Programme Area: Nuclear

Project: SMR Deployment Enablers

Title: SMR Deployment Enablers final project and summary reports

Abstract:

This report contributes to a wider study commissioned by the Energy Technologies Institute (ETI) to understand the opportunities for the deployment of Small Modular Reactors (SMR) as part of the transition towards a UK low carbon energy system. This wider study has considered key factors such as siting criteria and the potential locations for early SMR deployment in the UK; and the development characteristics, timescales, operational performance and cost envelope for SMRs to be an attractive technology.

Context:

The purpose of the SMR Deployment Enablers project was to identify the activities needed to take place in the first five years of a development plan for UK SMRs and the necessary capability of the SMR utility/developer organisation during this phase. Selection processes are out of scope so the starting assumption for the project is that both the SMR utility/developer and reactor vendor have already been identified.

Energy Technologies Institute

Small Modular Reactor (SMR) Deployment Enablers Project

11th July 2016

Final Report

Decision Analysis Services Ltd

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CONTENTS

1 EXECUTIVE SUMMARY

This report contributes to a wider study commissioned by the Energy Technologies Institute (ETI) to understand the opportunities for the deployment of Small Modular Reactors (SMR) as part of the transition towards a UK low carbon energy system. This wider study has considered key factors such as siting criteria and the potential locations for early SMR deployment in the UK; and the development characteristics, timescales, operational performance and cost envelope for SMRs to be an attractive technology.

Building on the findings from this earlier work, the SMR Deployment Enablers (SDE) Project identifies the enabling activities that would be necessary in the first five years of a programme to support potential operations of a first UK SMR by 2030.

Although the case of a single prospective developer/operator and vendor grouping is considered, this project is not constrained to one given scenario. Indeed, the project considers the route map for SMR deployment in generic terms, with detail explored to a level sufficient for examining the required activities, interactions and risks. Therefore, the applicability and durations of certain activities within this route map will vary in practice, according to the particular circumstances of a given combination of developer / operator / vendor electing to embark on such a deployment programme. However, the identified enabling actions are likely to be common.

The project has used a range of tools and techniques that are commonly employed in the management and analysis of major programmes to provide a structured and systematic framework upon which to develop, analyse and articulate a body of evidence relevant to SMR deployment in the UK. This evidence has been compiled by nuclear industry professionals with experience gained from recent large reactor new build programmes in the UK, from the perspectives of investment case development, risk and assumption management, nuclear operator organisational design, regulatory permitting and consents, technology requirements, stakeholder management and analysis of Government policy.

The premise of an SMR deployment differs from a large reactor new build as a result of a range of factors, including:

- The role of design standardisation in enabling economies of multiples.
- The potential for a staged (and therefore more affordable) roll-out of GW tranches of generating capacity.
- The potential of the technology to offer alternative operating modes and therefore diverse revenue streams.
- The potential deployment of SMRs at sites not suitable for large reactors, enabling additional potential nuclear sites and nuclear generation capacity.

These differences from large reactors would certainly be manifested in the structure of an SMR deployment programme. However, it is important to note that SMR deployment projects must address *the same* range of regulatory processes as large reactor programmes in the UK, with the bar associated with licensing a prospective operator and site being set at the same level irrespective of the SMR technology employed. It must also address a *potentially greater* challenge in gaining public acceptance, especially where the locality has no previous experience of nuclear developments and the technology will be unfamiliar to most. Hence the challenges associated with gaining acceptance of the technology from local, national and European stakeholders are likely to be comparable to those associated with large reactors; with particular consideration needing to be paid to the location of early deployment sites.

The scope of required activity within the first five years of a First of a Kind (FOAK) SMR deployment programme has been captured within a Work Breakdown Structure (WBS). This WBS outlines the discrete tasks to be considered by Government, the Regulators, the developer / operator, and the vendor.

The inter-dependencies between these activities are highlighted within descriptions provided for each WBS item. This has been set against a timeline for deployment, which draws out the logical sequencing of activity and the required interaction between each party involved, in the form of an integrated schedule. This schedule recognises the likely impact of unmitigated delivery risk on the behaviour of private sector investors and the consequential sequencing of activity.

Investor confidence therefore emerges as a fundamental factor when considering the timely delivery of a large scale and highly integrated delivery programme. Indeed, with the aspiration for FOAK SMR operation by 2030, Government is perceived to play a crucial role in creating the "right" investment environment. A timeline is therefore presented, which represents the impact of enabling action being taken to create this investment environment.

It is important to note that the development of such a schedule is not an attempt to predict or recommend a delivery plan, or to comment on the likelihood of achieving FOAK operation by 2030. Rather it is an attempt to identify what actions would be needed, and where delay would be most problematic, if FOAK operation by 2030 was the required outcome.

In considering the scope and timescale for FOAK deployment of SMRs in the UK, the following main conclusions are reached.

Implementation of an FOAK SMR is possible without facilitative action by Government. However, the complexity and non-prescriptive nature of the UK's consenting processes and the scale of the risks that remain through into first operation make it unlikely to be attractive for investors to make the scale of commitment necessary to achieve FOAK SMR operation by 2030.

Pre-Final Investment Decision (FID) investor confidence is of critical importance for achieving the 2030 timeline. Securing and maintaining pre-FID investor confidence will dictate whether the necessary commitment to time-critical decisions / actions is made by those leading delivery. Government and the developer / operator play a key role in creating an environment that fosters this confidence through the progressive reduction of perceived risks.

For an effective programme to achieve FOAK SMR deployment, significant Government commitment and facilitative action is required from the outset. Government action to promote investor confidence is required from the outset since the 2030 FOAK timeline requires the private sector to commission a wide range of work (related to technology, site selection and site development) early within the initial five years**.** Indeed, Government should remain engaged with the progress made and upcoming decision-points of the private sector delivery plan, and ensure that these interactions support the required evolution of the investment case. The specific actions to be considered by Government include:

- Addressing all potential areas of legal challenge so as to deliver a secure, legally robust framework for investment in a FOAK project. This should recognise the adequacy of existing policy and legislation in light of the proposed plans for SMR FOAK operation by 2030 and the experience gained from recent large reactor new build programmes.
- Engaging proactively with potential investors so as to understand and act on their perspective on the UK's fitness for investment in SMR design approval and implementation projects.
- Assessing, reviewing and influencing policy development at UK, European and international level which bears on electricity, nuclear and climate change.

- Providing a prospective vendor and developer / operator from the outset with comprehensive advice and guidance on negotiating the UK's policy, regulatory, land-use planning, and waste and decommissioning liability funding processes.

Without such actions being taken, the timeline associated with an entirely market-led deployment could result in FOAK operation nearly a decade late against a 2030 target.

It is insufficient for the first 5 years of the deployment schedule to focus on just Generic Design Assessment (GDA) and Regulatory Justification. Achievement of FOAK operation by 2030 requires private sector developers undertake a range of activities in parallel, in a manner that increases the complexity of the schedule interactions, and it demands that certain activities be performed at risk. In particular, wider work to develop the site specific aspects and credibility of the operator must commence early if the timeline is to be achieved. To underpin this:

- The developer / operator should formulate a coherent SMR business case and engage in the Government's strategic siting assessment process so as to establish a portfolio of potentially suitable SMR sites to support this business case.
- Preliminary work will be required ahead of FID (i.e. at risk). This includes work to develop the site (such as non-nuclear construction, non-nuclear safety related grid connection and local infrastructure) as well as to de-risk the SMR manufacture and testing timeline (through early procurement of long-lead items).

A strong and early marriage is required between developer / operator and vendor. Although SMR technology may differ in financial scale from that used in recent large reactor new build programmes**,** the bar to licensing a prospective operator / site in the UK is set to the same consistent standard.

The prospective licensee must present credible plans that demonstrate Intelligent Customer and Design Authority capability in respect of the SMR technology. This must include adequate oversight of the vendor's design and development (including relevant manufacturing / assembly activity performed by the vendor's supply chain). Therefore, the prospective operator must develop the required competency at an early stage of the deployment programme in order to assure itself of the adequacy of the vendor's generic design; the optimal boundary between generic and site specific aspects; and the plans for achieving economies of multiples beyond the development and deployment of the FOAK. To this end**,** a strong and early marriage is required between developer / operator and vendor. This must be credible not only in terms of the individual parties involved but also in the terms of their marriage (complementary offerings without anti-trust concerns, a shared delivery vision, access to the full coverage of required resources such as finance, experienced people, etc.).

The notion of a developer / operator / vendor 'boot camp' is proposed as a near-term risk mitigation activity. This recognises the requirement for close-working between all stakeholders involved in a SMR deployment project. The detailed scope of this boot camp should be considered further, however overall it should seek a common understanding by all parties of the required capabilities, information, interactions and timescales. In particular, where parties inexperienced in the UK nuclear market are participating in a SMR deployment project, they may need education in the standards and expectations of the UK regulatory and operating environment.

Deployment of a FOAK SMR in the UK is achievable by 2030 under the bounding scenario considered by this study. This is conditional on facilitative actions being implemented. It should be noted that the actual durations, sequencing and overall timeline of SMR deployment will depend on the specific organisational, commercial and financial characteristics of the parties engaged in such a programme and the SMR technology selected. However, the generic scenario considered by this study incorporates the following bounding conditions:

- That both the developer / operator and the vendor are credible parties to lead an integrated delivery programme:
    i. The vendor's technology is sufficiently mature from the outset of the programme to enable GDA and Regulatory Justification to commence early and progress systematically supported by timely submission of evidence.
    ii. The developer / operator and vendor have access to sufficient funding (equity or debt) to support the staged investment decisions.
    iii. The developer / operator and vendor commit from the outset to a close working arrangement (in whatever commercial / legal structure may be appropriate).
- That substantive work commences in early 2017 (noting that a later start reduces the credibility of achieving FOAK operation by 2030).
- That the approach to site selection for FOAK deployment avoids potentially contentious locations, in order to avoid creating undue challenges from local / regional stakeholder groups.
- That the local infrastructure development excludes work to supply district heating; with FOAK deployment focussing on electricity generation only. Future district heating capability may be accounted for within the design on a 'fitted for but not with' basis.

The scale of the recruitment challenge to establish a Nuclear Baseline should not be underestimated, with staged planning essential. A SMR developer/operator must unequivocally establish itself as a credible nuclear operator, including Design Authority and Intelligent Customer capability, and the power to be a Controlling Mind.

Regulators will need to be able to resource-up without adverse influence on current UK nuclear safety activity. It is recognised that the UK has finite SQEP resource (both direct and indirect) to support the regulatory processes of GDA, Regulatory Justification and site specific assessment. Concurrent regulatory assessment of SMR and large reactor licensing projects may only be achievable where careful consideration is given to the 'prequalification' of vendors (married to credible developer / operators) entering this process.

A co-ordinated public communications plan is required, led by the prospective Licensee, supported by the vendor and facilitated by Government. The developer / operator will lead many of the activities associated with the deployment programme. Achievement of the 2030 timeline will rest, in part, on the competency of this organisation to plan and drive the delivery of a highly integrated schedule, drawing in the inputs, as required from all parties. This requirement extends to the need for the developer / operator to address issues of public perception concerning the deployment of FOAK SMR technology in the UK: an activity that requires a co-ordinated public communications plan, led by the prospective Licensee, supported by the vendor and facilitated by Government. This is an important factor when considering the risk of potential applications for Judicial Review. A priority for the developer / operator is to establish an early, credible presence local to the FOAK site, with the influence to optimise the project's local benefits and mitigate its impacts.

Bounding assumptions were judged to be sound in the context of a deployment schedule leading to a UK FOAK SMR operating by 2030. A number of assumptions were used at the outset to bound the study. Although these assumptions are unlikely to be totally representative of any specific vendor / developer / operator solution, it was accepted that they remained sound at the completion of the study.

The evidence gathered in this study forms the basis of a toolkit which could be used to test or assess the feasibility of specific scenarios for SMR Deployment in the UK. While outside the scope of this study, which assumed a single non-specific solution for the vendor/developer/operator, the evidence (WBS,

assumptions, risks and schedules) developed could be used to test or assess a wide range of proposed options for SMR deployment in the UK.

2 INTRODUCTION

2.1 Context

In 2015 the ETI concluded that nuclear generation could be a key part of the transition to a low carbon economy by 2050 with potential for generation capacity of up to 50 GWe through a combination of large nuclear reactors and SMRs.

Two new ETI projects had been delivered to understand the opportunities for the deployment of large nuclear reactors and SMRs as part of the transition towards a UK low carbon energy system:

- The Power Plant Siting Study which applied the established siting criteria for new nuclear power stations to determine siting capacity constraints for large nuclear reactors as well as SMRs.
- Project for System Requirements for Alternative Nuclear Technologies which determined from an energy system perspective what would be required in terms of development characteristics, timescales, operational performance and cost envelope for SMRs to be an attractive technology.

In-house ETI energy system modelling and analysis had built on the learning from these two projects to conclude that two key factors in commercial viability of SMRs are a) potential for Combined Heat and Power (CHP) and b) the date of first operation, with the next 10 years critical in achieving deployment.

Detailed conclusions building on this work were published in the ETI's Nuclear Insights document, which highlighted the potential part of both large nuclear reactors and SMRs in a low carbon energy system.

Large nuclear reactors form a key component of current low carbon base load electricity production, but siting limitations may limit installed capacity to around 35 GWe by 2050. While SMRs may not be as cost effective for baseload generation, they offer scope for ancillary services and more flexibility in terms of deployment locations, enabling the gap to be closed to achieve 50 GWe. Flexibility in terms of deployment location combined with availability of district heating infrastructure also enables SMRs to deliver CHP to decarbonise energy use in commercial, public and domestic property.

ETI has commissioned further work to understand these two key commercial drivers more:

- Power Plant Siting Study Phase 3 which seeks to understand the range of locations suitable for early SMR deployment and if there is an obvious front runner for a FOAK SMR site.
- System Requirements for Alternative Nuclear Technologies Phase 3 which seeks to test and validate assumptions regarding the technical viability and cost impact of extracting heat from a PWR SMR steam cycle.

A conclusion from the ETI's Nuclear Insights document states the need to take action now if the option to deploy SMRs as part of the UK's low carbon transition is not to be closed off.

This is the context for the SMR Deployment Enablers (SDE) Project, initiated by the ETI, to explore the answer to a critical question:

"What are the enabling activities in the first five years of an SMR programme necessary to support potential operations of a first UK SMR by 2030?"

2.2 Project objectives

The SDE Project overall purpose is to identify what activities need to take place in the first five years of a development plan for UK SMRs, including the necessary capability of the SMR developer/operator organisation during this phase, for deployment and first operations by 2030.

This purpose has been achieved through three subsidiary objectives:

- Establish the activities comprising the first five years of a development programme for the UK deployment of a SMR.
- Establish a timeline with milestones to accompany this programme definition.
- Establish the necessary capability of the SMR developer/operator organisation during this phase of a UK SMR development programme.

The SDE project is ultimately seeking to determine if UK FOAK SMR operations around 2030 may be possible through timely managed implementation of enabling activities.

The following are not objectives for this project, and associated scope is excluded from this project:

- Cost estimates for the delivery of the potential programme.
- Any form of candidate technology evaluation or selection.
- Any form of candidate operator organisation evaluation or selection.
- The production of an SMR investment business case (other than the identification of scope necessary to maintain and update it).
- The consideration of the range of potential source(s) of funding for either vendor or operator other than the cash flow between them.

No account is taken in this report of the outcome of the very recent referendum on membership of the European Union and its implications for Regulatory Justification and Euratom Treaty requirements.

2.3 Report structure and deliverables

The main body of this report sets out the evidence which has been gathered throughout the project and discusses the analysis of this evidence in response to the main objectives:

- Section 3 – sets out the approach to conducting the project, including the means and modes of a) evidence collection/creation and b) assurance of the quality of evidence and analysis.
- Section 4 – sets out the evidence which has been built by way of discrete deliverables, including a WBS, considerations for organisational design, separate market led and facilitated integrated programme schedules, and the assumptions and risks identified which relate to this work.
- Section 5 – discusses the analysis and expert reflection on the evidence which has been gathered, and the consideration of what has been learnt. These sections are presented on key themes: securing FOAK operation by 2030, the role of investor confidence, and the importance of the first five years.
- Section 6 – presents the key conclusions arising from this analysis.

The detailed output of this work is captured in a series of appendices:

- A list of acronyms
- Programme scope definition associated to the WBS
- Developer / operator organisational design considerations

- A Gantt chart for each of the integrated programme schedules
- Assumptions used to bound the scope of the work
- Key risks associated with achieving the deployment timeline
- A register of key reference sources
- An overview of the project team

Table 1 below sets out for each SDE Project objective associated final deliverables and location of the deliverable in this report.

