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| ONR Assessment Report  Generic Design Assessment of the Rolls Royce SMR – Step 2 assessment of Conventional Health and Safety |

ONR Assessment Report

**Project Name**: Generic Design Assessment of the Rolls-Royce SMR

**Report Title**: Step 2 assessment of Conventional Health and Safety

**Authored by**: [Redacted]

**Report Issue No**: 1

**Document ID**: ONRW-2126615823-3662

**Publication Date**: Jun-24

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# Executive Summary

This report presents the outcomes of my conventional health and safety assessment of the Rolls-Royce Small Modular Reactor (SMR) as part of Step 2 of the Office for Nuclear Regulation (ONR) Generic Design Assessment (GDA). This assessment is based upon the information presented in version 2 of Rolls-Royce SMR Limited’s Environmental, Safety, Security and Safeguards (E3S) case chapters and supporting documentation.

ONR’s GDA process calls for a step-wise assessment, which increase in detail as the project progresses. The focus of my assessment in this step was towards the fundamental adequacy of the Rolls-Royce SMR design and safety case, and the suitability of the methodologies, approaches, codes, standards and philosophies which form the building blocks for the design and generic safety and security cases.

I targeted my assessment, in accordance with my assessment plan, at the content of most relevance to conventional health and safety against the expectations of the Health and Safety at Work etc. Act 1974, the supporting Regulations and Approved Codes of Practices (ACOPs). I also considered the ONR’s Safety Assessment Principles (SAPs), Technical Assessment Guides (TAGs) and other guidance which ONR regards as relevant good practice.

I targeted the following aspects in my assessment of the Rolls-Royce SMR E3S case:

* The adequacy of the claims, sub-claims and arguments presented by the RP. The claims, sub-claims and arguments demonstrate how the RP will develop the safety case and evidence for submission in Step 3, therefore, showing how the claims made will be substantiated.
* Whether the arrangements implemented by the RP are aligned with Great Britain’s regulatory expectations in relation to conventional health and safety for the effective control of significant risks throughout the lifecycle of the power station. The focus being on how the RP has demonstrated compliance with the Construction (Design and Management) Regulations 2015 (CDM).
* The adequacy of the RP’s approach when undertaking design work to identify foreseeable risks and take appropriate measures to eliminate, reduce or control the risks during design.

Based upon my assessment, I have concluded the following:

* Rolls-Royce SMR Limited recognises its legal responsibilities and has identified a high-level claim for the project that reflect these. The sub-claims and evidence to support this claim, and demonstrate the safety case, have broadly been identified.
* The RP’s organisational arrangements relating to conventional health and safety, and capabilities to fulfil these, are evolving. This includes recruiting people with relevant skills, knowledge and experience, providing relevant training to the designers involved in the project and undertaking client assurance activities.
* The RP has produced a suite of processes which support the integration of its legal duties to manage conventional health and safety risks into its engineering design processes. The detail of how the conventional health and safety processes will be implemented and evidence of their application to assess their effectiveness will be sampled in Step 3. This includes how the processes will identify and consider conflicting and contingent hazards. This is not a fundamental issue at this stage and is outside the scope of Step 2.
* The design is in concept design phase. At this stage, the RP’s design processes focus on eliminating hazards before looking to reduce and control the remaining hazards as the design matures. Whilst some submissions have demonstrated that the RP’s concept design has identified and considered hazards to date, I have not seen how this has been applied in relation to conventional health and safety robustly to ensure that risks have been eliminated so far as is reasonably practicable. The application of processes is in the scope of Step 3 and, therefore, I do not consider this a fundamental gap in Step 2.
* The RP has adopted the CDM role of client and appointed an individual as principal designer. It has demonstrated an understanding of the requirements of these regulations and the arrangements to meet these requirements are continuing to evolve. It is unclear how the duties of the principal designer to plan, manage and monitor during the pre-construction phase to date have been met. Demonstration of this is within the scope of Step 3.
* The RP continues to develop its arrangements to meet the expectations of CDM. However, assurance has not been provided to demonstrate that the hazards within the generic design have been robustly identified and understood. It is therefore unclear how the principles of prevention have been applied to foreseeable risks throughout the design to date. This is important where key design decisions have already been taken. I consider this a shortfall which the RP will need to resolve.

Overall, based on my assessment to date, and subject to the provision and assessment of suitable and sufficient supporting evidence, I have not identified any fundamental safety shortfalls that could prevent ONR permissioning the construction of a power station based on the generic Rolls-Royce SMR design.

# List of Abbreviations

ACOP Approved Code of Practice

ALARP As low as is reasonably practicable

CDM The Construction (Design and Management) Regulations 2015

CAE Claims, Arguments and Evidence

DAC Design Acceptance Confirmation

E3S Environment, Safety, Security and Safeguards

GDA Generic Design Assessment

HSE Health and Safety Executive

IAEA International Atomic Energy Agency

ONR Office for Nuclear Regulation

PD Principal Designer

PSRB Product Safety Review Board

PWR Pressurised Water Reactor

RCP Reactor Coolant Pumps

RGP Relevant Good Practice

RP Requesting Party

RPV Reactor Pressure Vessel

SAP Safety Assessment Principle(s)

SMR Small Modular Reactor

SFAIRP So far as is reasonably practicable

SG Steam Generator

SSC Structure, System and Component

TAG Technical Assessment Guide(s) (ONR)

