assessment of the NSHS aspects of the BWRX-300 GDA.

# 3. Requesting Party's submission

34. The RP submitted the SSSE at the start of Step 2 in four volumes that integrate environmental protection, safety, security, and safeguards. This was accompanied by a head document (ref. [3]), which presents the integrated GDA environmental, safety, security, and safeguards case for the BWRX-300 design.

35. All four volumes were subsequently consolidated to incorporate any commitments and clarifications identified in regulatory engagements, regulatory queries and regulatory observations, and were resubmitted in July 2025. This consolidated revision is the basis of the regulatory judgements reached in Step 2.

36. This section presents a summary of the RP's safety case for conventional health and safety. It also identifies the documents submitted by the RP which have formed the basis of my Step 2 assessment of the BWRX-300 design.

## 3.1. Summary of the BWRX-300 Design

37. The BWRX-300 is a single unit, direct-cycle, natural circulation, boiling water reactor with a power of ~870 MW (thermal) and a generating capacity of ~ 300 MW (electrical) and is designed to have an operational life of 60 years. The RP claims the design is at an advanced concept stage of development and is being further developed during the GDA in parallel with the RP's SSSE.

38. The BWRX-300 is the tenth generation of the boiling water reactor (BWR) designed by GVHA and its predecessor organisations. The BWRX-300 design builds upon technology and methodologies used in its earlier designs, including the Advanced Boiling Water Reactor (ABWR), Simplified Boiling Water Reactor (SBWR) and the Economic Simplified Boiling Water Reactor (ESBWR). The ABWR has been licensed, constructed and is currently in operation in Japan, and a UK version of the design was assessed in a previous GDA with a view to potential deployment at the Wylfa Newydd site. Neither the SBWR or ESBWR have been built or operated.

39. The BWRX-300 reactor core houses 240 fuel assemblies and 57 control rods inside a steel reactor pressure vessel (RPV). It uses fuel assemblies (GNF2) that are already currently widely used globally (ref. [62]).

40. The reactor is equipped with several supporting systems for normal operations, and a range of safety measures are present in the design to provide cooling, control criticality and contain radioactivity under fault conditions. The BWRX-300 utilises natural circulation and passive cooling rather than active components, reflecting the RP's design philosophy.

41. A fundamental aspect of the BWRX-300 SMR design is its modular approach which the RP has identified as being key to enable the design to meet its build certainty philosophy. Modularisation enables components and systems to be grouped together for manufacture and testing before being transported to site. Modularisation in this way is novel in the construction of a nuclear power station.

42. My assessment of the design has considered risk informed elements of the design process that are relevant to NSHS. These include the RP's recognition of its legal duties and how it addresses GB legal requirements. Targeted matters have been sampled and include (but are not limited to):

- the adequacy of the RP's claims arguments and evidence;
- the RP's recognition of managing significant risk in design;
- the ability to control risk throughout the lifetime of the plant;
- whether the modularisation of the design reduces risk ALARP;
- the benefits of early interaction with contractors;
- alignment with GB regulatory expectations;
- compliance with CDM 2015 Regulations; and
- work involving particular health and safety risks (as defined in Schedule 3 of the CDM 2015 regulations) and worker risks specific to BWRX-300 technology.

43. As part of my assessment, I have considered whether:

- the RP's submissions are consistent with UK NSHS legislation and relevant good practice (RGP); and
- the RP has implemented processes to apply the principles of prevention to the design and to enable risks to be reduced ALARP.

## 3.2. BWRX-300 Case Approach and Structure

44. The RP has submitted information on its strategy and intentions regarding the development of the SSSE (refs [63], [64], [65], [66]). This was submitted to ONR during Step 1.

45. The RP has submitted a SSSE for the BWRX-300 that claims to demonstrate that the standard BWRX-300 can be constructed, operated, and decommissioned on a generic site in GB such that a future licensee will be able to fulfil its legal duties for activities to be safe, secure and will protect people and the environment. The SSSE comprises a Preliminary Safety

Report (PSR) which also includes information on its approach to safeguards and security, a Security Assessment, and a Preliminary Environment Report (PER), and their supporting documents.

46. The format and structure of the PSR largely aligns with the IAEA guidance for safety cases, SSG-61 (ref. [67]), supplemented to include UK specific chapters such as Structural Integrity and Chemistry. The RP has also provided a chapter on ALARP, which is applicable to all safety chapters. The RP has stated that the design and analysis referenced in the PSR is consistent with the March 2024 Preliminary Safety Analysis Report (PSAR) submitted to the US Nuclear Regulatory Commission (NRC). The Security Assessment and PER are for the same March 2024 design but have more limited links to any US or Canadian submissions.

## 3.3. Summary of the RP's case for Conventional Health and Safety

47. The aspects covered by the BWRX-300 safety case in NSHS can be broadly grouped under 4 headings which are summarised as follows:

- adequacy of claims, arguments and evidence
- alignment with GB Regulatory expectations
- adequacy of RP's approach to effective control of significant risk during design
- interaction and interface with other technical disciplines.