Objective	Satisfied by
Establish the activities comprising the first five years of a development programme for the UK deployment of a SMR	Scope Definition in Appendix II of this report
Establish a timeline with milestones to accompany this programme definition	Schedule in Appendix V of this report
Establish the necessary capability of the SMR developer/operator organisation during this phase of a UK SMR development programme.	Organisational Design Report in Appendix III of this report
Capture the contract deliverables in a complete Project Final Report, Project Summary Report with presentation to ETI.	Project Final Report, Summary Report and Presentation Pack

Table 1: Final deliverables for each objective

2.4 Key definitions

Developer	A possible combination of an Operator and a Vendor, or a grouping consisting of an Operator and a Vendor amongst other parties, which has the intent to progress the deployment of a UK FOAK SMR.
Engineering	Variously covers all disciplines mechanical, electrical, C&I, civil, structural, metallurgy, chemistry, reactor physics, Radiological Protection Advisors (RPA) and Radioactive Waste advisors (RWA), and management of the SMR construction project. It encompasses the Design Authority and the Intelligent Customer capabilities. These latter two functions are identified as separate in the early development of the organisation but ultimately reside in the Engineering function. Additionally, as the plant moves to operations the Safety and Environment case capability and management would also reside in this function.
First of a Kind	The first unit in a tranche of SMRs equating to a capacity of 5 to 10 GWe.
Government	UK Government, encompassing or referring to the relevant department as appropriate.
Nuclear Safety	Variously refers to nuclear safety, conventional safety, environmental safety, radiological safety and health issues for workers and public. Here the term "Nuclear Safety" is used to encompass all of these.
Operations	Used generally as defined in LC1 of the Nuclear Site Licence Handbook: *"Operations" includes maintenance, examination, testing and operation of the plant and the treatment, processing, keeping, storing, accumulating or*

	carriage of any radioactive material or radioactive waste and "operating" and "operational" shall be construed accordingly.
Operator	The organisation responsible for the operation of an FOAK SMR, which transitions from a prospective operator to an actual SMR operator through the phases of the deployment programme. Includes variations of operator / licensee.
Regulators	Used to cover the Office for Nuclear Regulation (ONR), which regulates nuclear safety, security, safeguards and transport, and the Environmental Regulators, including the Environment Agency and Natural Resources Wales, and the term consents can apply to any or all of these.
Responsible Organisation(s)	Recognising the complexity of deployment, there may be more than one group named as a responsible organisation for the WBS one page scope. Responsible organisations are listed with the main one first, followed by those that may be supporting.
Vendor	The provider of the SMR technology solution, which transitions from a prospective vendor to the actual UK FOAK SMR vendor.

3 PROJECT APPROACH

3.1 Methodology

The project approach centres on the development of a conceptual route map for deployment of a FOAK SMR, using a range of techniques commonly employed in the management and analysis of major programmes. These techniques form both the tools used to develop the study evidence and, after iterative development by a team of nuclear industry and programme management experts, form the evidence itself. This dual use of the techniques is shown in Figure 1.

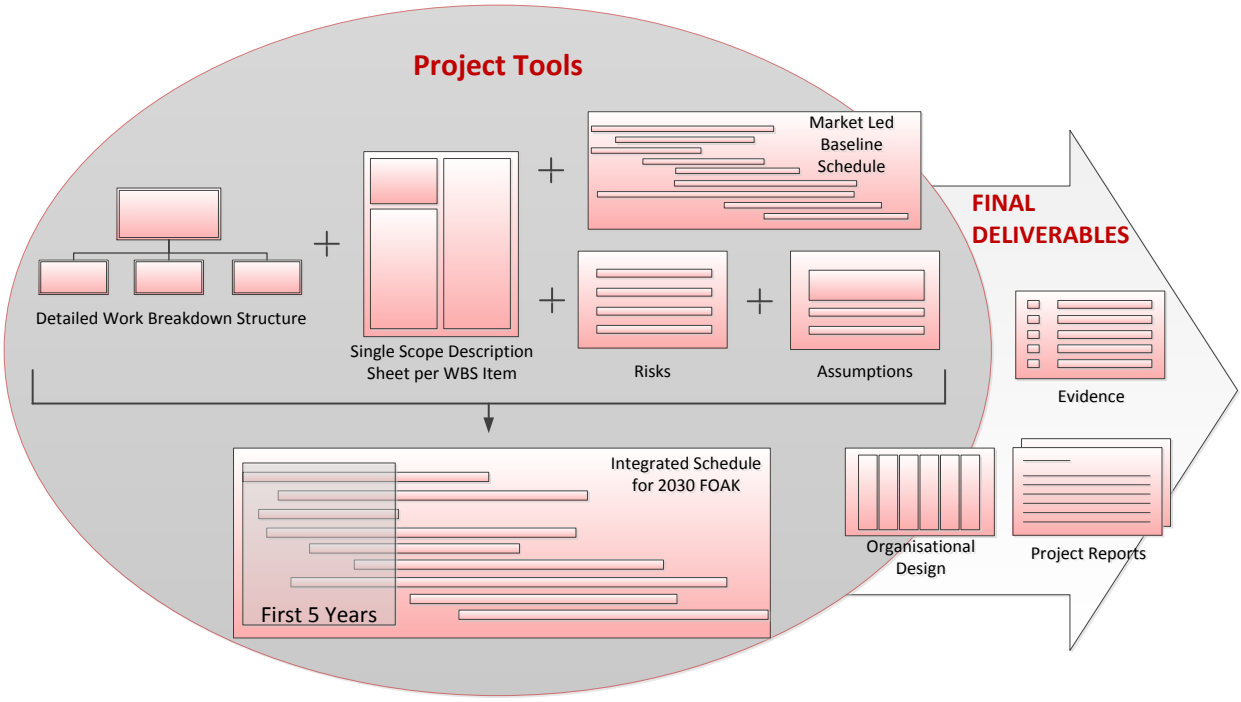


Figure 1: Project Tools and Work Flow

The tools consist of:

- A WBS and associated descriptions of each element
- Schedules of activity
- A Master Assumptions and Data List (MDAL)
- A Risk Register

The use of a WBS, scope descriptions, integrated schedules, and risk and assumptions registers provided a structured and systematic framework upon which to develop, analyse and articulate the required scope of the first five years of the SMR deployment programme.

The evidence developed consists of:

- WBS and associated descriptions
- Considerations for the organisational design of an SMR developer and associated operator
- Market-led integrated schedule
- Facilitated schedule
- Assumptions
- Risks and opportunities

The methods applied in the iterative development of each of the tools to form the study evidence are set out in Section 3.2.

The starting point for the study was a project vision, provided in a "setting to work pack" to all team members, consisting of the initial WBS, a conceptual scenario formed of the study initial bounding assumptions, this methodology, evidence methods, and the project objectives and tasks.

The role of the project vision was to ensure that the benefits of this study were maximised to ETI, by ensuring that the deliverables are both relevant and useful to ETI and its members. The vision was discussed and agreed with the ETI and project team during the joint project kick-off meeting.

The challenges associated with realising the associated benefits were owned by the study Design Manager. The conceptual scenario for this study was defined by bounding assumptions. These bounding assumptions include those provided by ETI at the start of the project and assumptions jointly agreed between Decision Analysis Services Ltd (DAS) and ETI as output of project workshops. Table 2 contains the key assumptions that bound this study.

Other components of the study starting point included the nuclear sector knowledge of the team members, specifically new build, and ETI insights, including other ETI project literature.

Iterative development of each area of evidence was achieved through the application of the tools in team workshops, individual task work and 1-2-1 focussed review sessions. The tools not only informed their associated evidence area but also interactively developed other evidence areas. For example:

- Dependencies captured through the WBS method informed the schedules. Schedule reviews then raised new areas of WBS.
- Risks and associated risk mitigations captured in the WBS description informed enabling activities for the facilitated schedule and raised new areas of WBS.

At each stage of the iterative development of the evidence the quality assurance methods described in Section 3.3 were appropriately applied, along with the issue of interim deliverables to ensure ETI satisfaction with the evidence during its staged development.

The above activity was managed and co-ordinated through two functions:

- The Design Manager. The fundamental role of the Design Manager was to ensure that the correct focus is adopted by the project team: a balance between providing insight but not getting stuck in the detail; ensuring the nuances of SMR development are contrasted against recent nuclear new build experience; and ensuring that the defined time horizon is considered. This focus is shown in Figure 2. The Design Manager is supported by two teams: a team of technical consultants with deep knowledge of nuclear new build, and a team of programme support consultants also with nuclear industry experience.
- The Project Manager. The Project Manager was responsible for ensuring the scope is delivered in a logical sequence, controlled and project risks mitigated and emergent issues managed effectively.

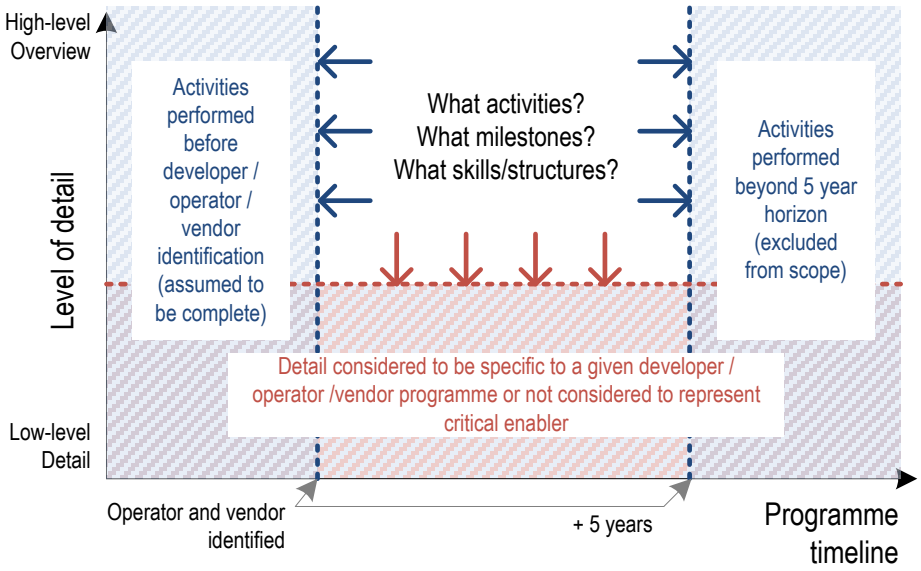


Figure 2: Project Focus

The final task of the project approach was the creation from the evidence of the Project Final Report, Project Summary Report and Project Presentation. The quality assurance methods described in Section 3.3 were appropriately applied in the development of these final deliverables.

3.2 Evidence creation methods

3.2.1 WBS and associated descriptions

The WBS is a hierarchical decomposition of the deployment programme into specific work packages and activities, presented in a tree structure.

It is used to develop, at a programme summary level, the total scope and schedule for the first five years of a development programme to deploy a FOAK SMR in the UK.

When developing the WBS the focus was first to capture the breadth and completeness of the programme, and then subsequently to develop a sufficient number of levels consistent with the importance or significance of each element of scope, but balanced against the level of detail necessary and achievable within the project duration and budget.

The WBS dictionary includes an entry for each WBS element, at each level of the WBS, which briefly describes the scope of the work package or activity in a single paragraph.

The WBS dictionary is used to explore and refine the totality of the WBS, and to provide a high-level overview of each main aspect of the WBS.

Due consideration is given to the range of organisations involved, in order to ensure the scope statement is relevant.

Potential risks and assumptions are initially identified at this stage.

With a complete WBS and accompanying WBS dictionary in place, the scope description is expanded into a common tabular format with one page of description for each WBS element, at each level of the WBS.

The tabular format includes: a unique scope reference number within the WBS, a description of the scope to be delivered, key objectives, a high-level statement of work, identification of the organisation(s) responsible for the delivery of the scope, key inputs and dependencies linked to this scope, key risks associated with the scope, and assumptions associated with the scope.

3.2.2 Integrated programme schedule

The integrated programme schedule models the full scope associated with the WBS, incorporating logic links, dependencies and hand-offs, and taking into account indicative activity durations.

The integrated programme schedule is used to highlight and explore the inter-dependencies between activities undertaken by a range of organisations involved in the programme.

The logic-linked integrated programme schedule allows the identification of the critical path.

A tabulated summary of milestones is provided alongside the integrated programme schedule.

The integrated programme schedule is also represented pictorially as a plan on a page.

3.2.3 Master Data and Assumptions List

The MDAL, a tabular format, is used to systematically capture and monitor assumptions throughout the course of the project.

The tabular format includes: a unique reference number, the area to which the assumption relates, an assumption title, the details of the assumption, and the source of the assumption.

The MDAL is used to support discussion which enables each assumption to be tested and its effect on the programme explored.

Key data sources are also captured throughout the course of the project and referenced in tabular format.

Each entry in the MDAL is reviewed systematically and then accepted or rejected, remaining captured in either case.

3.2.4 Risk register

The risk register, a tabular format, is used to systematically capture and categorise the risks which have been identified for specific WBS areas associated with the deployment of a FOAK SMR in the UK, as part of the high level risk analysis used during this project. The risk register is developed according to the project risk management plan which sets out likelihood and impact criteria associated with SMR deployment time. These criteria are in Appendix VII.

The tabular format includes: a unique reference number, the area to which the risk relates, a risk title, the details of the risk, and the source of the risk, the probable owner of the risk, the likelihood of the risk, the impact of the risk, the overall likelihood-impact score, a high-level mitigation option, the possible owner of the mitigation, a potential fall-back plan, and associated further comments.

The risk register is used in discussion to support and challenge the development of the programme scope and schedule, and introduce and verify thought on critical enabling actions.

Each entry in the risk register is reviewed systematically and then accepted or rejected, remaining captured in either case.

The risk analysis has not been exhaustive, and nor was it required or intended to be. Rather, it has been used to inform and substantiate the conclusions as part of the underpinning knowledge and evidence on which this project is based.

3.3 Quality assurance

A staged approach to the delivery of this project has been adopted, with interim reviews providing progressive assurance of the fitness for purpose and accuracy of the evidence creation and analysis, as shown in Figure 3. This included:

- A detailed kick-off meeting and information day.

- Collective and task-level pre-job-briefings.
- Independent task level review and sign-off.
- Overlapping internal peer review, through 1-2-1 and workshop challenge.
- Progressive development of project deliverables.
- Periodic validation of findings.
- Verification of references from research.
- Formal sign-off from each team member on all project content, providing further internal peer review and agreement.

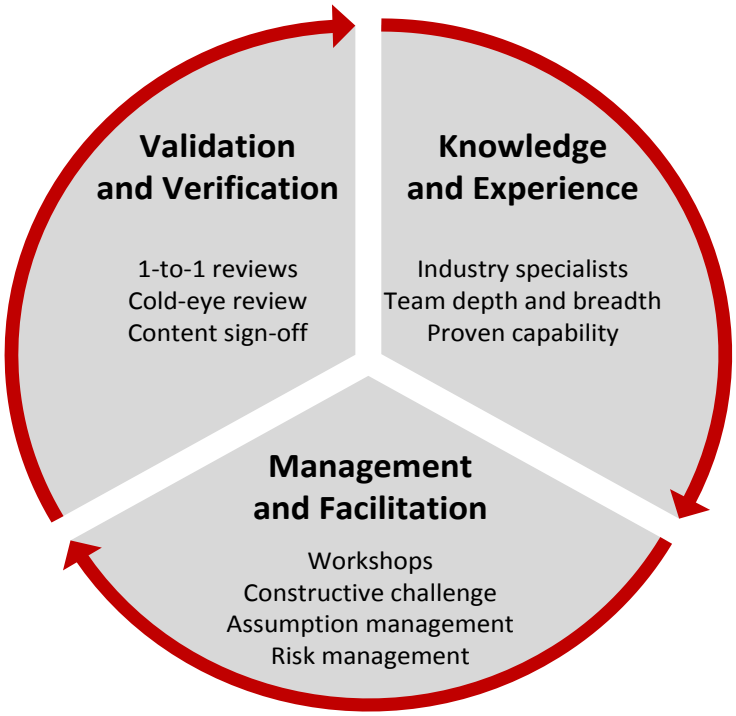


Figure 3: Phased assurance during programme design

Consistent with the methodology, the Project Team was selected to bring significant experience of the UK nuclear new build sector, alongside expertise in major programme delivery support. All team members are nuclear industry professionals with experience spanning investment cases, risk and assumption management, nuclear operator organisational design, regulatory permitting and consents, technology requirements, stakeholder management and analysis of Government policy.

At the outset of this project, technical leads were appointed for each key theme within the project, with central oversight from the Design Manager. Each technical lead was selected on the basis of a SQEP assessment, incorporating a range of criteria that included:

- Knowledge gained from recent large reactor new build programmes in the UK.
- Knowledge of the inter-related activities between Government, developer/operator and reactor vendor, and their interfaces with other organisations involved in such a development programme.
- Proven programme management capability through the systematic definition of project activity by scope, associated assumptions, risks and project schedule.

Information on the Project Team is given in Appendix IX.

4 EVIDENCE

4.1 Work Breakdown Structure

The WBS is intended to enable exploration of the range of activities that must be undertaken over the first 5 years of the SMR development programme.

The WBS is intended to be illustrative and appropriate for the purpose of the project, but it is not necessarily exhaustive and complete for a specific solution. In its derivation activities either side of the 5 year period have been considered to ensure completeness of the activities that are required in the first five years to enable FOAK operation by 2030.

The WBS has been constructed iteratively during the development of the programme definition and the integrated schedule and has been shared periodically with ETI in order to gain progressive agreement of a WBS that represents a comprehensive and balanced framework.

The initial elaborations sought to ensure that the WBS contained sufficient breadth and completeness, and the activities may not have been tightly constrained by the stated timelines (5 years leading to the substantive completion of GDA). This refinement was undertaken alongside the development and refinement of the integrated schedule.

Updates to the WBS have been incorporated according to the following:

- As the literature review progressed and in response to changes to the project assumptions.
- As new policy requirements and decisions were identified which are considered potentially necessary for the potential cost effective UK deployment of SMRs.
- As development of the Integrated Programme Schedule identified the boundary of scope that would be applicable to the 5-year period under consideration.
- As risk mitigations, opportunities and assumptions developed potential new scope areas and refined interdependencies of activities.
- As work to define both the Corporate Structural Features and Internal Organisational Capabilities progressed.
- In response to any comments made by ETI.

Emphasis was placed on these updates to ensure that the WBS represents the key enabling activities; and that undue emphasis is not placed on activities that are secondary to the overall aim. Scoping workshops have been used to peer review this balancing and prioritisation activity. Emphasis has also been placed on identifying the inter-dependencies, assumptions, decision points and delivery risks/opportunities that inform the development of the WBS, Programme Scope Definition and Integrated Programme Schedule.

The Programme Scope Definition has been developed iteratively, in conjunction with the WBS.