TSC Technical Support Contractor

WENRA Western European Nuclear Regulators’ Association

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# Introduction

1. This report presents the outcomes of my conventional health and safety assessment of the Rolls-Royce Small Modular Reactor (SMR) as part of step 2 of the Office for Nuclear Regulation (ONR) Generic Design Assessment (GDA). This assessment is based upon the information presented in version 2 of Rolls-Royce SMR Limited’s Environmental, Safety, Security and Safeguards (E3S) case chapters (refs [1], [2], [3], [4], [5], [6], [7], [8], [9] and [10]) and supporting documentation.
2. Assessment was undertaken in accordance with the requirements of the ONR Management System and follows ONR’s guidance on the mechanics of assessment, NS-TAST-GD-096 (ref. [11]). The ONR Safety Assessment Principles (SAPs) (ref. [12]), the supporting Technical Assessment Guides (TAGs) (ref. [13]), together with The Health and Safety at Work etc Act 1974 and supporting Regulations have been used as the basis for this assessment. A list of the Act and Regulations used in this assessment is recorded in Appendix 1.
3. This is a Major report (refer to NS-TAST-GD-108 (ref. [14])).
   1. Background
4. The ONR’s GDA process (ref. [15]) calls for a step-wise assessment of the Requesting Party's (RP) submissions with the assessments increasing in detail as the project progresses. Rolls-Royce SMR Limited is the RP for the GDA of the Rolls-Royce SMR design.
5. In April 2022 ONR, together with the Environment Agency and Natural Resources Wales (NRW), began step 1 of the GDA for the generic Rolls-Royce SMR design. Step 1, which is the preparatory part of the design assessment process and mainly associated with initiation of the project and preparation for technical assessment in later steps, was successfully completed in 12 months.
6. Step 2 commenced in April 2023. This is the first substantive technical assessment step. The focus of ONR’s assessments in this step is towards the fundamental adequacy of the design and safety and security cases, and the suitability of the methodologies, approaches, codes, standards and philosophies which form the building blocks for the design and generic safety and security cases. The objective is to undertake an assessment of the design against regulatory expectations to identify any fundamental safety or security shortfalls that could prevent ONR permissioning the construction of a power station based on the design.
7. Prior to the start of Step 2 a detailed Assessment Plan for conventional health and safety was prepared (ref. [16]). This has formed the basis of this assessment and was also shared with the RP to maximise openness and transparency.
8. 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. [17]).
   1. Scope
9. The assessment documented in this report is based upon the E3S case for the Rolls-Royce SMR as summarised in the E3S case chapters and supporting documentation.
10. The overall scope of the Rolls-Royce SMR GDA is described in Rolls-Royce SMR Generic Design Assessment Scope, SMR0002183, Issue 2, January 2023 (ref. [18]). Rolls-Royce SMR Limited has indicated that it intends to complete a three-step GDA, with the objective of receiving Design Acceptance Confirmation (DAC) from ONR and has aligned their GDA scope with this objective. The GDA scope defines the generic plant and layout and includes all systems, structures and components that are identified as being important to safety, security and safeguards, all modes of operation, and all stages of the plant lifecycle.
11. My assessment has considered the following aspects:

* The policies and processes identified to demonstrate compliance with the Construction (Design and Management) Regulations 2015 (CDM).
* How the RP has considered the different lifecycle phases of the Rolls-Royce SMR in its design.
* The identification of relevant codes and standards.
* The identification of the relevant hazards present during construction and operational activities.
* The demonstration of the approach to ensure foreseeable risks to the health and safety of people involved in construction, maintenance or operational activities for the Rolls-Royce SMR are reduced as low as reasonably practicable (ALARP).

# Assessment standards and interfaces

1. For ONR, the primary goal of the GDA Step 2 assessment is to reach an independent and informed judgment on the adequacy of a safety, security and safeguards case for the reactor technology being assessed.
2. 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.
3. This section also identifies the key interfaces with other technical topic areas.
   1. Legislation and Standards
4. The standards applied in the conventional health and safety assessment were legislative requirements, specifically, the Health and Safety at Work etc. Act 1974 being the primary piece of Great Britain’s (GB) occupational health and safety legislation, and supporting Regulations. These are listed in Appendix 1. These, together with relevant Approved Codes of Practice (ACOPs), HSE and industry guidance formed the basis for this assessment.
5. The ONR Safety Assessment Principles (SAPs) (ref. [12]) and supporting TAGs (ref. [13]) have also been considered as they constitute the regulatory principles against which the RP’s case is judged.
   * 1. National standards and guidance
6. The following standards and guidance have been used as part of this assessment:

* HSE, Managing Health and Safety in Construction (L153) (ref. [19]).
* HSE, Safe work in confined spaces (L101) (ref. [20]).
* ICE, Guidance for design risk management (ref. [21]).
  + 1. Safety Assessment Principles (SAPs)

1. The key SAPs applied within my assessment are FP.4, MS.4, SC.3 and SC.4.
2. A list of the SAPs used in this assessment is recorded in Appendix 2.
   * 1. Technical Assessment Guides (TAGs)
3. The following TAGs have been used as part of this assessment:

* NS-TAST-GD-096 - Guidance on Mechanics of Assessment (ref. [11]).
* NS-TAST-GD-005 – Regulating duties to reduce risks to ALARP (ref. [22]).
* NS-TAST-GD-051 The Purpose, Scope and Content of Safety Cases (ref. [23]).
  1. Integration with other assessment topics

1. I worked closely with other topics as part of my conventional health and safety assessment. Similarly, other assessors 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.
2. The key interactions with other topic areas were:

* Mechanical engineering in relation to mechanical fuel handling and how conventional health and safety throughout the lifecycle stages of the Rolls-Royce SMR is considered in the mechanical fuel handling design.
* Civil engineering considering constructability of civil structures.
* Management of safety and quality assurance in relation to the integration of internal and external sources of learning being considered in the design.
* Human factors considering how the design incorporates sufficient space for examination, maintenance, inspection and testing activities.
  1. Use of technical support contractors

1. During step 2 I have not engaged Technical Support Contractors (TSCs) to support my assessment of the conventional health and safety aspects of the Rolls-Royce SMR.

# Requesting party’s submission

1. Rolls-Royce SMR Limited submitted a series of E3S chapters, or summary reports, and other supporting references, which outline the E3S case for the generic Rolls-Royce SMR design. 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 assessment of the conventional health and safety of the Rolls-Royce SMR.
   1. Summary of the Rolls-Royce Small Modular Reactor design
2. The generic Rolls-Royce SMR design is a three-loop Pressurised Water Reactor (PWR) with a target electrical power output of 470 MWe (from a thermal power of 1,358 MWth) and a design life of 60 years for non-replaceable components.
3. The Rolls-Royce SMR design has been developed by the RP based upon well-established PWR technology, in use all over the world. Innovation comes in the form of its modular approach to construction which would see the majority of the power station built in factory conditions and assembled on site.
4. The reactor itself is of a typical PWR design, including a steel Reactor Pressure Vessel (RPV) holding fuel assemblies, Steam Generators (SG), Reactor Coolant Pumps (RCP) and piping, all held within a steel containment vessel. The reactor is equipped with a number of 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. Passive safety features are preferred to active components, reflecting the RP’s design philosophy.
5. A fundamental aspect of the Rolls-Royce 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.
   1. E3S case approach and structure
6. Rolls-Royce SMR Limited has chosen to develop its cases in a holistic manner, as an Environment, Safety, Security and Safeguards (E3S) case. The overall objective for the E3S case is to demonstrate that the design will ‘protect people and the environment from harm’.
7. This means that, although the case made for each of the E3S purposes (i.e. environment, safety, security and safeguards) will inevitably be different at the top level, it will draw upon common evidence outputs (as well as other non-common outputs) to substantiate each of the purposes. This is claimed to offer benefits in terms of clarity, integration and understanding impacts from any changes to the case.
8. The E3S case is being developed using a three tier hierarchy and incorporating a Claim, Argument and Evidence (CAE) structure with the highest-level claims being derived from the RP’s own E3S principles. The highest level of the three tiers is the RP’s Tier 1 E3S chapters, with the lower tiers providing more detailed arguments and evidence. This is illustrated in Figure 1.