48. In the Conventional Safety Strategy Report (ref. [45]) the RP states that the "legal requirement to apply and demonstrate the ALARP principle also applies to conventional industrial risks which are addressed in the BWRX-300 design under Conventional Health and Safety (CHS) and Conventional Fire Safety risk" and also that "the application of ALARP principles is embedded in the approach taken and aligns with UK expectations".

49. The fundamental claim of the BWRX-300 is that the design eliminates, reduces or controls, so far as is reasonably practicable, the conventional health and safety risks to workers and the public that may arise during the lifecycle of the plant (ref. [3]). The RP seeks to achieve this by:

- ensuring the relevant legislation and RGP is identified, understood and can be implemented;
- having suitably qualified and experienced personnel (SQEP) within the organisation to develop the design; and
- implementing processes and methodologies to apply the principles of prevention to the design and reduce the risks ALARP.

### 3.3.1. ALARP by Design

50. The RP has four fundamental aspects of approach (ref. [7]) to demonstrate that risks are being reduced ALARP. These are:

- RGP has demonstrably been followed;
- OPEX (operational experience) has been taken into account within the design process;
- all reasonably practicable options to reduce risk have been incorporated within the design; and
- quantitative dose/risk calculations comply with numerical dose/risk targets, and a balanced design has been achieved, i.e., no fault sequences contribute a disproportionately large part of the overall risk.

51. The RP's Chapter 24 submission: Conventional safety and fire safety summary report (sub section 24.2.5 ALARP) (ref. [7]) sets out the claims and arguments for ALARP in design.

52. Furthermore, the BWRX 300 Design Plan, Section 5, (ref. [68]) details claims of the adequacy of the RP's approach to effective control of significant risk during design.

## 3.4. Basis of assessment: RP's documentation

53. The principal documents that have formed the basis of my NSHS assessment of the SSSE are:

- BWRX-300 UK Generic Design Assessment (GDA) Safety, Security, Safeguards and Environment Summary (ref. [3]). This sets out the Fundamental Objective as "The BWRX-300 is capable of being constructed, operated and decommissioned in accordance with the standards of environmental, safety, security and safeguard protection required in the UK";
- The Conventional Safety Strategy (methods) (ref. [64]). This document outlines methodologies presented by the RP to reach a design where risks to health and safety are as low as reasonably practicable;
- Conventional safety and fire safety summary report, Chapter 24 (ref. [7]). This document identifies the conventional health and safety specific claims and arguments which will be further described in subsequent submissions; and
- Chapter 14 – Plant Construction and Commissioning (ref. [6]). This document is high-level, setting out how the BWRX-300 construction and commissioning strategy which will enable a future duty

holder/licensee to implement processes. These processes will ensure the suitability of documentation, training, organisational structure/arrangements and plant and system interfaces to support the implementation of the construction and commissioning program.

54. I have assessed these, and any supporting documents, on a sampling basis, and requested further information as necessary, to allow completion of my assessment scope.

## 3.5. Design Maturity

55. My assessment is based on revision 3 of the DRR (ref. [8]). The DRR presents the baseline design for GDA Step 2, outlining the physical system descriptions and requirements that form the design at that point in time.

56. The reactor building and the turbine building, along with most of the significant structures, systems and components (SSCs) are housed with the ‘power block’. The power block also includes the radwaste building, the control building and a plant services building. For security, this also includes the PA boundary and the PA access building.

57. The GDA Scope Report (ref. [48]) describes the RP’s design process that extends from baseline (BL) 0 (where functional requirements are defined) up to BL 3 (where the design is ready for construction).

58. In the March 2024 design reference, SSCs in the power block are stated to be at BL1. BL1 is defined as:

- system interfaces established
- (included) in an integrated 3-Dimensional (3D) model
- instrumentation and control aspects have been modelled
- deterministic and probabilistic analysis has been undertaken
- system descriptions developed for the primary systems

59. The balance of plant remains at BL0 for which only plant requirements have been established, and SSC design remains at a high concept level.

# 4. ONR assessment

## 4.1. Assessment strategy

60. The objective of my GDA Step 2 assessment is to reach an independent regulatory judgement on the fundamental aspects of the BWRX-300 design, relevant to NSHS as described in sections 1 and 3 of this report. My assessment strategy is set out in this section and defines how I have chosen

which matters to target for assessment. My assessment is consistent with the delivery strategy for the GVHA BWRX-300 GDA [69].

61. GVHA is currently engaging with regulators internationally, including the Nuclear Regulatory Commission in the US (US NRC) and the Canadian Nuclear Safety Commission in Canada (CNSC). It is proposing a standard BWRX-300 design for global deployment with minimal design variations from country to country. My assessment takes cognisance of work undertaken by overseas regulators.