The first iteration established a WBS Dictionary – a brief textual description of each item on the WBS. This served to support the review and development of the WBS for completeness and breadth.

A subsequent iteration expanded the WBS Dictionary into a tabular format of up to one page of description for each element of scope, enabling the scope of each activity to be defined in terms of further criteria.

The final version of the WBS is presented in Figure 4 on the following page.

The WBS Dictionary is presented thereafter, while the one-page scope descriptions are presented in Appendix II.

These elements comprise the final version of the Programme Scope Definition.

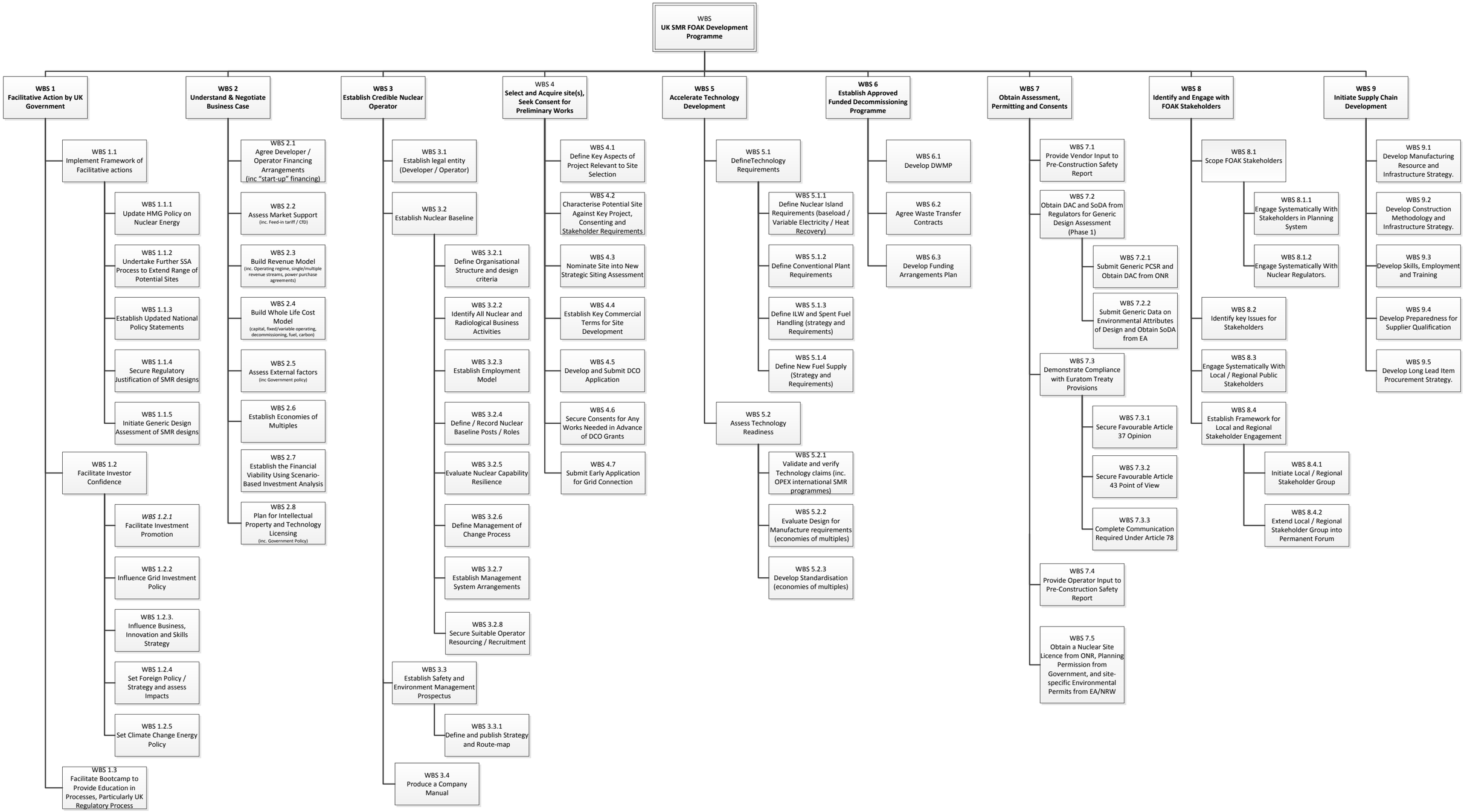


Figure 4: Work Breakdown Structure

4.1.1 WBS 1: Initiate facilitative action by UK Government

Covers actions needed to update the facilitative framework established by UK Government for current new nuclear projects.

	WBS Dictionary
WBS 1 **Initiate Facilitative Action by UK Government**	
WBS 1.1 Implement Framework of Facilitative Actions	Establish the nuclear specific actions needed to update the facilitative framework established by the HM Government for current new nuclear projects.
WBS 1.1.1 Update HMG Policy on Nuclear Energy	Update HM Government policy on nuclear energy to encompass SMR's deployed post 2025 as Nationally Significant Infrastructure Projects.
WBS 1.1.2 Undertake Further SSA Process to Extend Range of Potential Sites	Define and consult on siting criteria appropriate for SMR power stations, invite and assess credible nominations in order to provide updated National Policy Statement with additional potentially suitable sites.
WBS 1.1.3 Establish Updated National Policy Statements	Draft, consult on and adopt updated National Policy Statements, EN-1 and EN-6, together with AoS and HRA. Provides formal guidance to Planning Inspectorate.
WBS 1.1.4 Secure Regulatory Justification of SMR designs	Develop and submit application for Regulatory Justification of one or more SMR designs, followed by a consultation on Justification Decision and finalisation as a Statutory Instrument.
WBS 1.1.5 Initiate Generic Design Assessment of SMR designs	Request nuclear regulators to commit resource to GDA of SMR designs and encourage SMR vendors as Requesting Parties to submit design(s). (Precursor to implementation of GDA – WBS 7.2).
WBS 1.2 Facilitate Investor Confidence	Creation of an investment environment that readily supports the financing and commercial development of SMR sites, by facilitative action through policy mechanisms and wider business support strategies.
WBS 1.2.1 Facilitate Investment Promotion	Activity that HM Government may undertake to support investor confidence and developer appetite for national SMR programmes through facilitative action in the area of investment promotion.
WBS 1.2.2 Influence Grid Investment Policy	Activity that HM Government may undertake to influence, direct and intervene in the strategy for National and European grid investment planning to help support investor confidence in medium-scale distributed generation projects, such as SMR.
WBS 1.2.3. Influence Business, Innovation and Skills Strategy	Use policy to impact the balance of skills and national supply chain industrialisation to affect the viability of SMR projects for developers/operators and maximise the potential for UK manufacture and funded research; including funding for skills development, business growth and funded research.
WBS 1.2.4 Set Foreign Policy / Strategy and assess Impacts	How broader foreign policy might be used to affect the SMR programme, and the impact on developer/operator appetite with particular focus on foreign stakeholders. (E.g. ramifications of the recent Transatlantic Trade and Investment Partnership, etc.)
WBS 1.2.5 Set Climate Change Energy Policy	How UK's energy and climate change policy might support the SMR Programme and developer/ operator appetite. (E.g. District heating etc.)
WBS 1.3 Facilitate Bootcamp to Provide Education in Processes, Particularly UK Regulatory Process	Engagement with vendors and also potential Licensees in order to inform (educate) international vendors and Licensees in 'how we do it round here' – the GB processes; regulatory, planning, stakeholder consultation, Euratom requirements and funding decommissioning plans.

4.1.2 WBS 2: Understand and negotiate business case

Covers the approach that a prospective SMR developer/operator may be expected to take in constructing a robust business case to justify and underpin the viability of a future development, from conception through to Final Investment Decision.

WBS 2 **Understand & Negotiate Business Case**	**WBS Dictionary**
WBS 2.1 Agree Developer/ Operator Financing Arrangements (inc "start-up" financing)	Identify, evaluate, structure and select the financing arrangements most readily available and applicable to support the business case; considering the requirements for early stage financing rounds and working capital through the first five years of development.
WBS 2.2 Assess Market Support (inc. Feed-in tariff / CfD)	Assess the impact of prevailing market support mechanisms on the business case; considering current mechanisms, such as FiT, CfD, capacity markets, ETS schemes (especially relevant for CHP plants) and other mechanisms, including but not limited to. generation tax credits, preferential grid access, curtailment guarantees and ancillary services.
WBS 2.3 Build Revenue Model (inc. Operating regime, single/ multiple revenue streams, power purchase agreements)	Consider the available revenue models when constructing the development business case.. E.g. PPA's, ETS, Carbon Markets, YieldCo's) as well as exploring the impact of innovative revenue models such as Mankala, Exceltium, and shared-use sites.
WBS 2.4 Build Whole Life Cost Model (capital, fixed/variable operating, decommissioning, fuel, carbon)	Identify primary, secondary and tertiary cost factors associated with the development, operation and decommissioning of the SMR and associated site/operation, and model their effect on the overarching business case.
WBS 2.5 Assess External Factors (inc Government policy)	Consider how external factors, including government policy, socioeconomics, legal factors such as competition law, insurance underwriter solvency, and structured credit guarantees may affect the overarching business case viability.
WBS 2.6 Establish Economies of Multiples	Explore Economies of Multiples and acceleration opportunities that might derive from multiple country deployments of vendor SMR.
WBS 2.7 Establish the Financial Viability Using Scenario-Based Investment Analysis	Use the financial model to assess the financial viability of the development for various scenarios derived from WBS 2.1 to 2.6.
WBS 2.8 Plan for Intellectual Property and Technology Licensing (inc. Government Policy)	Consider Intellectual Property and Technology licensing in the context of the overarching business case for development, including the role of IP and technology licensing opportunities in the ability of the developer/operator to secure financing, and the opportunities created for the vendor in multiple markets.

4.1.3 WBS 3: Establish credible nuclear operator

Covers the characteristics, qualities, requirements and culture of an entity which could be licensable under the UK nuclear safety, security and environmental regulations. Considers how these might develop over time recognising how "requirements" will need to adapt as an SMR project progresses from concept through to operation.

WBS 3 **Establish Credible Nuclear Operator**	**WBS Dictionary**
WBS 3.1 Establish Legal Entity (Developer / Operator)	Establish a legal entity to enable Nuclear Site Licence and Environmental permits to be awarded. Ownership of the entity will depend on the financing arrangements, whether the entity is set-up for a single SMR or fleet, and whether licence each as a separate operating company on a site by site basis or set up an operating company to own a fleet.
WBS 3.2 Establish Nuclear Baseline	Establish the minimum requirements for an entity capable of being licenced as a nuclear operator in the UK. The baseline is different for each stage of a nuclear project and the way and rate at which it changes needs to be appropriately planned so that Nuclear site licence and environmental permit compliance is always maintained.
WBS 3.2.1 Define Organisational Structures and Design Criteria	Design an organisational structure to encompass both the needs of a commercial entity plus the unique needs of a nuclear company engaged in the construction of an SMR and/or its operation which is capable of managing all aspects of Nuclear Safety and Environmental authorisation.
WBS 3.2.2 Identify All Nuclear and Radiological Business Activities	Define all nuclear and radiological business activities within the entity: what they are, who will do them; and mix of in-house capability vs. delivery via contractual links acting as Intelligent Customer.
WBS 3.2.3 Establish Employment Model	Establish appropriate employment arrangements for the development and operation of an SMR or fleet of SMR's.
WBS 3.2.4 Define / Record Nuclear Baseline Posts / Roles	Define in the nuclear baseline document all posts/roles which have nuclear safety, security or environmental permitting responsibility; within a licenced company these include Duly Authorised Persons (DAP) appointed in writing under Licence Condition (LC) 12 for specific tasks.
WBS 3.2.5 Evaluate Nuclear Capability Resilience	Put in place processes and procedures to ensure baseline roles are always filled; resilience to cover for staff leaving, illness or other factors which mean personnel are not available to undertake the work.
WBS 3.2.6 Define Management of Change Process	Establish processes to ensure any change to the organisation or the plant/equipment is appropriately considered proportionate to its impact. Once a licence is established such process are covered by Licence Conditions; changes to plant/equipment under LC20 and LC22 and organisational change under LC36.
WBS 3.2.7 Establish Management System Arrangements	Set-up management system requirements that address all aspects of the management and control of a nuclear operating entity which affect nuclear safety, security or environmental protection.
WBS 3.2.8 Secure Suitable Operator Resourcing / Recruitment	Timely recruitment to resource the baseline roles in time for next project stage, subsequently always filled and there is always "bench strength"; resilience to cover for staff leaving, illness or other factors which mean personnel are not available to undertake the work.
WBS 3.3 Establish Safety and Environment Management Prospectus	Write a prospectus that clearly establishes management arrangements, processes and procedures and the roles in the organisation which have a locus in nuclear safety and environmental management /control and establishes the levels of responsibility and accountability clearly showing how these issues are given overriding priority at Board level.
WBS 3.3.1 Define and Publish Strategy and Route-map	Set out the strategic plan for nuclear safety and environmental permissions compliance with a Route Map that describes an integrated sequenced approach to all matters related to the entity operation including an internal regulatory system independent from operations, engineering and other line functions with the role to appropriately challenge activities in a graded way according to their impact.
WBS 3.4 Produce a Company Manual	Write a company manual that describes the hierarchy of governance arrangements established to ensure that the company remains compliant with all relevant legal/commercial controls. In particular, how the company ensures safety has an overriding priority over all other matters specifically showing how issues such as financial controls or revenue generation will not overrule safety matters.

4.1.4 WBS 4: Select and acquire site(s), seek consent for preliminary works

Covers the work required to achieve a legally robust designation of potentially acceptable sites for SMR deployment, to develop and submit a competent application for development consent, and to establish necessary commercial terms for deployment together with local planning applications for any necessary advance works.

WBS 4 **Select and Acquire Site(s), Seek Consent for Preliminary Works**	**WBS Dictionary**
WBS 4.1 Define Key Aspects of Project Relevant to Site Selection	Define the essential parameters for the developer's desired site(s) including: number of generating units, ILW/spent fuel storage, land area for construction and operation, heat sink requirement, grid access requirement and transport access.
WBS 4.2 Characterise Potential Site Against Key Project, Consenting and Stakeholder Requirements	Characterise potential site against key project, consenting and stakeholder requirements; demographics, geology and hydrology, external hazards, environmental and planning sensitivities. Undertake site characterisation studies to establish the information necessary for SSA nomination and for subsequent licensing / permitting / consenting
WBS 4.3 Nominate Site Into New Strategic Siting Assessment	Deliver site nomination with robust information against all required technical criteria and with demonstration of full compliance with all exclusionary criteria and acceptance compliance with discretionary criteria and evidence of a credible prospect of deployment by SSA date, with vendor, operator and local stakeholder support.
WBS 4.4 Establish Key Commercial Terms for Site Development	Set-out procurement strategy for key supplies, other than those provided by technology vendor, for implementation of project and establishing its cost and schedule; including terms and timescale for grid connection, any district heating connection and options with landowners capable of exercise following development consent.
WBS 4.5 Develop and Submit DCO Application	Develop comprehensive procedural requirements (especially consultations) for competent DCO application. Depends on strong co-ordination across work streams to ensure key stakeholders (especially nuclear regulators and local authorities) are in the position to make timely and informed positive inputs.
WBS 4.6 Secure Consents for Any Works Needed in Advance of DCO Grants	Secure any necessary consent under normal planning system for advance works needed in advance of DCO grant; including develop application for relevant works, recognising local stakeholder concerns and including remedial action if DCO is not granted.
WBS 4.7 Submit Early Application for Grid Connection	Submit an application as soon as possible to National Grid Electricity Transmission plc for the purpose of securing an Offer to enter into an agreement for connection to and use of the National Electricity Transmission System.

4.1.5 WBS 5: Accelerate technology development

Covers development of the maturity of a given vendor technology (rather than any process associated with selecting it) and supply chain, in a manner that supports the premise of the business case.

WBS 5 **Accelerate Technology Development**	**WBS Dictionary**
WBS 5.1 Define Technology Requirements	Establish the functional/ non-functional requirements of a SMR site (incorporating nuclear island and ancillary plant), spanning each phase of the lifecycle; derived from the premise of the business case and trade-offs that are necessary to underpin the revenue and cost model.
WBS 5.1.1 Define Nuclear Island Requirements (Baseload / Variable Electricity / Heat Recovery)	Capture any adaptation of the design that is required to ensure compliance with UK regulatory requirements, transport from manufacturing facility and operational requirements to support appropriate manning (C&I, security and infrastructure).
WBS 5.1.2 Define Conventional Plant Requirements	Establish requirements associated with ancillary plant including the steam turbine – specifically and the design of the intermediate pressure stage for (future) district heating capability which may follow the principle of "fitted for but not with".
WBS 5.1.3 Define ILW and Spent Fuel Handling Strategy and Requirements	Set out the strategy for ILW and spent fuel handling in the context of specific vendor reactor design. Establish handling and storage requirements consistent with the strategy.
WBS 5.1.4 Define New Fuel Supply Strategy and Requirements.	Set out the strategy for new fuel supply in the context of specific vendor reactor design. Set-out transport and handling requirements consistent with the strategy.
WBS 5.2 Assess Technology Readiness (as applicable)	Deliver targeted investment in both the vendor technology and manufacturing capability in order to support readiness in time for deployment; ensuring that substantive design changes are not being considered at a point in time when these could undermine the GDA process.
WBS 5.2.1 Validate and Verify Technology claims (inc. OPEX International SMR Programmes)	Engage the vendor in 'trials of truth' in order to verify critical aspects of the business case and enable targeted investment on gaps; materials, design for manufacture or any emergent requirements to ensure compliance.
WBS 5.2.2 Evaluate Design for Manufacture Requirements (Economies of Multiples)	Consider in design manufacturing operations/techniques/standards for supply chain components and final production line facilities to achieve economies for multiple SMR deployment .
WBS 5.2.3 Develop Standardisation (Economies of Multiples) Principles.	Develop standardization principles to ensure equipment and operations are compatible, interoperable and/or interchangeable.