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**Figure 1: Claim, Argument and Evidence (CAE) structure within the E3S hierarchy** (ref. [1])

1. The structure of the E3S case largely aligns with the IAEA guidance for safety cases, SSG-61 (ref. [24]), supplemented to include UK specific expectations and expanded to include the other E3S purposes.
   1. Summary of the requesting party’s E3S case for conventional health and safety
2. The RP’s intention is that its processes to design for conventional health and safety are embedded throughout the design and therefore integrated in all aspects of the Rolls-Royce SMR safety case.

The fundamental claim of the Rolls-Royce SMR is that 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. Rolls-Royce SMR Limited seeks to achieve this by:

* Ensuring the relevant legislation and relevant good practice (RGP) is identified and understood
* Having suitably qualified and experienced people within the organisation to develop the design
* Implementing processes and methodologies to apply the principles of prevention to the design and reduce the risks ALARP.
  1. Basis of assessment: requesting party’s documentation

1. The principal documents that have formed the basis of my conventional health and safety assessment of the E3S case are:

* Conventional Health and Safety – Construction (Design and Management) Strategy During Generic Design (ref. [25]) which outlines the approach for applying the requirements of CDM.
* E3S Case Chapter 22: Conventional & Fire Safety (ref. [9]).
* E3S Case Chapter 24: ALARP summary (ref. [10]).
* C3.2.2-4 Design for Conventional Safety (ref. [26]) which outlines the conventional health and safety design process.

# ONR assessment

* 1. Assessment strategy

1. In line with the Step 2 assessment plan (ref. [16]), I have assessed the adequacy of the claims, sub-claims and arguments presented by the RP. The claims, sub-claims and arguments aim to demonstrate how the RP will develop the safety case and evidence for submission in Step 3, therefore, showing how the claims made will be eventually substantiated.
2. My assessment included considering whether the arrangements implemented by the RP are aligned with Great Britain’s regulatory expectations in relation to conventional health and safety 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 its legal requirements, along with the arrangements in place to enable the RP to implement its processes. I sampled a number of topic areas to test the application of the RP’s processes and arrangements. The topic areas were selected in accordance with ONR Technical Assessment Guidance (ref. [13]) and identified due to their high significance to conventional health and safety, or novelty.
3. Not all planned activities within the Step 2 Assessment Plan have been carried out. The planned submissions changed to represent the RP’s updated processes. Additionally, I have not interacted with the nuclear liabilities regulation team regarding design for decommissioning as this is more appropriate during Step 3 when the design is more mature. My interaction with human factors has been proportionate when considering the position presented by the RP. The human factors Step 2 assessment recognised the RP’s human factors approach is broadly adequate although insufficient material has been provided for conventional health and safety (ref. [27]). As a result, this residual matter will be followed up in Step 3.
   1. Assessment

### Adequacy of claims, sub claims and arguments

#### My assessment considered how the RP’s safety case has been presented from the safety claims through to sub-claims, arguments and evidence. The safety case should logically progress and make sense to all people with responsibility for conventional health and safety. Clarity in the claims, arguments and evidence will assist the RP 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. [23]).

1. Rolls-Royce SMR Limited’s fundamental objective for its SMR to protect people and the environment from harm (ref. [28]). This is supported by a top-level claim in E3S case chapter 22 that the conventional health and safety risks to workers and the public throughout the different lifecycle stages of the Rolls-Royce SMR have been reduced ALARP (ref. [9]). Other E3S case chapter claims are relevant to conventional health and safety including, for example, those in the ALARP and decommissioning chapters. The claims made may be the RP’s objective, but they have not yet been met as the design is still being developed and therefore, I recognise that the wording is forward thinking.
2. In relation to the E3S case chapter 22, the top-level claim is broken down into sub-claims and reference is made to the claims, arguments and evidence route map. The route map (ref. [29]) links the E3S design principles to the fundamental claims and then the top-level claims in the relevant E3S case chapters. Whilst there is no specific design principle for conventional health and safety, lifecycle risks are incorporated into the ALARP design principle. There is a lack of clarity on how design principles are linked to the relevant claims. For example, the ALARP design principle was not linked to the top-level claim 24 which states “The RR SMR design permits construction, commissioning, operation, maintenance and decommissioning with risks and exposures reduced to ALARP” (ref. [29]). Whilst the mapping of claims with principles requires development to ensure visibility of the links between them, I do not consider this to affect the application of the objectives in the design.
3. The claims, arguments, evidence route map relating to E3S case chapter 22 (ref. [29]) does not set out a clear planned ‘golden thread’ demonstrating how the top-level claim will be addressed throughout the design process. This requires further development by the RP to ensure it meets the requirements of the SAPs, including SC.2, SC.3, SC.4 and SC.5, for safety cases (ref. [12]). An example demonstrating this is that evidence to support the claim that the organisation has suitably qualified and experienced people to undertake design duties focuses on understanding the legal requirements of CDM, and does not consider the knowledge required of specific hazards. Knowledge of the specific hazards is required to ensure the hazards are identified, understood and the principles of prevention are applied.
4. A further example is that there is no clear link with level 1 sub-claim, relating to reducing risks ALARP across the lifecycle of the Rolls-Royce SMR and the related sub-claims, as these refer to layout design, with no comment on the lifecycle stages. Additionally, the layout sub-claims all relate to distinct areas of the Rolls-Royce SMR and it is unclear how the interfaces between these areas and any resulting risks will be captured and evidenced. In my judgement, these examples demonstrate the RP needs to refine its claims, arguments and evidence mapping but there is no fundamental shortfall as it does not affect the application of the RP’s process to the design.
5. The assessment sampled E3S case chapter 24 ALARP (ref. [10]) for visibility of a ‘golden thread’ from the RP’s claims, sub-claims, arguments and evidence. The claims, arguments and evidence includes sub-claims relating to reducing risk ALARP throughout the lifecycle of the product and conventional health and safety informing the design. The Tier 2 evidence presented for this is the ALARP summary report (ref. [30]) which links to the ‘design for conventional safety’ process (ref. [26]) and sets out the RP’s approach that the legal requirements to apply the principles of prevention are fully integrated in the design management system and processes. Whilst also recognising that the design risk assessment process, life cycle risk assessment and hazard identification studies will be undertaken at the next design phase. Whilst the ALARP summary report states it demonstrated the design is capable of reducing risks ALARP throughout the lifecycle of the product, using construction as a sample, the build certainty, modularisation and standardisation section (3.11) focuses on reliable and affordable construction. Whilst there may be health and safety benefits realised from this approach, no evidence has been provided on the hazard identification or optioneering for modularisation and how conventional health and safety has been considered. Additionally, section 3.11 does not set out how risks associated with the construction activities that will take place are being eliminated, or where this is not possible, reduced to ALARP. Sampling this evidence is within the scope of Step 3.
6. I also sampled the ‘golden thread’ relating to the application of the claim to operational activities, specifically relating to hazards to health. Conventional health risks during operations are included in the high-level claim in the E3S case chapter 22 (ref. [9]) which identifies relevant legislation including the Control of Noise at Work Regulations 2005 and the Control of Substances Hazardous to Health Regulations 2002. Although the RP recognises the relevant legislation identified in the chapter is not exhaustive, an obvious omission is the Control of Vibration at Work Regulations 2005. No evidence was seen on how health hazards have been identified and the legislative requirements applied to the design. This is outside the scope of Step 2 and will be sampled in Step 3.
7. Overall, the RP has a clear fundamental claim for the design which is supported by a conventional health and safety top level claim and further sub-claims. The RP has demonstrated a commitment to these claims through its processes however the safety case does not currently have a clear ‘golden thread’ from the claims to the sub-claims and arguments demonstrating how they will be realised in the design and be substantiated in Step 3.
8. This is a shortfall against the UK relevant good practice as set out in ONR Technical Assessment Guide (ref. [23]) and the safety assessment principle SC.4 (ref. [12]) which requires a safety case to be accurate, objective and demonstrably complete for its intended purpose. However, I consider this shortfall to be surmountable as the design and safety case progresses into Step 3. The adequacy of the claims, sub-claims and arguments will be sampled, together with evidence, in Step 3 as a residual matter.