62. Whilst there is no operating BWR plant in the UK, ONR has previously performed a four-Step GDA on the Hitachi-GE UK ABWR (ref. [70]). I have taken learning from this previous activity, targeting my assessment on those aspects of the BWRX-300 which are novel or specific to this design. I have not reassessed inherent aspects of BWR technology which were considered in significant detail for the UK ABWR and judged to be acceptable.

63. In line with my Step 2 assessment plan (ref. [1]), I have assessed the adequacy of the claims, sub-claims and arguments presented by the RP.

64. My assessment included considering whether the arrangements implemented by the RP are aligned with GB regulatory expectations in relation to NSHS for the effective control of significant risks throughout the lifecycle of the power station. This included reviewing the key processes the RP has developed to implement legal requirements, along with the arrangements in place to enable the RP to implement its processes. I sampled several areas to test the application of the RP's processes and arrangements. I selected topic areas in accordance with my assessment plan (ref. [1]) and high significance to NSHS, or design novelty.

65. CDM 2015 (ref. [58]) defines a client as anyone for whom a construction project is carried out, and in any project there may be more than one client. The BWRX-300 design has been prepared outside GB, and the client or clients have not been defined during Steps 1 and 2 of the UK GDA process. The client or clients will need to be appointed if the project progresses further in the UK and then the client(s) will need to demonstrate they have suitable and sufficient arrangements in place for managing the new build project including the allocation of sufficient time and resources.

## 4.2. Assessment Scope

66. My assessment scope and the areas I have chosen to target for my assessment are set out in this section. This section also outlines the submissions that I have sampled, the standards and criteria that I will judge against and how I have interacted with the RP and other ONR assessment topics.

67. My assessment scope is consistent with the GDA scope agreed between the regulators and the RP during Step 1 and detailed in Section 1.2 of this report. I have targeted my assessment within this scope.

68. In line with the objectives for Step 2, I have undertaken a broad review of the highest level, fundamental claims and supporting arguments related to NSHS. To support this, I have sampled a targeted set of the claims or arguments as set out below. Where applicable, I have also sampled the evidence available to support any claims and arguments.

69. In line with my assessment plan, I have considered the following related to NSHS:

- Adequate demonstration of departures from relevant GB legal requirements, standards or codes. This assessment is targeted at fundamental level;
- Demonstration of a clear understanding of CDM and dutyholders compliance with CDM during the design process. This is high level judgement on the 'Design Assurance' of the BWRX-300 GDA submission;
- Identification of foreseeable risks and appropriate measures to eliminate, reduce or control those risks through the design stages as they develop, with a focus on risks to the health and safety of workers across the life cycle of the design to ensure risks can be reduced to SFAIRP;
- Consideration of the specific risks associated with deep excavations, confined spaces, examination, maintenance, inspection and testing of plant and systems, lifting and work at height as listed in CDM Schedule 3 (ref [58]). These are particularly relevant to risks from and with modularisation, compact layout and building below grade;
- Identification of the need for SQEP relevant to their role; and
- Consideration of risks to workers related to the control of asphyxiation hazards (atmospheric control system) and hydrogen risks from BWRX-300 technology.

## 4.3. Assessment

### 4.3.1. Assessment Overview

70. My assessment considered RP's SSSE, from the safety claims through to sub-claims, arguments and evidence. The safety case should logically progress and be clear for everyone with responsibility for conventional health and safety. At step 2 this relates to designers. Clarity in the claims, arguments and evidence assists in planning the development of the safety

case, as it can describe the purpose and requirements of evidence needed that will be developed through the continuing design process (ref. [17]).

71. Figure 1 below provides a diagram of the hierarchy of risk control that is referred to during this assessment report. The hierarchy of risk control is a systematic framework derived in 1950s and used by many organisations to manage risks in the workplace. It ranks risk controls from the highest level of protection to the lowest.