4.1.6 WBS 6: Establish approved funded decommissioning programme

Covers establishment and Secretary of State approval of the Decommissioning and Waste Management Plan and Funding Arrangements Plan, together with agreement on associated Waste Transfer Contracts – the essential components necessary to transfer nuclear liabilities away from the operator at the end of operating lifetime at a known price.

WBS 6 **Establish Approved Funded Decommissioning Programme**	**WBS Dictionary**
WBS 6.1 Develop DWMP	Undertake analysis and costing of activities required to dismantle and decommission the SMR, condition higher level wastes into a form suitable for disposal, store safely and securely pending disposal, and finally clear, remediate and delicense the site.
WBS 6.2 Agree Waste Transfer Contracts	Negotiate and agree contract with HM Government for transfer of title and liability for disposal of higher-level SMR wastes.
WBS 6.3 Develop Funding Arrangements Plan	Establish independently-owned fund(s) to receive sufficient contributions from SMR start-up onwards to meet the price for transferring its waste and decommissioning liabilities, to the satisfaction of the Nuclear Liabilities Funding Assurance Board.

4.1.7 WBS 7: Obtain assessments, permitting and consents

Covers securing Design Acceptance Confirmation, Statement of Design Acceptability and compliance with Euratom Treaty provisions, then a Nuclear Site Licence, environmental permits and development consent for the FOAK site.

	WBS Dictionary
WBS 7 **Obtain Assessment, Permitting and Consents**	
WBS 7.1 Provide Vendor Input into Pre-Construction Safety Report	Provide timely safety cases to the Regulator to support Generic Design Assessment before DAC/SoDAs are issued.
WBS 7.2 Obtain DAC and SoDA from Regulators for Generic Design Assessment (Phase 1)	Regulatory assessment of the vendor's non-site specific design, leading, if successful, to issue of a Design Acceptance Confirmation (DAC) by ONR and Statement of Design Acceptability (SoDA) by the Environment Agency, stating that the generic design is suitable for construction and operation on a suitable UK site, subject to issue of a Nuclear Site Licence, Environmental Permits and Regulatory Consents on the basis of site-specific submissions by a future Licensee.
WBS 7.2.1 Submit Generic PCSR and Obtain DAC from ONR	Vendor submission of a generic Pre-Construction Safety Report (PCSR) to ONR which needs a complete and fixed design, and should envelope as many of the known site-specific features as possible, thereby reducing the re-work by the future Licensees. ONR assessment , leads, if successful, to issue of a DAC by ONR.
WBS 7.2.2 Submit Generic Data on Environmental Attributes of Design and Obtain SoDA from EA.	Vendor submission of non-site specific design to Environment Agency and NRW: Acceptance criteria for a SoDA from the Environment Agency are the future requirements of the Environmental Permitting Regs and the Water Resources Act, against which future site-specific Permits would be issued to the Operators.
WBS 7.3 Demonstrate Compliance with Euratom Treaty Provisions	Under the Euratom Treaty the HM Government provides information to the Commission, and some areas require the Commission to respond positively. This includes obligations placed directly on the developer / operator, and also those placed on the HM Government or nuclear regulator but actually requiring developer / operator support to discharge.
WBS 7.3.1 Secure Favourable Article 37 Opinion	Draft submission in consultation with nuclear regulators and DECC, presentation and clarification to European Commission's Group of Experts as required, and receipt of favourable Opinion via HM Government.
WBS 7.3.2 Secure Favourable Article 43 Point of View	Under the Euratom Treaty Article 41, the Operator (supported by Government and ONR/Environment Agency/NRW) has to communicate to the European Commission any new industrial activities (nuclear power is a listed relevant activity). Article 43 then says that the Commission will discuss those activities with the Operator and will then provide its views to the Member State.
WBS 7.3.3 Complete Communication Required Under Article 78	Communicate as required under Article 78: pre-brief ONR Safeguards function, develop preliminary communication and submit via ONR, develop Basic Technical Characteristics and submit via ONR and present / clarify Safeguards arrangements as required.
WBS 7.4 Provide Operator Input into Pre-Construction Safety Report	Provide timely safety cases to the Regulator to support the request for Consent to commence nuclear safety-related construction 'on site' under the Nuclear Site Licence.
WBS 7.5 Obtain a Nuclear Site Licence from ONR, Development Consent by Secretary of State (SoS) and Site-specific Environmental Permits from EA/NRW	The Operator must obtain permission before nuclear safety-related construction can start: a Nuclear Site Licence from ONR (together with the relevant Consent to begin nuclear safety-related construction), site-specific Environmental Permits from the Environment Agency or Natural Resources Wales and planning Permission from the Department of Energy and Climate Change.

4.1.8 WBS 8: Identify and engage with FOAK stakeholders

Covers identification of stakeholders affected by a proposed project or able to influence or contribute to its success, and establishment of ongoing interfaces through which relevant issues can be addressed.

WBS 8 **Identify and Engage with FOAK Stakeholders**	**WBS Dictionary**
WBS 8.1 Scope FOAK Stakeholders	Identify stakeholders and undertake initial engagement aimed at communicating intent and establishing potential impacts (both positive and negative)
WBS 8.1.1 Engage Systematically with Stakeholders in Planning System	Ongoing interface through which impacts, issue and concerns can be addressed, mitigations discussed and common positions sought for use in formal processes (especially consultations)
WBS 8.1.2 Engage Systematically with Nuclear Regulators.	Ongoing interface through which impacts, issue and concerns can be addressed, mitigations discussed and common positions sought for use in formal licensing / permitting processes
WBS 8.2 Identify Key Issues for Stakeholders	Use stakeholder interfaces to build and maintain a comprehensive issue management plan to optimise impacts and maximise support.
WBS 8.3 Engage Systematically with Local / Regional Public Stakeholders	Identify public stakeholders affected by the proposed project and establish consultation, communication and meetings through which issues can be addressed.
WBS 8.4 Establish Framework for Local and Regional Stakeholder Engagement	Identify local and regional stakeholders affected by the proposed project or able to influence or contribute to its success, and establish ongoing interfaces through which relevant issues can be addressed.
WBS 8.4.1 Initiate Local / Regional Stakeholder Group	Identify all local stakeholders, plan consultation/campaign frequency/material by location/ stakeholder activity, co-ordinate with local authorities and communicate by a variety of media tools and consultation methods.
WBS 8.4.2 Extend Local / Regional Stakeholder Group into Permanent Forum	Set out and implement the Terms of Reference and Members' Code of Conduct for the Local Liaison Committee; a communications forum with the local community which helps hold to account the operator for maintaining a safe, secure and environmentally responsible operation.

4.1.9 WBS 9: Initiate supply chain development

Covers de-risking actions to ensure a capable and qualified UK supply chain with the capacity to provide long-term support to a UK SMR programme, accounting for the anticipated future demands on the wider UK nuclear supply chain, and enabling the basis of a future supply chain system to harness the longer-term benefits of a UK SMR programme (economies of multiples, standardisation, future export).

WBS 9 **Initiate Supply Chain Development**	**WBS Dictionary**
WBS 9.1 Develop Manufacturing Resource and Infrastructure Strategy	Establish clear plans and implement de-risking actions to ensure a capable and qualified UK supply chain with the capacity to provide long-term support to a UK SMR programme, accounting for the anticipated future demands on the wider UK nuclear supply chain, and enabling the basis of a future supply chain system to harness the longer-term benefits of a UK SMR programme (economies of multiples, standardisation, future export).
WBS 9.2 Develop Construction Methodology and Infrastructure Strategy	Establish the FOAK SMR manufacturing system strategy, with inbound logistics and delivery integration planned as appropriate to enable an on-time FOAK, and prepare the basis of a robust, reliable, qualified and diversified manufacturing capability to support NOAK production as an integrated enterprise ensuring to harness the longer-term benefits of a UK SMR programme (standardised modular components and systems).
WBS 9.3 Develop Skills, Employment and Training	Establish the construction methodology/infrastructure for SMR construction, planning a risk-balanced and phased approach for stages such as preliminary site works, non-nuclear construction, nuclear construction, and commissioning activities, addressing the expectation of a changing workforce profile and a skills shortage in the area of new nuclear construction, in order to de-risk the delivery schedule of a UK SMR programme.
WBS 9.4 Develop Preparedness for Supplier Qualification	Develop, attract, and retain the necessary skilled talent with nuclear plant construction, operation and manufacturing experience in the face of significant demand from other nuclear programmes, in order to support a FOAK SMR and the longer-term UK SMR programme.
WBS 9.5 Develop Long lead Item Procurement Strategy	Ensure thorough supply chain awareness of nuclear qualification through targeted improvement programmes to develop supply chain readiness, particularly in areas for key components (e.g. Reactor Pressure Vessel) and those components and systems of focus during Generic Design Assessment.

4.2 SMR developer and organisational design of the associated operator

This element of the evidence covers two discrete perspectives on organisational design; one upward-looking, focussed on the corporate structural features of the SMR developer / operator, and one inward-looking, focussed on the internal organisational capabilities required within the SMR developer / operator organisation.

An illustration of these perspectives is shown in the following Figure 5.

Key notes are provided in the following sections, with detailed information structured in specific tables in Appendix III.

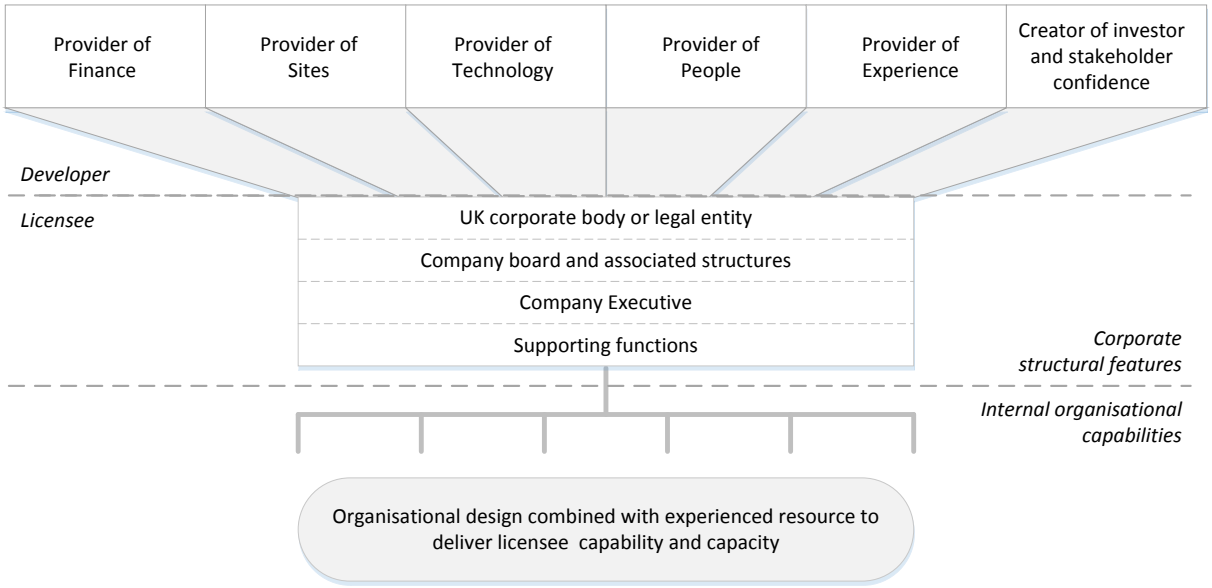


Figure 5: Organisational Design

4.2.1 Corporate structural features

Developer vs Licensee

The distinction between the developer organisation and the prospective nuclear site licensee is critical, and needs to be fully appreciated.

In order to secure a Nuclear Site Licence, the prospective licensee needs to establish to the Regulators' confidence that it understands the characteristics and hazards of the plant it proposes to construct and operate, and has or will have the capability to control these effectively by the time they arise. Once its licence is granted, it is subject to a wide range of duties and controls, together with absolute technical and financial liabilities for example in the case of accidents. Furthermore, it cannot end its period of responsibility for its licensed site until it can satisfy the Regulator that there is no longer any danger from radioactivity on the site.

For a developer whose business is wider than the development and operation of one or more UK SMRs, these duties and controls may be unduly restrictive. In such cases, the developer(s) will generally establish the prospective licensee as a separate subsidiary.

However, in this case the relationship between the parent and its subsidiary is different from the norm under company law. In particular, to enable the subsidiary to be licensed, the parent itself will need to ensure that it will have access to the resources it needs to support the licensee to maintain the safety of the licensed site – noting, the licensee cannot devolve its responsibility for safety. The parent will also need to ensure that the subsidiary has the information and power to satisfy itself on the nuclear

and radiological acceptability in UK environment of the plant design and the systems, structure and components procured, and to require these to be changed where it has not been satisfied.

In this situation, it is apparent that there is a significant risk of redesign, rework or even project failure if the prospective licensee is not created until after the safety-significant design and procurement decisions have been made.

Nevertheless, there are a range of other aspects of project initiation which the developer can initiate without needing the licensee to participate actively at the outset. Indeed, where the developer wishes to retain unfettered ownership of intellectual property, for example in the reactor design and any generic regulatory approval gained to support this, it may be essential for the parent to take the lead. However, it will still be necessary for the future operator (Licensee) to be provided with the necessary information for it to understand the SMR it is then responsible for.

Accordingly, the work in this area focuses on the capabilities and experience which, based on experience of other UK nuclear projects, the developer must embody in order to progress an SMR project with minimum risk of failure or delay.

The work will then identify the activities and processes which it is essential that the developer addresses, and where it can take an early lead.

The requirements may be met in a number of ways, depending on whether the developer organisation is a single corporate entity with a full range of in-house capabilities, experience and resources, or alternatively a partnership or joint venture in which each participant makes its own contribution. The key point is that, collectively or individually, all the requirements should be addressed.

Key capabilities and experience of the developer

- **Provider of finance**:
  Taking into account the profile over time of increasing financial commitment versus reducing risk to the lifetime value of the project, and including the financial commitment necessary to support the licensee.
  In particular, the timing of the start of revenue-earning operation will be subject to regulatory permissioning in which nuclear safety rather than commercial considerations will be over-riding. Also, once active commissioning has started, substantial further costs are likely to be incurred even if the project is aborted.
  These factors will bear on the extent to which conventional financing arrangements can be used, as well as the point at which restructuring towards a more efficient debt-equity ratio can be undertaken.
- **Provider of secure access to a suitable site or sites:**
  With geographical, demographic, geological and meteorological characteristics and access to transport networks, cooling water and grid connections that make them capable of being successfully nominated into any new Strategic Siting Assessment and subsequently licensed, permitted and consented under the UK's regulatory and land-use planning systems.
- **Provider of key nuclear technology:**
  Certainly for the reactor, and also where appropriate for the lifetime storage technology for spent fuel and higher level wastes which is designed for that reactor. This includes the intellectual property necessary to enable licensing, permitting and consenting in the UK regulatory and planning environment.
- **Provider of suitably qualified and experienced staff:**
  For both the developer and the licensee, particularly with experience in developing and undertaking major projects, major infrastructure-scale procurement and supplier

engagement, nuclear legislation, and building constructive relationships with Government, financial and public stakeholders at all levels.

- **Direct experience of construction and/or electricity generation:**
  Preferably nuclear construction or operation in a regulated environment somewhere in the world, and/or management of major infrastructure projects in the UK or a similarly regulated environment somewhere in the world, and/or participation as generator in the UK electricity industry.
- **Creator of investor and stakeholder confidence:**
  Experienced in investor relationship management and interfacing with various stakeholders.

4.2.2 Organisational capability and capacity

Key features of Developer / Operator as licensee

The structural features of the developer / operator as a licensee include:

- Establishment as a UK corporate body / legal entity.
- Appointment of a company board with associated structures.
- Appointment of a company executive team.
- Supporting functions to provide capability and capacity.

To become a credible steward of an SMR installation, compliant with the requirements and expectations of the nuclear Regulators, the licensee must embody a number of key features. These cover its organisational structure (such as Design Authority and Intelligent Customer functions), its culture (such as questioning and learning attitudes), its management processes (such as robust governance and management of organisational change), and its financial and commercial arrangements.

In particular, its agreements with fund providers – including its own parent – must ensure it has secure access to the resources needed to ensure safety, and those with safety-significant vendors – including the owner of the SMR design – must ensure it is the controlling mind in specifying and accepting designs for the key systems, structures and components of the SMR. That is, it has the autonomous decision making capability for all issues related to nuclear safety.

Staged development of key features

UK regulatory requirements are applied in a proportionate way. The SMR installation will pass through successive stages of development from design definition through pre-construction, nuclear construction, inactive commissioning, active commissioning and commercial operation. At each stage, the arrangements expected to be in place within the potential licensee will be proportionate to the hazards and risks to the public and the environment at that stage. In the early stages, a potential or candidate licensee is not expected to have all the features in place that will be required to support future operation.

Nevertheless, the licensee must have a clear view and forward plan for the progressive development of its breadth of capability and depth of resource capacity, so as to convey confidence that it has a coherent development pathway, with new capability implemented in good time in advance of need.

Interaction with GDA

Furthermore, certain requirements – in particular, Design Authority and Intelligent Customer functions – are essential at the outset. This arises from the licensee's role with respect to GDA.

Here the Requesting Party engaging with the Regulators would be the SMR technology vendor, rather than the licensee. Accordingly, the vendor will submit information on the design and performance of the structures, systems and components that make up the SMR, together with assumptions on how it

will be operated and maintained. It is critical that the prospective licensee has the capability and power to ensure that this information is consistent with its own expectations and requirements.