### Compliance with The Construction (Design and Management) Regulations 2015 expectations

1. My assessment has focused on how the RP is complying with its duties under CDM. This has been assessed in line with the Health and Safety Executive’s (HSE) guidance L153 Managing Health and Safety in Construction (ref. [19]).
2. Rolls-Royce SMR Limited has identified itself as client for the project under CDM as set out in the CDM strategy document (ref. [25]). The named client representative has changed throughout Step 2 and has recently been offered to a new representative, although not yet formally accepted.
3. In fulfilling the role of CDM client, Rolls-Royce SMR Limited is required to make suitable arrangements for managing the project including the allocation of sufficient resource. Whilst its process ‘S1.1.5 identify and manage core capability’ (ref. [31]) is used to determine minimum levels of core capability to demonstrate its organisation is capable of delivering designs which meet nuclear safety, security and safeguards requirements, as well as its core business functions, the RP has not demonstrated in step 2 how it has planned conventional health and safety resource to ensure health and safety risks are managed in the design phase. Rolls-Royce SMR Limited stated the required resource levels will be reviewed in Step 3 including whether additional subject matter expertise will be required (RQ 01091 ref. [32]).
4. The RP has recently identified the need for suitably qualified and experienced technical conventional health and safety lead resource and have commenced the recruitment process for this position (RQ01251 ref. [32]). The RP have has not demonstrated the process for how this level of resource was identified as adequate. If this technical conventional health and safety lead role is fulfilling designer or principal designer duties under CDM, they must have the ‘skills, knowledge and experience […] necessary to fulfil the role they are appointed to take’ (ref. [19]). The RP’s arrangements for managing this are considered in section 4.2.3.2.
5. When it is foreseeable that there will be more than contractor working on the project, the client under CDM is responsible for appointing a principal designer (PD) and principal contractor who have control over the pre-construction phase and construction phase respectively.
6. Rolls-Royce SMR Limited, in fulling the client role, initially appointed a named individual as PD (ref. [9]). The appointment should be a ‘designer with control over the pre-construction phase (ref. [19]) with the ‘skills, knowledge, experience and (if an organisation) the organisational capability to manage health and safety risks […]. The extent of check a client must make into the capability of the dutyholders depends on the complexity of the project and the range and nature of the risks involved.’ (ref. [19]).
7. ”Organisational capability means the policies and systems an organisation has 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” (ref. [19]). Throughout this assessment the information provided on how the PD function is intended to be met utilises Rolls-Royce SMR Limited organisational processes and resources. It has not been demonstrated that the named individual appointed as PD, has control of the pre-construction phase. The appointment of an individual is considered inappropriate, as it is a complex project and the role is not being fulfilled by one person. I have raised it with the RP as a concern.
8. Rolls-Royce SMR Limited recognises that the named individual appointed as PD will require specific CDM training (RQ01091 ref. [32]). Whilst it is positive that it has identified a need for this training, it is unclear how the named individual was deemed a suitable appointment originally, if CDM specific training was deemed as required. Consequently, I provided advice to the RP about the suitability of its PD arrangements and it agreed to review this (ref. [33]).
9. In my judgement, the above shortfalls are not a fundamental issue at this stage as the processes applied indicate potential to fulfil legal duties, and, as such, the appointment of an individual as PD does not impact on the management of risk in the design. The arrangements will be assessed further in Step 3 as the project progresses.
10. I would also note that Rolls-Royce SMR Limited has not appointed a principal contractor for the project, as there is no planned construction phase due to no order being placed and no site identified. This is, therefore, not a shortfall at present, however, when a site is identified for construction, the CDM client will be required to appoint a principal contractor to allow for adequate planning for the construction phase.
11. The RP, in fulfilling the role of client, is also required to ensure the project arrangements are maintained and reviewed throughout the project and that the PD complies with its duties. Rolls-Royce SMR Limited has indicated this will be integrated within the level 3 assurance in the ‘integrated management system manual' (ref. [34]) and in the ‘S2.3.1-1 develop integrated assurance function’ (ref. [35]). The level 3 client assurance is independent from the level 1 self-checking and PD monitoring function within the engineering department (ref. [35]). This is important to ensure the client and PD are fulfilling their respective duties.
12. The CDM strategy (ref. [25]) indicates the client will chair the monthly engineering programme review meetings which provides an additional level of oversight and the PD can provide updates and areas of concern or escalation in the design. The RP has indicated this will now be incorporated into the Product Safety Review Board meeting however this has not been incorporated into the processes which have been submitted for this assessment. Furthermore, the RP has not provided any information on the frequency of the governance activities or any evidence of the governance activities carried out so far.
13. The PD is required to plan, manage, monitor and co-ordinate the pre-construction phase. Rolls-Royce SMR Limited indicates the intention is to embed these duties within the design processes including ‘C3 develop solution’ processes including ‘design for conventional safety’ (ref. [26]), ‘define and management requirements’ (ref. [36]), ‘definition review’ (ref. [37]) and the ‘engineering management plan’ (ref. [38]). These are owned by the engineering arm of the business and are independent from the client assurance activities. No information has been provided on the detailed implementation of these processes to ensure they are effective. The processes are assessed in section 4.2.3.1.
14. Notwithstanding the above shortfalls, Rolls-Royce SMR Limited has identified itself as client and demonstrated an understanding of the client duties under CDM. Its arrangements to meet these duties continue to evolve and this includes developing the level of conventional health and safety resource through recruitment and training. While I am satisfied the client assurance and PD monitoring functions are independent to ensure clarity, evidence of the implementation of the assurance has not yet been provided. As such, I have identified potential shortfalls against CDM and UK relevant good practice (ref. [19]) when considering how the arrangements have been implemented to date. Nevertheless, in my judgement, the shortfalls are not insurmountable as design progresses and I will therefore follow them up in Step 3 as a residual matter.