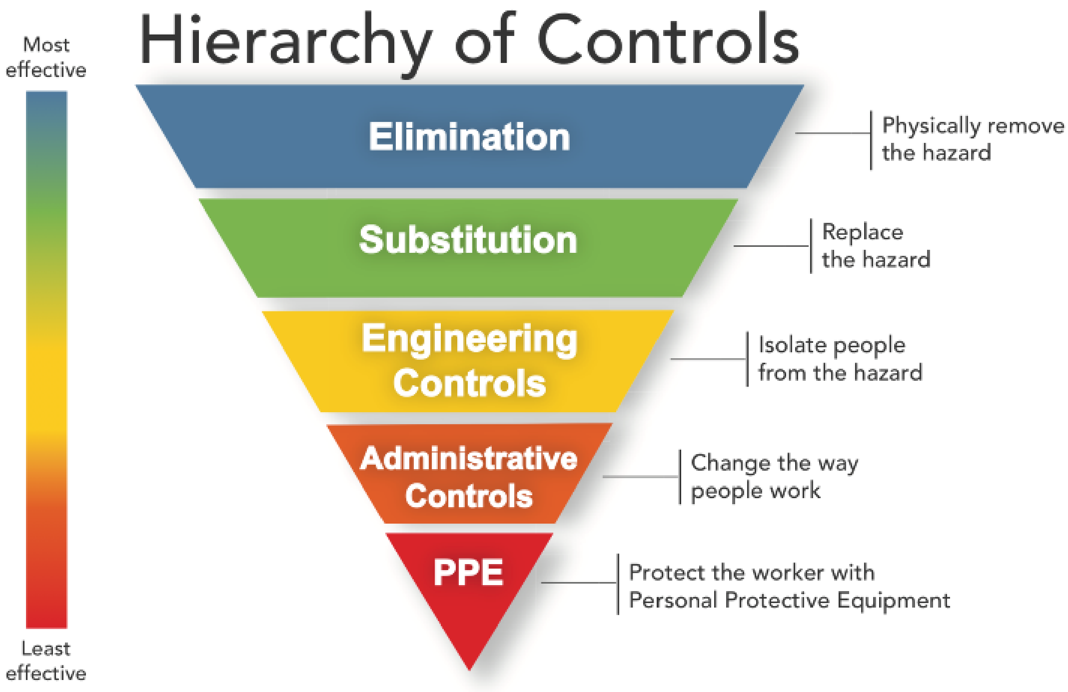


Figure 1. Hierarchy of Risk Control

72. My assessment considered whether the RP's BWRX-300 arrangements are aligned with GB regulatory expectations in relation to NSHS for the effective control of significant risks throughout the lifecycle of the nuclear power station. This included reviewing the key processes the RP has developed to implement its legal requirements, along with the arrangements to enable the RP to implement its processes. I sampled several topic areas to test the application of the RP's processes and arrangements. The topic areas were selected in accordance with the NSHS assessment plan (ref. [1]) and identified due to their high significance to NSHS, or uniqueness.

73. My assessment considers the RP's compliance with GB regulatory requirements. These include, but are not limited to:

- The Health and Safety at Work etc. Act 1974 (HSWA);
- The Management of Health and Safety at Work Regulations 1999 (MHSWR);

- Construction (Design and Management) Regulations 2015 (CDM); and
- The Workplace (Health, Safety and Welfare) Regulations 1992.

74. In accordance with CDM and MHSWR, the RP should demonstrate that the principles of prevention (MHSWR schedule 1) have been applied to the design to eliminate, so far as is reasonably practicable, or reduce or control foreseeable risks to health and safety of people involved in the lifecycle of the BWRX-300.

75. I have sampled documents in accordance with SAP SC.4 , to verify that the safety case has systematically identified hazards and provides evidence to demonstrate how risks are being reduced ALARP throughout the lifecycle of the project whilst incorporating learning into the design (ref. [66]).

76. The RP has employed a consultant to assist in its development and understanding of NSHS in line with GB legislation. Throughout this Step 2 GDA process, training and workshops and specifically during regular RP and regulator meetings (ref. [2]) included its GB consultants.

77. I have sampled the RP BWRX-300 documentation, particularly Chapter 24 Conventional Safety and Fire Safety Summary Report (ref. [7]) to review alignment with GB legislation. During routine regulatory meetings with the RP we discussed the UK NSHS requirements and how these could be implemented in future BWRX-300 project phases (ref. [2]).

78. The RP has identified, through workshops, that GB Regulations would require future site-specific work to demonstrate compliance against them. In our discussions (ref. [2]) the RP highlighted measures in place to ensure quality in construction and maintenance, pointing to chapter 13, 14 and 17 (refs. [26], [6], [38]) of the PSR which detail the arrangements in place. As a summary, the RP confirmed that SSCs are maintained in accordance with a maintenance strategy defining the frequency and type of maintenance to be performed, taking into consideration the supplier recommendations, safety analysis, periodic inspection requirements, OPEX, cost benefit analysis, and service conditions. Maintenance activities are performed in accordance with approved procedures and practices. Preventive measures are employed to eliminate structural, system, and component damage or the contamination of systems with foreign material. In addition, predictive maintenance is performed based on plant monitoring system information. The RP also noted the requirement to appoint CDM dutyholders and confirmed that these appointments would be made once a UK site (and project) is confirmed. The RP noted that GVHA is an international organisation and when working across different countries with different cultures and regulatory expectations its standard approach is to ensure compliance with in-country needs by collaborating with in-country subject matter experts.

79. I am satisfied from my assessment of the RP's documentation and through the discussions in regulatory meetings with the RP, that should there be a future project to build the BWRX-300 in GB there is a strategy to align with GB regulatory expectations regarding compliance with GB legislation.