Contractor resourcing

For a prospective new licensee who cannot benefit from a history of nuclear operation under the UK regulatory regime, and which therefore has limited scope to provide or develop competent and experienced staff from its own resources, it will be essential to draw on support from contract partners.

The nuclear Regulators draw an important distinction between, on the one hand, staff seconded under contract but located within the licensee's own organisational roles and management arrangements; and on the other, staff providing safety-related services from positions within a contractor's organisation and management arrangements. In the former case, the resource is considered as an integral part of the licensee; in the latter, the specification of the work and acceptance of its outputs must be subject to a formal Intelligent Customer process.

Relating development stage to timeline

The required evolution of the organisational capabilities and capacity of a potential / candidate licensee is determined by the stage of development of the SMR installation from design through to operation, alongside the corresponding progress of licensing and permitting from pre-application consultation through formal application to grant.

This evolution will be shown through discrete stages of the programme development and mapped against the indicative timeline of the integrated schedule.

Comprehensive information defining the organisational capability and capacity is shown in Appendix III, presented systematically according to the information flow shown in Figure 6.

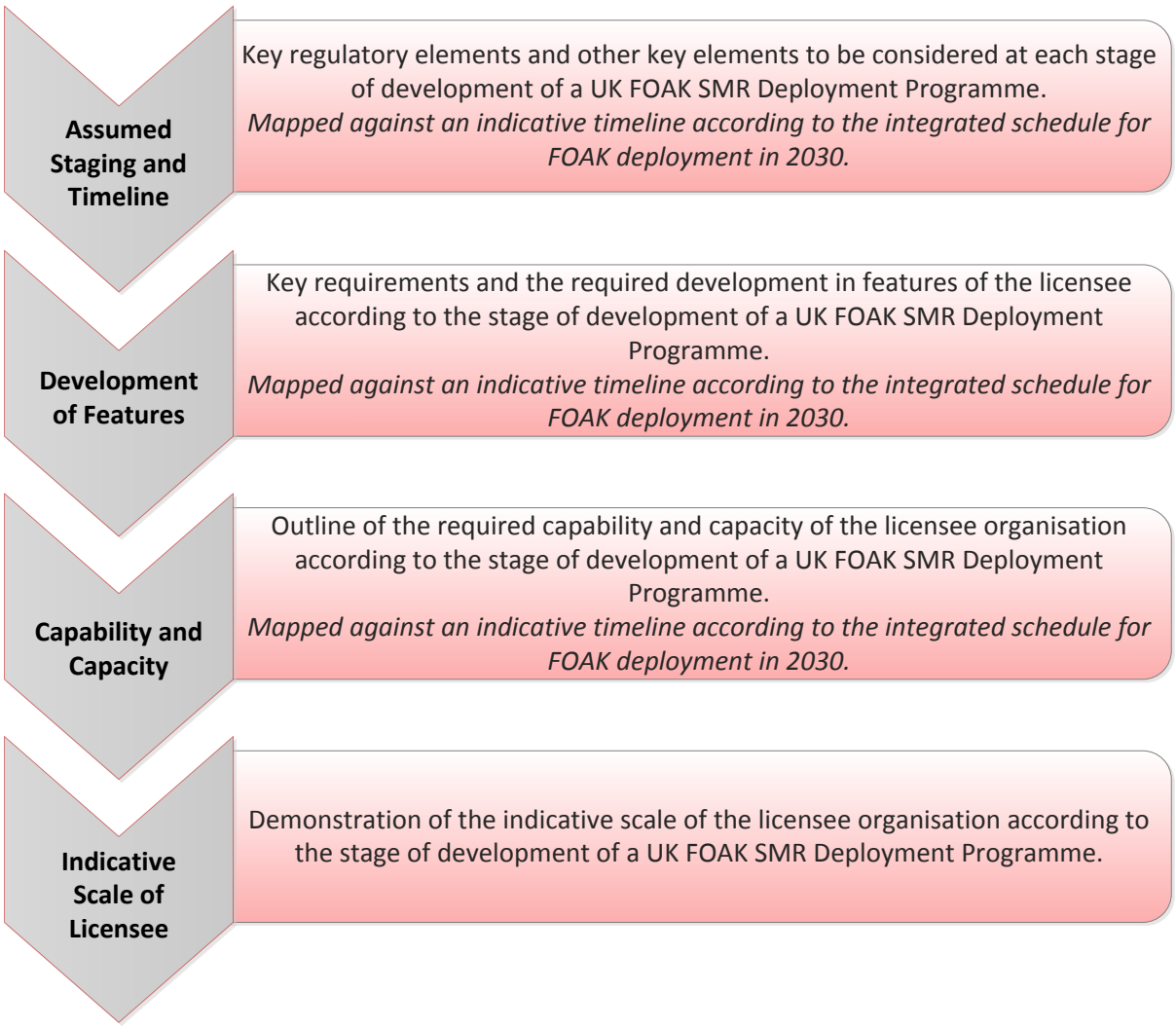


Figure 6: Information flow for organisational capability and capacity

4.3 Market-led integrated schedule

In order to deliver relevant and insightful conclusions to ETI and its members, it has been important to consider a route map that is not specific to one particular solution / scenario of vendor technology or vendor / developer / operator arrangements. With this in mind, the approach to this project considers the FOAK deployment route map in generic terms only, with detail explored only to a level sufficient for examining the likely interactions and risks. Accordingly, the applicability and durations of certain activities within this route map may vary in practice, according to the particular circumstances of any given vendor / developer / operator electing to embark on such a deployment programme.

Noting this approach, the following judgements have been applied:

1. Consideration of 'fixed' interdependencies, such as those associated with defined regulatory or legislative process.
2. Consideration of the likely durations associated with activities undertaken by all parties within the route map.
3. Consideration of the likely decision points and behaviour of private sector investors in response to prevailing market conditions.

Where formalised processes exist, these judgements draw on the relevant documented procedures – adjusted in light of experience gained from recent large reactor new build programmes in the UK; and accounting for the nuances that are likely to be associated with an SMR deployment programme.

It is important to establish first a baseline timeline to FOAK operation for a scenario in which the market leads the deployment of a FOAK SMR in the UK, *without external facilitative action* led by the Government. This baseline is useful for illustrating the timescales, scope and logical sequence of activity in an environment where the perceptions held by private sector investors of regulatory, legislative and commercial risk remain high throughout the early stages of the programme. This can then be used to establish the need for, and efficacy of, enabling actions to achieve FOAK operation by 2030.

The Integrated Programme Schedule has been developed in conjunction with the WBS and Programme Scope Description; taking the basic structure of, and making explicit cross-reference to, the WBS identifiers, activities, inputs and outputs.

The Gantt chart derived for a market-led schedule is given in Appendix IV.

A high-level schedule associated with this market-led investment environment is set out in Figure 7.

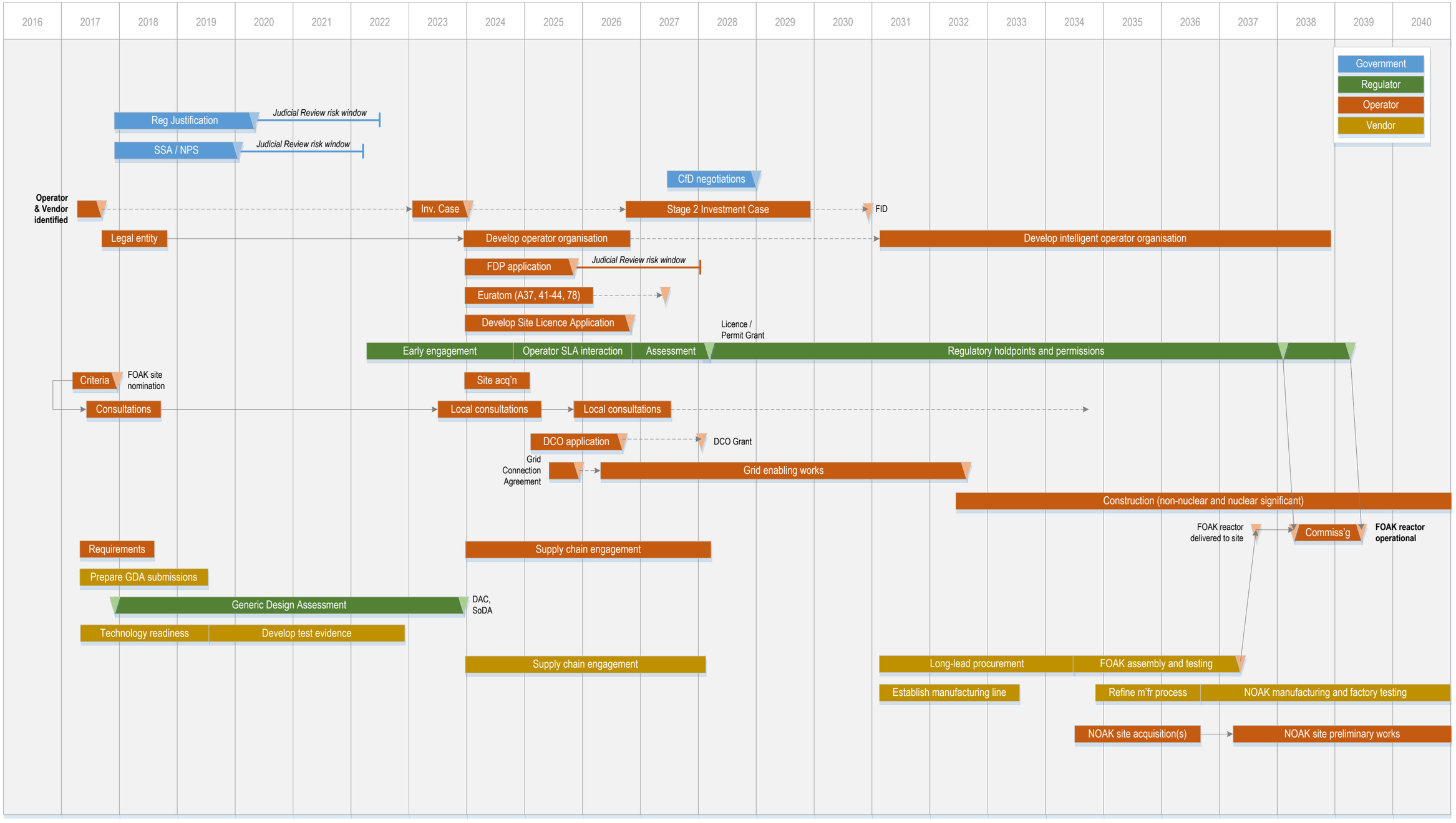


Figure 7: Market-led schedule (Plan on a Page)

4.4 Facilitated schedule

By constraining the completion date of the market-led (baseline) schedule to 2030, a "facilitated schedule" was created to examine the required sequencing of activity, timing of decisions and required scope of activities to be undertaken *within the first 5 years* of a UK SMR deployment programme to achieve FOAK operation by 2030. The focus of this schedule is to highlight the key activities that would be required within this initial timeframe to enable FOAK operation by 2030. Consistent with the WBS, this schedule considers the required activity and interaction of all parties involved in the delivery programme: technology vendor, prospective operator, Regulators and Government.

It is important to note that the development of such a schedule is not an attempt to predict or recommend a delivery plan, or to comment on the likelihood of achieving FOAK operation by 2030. Rather it is an attempt to identify *what* actions would be needed, and *where* delay would be most problematic, *if* FOAK operation by 2030 was the required outcome.

The formation of the facilitated schedule and its links to the market-led schedule are discussed in Section 5.

Figure 8 sets out this facilitated schedule as a plan on a page with the Gantt chart derived for a facilitated schedule given in Appendix V.

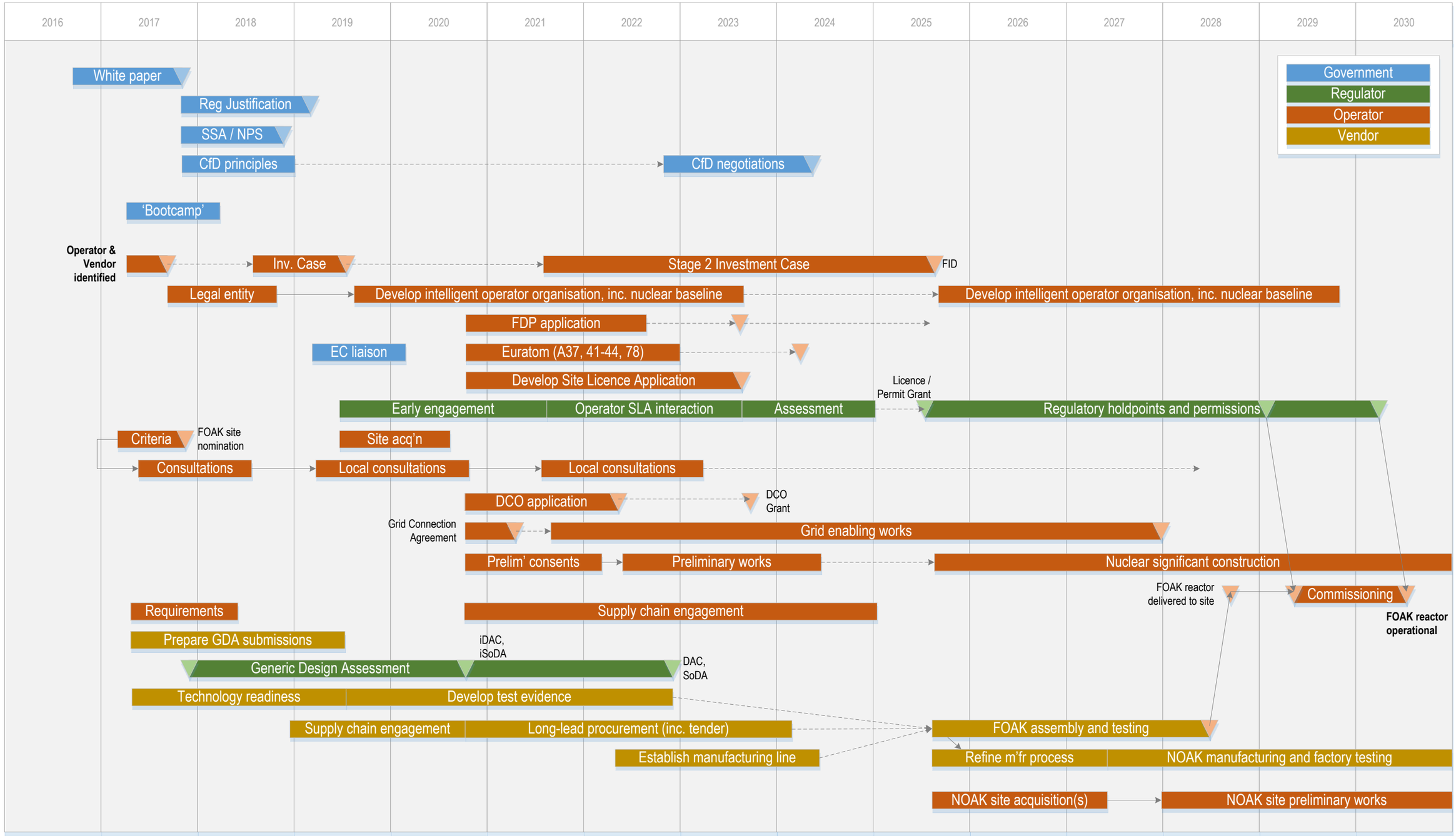


Figure 8: Facilitated schedule for 2030 deployment (Plan on a Page)

4.5 Assumptions

It is necessary to define a conceptual scenario upon which to frame and develop a deployment route map, WBS and schedule. In-order to create this scenario some key bounding assumptions have been applied in the work. These bounding assumptions include assumptions provided by ETI at the start of the project and assumptions jointly agreed between DAS and ETI as output of project workshops. Table 2 below contains the key assumptions that bound the study.

Ref	Assumption description
A1	The programme start point assumes that organisations have been identified both for the reactor vendor and the UK operator, and that the five year schedule commences from this point.
A3	The UK deployment of a FOAK SMR is considered to be part of a first tranche of SMRs equating to a capacity of 5 to 10 GWe.
A4	The WBS shall represent the key enabling activities for all parties involved with the 5 year horizon. Some activities set out in the WBS may start before the five year window and some may continue after the five year window.
A5	Work undertaken will avoid a presumed assumption for a specific reactor vendor, developer, operator or owner. It will also avoid a presumed solution for how these roles may combine.
A6	Schedule will be based on most likely activity durations, based on published timescales/industry experience. Where uncertainty and risks/opportunities are known these will be noted and drawn out as necessary on critical paths.
A42	Once licenced, organisational structure becomes the subject of LC 36 should further changes be required.
A43	Nuclear safety is an all-encompassing term covering specific nuclear safeguards & safety, industrial safeguards & safety, radiological protection, health, transport and security within the organisation.
A51	SMR development will need sites beyond those identified and delineated in the existing NPS for Nuclear Power Generation.
A67	CHP capability is an opportunistic rather than planned revenue for FOAK as district heating connection is not within the scope of the SMR plant investment.
A68	Single technology selected for UK SMR deployment.
A69	The vendor will be well advanced with safety case and feasibility design, but with detailed design, design for manufacture and procurement specifications yet to be detailed. This assumption recognises the required level of maturity required to make a credible GDA application within the timescales associated with the 5 year window.
A70	The technology will be developed for UK deployment as the principal aim; however, tertiary revenue may subsequently be sought from overseas export. The technology will therefore be designed to meet UK regulatory requirements; but the development programme may also pay cognisance to the potential regulatory requirements of a given target market.
A84	Government continues its tradition to only request ONR and the Environment Agency to undertake GDA on vendor designs that have a credible nuclear operator identified against it, who has experience also of operating nuclear reactors somewhere in the world.
A117	It is necessary that at the end of the five year schedule, GDA would be substantially complete, and it is assumed that GDA is a 5 year process.
A118	The desired timeline for FOAK SMR operation in the UK is by 2030.