### 4.2.3 Adequacy of RP approach to effective control of significant risks ALARP

#### Process

1. The RP is required to implement arrangements for designing the Rolls-Royce SMR to ensure the principles of prevention are applied to eliminate or, where this is not reasonably practicable, reduce risks so far as is reasonably practicable, throughout the lifecycle of the Rolls-Royce SMR, in line with GB regulatory requirements. These include:

* The Health and Safety at Work etc Act 1974 (HSWA).
* The Management of Health and Safety at Work Regulations 1999 (MSHWR).
* Construction (Design and Management) Regulations 2015 (CDM).

1. Rolls-Royce SMR Limited has submitted overviews of the processes it is implementing with the intention of embedding decision making relating to conventional health and safety within the overall design process. Rolls-Royce SMR Limited has not yet submitted evidence of the processes being applied. This will be sampled in Step 3.
2. The ‘define and manage requirements’ process ref. [36]) is the fundamental process which sets out how the requirements of the design are defined, developed and incorporated, ensuring conventional health and safety throughout the lifecycle of the Rolls-Royce SMR. The Regulatory Affairs Group is responsible for providing the E3S and conventional safety input into engineering design through the definition of requirements (RQ01184 ref. [32]). It is expected that the conventional health and safety ‘transverse’ requirements will be applied to all aspects of the design and will encompass all legal requirements. Details of the conventional health and safety transverse requirements which have been provided (RQ01251 ref. [32]) generally refer to EU Directives or GB legislation. However, there are some obvious omissions including, for example, the requirement to ensure the design is compliant with The Work at Height Regulations 2005 and The Lifting Operations and Lifting Equipment Regulations 1998. The RP recognises, however, that the requirements are still under development (ref. [9]). These will be assessed further in Step 3.
3. There is clear responsibility allocated for ensuring the requirements are of appropriate quality, developed with input from relevant stakeholders and are linked to the design for systems and components within their scope (ref. [38]). This responsibility sits with the design managers. The RP has nevertheless not yet provided details of the skills, knowledge and experience required to fulfil this role. The RP’s process for assessing competence of people is considered in section 4.2.3.2 and is therefore not repeated here for conciseness. During Step 3, I expect the RP to demonstrate how it robustly identifies, assesses suitability and applies requirements to the design.
4. The ‘design for conventional safety’ process (ref. [26]) is the process for ensuring conventional health and safety requirements inform the design and compliance with legislation is achieved. It focuses on identifying and eliminating risk in the concept phase and then controlling the residual risks as the design progresses (RQ01119 ref. [32]). I am content with this approach as it prioritises elimination, in line with the general principles of prevention set out in the Management of Health and Safety at Work Regulations 1999, before progressing down the hierarchy to controlling risks.
5. Step 1 of the process is at the initial concept (optioneering) hazards assessment stage; when the optioneering process is expected to demonstrate that hazards have been appropriately identified and accounted for. This is a requirement of SAP FP.4 (ref. [12]). This includes production of an initial (optioneering) hazard assessment, showing the use of tools such as hazard and operability studies, designer risk assessment and lifecycle risk assessment. The hazard assessment continues to be developed as the ‘design for conventional safety’ process progresses.
6. I sampled the designer and lifecycle risk assessment templates submitted for this assessment, and found them to include a comprehensive list of individual hazards identified by the RP. It is, however, unclear how the risk assessment process will ensure contingent and competing hazards are robustly identified and evaluated. This includes how conflicting nuclear and conventional health and safety hazards will be considered. It is also unclear how risks from interfaces between the SSC designs will be identified and captured in the risk assessment processes.
7. The RP intends that the designer risk assessment process will be supported by guidance on the hazards. This is still under development and has not been considered in the assessment. For example, the RP stated a clear definition for confined spaces will be included in the ‘design for conventional safety’ process guidance (RQ01184 ref. [32]). Whilst it is important the RP provides effective guidance to ensure the design process is robust, I am satisfied this is not a fundamental shortfall and the adequacy of the guidance can be sampled, with the evidence of its application, as a residual matter in Step 3.
8. The RP has a number of review points within the ‘C3 develop solution’ processes as set out in the engineering management plan (ref. [38]). These support the PD with co-ordinating and monitoring the pre-construction phase.
9. An example of one of the review processes considered is the ‘definition review’ process (ref. [37]). This is designed to provide technical oversight of the development of the systems, structures and components throughout the design process. The nine definition review gates require a multidisciplinary review and the composition of the panel will be agreed with the chair. However, currently it is unclear how the RP will ensure that there is representation on the panel of a person with skills, knowledge and experience in relation to relevant conventional health and safety hazards. This is required to ensure the review gate is effective and to avoid foreclosure of decisions on alternative design elements. This is also the case in relation to the technical reviews which are held ahead of the definition reviews. At this stage, I do not consider this to be a fundamental shortfall and the effectiveness of the review panels, including the composition of panel members, will be sampled in Step 3 as a residual matter.
10. The ‘conduct design optioneering’ process (ref. [39]) also sits within the C3 ‘develop solution’ suite of documents. The decision record (ref. [40]) being an output from this process. The use of a Pugh Matrix is identified in the decision record as a method to guide decision making and encourage holistic evaluation of options against the key criteria for high impact decisions. It has weighted scoring over twenty design objectives and criteria with one criteria being that the design must meet UK legislative requirements applying to conventional health and safety. Whilst Rolls-Royce SMR Limited recognises that it needs to be a licensable design, it is unclear how comparisons between design options are made in relation to conventional health and safety including for example, constructability, and how the overall scoring for options prioritises safety when cost, programme and build certainty have a higher number of criteria and scores when using the Pugh Matrix.
11. I sampled the reactor cooling pump optioneering example (RQ00152 ref. [32]) and found that the RP had considered whether options had been licensed elsewhere, not the specific risks associated with the different options. I recognise the Pugh Matrix scoring is not the only factor considered in optioneering and the decision record requires a description of how each option changes the risk to people who will be involved in the Rolls-Royce SMRs construction, operation and maintenance (ref. [40]). However, the RP has not demonstrated how, when evaluating the different options, it has considered each option against clearly selected factors, including safety factors covering all relevant risks of harm, which are accorded appropriate weighting and importance (ref. [22]). Rolls-Royce SMR Limited have stated the process is being updated in relation to conventional health and safety (RQ00152 ref. [32]). Although this has the potential to impact on decision making, I will consider how the RP has applied the process within the evidence sampled in Step 3 and, therefore, do not consider this a fundamental shortfall which would prevent the RP progressing to Step 3.
12. I would expect the optioneering process to refer to OPEX to demonstrate foreseeable risks have been considered. The RP should be able to demonstrate it is learning from internal and external sources and the learning is considered in the design in accordance with SAP MS.4 (ref. [12]). Rolls-Royce SMR Limited has started developing an OPEX library although this is at an early stage of development and does not contain conventional health and safety OPEX (RQ01092 ref. [32]). Rolls-Royce SMR Limited’s strategy to date has been to rely on designers identifying relevant OPEX which would then be monitored at the review dates. Whilst this may be appropriate, my judgement is that Rolls-Royce SMR Limited has not yet demonstrated its effectiveness in ensuring that relevant OPEX is identified and learning applied. I do not consider this a fundamental shortfall at this stage and will sample the evidence and assess how OPEX has been applied to the designs as a residual matter in Step 3.
13. The RP is implementing a Product Safety Review Board (PSRB) to ensure the product is safe by design (ref. [41]) including by ensuring processes are being followed and identifying any gaps in the Integrated Management System. The RP has indicated that the use of containment gates which require multiple lifting activities (ref. [42]) will be reviewed at the PSRB following challenge during an assessment meeting about how the implications of the lifting activities have been considered (ref. [43]). Whilst the RP has indicated this will provide assurance in relation the decisions relating to this particular design feature, the PSRB has not yet been incorporated into the processes to ensure conflicting requirements are identified, assessed and reviewed for other design decisions. As this is only one part of the RP’s assurance process, I do not consider this a fundamental shortfall at this step. My assessment at Step 3 of the GDA process will include sampling evidence of Rolls-Royce SMR Limited’s processes being applied, to judge whether risks are reduced ALARP in practice.
14. In my view, the submissions provided in Step 2 do not adequately demonstrate how the early design decisions, including designs fundamental to the key criteria of the project, have been derived in accordance with the principles of prevention and do not have unintended consequences on conventional health and safety in the ongoing designs. Examples of these decisions include:

* The height of containment has implications on the arrangements inside including the use of containment gates which will require multiple lifting operations. The RP has indicated this decision will be reviewed at the PSRB (see paragraph 74).
* A key design objective of the Rolls-Royce SMR is to maximise modularisation within its construction (ref. [1]). The RP makes claims in relation to the safety benefits of modularisation, but it is unclear how these will be substantiated, if this early design decision has been assessed to ensure it reduces ongoing risks ALARP including in relation to constructability and layout, and how the RP ensures they have not foreclosed on the decision for modular construction before assessing all risks.

1. Despite this shortfall at this step, evidence of application is outside the scope of Step 2 and therefore, I will sample the application of processes to demonstrate the principles of prevention have been applied in Step 3.

#### 4.2.3.2 Skills, knowledge and experience

1. The RP’s design processes rely on designers (including design managers, technical leads and people on the review gates) to identify hazards and apply the principles of prevention to reduce the risk ALARP 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 (ref. [19]). This includes in relation to their duties and the hazards they need to consider during the design.
2. Rolls-Royce SMR Limited has ‘develop people’ processes which include ‘assess competence’ (ref. [44]) which requires competencies to be assigned to job roles and individuals to be assessed against the competencies. The process requires this to be undertaken as part of an annual competence assessment process or following a change. The ‘undertake training and evaluation’ process (ref. [45]) is followed when a training need has been identified. The RP intends that formal competence assessments will be captured in ‘Skills Assured’. Evidence of the application of the processes including how relevant skills, knowledge and experience, relating to conventional health and safety, for roles are identified and how individuals are assessed was outside the scope of Step 2 and will be sampled in Step 3.
3. Rolls-Royce SMR Limited has identified that CDM training is required and have commenced roll out of training on CDM, design risk management and UKCA/CE requirements. In its response to my query, Rolls-Royce SMR has stated that it has trained fourteen people to-date and this will be rolled out to a further 28 designers in 2024 (RQ01184 ref. [32]). The RP’s training is an Institute of Occupational Safety and Health accredited course and is not specific to the Rolls-Royce SMR project. The RP envisages those undertaking this training to act as ‘CDM champions’ and provide assistance is design risk management to the wider design teams.
4. Whilst the RP’s commitment to training is encouraging, the RP has not yet provided information on how it will assess the effectiveness of the training, except via the high-level activity in the process to review feedback provided by Microsoft Forms (ref. [45]). Furthermore, the training has not yet been implemented, hence I am not yet assured that the RP avoided gaps in the knowledge of designers involved to-date, at the critical phase for elimination of hazards. Nevertheless, during my assessment at Step 2 I have not found evidence of hazards whose elimination could have been foreclosed as a result of this shortfall and will sample the training roll out and application of learning in managing risks as a residual matter in Step 3.
5. Rolls-Royce SMR Limited have also identified the need for a suitably qualified and experienced technical lead for conventional health and safety and are in the process of recruiting for the position (RQ01251 ref. [32]). Information has not been provided on the roles and responsibilities of the position Whilst it is positive the RP has identified this resource need, I expect the RP to demonstrate in the evidence in scope of Step 3 that the right people have been involved throughout the design process. This evidence is outside of the scope of Step 2 and therefore this will be sampled as a residual matter in Step 3.
6. To summarise my conclusions on the RPs approach to controlling significant risks ALARP, I recognise that during Step 2 the RP has worked to improve its arrangements to apply the expectations of CDM, including the processes and resources. The RP’s stated project intention is to focus on hazard identification and elimination in the concept phase before reducing and controlling risks ALARP in the detailed design. It is my judgement that the intent underpinning this is reasonable and aligns with legal requirements. I will seek and assess evidence of the adequacy and implementation of these arrangements in Step 3 of GDA.
7. The RP’s CDM arrangements have been developed late in Step 2. Whilst Rolls-Royce SMR Limited has made commitments to developing the skills, knowledge and experience of its resource through recruitment and training, it has not yet provided assurance that hazards in the generic design have been fully identified and understood. It is therefore unclear how the principles of prevention have been applied to foreseeable risks throughout the design to date. This is important where key design decisions have already been taken. I consider this a shortfall which the RP will need to resolve in Step 3 by providing evidence demonstrating how the principles of prevention have been applied throughout the design.
8. I expect the RP to demonstrate how it has eliminated hazards where reasonably practicable and provide assurance that early design decisions have not resulted in foreclosure of risks for subsequent designs. This would include demonstrating robust methods of hazard identification, including contingent hazards and those arising from the interfaces between different SSCs. Also, demonstrating the people involved throughout the process have relevant skills, knowledge and experience. This should provide evidence to demonstrate that:

* In accordance with CDM, that the principles of prevention 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 Rolls-Royce SMR [19].
* In accordance with SAP SC.4, the safety case has systematically identified hazards and provides evidence to demonstrate how risks have been reduced ALARP throughout the lifecycle of the product whilst incorporating learning into the design (ref: [12]).

Notwithstanding the above, through my sampling in Step 2, I have not found hazards whose elimination had been foreclosed as a result of the above. I will therefore follow the above shortfalls as a residual matter early from Step 3 .

### **Sampling of evidence from the design**

1. I sampled several areas of design to assess how the RP has identified hazards and applied the principles of prevention in the design to date. The summaries below support the previous conclusions in this assessment report:

* The RP submitted the ‘in containment’ mechanical sequence diagrams (ref. [42]). It has not provided submissions demonstrating the application of the optioneering process, how the multiple lifting operations involving gates have been considered and whether the associated risks from lifting operations have been controlled ALARP. It was unclear from the diagrams what human interaction will be required in the operation, examination, inspection, testing and maintenance requirements for these processes and how conventional health and safety hazards have been identified in the design presented; for instance the additional hazard represented by potential confined spaces. This is not a fundamental issue due to the maturity of the design but will be sampled in Step 3.
* The ALARP summary report (ref. [30]) provides the RP’s summary of how the design reduces risk ALARP and presents its optioneering conclusions. I sampled the operator access to the fuel pool which identified that the final selected option for access is via a ladder. Discounted options during the optioneering process included no access as operator access is obsolete, stairs and level access through a door. It is unclear how the design has taken reasonably practicable, suitable and effective measures to prevent any person falling a distance liable to cause personal injury as required by the Workplace (Health, Safety and Welfare) Regulations 1992. I would expect working conditions, including environmental, and personal protective equipment requirements, to be factored into the decision.
* The RP considers the replacement of the steam generator as an unplanned operation. The RP has identified that the steam generator may require through life replacement and has assumed this will be achieved via vertical extraction through the roof of the reactor island hazard shield and any architectural covering. The RP has made this assumption based on assumed grossly disproportionate effects if it was handled horizontally through the containment vessel wall (ref. [46]). This assumption is made before the features of the containment vessel roof, hazard shield and architectural cover have been decided. I have not sampled evidence demonstrating how the RP’s decisions have reduced risks ALARP as this is outside the scope of Step 2. It is nevertheless encouraging that the RP has identified priority work needs to be carried out including features of the aperture and the associated safety risks as well as the key safety risks around the handling operation to avoid foreclosure of significant risk (RQ01180 ref. [32]).
* Layout is at concept design maturity. Layout has been identified by the RP as a key area which needs to be prioritised for hazard identification (RQ01251 ref. [32]). The RP has committed to undertaking reviews of hazard identification by next design reference point (RQ01251 ref. [32]) which corresponds with the end of final concept definition (ref. [1]). The RP has not demonstrated what hazard identification has been carried out in relation to layout and conventional health and safety during the initial concept optioneering stage. The RP has not provided evidence of how it has considered conventional health and safety hazards during concept design to allow informed decisions to be made as the layout maturity progresses. An example demonstrating this is the containment and interspace systems layout summary report [47] which states ‘the conventional safety aspects within containment and the interspace have not been assessed in detail. There are several requirements in place regarding conventional safety and the layout will develop to comply with these as well as all relevant legislation and regulations’. I do not consider this a fundamental issue at Step 2 due to the maturity of the layout design and as the RP should be able to demonstrate how these issues are addressed in Step 3.
* The internal hazards summary report – reactor island within hazard shield (ref. [48]) cites the objective for the internal hazard assessment is to consider the impact of plant internal hazards on nuclear safety. It is unclear how conventional health and safety hazards were considered including any conflicts between nuclear and conventional health and safety. Examples include the assessment for risk to nuclear safety from flooding did not specify any consideration of the risks to people in the area relating to confined spaces and drowning. The report did identify a conventional safety benefit from the use of a single boron storage tank as it results in reduced quantity of potassium tetraborate solution on site which, as it reduces the inventory of chemicals, it demonstrates a positive application of the principles of prevention.
* The RP’s human factors engineering E3S chapter identifies that its human design will allow the Rolls-Royce SMR to be operated and maintained safely throughout its lifecycle (ref. [7]). The RP’s intention is for human factors to be systematically integrated into the design. The human factors checklist is required to be completed for each structure, system and component (SSC) in the design and the RP intends for it to provide a structured approach to understanding interactions with people throughout the lifecycle of the SSC. The RP developed Target Audience Description (TAD) guidance which will be used to identify physical space requirements, including for maintenance activities. This is encouraging as it shows that the RP has identified it needs to ensure the design incorporates space for conventional health and safety activities. I will assess the evidence of implementation in Step 3.
* The Fuelling Systems Outside Containment Layout Report (ref. [49]) reports the layout at concept definition. The RP acknowledges the E3S chapter 22 conventional health and safety (ref. [9]) has direct claims on layout and that requirements have been driven by maintenance, construction, commissioning, and decommissioning. The RP has considered constructability, including risk of the design being unconstructable, sequencing and temporary works but no information has been submitted to demonstrate suitability of the decision-making process and how conflicts between space and constructability, for example, are considered and resolved. Provision of evidence in this context is commensurate with my future Step 3 assessment when I will revisit the topic.
* It is important to note that the RP has made provision in the design for some maintenance activities including allocation of layout space and access for elevated work at height equipment. It has also acknowledged the next major layout decisions and considered the implication of these on conventional health and safety. Whilst it is positive that the RP is demonstrating an awareness and consideration of activities, and acknowledges the use of remote monitoring and control, it is unclear what the extent of this will be and how elimination of risk has been prioritised in line with the principles of prevention throughout all lifecycle stages. This will be sampled within Step 3 as the detailed application of the principles of prevention is outside the scope of Step 2.