80. My assessment has focused on how GVHA is complying with its duties as a designer under CDM in line with the Health and Safety Executive's (HSE) guidance L153 Managing Health and Safety in Construction (ref. [58]). The RP has provided documents including arrangements related to design, construction and commissioning (ref. [6]). These are key phases of the CDM process. The RP also identifies the need to consider operations and any future decommissioning and end of life (ref. [5]). During my assessment I considered SAP ECM.1 as this states 'before operating any facility or process that may affect safety it should be subject to commissioning tests defined in the safety case'. The RP's document (ref. [5]) requires further development for decommissioning and end of life aspects for the below grade design. This will be developed as the design and related documents mature. I judge that for this step 2 GDA assessment; GE Hitachi is complying with its duties as a designer noting that should the BWRX-300 project proceed in the UK, additional work will be required to consider decommissioning and end of life requirements. CDM dutyholders

81. The RP identifies the requirement for CDM dutyholders, as set out in Appendix C of the conventional safety and fire safety summary report (ref [7]). This also includes the RP's programme that identifies "the Best Available Techniques (BAT) and up-to-date technologies for construction and commissioning (including future decommissioning) to reduce the impact on workers, the public and the environment".

82. Anyone undertaking or intending to undertake a construction project in GB will have CDM (ref. [58]), duties to fulfil. For this step 2 GDA CDM dutyholders and a specific GB site have not been identified. Clarification of the client dutyholder can be made in later project phases, noting that the client is required to have suitable arrangements for managing the new build project including the allocation of sufficient time and resources. In my judgement this is acceptable for the current stage of design and for step 2 of GDA.

83. During the GDA process, the RP demonstrated full understanding of the requirements for having a Principal Designer (PD) and competent contractors involved in the early stages of the design. The PD, once appointed, is required to plan, manage, monitor and co-ordinate the pre-construction phase. The RP's GB health and safety consultants have given competent advice to the RP regarding CDM dutyholders and their appointment. I verified this through discussions in meetings with the RP (ref. [2]), where I raised questions asking how GB regulatory requirements would be addressed and received assurances that the GVHA understood the

requirements of CDM legislation and would seek to collaborate with GB experts.

84. When comparing this GDA to other potential construction projects, there needs to be an understanding of both the GDA process (ref. [14]) and CDM. At this stage, the scope of assessment is limited, as there is no known site location. BWRX-300 UK GDA Chapter 14 - Plant Construction and Commissioning (ref. [6]) documents a viable construction execution approach that can be used to build BWRX-300 on a generic site.

85. CDM 2015 (ref. [58]) has a relationship with many other GB Relevant Statutory Provisions (RSPs) of the Health and Safety at Work Act 1974. Other Regulations such as Working at Height Regulations 2005 (ref. [71] and the Provision and Use of Work Equipment Regulations (PUWER) 1998 (ref. [72] are likely to be relevant when construction work where CDM applies takes place. Therefore, my assessment considered particular risk activities and the RP's ability to recognise the interaction between the relative legislation for the activity.

86. In my assessment plan (ref. [1]) I included an intention to assess how the RP and its contractors understand CDM roles and how this impacts dutyholders compliance with CDM during the design process. The RP and GVHA have not appointed or consulted with construction contractors (per se) at this fundamental stage of the design. In my judgement, including contractors can be beneficial when discussing and agreeing design, construction materials, techniques and sequencing of the construction works. I judge that the RP's approach is acceptable at this stage, as there is no UK construction project at present.

### 4.3.2. Design

87. The design for conventional health and safety is high level at this stage of the design (ref. [7]). This is the process to ensure the RP's conventional health and safety requirements throughout the design are assessed and compliance with legislation is achieved. The RP's approach focuses on identifying and eliminating risk in the concept phase and then controlling the residual risks in line with MHSWR (schedule 1) (ref. [73] . I am content with this approach as it prioritises elimination, in line with the general principles of prevention set out in the MHSWR, while applying the other principles to risks that cannot be fully eliminated.

88. The RP's interfaces between its design disciplines, as per examples documented in Section 24.1 of the Conventional Safety and Fire Safety Summary Report (ref. [7]) This indicates that either elimination or other controls are used to protect workers at various phases of the BWRX-300 plant lifecycle. I judge that the RP's interfaces between design specialisms as detailed above is adequate to show compliance with CDM design management (ref. [58]).

89. BWRX-300 Chapter 24 – Conventional Safety and Fire Safety Summary Report Appendix A presents conventional health and safety claims arguments and evidence for considering maintenance as part of the design. As I noted in my assessment plan, maintenance plays a key role in the safety of a nuclear facility and should be considered as part of the design (ref. [1]). I note that maintenance is considered in various chapters of the PSR including, chapter 6 (ref. [18]) and chapter 18 (ref. [39]) and although I have not assessed these in detail, I judge that, from a conventional safety perspective, the RP has identified the requirement for maintenance to be addressed. Any future UK project will need to assess this in more detail. This meets the expectations of SAP EMT.1 (ref. [11]) which states that, ‘Safety requirements for in-service testing, inspection and other maintenance procedures and frequencies should be identified in the safety case’. Maintenance is also assessed by other ONR regulatory topics including human factors (ref. [74]).