Table 2: Bounding assumptions

Alongside bounding assumptions, throughout the course of this project assumptions have been developed for specific WBS areas associated with the deployment of a FOAK SMR in the UK. As the project has progressed, assumptions have been tested to accept or reject them, test each WBS scope and to explore if they form opportunities for schedule/activity enhancement or risk reduction. The table in Appendix VI contains the assumptions extracted from the project MDAL along with the assumption source and its associated WBS.

4.6 Risk and opportunities

A high level risk analysis has been used in this project to support and challenge the development of the programme scope and schedule, and introduce and verify thought on enabling actions. The risk analysis has not been exhaustive, and nor was it required or intended to be. Rather, it has been used to inform and substantiate the conclusions as part of the underpinning knowledge and evidence on which this project is based.

Throughout the course of this project risks and opportunities have been identified for specific WBS areas associated with the deployment of a FOAK SMR in the UK. As the project has progressed, risks and opportunities have been tested to accept or reject them, test each WBS scope and to explore if the mitigating actions form the enabling activities for the deployment of a FOAK SMR in the UK. The table in Appendix VII contains the risks and opportunities extracted from the Risk Register.

The Risk Register grades risks into four categories: critical, high, medium and low. In the final risk register there are 7 critical, 46 high, 28 medium and 30 low active risks. The 7 risks classified as critical are summarised in Table 3 below:

Ref	Risk Description
R3	Legal intervention by nuclear NGOs building on experience from 2008 programme.
R4	There is a risk that if you don't apply for Parliamentary time early enough, Parliamentary time will not be allocated.
R84	If the Safety and Environmental Management Prospectus document does not meet the required standards and/or there is insufficient evidence of its application then Licence Grant has the potential to be delayed by the Regulators.
R113	Over emphasising passive safety.
R118	PCSR evidence insufficient.
R146	Lack of supply chain appetite to invest in nuclear.
R152	Skills are not available in sufficient quantities in some vocations and professions due to demand elsewhere (nuclear and non-nuclear).

Table 3: Top Risks (classified as critical)

5 DISCUSSION OF EVIDENCE

5.1 Credibility of the market-led schedule

The premise of an SMR deployment differs from a large reactor new build as a result of a range of factors, including:

- The role of design standardisation in enabling economies of multiples.
- The potential for a staged (and therefore more affordable) roll-out of GW tranches of generating capacity.
- The potential of the technology to offer alternative operating modes and therefore diverse revenue streams.
- The potential deployment of SMRs at sites not suitable for large reactors, enabling additional potential nuclear sites and nuclear generation capacity.

These differences from large reactors would certainly be manifested in the structure of an SMR deployment programme. However, it is important to note that SMR deployment projects must address *the same* range of regulatory processes as large reactor programmes in the UK, with the bar associated with licensing a prospective operator and site being set at the same level irrespective of the SMR technology employed. It must also address a *potentially greater* challenge in gaining public acceptance, especially where the locality has no previous experience of nuclear developments and where the technology will be unfamiliar to most. Hence the challenges associated with gaining acceptance of the technology from local, national and European stakeholders are likely to be comparable to those associated with large reactors; with particular consideration needing to be paid to the location of early deployment sites. Finally, despite each reactor unit representing a smaller alternative to those employed by existing large reactor programmes, the generating capacity of any multi-unit site is likely to represent a nationally significant infrastructure project and a tranche of such SMR sites would require large-scale investment.

It is from this perspective that the timeline for an SMR deployment project must draw in the practical experience from recent large reactor projects in the UK, and recognise the likely implications of private sector investor behaviour. This overall timeline comprises a number of interrelated issues, including:

- Technology
    - Vendor design development and licensing (including GDA and Regulatory Justification)
    - Manufacture, testing and commissioning
- Site
    - Site selection, acquisition and licencing (including nuclear site licence and environmental permits)
    - Site consenting, development and commissioning (encompassing grid enabling works, preliminary site works, local infrastructure development and nuclear significant construction)
- Operator
    - Development of a credible nuclear operator (including the establishment of licensable management arrangements and nuclear baseline)

The sequencing of these activities is driven by a number of factors, including fixed dependencies inherent within the regulatory consenting process and logical decision-points associated with the financial commitments being made.

5.2 Possible outcome of the market-led schedule

The high-level schedule associated with the market-led investment environment indicates that, without any enabling action, FOAK operation is possible but may exceed the 2030 target by a considerable margin (potentially, in the order of a decade later).

Table 4 sets out possible cumulative outcomes of a market-led schedule for FOAK SMR deployment:

Possible outcomes of a Market-led deployment schedule
Delayed commencement of GDA and/or completion in a timeframe > 5 years: • Potential issues securing regulatory resource / commitment (noting that GDA is not a statutory process) and the wider pressures placed on the Regulators by UK nuclear developers, UK nuclear operators and other national and international commitments. • Limited foreign vendor awareness of the UK regulatory context and the standards and expectations of GDA submissions and of Regulatory Justification.
Criteria necessary for compiling case for FID met by end-2028: • Commencement of substantive organisational development and site specific licensing activities only on completion of GDA and Regulatory Justification (i.e. requiring confirmation of a licensable design).
FID achieved as late as end-2030 (estimate): • Protracted period for FID, arising from a cautious investment environment, with achievement >12 months' following completion of necessary criteria.
>5 year timeline post-FID: • No preliminary works or long-lead procurement undertaken pre-FID (cautious approach to risk). • Dual critical-path through extended construction phase and SMR manufacture / assembly.
2039 FOAK operation (estimate)

Table 4: Possible outcomes of a market-led delivery strategy

Conclusion 1 (C1): Implementation of an FOAK SMR is possible without facilitative action by Government.

5.3 Securing First of a Kind operation by 2030

5.3.1 The critical path

By working back from a 2030 target for operation, the basic logic of a critical path can be established and this, in turn, defines the required activities by all parties involved:

- FOAK operation (subject to clearance of relevant regulatory hold points) would be preceded by a period of site / SMR construction and commissioning. Dominant within this period, *nuclear significant* construction and *active* commissioning would be likely to form the critical path leading to FOAK operation – the timescales for these specific aspects within the wider construction programme being dependant on the given circumstances of the site / design, although notionally considered to be a 5 year period.

- Commencement of *nuclear significant* construction (and *active* commissioning) cannot be undertaken without regulatory consent. Two required milestone precursors to this are the grant of a Nuclear Site Licence (NSL) by the ONR and approval of a Funded Decommissioning Programme (FDP) by the Secretary of State. It is important to note that the grant of a NSL places a wide range of obligations on the prospective operator and would represent a significant step-change in the commitments being made by the developer / operator, over and above the financial commitments incurred through the contracts for nuclear significant construction and the Waste Transfer Contracts supporting the FDP. It may therefore be logical for an investor to link a FID to, *inter alia*, the grant of a NSL; and for the request for a NSL grant to be delayed to the latest possible point in the programme, in order to enable wider preliminary non-nuclear related site construction work to be undertaken without the need for regulatory consents. The timing of FID may vary, depending on the circumstances of any given private sector investor however 2025 would represent the latest possible deadline for FID within a 2030 timeline for FOAK operation. Such a timeline would demand that SMR manufacture / assembly activities do not occupy the critical path and that preliminary site works (that is, any and all site and local infrastructure construction permissible ahead of NSL grant) commence ahead of FID.
- Pre-FID activity would broadly subdivide into four themes, which influence and would ultimately trigger FID: (i) the *technology*, including generic regulatory assessment, Regulatory Justification and development of a mature design; (ii) the *site*, including selection, acquisition, licensing, consenting and preliminary works; (iii) the *operator*, including the development of the required structures and capabilities, manning and licensing; and (iv) a series of staged investment cases, culminating in FID. The timescales for developing these to a level necessary for FID in 2025 would depend on a range of factors such as the technical suitability of the site and its status in the existing Nuclear National Policy Statement (NNPS), local stakeholder support, and vendor design maturity. Moreover, the required phasing of activity will depend on how late work commences on each of these four themes following the identification of a credible vendor and operator. To illustrate this point, a five-year process of GDA commencing in early 2018 would leave less than three years between GDA completion and the deadline for FID. Within this window, it should be noted that assessment of applications for a Site Licence and environmental permits and the process for securing Development Consent could each take over a year. Such circumstances would require preliminary work to be undertaken ahead of GDA, from early 2017, in order to ensure a timely start and efficient execution of the regulatory consenting process; and development of both operator and site licensing to commence in parallel with the GDA process. For the purposes of this study, work is assumed to start in early 2017; however, in practice, a later start would require a more aggressive delivery approach during the pre-FID phase; and result in lower confidence in the achievement of a 2030 target for FOAK operation.

An abridged critical path to 2030 FOAK operation, which sets out this basic logic, is represented in Figure 9.

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0

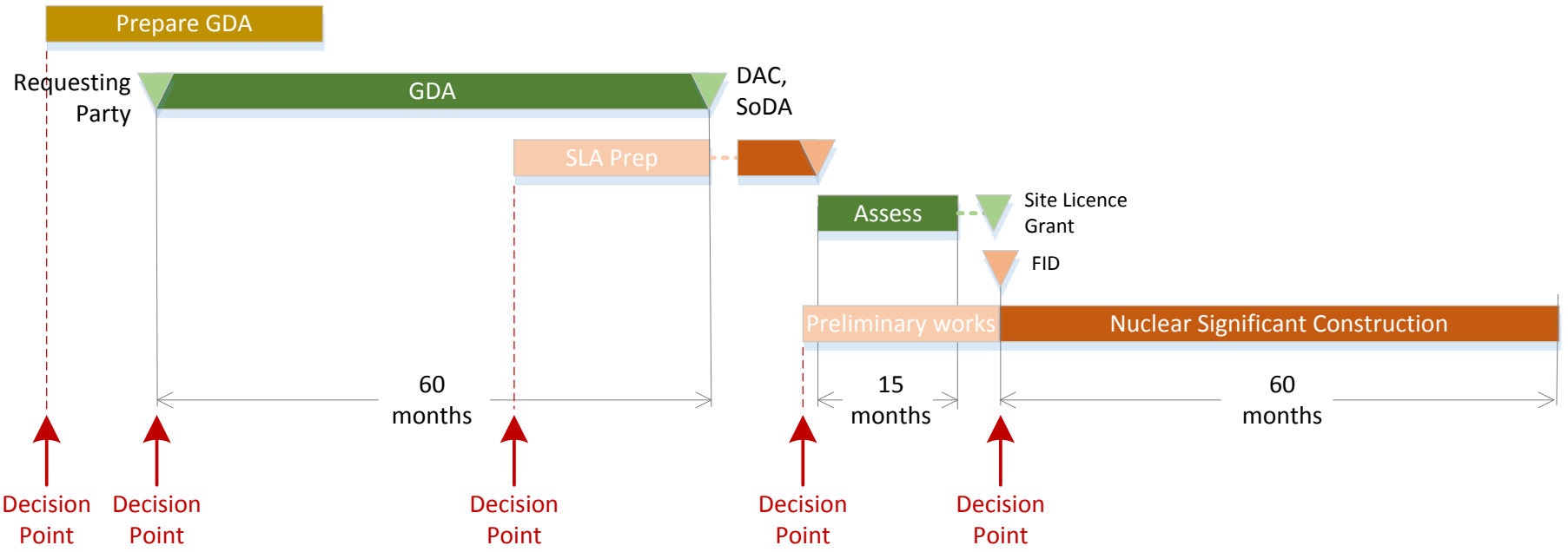


Figure 9: Abridged timeline to 2030 FOAK operation

5.3.2 Required outcomes of a 2030 deployment schedule

Table 5 summarises cumulative outcomes required for FOAK operation by 2030 and contrasts these with the market-led schedule:

Required outcomes of 2030 deployment schedule		Likely outcomes of a Market-led deployment schedule
Required Outcome 1	**Early commencement of GDA and Regulatory Justification, and completion within a 5 year timeframe**	**Delayed commencement of GDA and Regulatory Justification, and/or completion in a timeframe > 5 years** • Potential issues securing regulatory resource / commitment (noting that GDA is not a statutory process, that Regulatory Justification depends on the availability of Government, Regulator and parliamentary resources, and the wider pressures placed on the Regulators by other UK national developers, UK national operators and national and international commitments). • Foreign vendor awareness of the UK regulatory context and the standards and expectations of GDA submissions
Required Outcome 2	**Criteria necessary for compiling case for FID met by end-2024** • Commencement of organisational development and site specific licensing activities in parallel with GDA and Regulatory Justification (at risk), potentially triggered by issue of an interim Design Acceptance Confirmation (iDAC) and interim Statement of Design Acceptability (iSoDA)	**Criteria necessary for compiling case for FID met by end-2028** • Commencement of substantive organisational development and site specific licensing activities only on completion of GDA and Regulatory Justification (i.e. requiring confirmation of a licensable design).
Required Outcome 3	**FID achieved by mid-2025** • Efficient process for FID, achieved <12 months' following completion of necessary criteria	**FID achieved as late as end-2030** (estimate) • Protracted period for FID, arising from a cautious investment environment, with achievement >12 months' following completion of necessary criteria.
Required Outcome 4	**5 year timeline post-FID** • Dominated by nuclear significant construction • Preliminary site works commenced ahead of FID (at risk) • SMR long-lead procurement commenced ahead of FID (at risk)	**>5 year timeline post-FID** • No preliminary works or long-lead procurement undertaken pre-FID (cautious approach to risk) • Dual critical-path through extended construction phase and SMR manufacture / assembly
	2030 FOAK operation	**2039 FOAK operation** (estimate)

Table 5: Comparison of the required versus likely outcomes of a market-led delivery strategy

5.4 Key decision points and the role of investor confidence

The timeline in Figure 9 reveals three critical distinct decision-points associated with the commencement of work necessary to secure 2030 operation:

- The decision by private sector investors to bring together necessary resources (such as technology, personnel, finance) under a shared vision to pursue a FOAK SMR deployment project by 2030.
- The decision(s) by private sector investors to commence preparations for site-specific licencing, permitting and consenting early, ahead of completing GDA and Regulatory Justification (i.e. at risk), in order to secure FID five years ahead of FOAK operation.
- The decision by private sector investors to commence nuclear significant construction (where consented under a nuclear site licence) and other high value works – FID.

These are further elaborated in Figure 10, as part of a simplistic gated review process for project delivery.

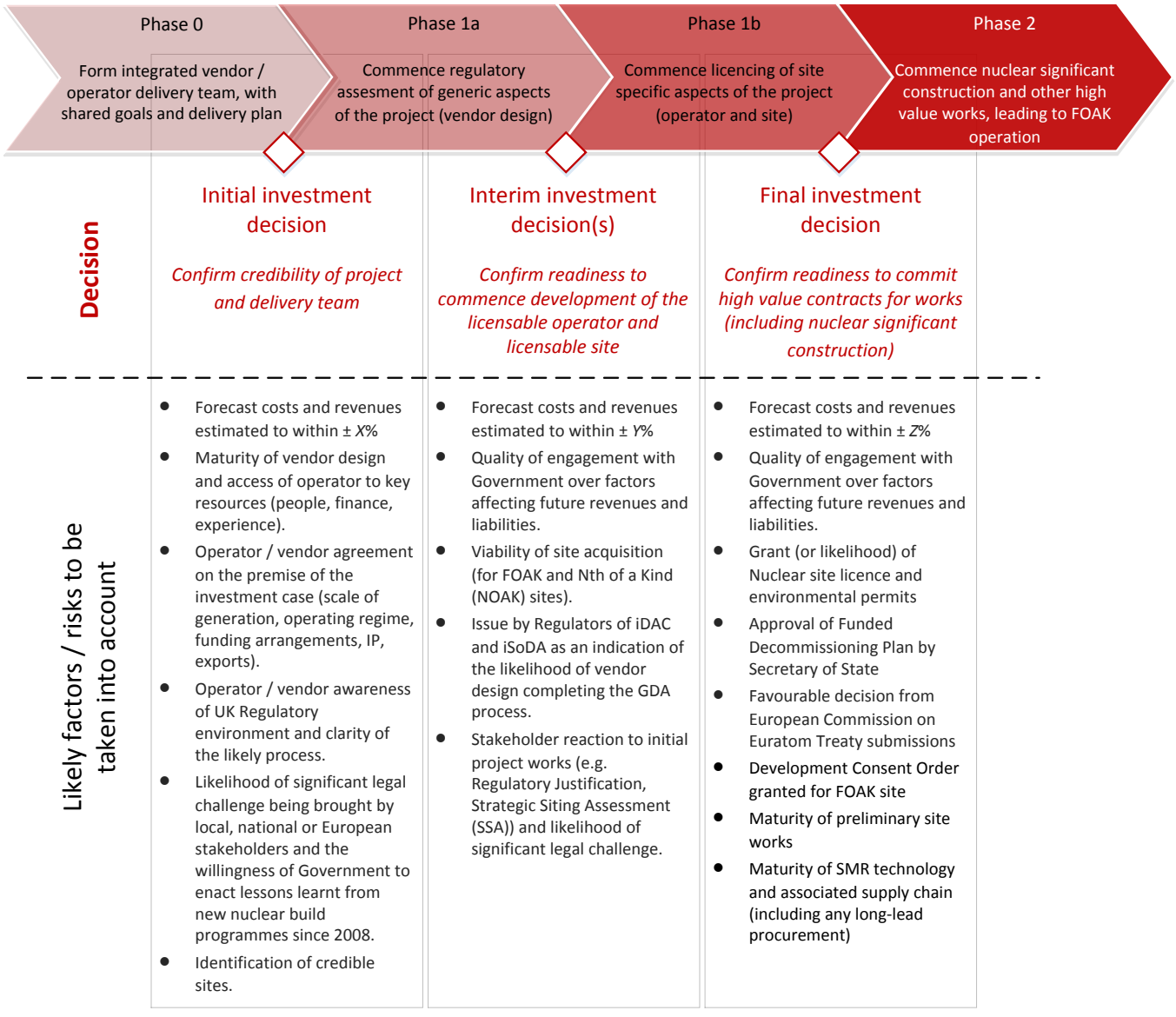


Figure 10: Key investment decisions associated with the deployment project

The timing of these review gates will vary depending on the circumstances, risk appetite and approach taken by any given private sector investor. However, it is only at the point at which risks have been adequately reduced (or bounded) and likely future revenues and costs understood, to the satisfaction of a private sector investor, that such decisions will be taken and therefore the large funds necessary to make substantive progress with the construction of a FOAK site would be committed.