1. Through my sampling of the RP’s submissions, I found examples of where the RP is, in line with legal requirements, considering the different lifecycle stages in the generic design and how it has identified some conventional health and safety hazards. The RP has also demonstrated some visibility of the claims and arguments in the documents and highlighted where it is aware of shortfalls. Through my sampling, however, I have also found that the RP has not been consistent throughout the sampled hazards and topics, and further information and design maturity is required to judge the adequacy of the overall design. Nevertheless, through my engagements with the RP, I recognise that there is likely further underpinning evidence which will be further developed and provided in Step 3.
2. Throughout the sampling detailed above the relevant E3S case chapters align with the submissions I assessed. Additionally, the design evidence sampled aligns with the Design Reference Report (ref. [50]). This provides assurance that the RP is managing the design and development of the E3S case.

# Conclusions

1. This report presents the Step 2 conventional health and safety assessment for the GDA of the Rolls-Royce SMR design. The focus of my assessment in this step was towards the fundamental adequacy of the design and safety case. I have assessed the Tier 1 E3S chapters and relevant supporting documentation provided by Rolls-Royce SMR Limited to form my judgements. I targeted my assessment, in accordance with my assessment plan (ref. [16]), at the content of most relevance to conventional health and safety 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.
2. Based upon my assessment, I have concluded the following:

* Rolls-Royce SMR Limited recognises its legal responsibilities and has identified a high-level claim for the project that reflect these. The sub-claims and evidence to support this claim and demonstrate the safety case have broadly been identifed.
* The RP’s organisational arrangements relating to conventional health and safety, and capabilities to fulfil these, are evolving. This includes recruiting people with relevant skills, knowledge and experience, providing relevant training to the designers involved in the project and undertaking client assurance activities.
* The RP has produced a suite of processes which support the integration of its legal duties to manage conventional health and safety risks into its engineering design processes. The detail of how the conventional health and safety processes will be implemented and evidence of their application to assess their effectiveness will be sampled in Step 3. This includes how the processes will identify and consider conflicting and contingent hazards. This is not a fundamental issue at this stage and is outside the scope of Step 2.
* The design is in concept design phase. At this stage, the RP’s design processes focus on eliminating hazards before looking to reduce and control the remaining hazards as the design matures. Whilst some submissions have demonstrated that the RP’s concept design has identified and considered hazards to date, I have not seen how this has been applied in relation to conventional health and safety robustly to ensure that risks have been eliminated so far as is reasonably practicable.
* The RP has adopted the CDM role of client and appointed an individual as principal designer. It has demonstrated an understanding of the requirements of these regulations and the arrangements to meet these requirements are continuing to evolve. It is unclear how the duties of the principal designer to plan, manage and monitor during the pre-construction phase to date have been met. Demonstration of this is within the scope of Step 3.

1. The RP continues to develop its arrangements to meeting the expectations of CDM. However, assurance has not been provided to demonstrate that the hazards within the generic design have been robustly identified and understood. It is therefore unclear how the principles of prevention have been applied to foreseeable risks throughout the design to date. This is important where key design decisions have already been taken. I consider this a shortfall which the RP will need to resolve.
2. I recognise that the design is still being developed and, therefore, the RP has opportunity to ensure remedial action is taken to address the shortfalls identified. Furthermore, the above shortfalls relate to evidence of systematic application and understanding, which is in scope of Step 3 and will sampled accordingly.
3. Overall, based on my assessment to date, and subject to the provision and assessment of suitable and sufficient supporting evidence, I have not identified any fundamental safety shortfalls that could prevent ONR permissioning the construction of a power station based on the generic Rolls-Royce SMR design.
   1. Recommendations
4. My recommendations are as follows:

* Recommendation 1: ONR should consider the outcomes from my assessment as part of the decision to progress to Step 3 of GDA for the generic Rolls-Royce SMR design.

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| [47] | Rolls-Royce SMR Limited, Containment and Interspace Systems Layout Summary Report, SMR0008507, Issue 1, January 2024. (Record ref. ONRW-2019369590-7012). |
| [48] | Rolls-Royce SMR Limited, Internal Hazards Summary Report - Reactor Island within Hazard Shield, SMR0007172, Issue 1, January 2024. (Record ref. ONRW-2019369590-6173). |
| [49] | Rolls-Royce SMR Limited, Fuelling Systems Outside Containment Layout Report, SMR0008151, Issue 1, January 2024. (Record ref. ONRW-2019369590-7013). |
| [50] | Rolls-Royce SMR Limited, Rolls-Royce SMR – GDA Design Reference Report, SMR0009043, Issue 2, April 2024. (Record ref. ONRW-2019369590-8872). |

# Appendix 1 – Relevant acts and regulations considered during the assessment

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| Regulation Title |
| 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 |

# Appendix 2 – Relevant SAPs considered during the assessment

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| SAP No. | SAP Title |
| FP.4 | Safety assessment |
| MS.4 | Learning |
| SC.2 | Safety case process outputs |
| SC.3 | Lifecycle aspects |
| SC.4 | Safety case characteristics |
| SC.5 | Optimism, uncertainty and conservatism |