90. As part of CDM risk assessment process (ref. [58], each designer must assess the risk and follow the hierarchy of controls. I sampled the designer and lifecycle risk assessment process submitted for this assessment and found them to include a comprehensive list of individual hazards identified by the RP. The four fundamental aspects of the approach to demonstrate that risks have been reduced (SFAIRP) are:

- RGP has noticeably been followed;
- OPEX has been considered within the design process;
- All reasonably practicable options to reduce risk have been incorporated within the design; and
- Quantitative dose/risk calculations comply with numerical dose/risk targets, and a balanced design has been achieved (i.e., no fault sequences contribute a disproportionately large part of the overall risk).

91. In my judgement the evidence provided gives confidence that an appropriate approach to manage and reduce risks SFAIRP could be demonstrated in future project phases. In my judgement, the design related submissions provided by the RP in Step 2 adequately demonstrate how the early design decisions, including design fundamentals that are key criteria of the project, have been risk assessed in accordance with the principles of prevention. This has been supported by my discussions with the RP during regulator meetings (ref. [2]).

### 4.3.3. Skills Knowledge and Experience

92. Skills, knowledge and experience form part of fundamental requirements for all personnel engaged in the CDM and GDA process. Within the nuclear industry this is often known as SQEP (suitably qualified and experienced

personnel). The RP's design processes rely on designers to identify hazards and apply the principles of prevention to reduce the risk SFAIRP as the design develops with a focus on risk elimination during the concept design phase. CDM requires that those making design decisions have the skills, knowledge and experience to fulfil their role and use up-to-date experience to make informed decisions regarding methods and materials to be used in relation to their design discipline. This may include dealing with other designers, contractors and suppliers, as necessary.

93. The RP has identified the requirements for SQEP for conventional health and safety (ref. [38]). As the RP has not appointed CDM dutyholders (ref. [58]), the RP retains these duties and hence must ensure that personnel or organisations involved in the GDA are competent. In my discussions with the RP and GVHA (ref. [2]) I have gained confidence they understand the e requirement to have SQEP personnel or organisations in place to fulfil the CDM roles at the appropriate project stages and for appropriate SQEP training to take place. In these discussions the RP noted that all QEP training is (and will be) provided to all personnel as required and that CDM dutyholders will be appointed in the event of a GB site being allocated and future BWRX-300 project commencing.

94. The RP identified potential gaps in Step 1 of this GDA, noting that NSHS training was required. The RP proactively rolled out training on CDM and UK legislation during Step 1 (ref. [7]). The training included:

- Workshops to make all stakeholders aware of the GB NSHS regulatory expectations;
- A workshop to discuss and agree a suitable and manageable suite of construction, operation and/or maintenance activities including decommissioning that could be assessed; and
- A health and safety hazard checklist proforma which was proposed and agreed at this workshop.

95. This led the RP to summarise that UK RGP is well understood and that plant designers can apply their knowledge and experience of these expectations appropriately (ref. [7]).

96. I judge that the Step 2 submissions, backed up by confidence provided by the RP in regulatory meetings (ref. [2]) has adequately demonstrated an understanding of CDM and other UK NSHS legislation.

### 4.3.4. Organisational Capability

97. CDM regulations (ref. [58]) include the requirement for organisational capability. This means the policies and systems an organisation needs to have in place to set acceptable health and safety standards which comply with the law, and the resources and people to ensure the standards are

delivered. I aligned my assessment with SAP MS.2 (capable organisation) ‘The organisation should have adequate human resources. This includes having the necessary competences and knowledge in sufficient numbers to provide resilience and maintain the capability to govern, always lead and manage for safety.’ I considered a widely used GB standard for larger organisations, managing for health and safety (HSG65) (ref. [75]) for leaders, owners and line managers particularly for those who need to put in place or oversee their organisation's health and safety arrangements. I considered the discussions held with the RP (ref. [2]) and the RP’s commitment to work with GB experts and to appoint SQEP CDM dutyholders and hence I judge that the RP has a process to identify and meet the needs for NSHS organisational capability.

98. Throughout this assessment I have considered the information provided, related to how future dutyholders will ensure that CDM organisational processes and resources are met. I have identified that although a PD has not been appointed, the RP’s GB based consultants have provided guidance on GB requirements and legislation to support the RP’s Step 2 GDA submissions.

99. The RP has demonstrated in Step 2 how it has planned conventional health and safety resource to fulfil its organisational capability (refs. [64] and [38]). This ensures health and safety risks are managed in the design phase. This has given me confidence that, providing GB consultants/health & safety personnel with the requisite SQEP are involved, a future project would be able to demonstrate the organisational capability and skills, knowledge and experience to deliver BWRX-300 in GB.