C2: Pre-FID investor confidence is of critical importance for achieving the 2030 timeline

It is in this context that the Government's role in fostering investor confidence is viewed to be crucial for enabling a 2030 timeline for FOAK operation. It is insufficient for Government to set out an aggressive timeline for private sector investment without also taking steps to create an environment that promotes this investment through a systematic reduction of risk.

C3: For an effective programme to achieve FOAK SMR deployment, significant Government commitment and facilitative action is required from the outset.

In simple terms, earlier investment in large-scale capital works requires a quicker reduction in an investor's perception of risk. This fundamental concept is illustrated in Figure 11 which contrasts two scenarios:

- A market-led investment environment (that is, one in which delivery risks are actively minimised; but where Government is considered not to be proactive in facilitating projects in the SMR sector and progress is only made by private sector investment taking a cautious perspective on risk).
- A Government facilitated investment environment (that is, one in which Government undertakes certain enabling actions to bound/reduce the commercial risk to private sector).

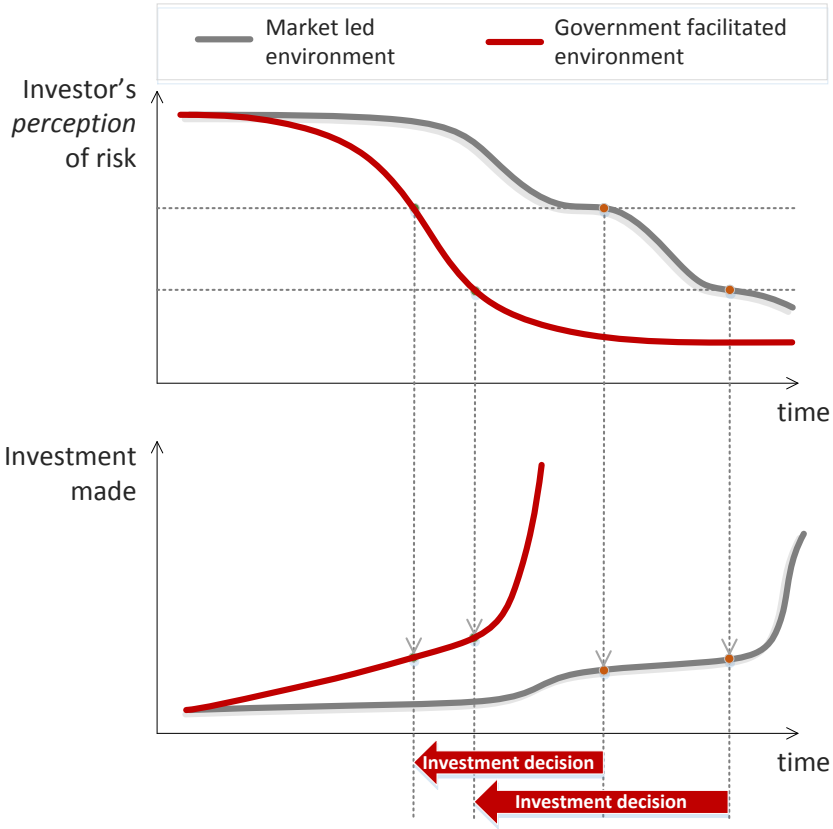


Figure 11: The role of Government facilitation to reduce perceptions of risk and the implications for investment phasing

The risk management analysis also identified opportunities for direct intervention by Government as potential additional mitigations. These interventions include funding or underwriting certain activities at risk, including interim investment decisions ahead of FID, if the private sector is unable or unwilling to accept the risk. Such activities may include commencement of preliminary works ahead of FID, commitment to long lead time items for procurement and grid enabling works. This project has not taken account of such direct interventions in the development of schedules and project conclusions. Neither has it assessed their practicality from the Government perspective or for their risk of legal challenge.

5.5 The importance of the first five years

5.5.1 Pre-FID schedule

As set out, Pre-FID activity would broadly subdivide into four themes:

- The *technology*, including GDA, Regulatory Justification and maturity development.
- The *site*, including selection, acquisition, licensing, permitting and development consenting, and preliminary works.
- The *operator*, including the development of the required structures and capabilities, manning and licensing.
- A series of staged investment cases.

Achievement of a 2030 target for FOAK operation demands that the first five years' activity must progress all four of these themes (not GDA and Regulatory Justification alone). From a timing perspective, it is therefore important to identify the earliest point at which work might credibly commence on the wider site specific and organisational development activities alongside the plans for GDA.

C4: It is insufficient for the first 5 years of the deployment schedule to focus on just GDA and Regulatory Justification.

The Government Facilitated schedule recognises the potential for this decision point (as an Interim Investment Decision) to be triggered by the issue of an interim Design Acceptance Confirmation (iDAC) and interim Statement of Design Acceptability (iSoDA) by the Regulators following completion of a GDA Stage 3 Report and Regulatory Justification, as illustrated in Figure 12.

Such an approach illustrates the need for skilful integrated project management and close interaction between the various private sector parties (vendor, developer / operator, and investor, where these are separate), Regulators, Government and relevant local planning authorities.

C5: A strong and early marriage is required between developer / operator and vendor.

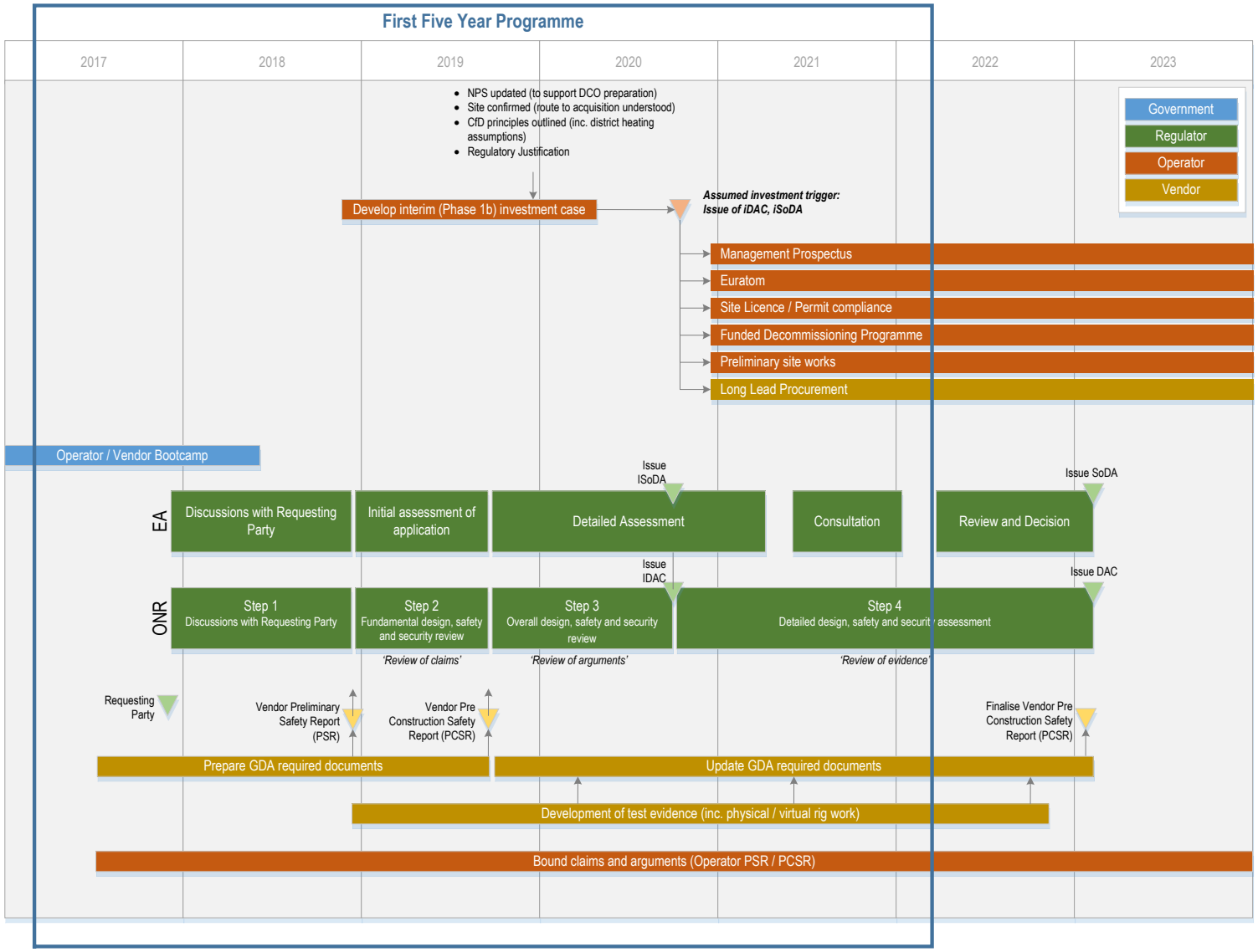


Figure 12: The interaction between investment and the GDA process (iDAC, iSoDA as a trigger for investment)

5.5.2 Enabling actions for 2030 deployment

Government is perceived to play a crucial role in creating the right investment environment to enable such a schedule. Creation of this environment would require action by Government from the outset and throughout the delivery of the timeline to FID. Building on the required areas to address in Table 5, a range of potential approaches is identified in Table 6 alongside a potential role for Government. It should be noted that all four of the required outcomes, as set out, are enabled by actions within the first 5 years of the deployment timeline.

Aim	Method(s)	Enabling role of Government
Commence GDA and Regulatory Justification early and complete within a 5 year timeframe	Enhance the quality of engagement between vendor(s) and Regulators by raising awareness of the GDA process, in particular the UK regulatory standards and expectations, and by promoting progress on GDA and Regulatory Justification processes.	Facilitation / UK awareness: To promote early engagement with vendors, through a UK 'boot camp' (facilitated by an industry body, such as the NIA). Bootcamp includes regulatory aspects but also wider scope, see WBS 1.3 in Appendix II. Facilitation / commit resource to: • Request the Regulators to support GDA (and support headcount implications). • Invite, resource and progress assessment of Regulatory Justification applications. • Encourage a positive relationship between vendor and developer/operator.
Criteria necessary for compiling case for FID met by end-2024	Enhance the confidence of private sector investors that future revenue SMR generation is likely. Identify opportunities for the developer / operator to commence wider site licence and consenting work in parallel with vendor GDA (noting that this will represent a commercial risk to the private sector). Limit uncertainty within the investment case that underpins FID (in order to release interim investment ahead of FID and increase investor confidence concerning FID itself)	Facilitation / statement of intent: To set out a clear statement of intent in relation to SMR development in the UK, the required timescales and facilitative actions that may be taken by Government, including a further round of strategic siting assessment. Risk management / facilitation: To review the adequacy of current legislation in light of the proposed SMR development programme and lessons learnt since the publication of the 2008 White Paper; and pass new legislation where required, in order to minimise the risk of challenge by Judicial Review Risk management / facilitation: To engage early and constructively with developer / operators (and their investors) to confirm agreements that underpin cost and revenue models (including negotiations on CfD, FDP and Waste Transfer Contracts, district heating assumptions, export market facilitation, strategies for waste management and geological disposal). Risk management / facilitation: To engage early with European member states and the European Commission to identify and address potential challenges to Euratom Treaty submissions.
FID achieved by mid-2025	Limit uncertainty within the investment case that underpins FID	Risk management / facilitation: To engage early and constructively with developer / operators (and their investors) to confirm agreements that underpin

Aim	Method(s)	Enabling role of Government
		cost and revenue models (including, CfD negotiations, district heating assumptions, export market facilitation, waste strategies / geological disposal).
5 year timeline post-FID	Minimise the scope of post-FID construction to nuclear significant works by undertaking as much preliminary site work as is permissible ahead of Site Licence Grant (i.e. all non-nuclear construction) Ensure the manufacture and assembly of the FOAK reactor is not on the critical path, by commencing the procurement of long-lead items ahead of FID.	Risk management / facilitation: To engage early and constructively with developer / operators (and their investors) to confirm agreements that underpin cost and revenue models (including, CfD negotiations, district heating assumptions, export market facilitation, waste strategies / geological disposal).

Table 6: The potential role of Government in delivery of FOAK operation by 2030

C6: A developer / operator / vendor 'boot camp' is proposed as a near-term risk mitigation activity.

A high-level schedule with a critical path consistent with FOAK operation by 2030 is given in Figure 13.

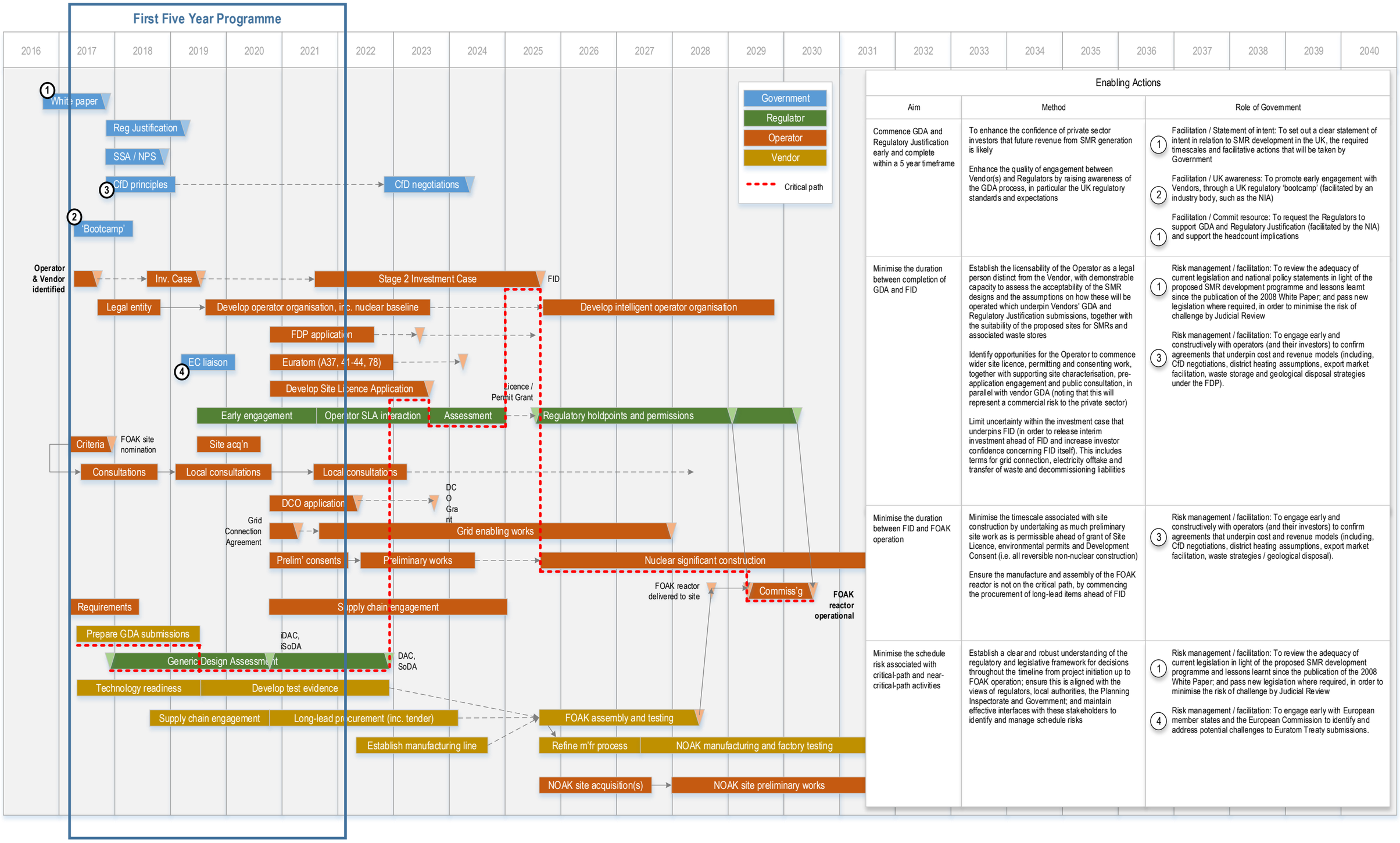
C7: Deployment of a FOAK SMR in the UK is achievable by 2030 under the bounding scenario considered by this study.

The schedule combined with the WBS highlights the enabling activities that would be required within the first five years of such a development programme.

The critical milestones associated to this deployment schedule are shown in Table 7 below.