### 4.3.5. Modularisation

100. The BWRX-300 design utilises limited modularisation construction techniques, which can reduce the onsite construction time, lower onsite construction peaks and logistics with a goal of reducing the overall project schedule risk. These improved construction techniques are also employed to improve quality, reduce site personnel hours, reduce weather-related delays and improve schedule duration and margin. The use of modularisation construction techniques meets the expectations of SAP ELO.1 (ref. [11]) which states that ‘The layout should: (a) make provision for construction, assembly, installation, erection, decommissioning, maintenance and demolition’.

101. The BWRX-300 UK Generic Design Assessment (GDA) Safety, Security, Safeguards and Environment Summary (ref. [3]) provides a high level statement on modularisation and how the RP intends to utilise modularisation: “The module and skid assemblies are intended to be built off-site, transported to the site, and erected on-site”. This modularisation strategy will also provide guidance in selection of disassembly methods employed during decommissioning’.

102. Modularisation techniques to deliver the BWRX-300 plant design to support construction and reduce risk in design included examples such as automated welding and the use of equipment on skids. show the use of the hierarchy of controls to eliminate risk through design.

103. I judge that modularisation and strategies for eliminating and reducing risks have been adequately utilised in the BWRX-300 design to date.

### 4.3.6. Particular Risk Activities

104. Particular risk construction activities are identified in CDM (schedule 3) (ref. [58]). These often include high risk activities such as working at height and collapse of excavations, as examples. Work involving particular risks requires detailed attention throughout all phases of the project. Approved Codes of Practice (ACoPs), and guidance documents (both from the HSE and industry bodies) provide guidance and RGP for specific activities and their associated risk. Particular risk work activities, and other risks for workers which the RP has identified, are as follows:

- working at height;
- collapse of excavations;
- collapse of structures;
- exposure to building dust;
- exposure to asbestos;
- electricity;
- lifting operations; and
- working in confined spaces.

105. Particular risks are generally high-risk activities that cause injury to workers and those affected by construction work. Other risks from working with hazardous substances, tools that create noise and vibration and so on should be considered throughout the design, build and lifecycle of the plant. These occupational risks are covered in regulations, namely:

- The Control of Substances Hazardous to Health Regulations 2005
- The Control of Noise at Work Regulations 2005
- The Control of Vibration at Work Regulations 2005

106. The RP has considered construction and commissioning in Chapter 14 of the BWRX-300 PSR, (ref. [6]). This sets out the processes to ensure the suitability of the documentation, training, and organisational

structure/arrangements for the implementation of the construction and commissioning program, together with plant and system interfaces. Detail of the dutyholder (PC)/licensee arrangements are not specific and largely unknown at this stage. Therefore, at this stage, the scope of this submission is limited to a summary of the operational philosophies developed for the BWRX-300 design. I judge that the RP has presented a submission that adequately identifies high risk construction work activities that are in line with Step 2 GDA assessment requirements.

### 4.3.7. ALARP

107. The BWRX-300 design, specifically modularisation (civils and mechanical), has examples that demonstrate eliminating or reducing risk ALARP, these are documented in PSR chapter 27 (ref. [45]). Modularisation and reducing risk in design forms part of the RP's design strategy (ref. [17]) and presents information on the design approaches to civil engineering, seismic category buildings and structures, mechanical components, instrumentation and control systems, and electrical systems and components.

108. My interactions with the management of safety and quality assurance ONR topic lead for the BWRX-300 design assurance (ref. [38] ) considered construction and the RP's design strategy to reduce design risk SFAIRP.

109. I have considered the application of SFAIRP that supports the lifecycle of the plant as a fundamental objective that the BWRX-300 and its capability of being constructed, operated and decommissioned in accordance with the standards of safety required in GB. This is primarily identified in the RP's ALARP submission (ref. [45]) and further in other documents such as chapter 14 of the PSR, construction and commissioning (ref. [6]).

110. Having reviewed the BWRX-300 PSR submissions and from my discussions with the RP at regulatory meetings I judge that the BWRX-300 should be able to demonstrate that risk reduction SFAIRP in future UK project phases.

### 4.3.8. Interaction with other Regulatory Topics

111. As part of this assessment report, I have interacted with other regulatory topics to discuss areas of common interest with respect to the BWRX-300 design. This has included the human factors inspector to discuss construction workers working in areas below grade and relying on artificial light for large periods of time. Also, the evacuation of workers to a safe location during the construction and commissioning phase. A temporary means of alerting all those on site (of the emergency) and egressing to a safe predetermined location must be identified, tested and maintained.

112. As part of my regulatory interactions with ONR life fire safety inspector. I have discussed matters of life fire safety that have knock on impacts to NSHS with the fire safety topic lead and the RP. These matters are recorded in the life fire safety assessment report (ref. [76]).

113. I have discussed the RP's engineered safety features (ref. [18] and civil engineering (ref. [22]) submissions for the BWRX-300 design with the relevant ONR topics lead assessors. We identified where the RP has, through the design, eliminated or mitigated risks by considering better means of sequencing, or use of alternative materials or methods that can enhance the project through its lifecycle.

114. I discussed specific BWRX-300 challenges, particularly related to the control of asphyxiation hazards (atmospheric control system) and hydrogen risks from BWRX-300 technology with the ONR internal hazards inspectors. SAP EHA.14 (ref. [11]) identifies that the safety case should consider 'fire, explosion, missiles, toxic gases, etc. as sources of harm. At step 2 the RP has demonstrated an awareness of these hazards but has not undertaken detailed assessment and hence further assessment will be required during any future GB project development.

115. I also discussed hydrogen accumulation leading to leakages, fires, and explosions with ONR internal hazards inspectors. The RP's fire hazard assessment within reference [7] indicates that explosion sources which impact on NSHS have not yet been identified and therefore analysis is not available but further work is required and has been added to the forward action plan (FAP) (ref. [77]). Even so, these areas are potential high risk confined spaces and there is potential for construction workers to work in confined spaces. The RP has identified confined spaces as a high-risk activity. I judge that the RP has sufficient procedures to manage these matters for step 2 of GDA, although further assessments will be required if BWRX-300 progresses to future UK project stages.

### 4.3.9. Assessment Summary

116. In my sampling of the RP's submissions, I found examples of where the RP has, in line with legal requirements, considered the different lifecycle stages in the generic design and how it has identified conventional health and safety hazards. The RP has also demonstrated visibility of the claims and arguments in the submissions and highlighted training requirements. Overall, from the documents I have sampled, I am content that the BWRX-300's consideration of NSHS is appropriate for Step 2 of GDA.

# 5. Conclusions

117. This report presents the Step 2 NSHS assessment for the GDA of the BWRX-300 design. The focus of my assessment in this Step was towards the fundamental adequacy of the design with respect to NSHS. I have assessed the SSSE chapters and relevant supporting documentation provided by the RP to form my judgements. I targeted my assessment, in accordance with my assessment plan (ref. [1]), at the content of most relevance to NSHS against the expectations of ONR's SAPs, TAGs and UK Legislation.

118. I targeted my assessment, in accordance with my assessment plan (ref. [1]), and at the content most relevant to NSHS against the Health and Safety at Work etc. Act 1974 and supporting regulations, and the expectations of ONR's SAPs, TAGs and other guidance which ONR regards as relevant good practice.

119. Based upon my assessment, I have concluded the following:

- The RP recognises its legal responsibilities and has identified a high-level claim for the project that reflects these. The sub-claims and evidence to support the RP's claim, and demonstrate the safety case, have adequately been identified;
- The RP meets GB regulatory expectations for NSHS, including standards and codes at this fundamental stage, step 2 of the GDA;
- The RP has arrangements to comply with GB legislation including CDM;
- The RP has identified particular risks that could injure workers and require detailed management;
- The RP has adequately considered organisational capability for Step 2 of GDA; and
- The RP has demonstrated through documented submissions and monthly meetings (ref. [2]) that conventional health and safety has so far been adequately considered as part of the lifecycle of the BWRX-300 design.

120. Overall, based on my assessment, I have not identified any fundamental NSHS shortfalls that could prevent ONR permissioning the construction of a power station based on the generic BWRX-300 design, noting that any decision to permission a BWRX-300 will require further assessment (in either a future Step 3 GDA or during site specific activities) of suitable and sufficient supporting evidence to substantiate the claims and proposals made in the GDA Step 2 submissions.

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# Appendix 1 – Relevant SAPs considered during the assessment

| SAP reference | SAP title |
|---|---|
| SC.4 | The regulatory assessment of safety cases. Safety Case characteristics |
| ECM.1 | Engineering principles: commissioning - commission testing |
| EMT.1 | Engineering principles: maintenance, inspection and testing. Identification of requirements |
| MS.2 | Leadership and management for safety. Capable organisation |
| ELO.1 | Engineering principles: layout |
| EHA.14 | Engineering principles: civil engineering: design - earthworks |

# Appendix 2 – Legislation

| Regulation title |
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| The Health and Safety at Work etc. Act 1974 |
| Management of Health and Safety at Work Regulations 1999 |
| The Construction (Design and Management) Regulations 2015 |
| The Confined Spaces Regulations 1997 |
| The Work at Height Regulations 2005 |
| The Lifting Operations and Lifting Equipment Regulations 1998 |
| The Control of Noise at Work Regulations 2005 |
| The Control of Vibration at Work Regulations 2005 |
| The Control of Substances Hazardous to Health Regulations 2005 |
| The Workplace (Health, Safety and Welfare) Regulations 1992 |