Milestone	Indicative Timescale
Publication of White Paper, setting out Government intent	September 2017
Initiate Operator / Vendor 'Bootcamp'	September 2017
Commence Generic Design Assessment (GDA) and Regulatory Justification	December 2017
Nominate site into new Strategic Siting Assessment	March 2018
Complete site selection / acquisition	September 2020
Issue of interim Design Acceptance Confirmation (iDAC) and interim Statement of Design Acceptability (iSoDA) to Vendor	August 2020
Commencement / acceleration of site specific licencing/permitting/development consenting and organisational development work	August 2020

Table 7: Key milestones within the first 5 years of the deployment project



Enabling Actions

Aim	Method	Role of Government
Commence GDA and Regulatory Justification early and complete within a 5 year timeframe	To enhance the confidence of private sector investors that future revenue from SMR generation is likely Enhance the quality of engagement between Vendor(s) and Regulators by raising awareness of the GDA process, in particular the UK regulatory standards and expectations	(1) Facilitation / Statement of intent: To set out a clear statement of intent in relation to SMR development in the UK, the required timescales and facilitative actions that will be taken by Government (2) Facilitation / UK awareness: To promote early engagement with Vendors, through a UK regulatory 'bootcamp' (facilitated by an industry body, such as the NIA) (1) Facilitation / Commit resource: To request the Regulators to support GDA and Regulatory Justification (facilitated by the NIA) and support the headcount implications
Minimise the duration between completion of GDA and FID	Establish the licensability of the Operator as a legal person distinct from the Vendor, with demonstrable capacity to assess the acceptability of the SMR designs and the assumptions on how these will be operated which underpin Vendors' GDA and Regulatory Justification submissions, together with the suitability of the proposed sites for SMRs and associated waste stores Identify opportunities for the Operator to commence wider site licence, permitting and consenting work, together with supporting site characterisation, pre-application engagement and public consultation, in parallel with vendor GDA (noting that this will represent a commercial risk to the private sector) Limit uncertainty within the investment case that underpins FID (in order to release interim investment ahead of FID and increase investor confidence concerning FID itself). This includes terms for grid connection, electricity offtake and transfer of waste and decommissioning liabilities	(1) Risk management / facilitation: To review the adequacy of current legislation and national policy statements in light of the proposed SMR development programme and lessons learnt since the publication of the 2008 White Paper; and pass new legislation where required, in order to minimise the risk of challenge by Judicial Review (3) Risk management / facilitation: To engage early and constructively with operators (and their investors) to confirm agreements that underpin cost and revenue models (including, CfD negotiations, district heating assumptions, export market facilitation, waste storage and geological disposal strategies under the FDP).
Minimise the duration between FID and FOAK operation	Minimise the timescale associated with site construction by undertaking as much preliminary site work as is permissible ahead of grant of Site Licence, environmental permits and Development Consent (i.e. all reversible non-nuclear construction) Ensure the manufacture and assembly of the FOAK reactor is not on the critical path, by commencing the procurement of long-lead items ahead of FID	(3) Risk management / facilitation: To engage early and constructively with operators (and their investors) to confirm agreements that underpin cost and revenue models (including, CfD negotiations, district heating assumptions, export market facilitation, waste strategies / geological disposal).
Minimise the schedule risk associated with critical-path and near-critical-path activities	Establish a clear and robust understanding of the regulatory and legislative framework for decisions throughout the timeline from project initiation up to FOAK operation; ensure this is aligned with the views of regulators, local authorities, the Planning Inspectorate and Government; and maintain effective interfaces with these stakeholders to identify and manage schedule risks	(1) Risk management / facilitation: To review the adequacy of current legislation in light of the proposed SMR development programme and lessons learnt since the publication of the 2008 White Paper; and pass new legislation where required, in order to minimise the risk of challenge by Judicial Review (4) Risk management / facilitation: To engage early with European member states and the European Commission to identify and address potential challenges to Euratom Treaty submissions.

Figure 13: High-level schedule for SMR Deployment

5.6 Consequential scope of the first five years

The scope of the first five years is captured in one page WBS descriptions in Appendix II. This initial phase of work centres on several themes, such as:

- Establishing the right environment for investment.
- Forming the developer / operator legal entity and organisation.
- Selecting sites and nominating these into the Government's Strategic Siting Assessment.
- Commencing GDA and developing the necessary evidence for submissions to this process.
- Commencing (when appropriate) development of site-specific licencing and consenting.

The sections below provide a narrative which describes activity in areas crucial to achieving SMR FOAK operation by 2030.

5.6.1 Establishing the right environment for investment

Positive facilitative action by UK Government should help achieve SMR deployment by 2030. The themes for such action reflect their three key purposes.

1. The first is to ensure timely completion of the legal and administrative steps by UK Government, other UK public bodies and the European Commission to facilitate approval of the proposed SMR design and its practical implementation at a FOAK UK site.
2. The second is to anticipate all points on which design approval and practical implementation could be subject to legal challenge after investment has been made, potentially threatening its viability, and to pre-empt this via early and robustly demonstrable completion of all due process.
3. The third is to build on the attractive investment environment thus created to ensure that its benefits are effectively marketed to potential investors, vendors and developer / operators, and that advice and guidance is provided to these from the outset on compliance with the UK consenting processes.

To achieve these purposes, the activity required of Government is to plan and co-ordinate actions by all relevant UK organisations with public functions to:

- Ensure that this plan addresses all potential areas of legal challenge and will deliver a secure, legally robust framework for investment in a FOAK project.
- Engage proactively with potential investors so as to understand and act on their perspective on the UK's fitness for investment in design approval and SMR projects.
- Scan, review and influence policy development at UK, European and international level which bears on electricity, nuclear and climate change.
- Provide prospective vendors and developer / operators from the outset with comprehensive advice and guidance on negotiating the UK's policy, regulatory, land-use planning, and waste and decommissioning liability funding processes.

The organisations through which UK Government exercises these facilitative actions span DECC itself (including Euratom Treaty issues) and:

- Other Government departments, including Communities & Local Government, Business Innovation and Skills, and UK Trade & Investment.

- Other public bodies, including the Planning Inspectorate, local authorities, the Nuclear Decommissioning Authority and Radioactive Waste Management Ltd, and the Infrastructure and Projects Authority.
- Regulators including the Office for Nuclear Regulation, the Environment Agency and (in Wales) Natural Resources Wales, and the Office of Gas and Electricity Markets.
- National Grid, both in respect of the UK transmission system and ENTSO-E.
- UK nuclear industry, including particularly the Nuclear Industry Association as its trade body and potential applicant for Regulatory Justification decisions.

Stakeholders engaged in the course of the facilitative actions span statutory and other consultees, including relevant conservation bodies and NGOs, landowners and the general public, especially those in the vicinity (local, district and region) of the proposed FOAK development. The required consultees will include the Fire and Rescue, Police and Ambulance Services, Public Health England, the Civil Aviation Authority, the Ministry of Defence, Highways England, Network Rail, Distribution Network Operators, local planning, emergency preparedness and highways authorities, water, sewage and drainage authorities, RSPB, and Natural England, or for sites in Wales, equivalent bodies under the Welsh Government where these exist. Depending on the location of this site and the extent of its impacts, the required consultees may also include the Marine Management Organisation, Trinity House, the Crown Estate Commissioners, and English Heritage or Cadw (the Welsh Government's historic environment service).

The key risks to delivery of a FOAK power station by 2030 that arise in this area of UK Government facilitative action are that:

- Appropriate sites are not identified in a National Policy Statement as potentially suitable for nuclear development.
- Applications for its licensing, permitting or consenting will be incomplete or inadequately supported by robust evidence of the acceptability of the design or the suitability of the site.
- Appropriately skilled and experienced workforce or a capable UK supply chain will not be available when needed.
- Grid capacity to accept their output will not be provided on the necessary timescale.
- A predictable price for their output which recognises their benefits for climate change and flexibility, alongside acceptable terms for funding and transferring away their waste and decommissioning liabilities at the end of their operating life, will not be available.
- The project will be subject to legal challenge at any stage by opposing NGOs or European Union member states on the grounds of inadequate administrative procedure.

The effects of these risks materialising are that the consenting of any SMR development would become protracted and uncertain in outcome, with the potential for significant design changes being needed during the process and for conflicting requirements by the planning and regulatory authorities; that construction and commissioning would be subject to delay outside the developer's control; and, resulting from all of these, that the business case for the project would become uncertain, detracting from the case for investing in the UK.

The opportunity is for UK Government to act to address these risks and create an attractive investment climate by building on the elements previously used for large reactor nuclear developments.

The critical components for early action are to develop the plan for delivering a secure, legally robust framework for investment in a FOAK project; to engage proactively with potential investors on the effectiveness of this plan in addressing their concerns and creating a secure and attractive investment environment; and to provide investors, and the developer / operators with which they will be married,

with comprehensive advice and guidance at the outset on negotiating the UK's policy, regulatory, planning, and liability funding processes.

Without clarity at the outset on the Government's intent and commitment, potential investors may not make the scale of commitment necessary to achieve the target of 2030 for operation of the FOAK SMR.

5.6.2 Establish Credible Nuclear Operator

Key aspects for a credible nuclear operator fall into three categories, specifically:

- Establishing a legal entity, together with its organisation and staffing.
- Embedding the appropriate culture and attributes necessary both in the "company" itself but also in the supply chain.
- Identifying and developing the necessary submissions forming part of the applications for a Nuclear Site Licence, environmental permits and development consent.

The initial activity within the deployment programme would be to form a body corporate under UK company law since only such entities can be granted a nuclear site licence.

When first set up this company need only comprise a few personnel (strictly a director and a company secretary). However, given the timescales to achieve an SMR deployment by 2030, it would rapidly need to employ the essential expertise to develop and operate an SMR. Such expertise and functions would include (but not be limited to), Engineering and Technical, Licensing, Construction Management, Nuclear Safety (encompassing nuclear safety, industrial safety, environment, radiological safety and health), Operations, Training, Nuclear Safety Case and HR. This is further considered in Appendix III.

Responsibilities of a company board include the requirement to create and populate the organisational structure along with ensuring its optimised development over the period of the project. To support this, the appropriate employment model would be needed early setting out a plan for which functions might be provided internally or externally. This not only informs the near term resource model and associated recruitment plan (see Appendix III) for the indicative scale of the licensee organisation according to the stage of development of a UK FOAK SMR deployment programme. The information also forms a main input to the "organisational nuclear baseline" and the "company manual" both of which are documents required at licence application.

C8: The scale of the recruitment challenge to establish a Nuclear Baseline should not be underestimated, with staged planning essential.

Recent reactor construction projects (Olkiluoto and Flamanville) have emphasised the vital importance for success of the early establishment of the correct "nuclear safety culture" within the whole company and its supply chain. Although not part of the formal licence application underlying evidence that the correct safety culture exists in the form of conservative decision making, a questioning attitude and a learning environment would create Regulator confidence and strongly support a positive and timely outcome. There are key lessons to be learnt here which would be valuable in any potential educational boot camp involving the vendor / developer / operator. Further positive evidence would be early identification of and engagement with the supply chain to ensure this nuclear safety ethos permeates the whole project.

The final theme is the creation of all the essential inputs to the submissions applying for a nuclear site licence and environmental permits, along with their supporting evidence in terms of appropriate processes and procedures. All this gives confidence to the Regulators that nuclear safety is given an overriding priority in the company. This is captured at the strategic level in the "Safety and Environment Management Prospectus", a document which forms part of the application.

Company functions which must be unequivocally demonstrated are:

- The “Design Authority” - the company employs sufficient suitably qualified and experienced personnel such that it completely understands the safety and environmental implications of the design of the plant it is constructing and operating.
- The “Intelligent Customer” - it employs the capability to specify and oversee any work related to nuclear safety undertaken outside of the company.
- The “Controlling Mind” - at all times, it specifically retains the independent autonomous decision-making power over all matters related to nuclear safety.

All these activities require robust processes and procedures to be established and used as “the normal way of doing business”. They also need to be backed up by robust record keeping capability.

As part of the Licence application a detailed Pre-Construction Safety Report (PCSR) will be required. This is the definitive technical justification for what will be constructed at the particular site. This safety case is the basis of all future safety cases for the plant through commissioning, operation and decommissioning. It must be developed by the company based on the GDA submissions made by the reactor vendor. It follows therefore that very early liaison between the reactor vendor and the company engineering/technical personnel is essential if this is to be robust.

For the proposed SMR programme to be achievable, the early formation of a licensable entity is essential, with all the involved partners agreeing the strategy to develop, construct and operate an SMR within the UK licensing environment. The delivery would be at risk if this formation did not mature quickly. Key to this success is that the involved partners all accept that the decision making on all aspects related to nuclear safety is the responsibility of the company.

5.6.3 Select and Acquire Site(s) and Seek Consent for Preliminary Works

The critical requirements for a prospective UK SMR developer / operator are to select a portfolio of suitable sites, including for the FOAK project, and to progress both these sites and the FOAK project through the UK’s land-use planning processes. Alongside this, it must secure terms for all supplies beyond those provided by its associated vendor that are needed to develop an operational FOAK power station, particularly the grid connection necessary to deliver its output.

To achieve this, the developer / operator must first determine the scope of its desired SMR programme. This does not mean an immediate financial commitment to complete the programme: that will progress in phases of which the FOAK power station is the first. However, unless the overall scope is defined – including the number of sites, number of SMR units on each site, the provision for long-term interim storage, etc. – full benefit cannot be taken from the Government’s strategic siting assessment and the developer / operator’s funded decommissioning programme.

Building on this scope and the vendor’s design, the developer / operator must define the requirements for credible sites. These are not only technical, but also those needed for licensing, permitting and consenting, taking into account likely stakeholder concerns. Relevant factors span geology, ground conditions, seismicity, meteorology including climate change, vulnerability to flooding; availability of a heat sink such as cooling water, access to transport networks, a grid connection point and where appropriate a district heating load; and nearby demographics, environmental designations, military, hazardous or sensitive installations. Using these as screening factors, the developer / operator can assemble a portfolio of potentially attractive sites for nomination into a strategic siting assessment, and a specific site for development as the FOAK power station.

Depending on the Government’s criteria, nomination into a strategic siting assessment is unlikely to need extensive intrusive investigations. Also, sites do not need to be already owned by the developer / operator, though the landowner’s and local authorities’ support is highly desirable. However intensive specialist investigations, scoped with the local authorities, will be essential to support the application for development consent for the FOAK site, alongside detailed surveys and modelling of

environmental impacts. These impacts include radiological, socio-economic, transport, noise and vibration, air quality, soils and land use, geology and contaminated land, surface and groundwater, ecology, landscape and visual, historic and marine environment, amenity and recreation. Extensive pre-application consultation will also be essential with the affected public and official and non-Governmental organisations, in accord with Planning Inspectorate guidance, and recognising the probable need for S.106 agreement to fund local infrastructure made necessary by the project.

Where this benefits the business case, e.g. by shortening the overall schedule, the developer / operator may apply to the local planning authority for permission for enabling works prior to grant of full development consent. Such works cannot include nuclear construction or pre-empt development consent, and would be undertaken at risk should the full development consent subsequently impose conflicting requirements.

In parallel, the developer / operator must negotiate commercial options for access to the construction and operational site, including unfettered control of the area to be subject to a nuclear site licence, and for long-lead supply beyond that provided by its associated SMR vendor. In particular, early application for a connection agreement (with National Grid Electricity Transmission where the capacity required is over 100MW) will be essential to ensure acceptable technical requirements and timescales for connection.

The key risks to delivery of a FOAK power station by 2030 in this area are, first, inadequate strategic planning of the intended SMR programme and site portfolio, including interim storage of spent fuel and ILW, and hence an inadequate range of sites identified as potentially suitable in strategic siting assessment. The second key risk is inadequate pre-application consultation and substantiation of the application for development consent for the FOAK project, leading to rejection or consent subject to over-restrictive conditions. The third is inability to procure key supplies, including grid connection and long-lead items such as nuclear-grade forgings, on a schedule consistent with project needs. The consequences would be to impair the business case or even the feasibility of proceeding with the FOAK project.

The key opportunity is to establish a portfolio of sites that reflects the developer / operator's long-term business intent, including the most economic and practical disposition of interim storage facilities for spent fuel and ILW. This recognises that a new strategic siting assessment will then bound the range of sites deemed potentially suitable for SMRs for the foreseeable future. The business case for investors, vendors and developer / operators may be substantially less attractive if based on the FOAK site alone: it will benefit from the demonstrable assurance that the SMR design can be replicated across a portfolio of potentially suitable sites, delivering the economy of multiples.

The key enabling actions are first, for the developer / operator to initiate engagement with stakeholders in preparation for formal consultations under the strategic siting and planning processes. This should focus, in particular, on stakeholders local to the sites chosen for nomination into the strategic siting assessment and on establishing a local presence near the proposed FOAK site. Relevant stakeholders are identified under WBS 1 and the actions to establish a local presence under WBS 8. Second, allied to this, the developer / operator must scope and initiate the investigations necessary to support nomination of sites and the application for FOAK development consent, recognising that many environmental surveys will be time-consuming and seasonally dependent. Third, the developer / operator must initiate negotiation on critical supplies, particularly grid connection.

Each of these needs early action if the FOAK power station is to enter operation by 2030.

5.6.4 Establish Approved Funded Decommissioning Programme

Decommissioning arrangements as required by Government and overseen on their behalf by the Nuclear Liabilities Funding Assurance Board (NLFAB) are set out in the Energy Act 2008. These arrangements must be in place and approved by the Secretary of State prior to commencement of new

nuclear build to account for the ultimate decommissioning of the plant and its associated waste disposal.

Three themes underpin this process:

- The development of a Decommissioning and Waste Management Plan (DWMP).
- Contracts agreeing the transfer of title of any waste arisings.
- Negotiation of a Funding Arrangements Plan.

The three themes break down directly into three activity steams which are initiated by the development of a DWMP. This task by the developer / operator sets out how the plant will finally be shutdown at end of operating life, defueled and decommissioned, and proposes how any waste arisings will be dealt with. It outlines the needs, if any, for interim storage of materials prior to their ultimate disposal. The plan must also cover the safety case for such activities and show how they align with the Nuclear Site Licence conditions associated with waste handling and decommissioning specifically; LC32, 33, 34, and 35. The ultimate goal of the plan is the remediation and delicensing of the site.

Decommissioning of a nuclear site represents a major change in the focus of activities moving away from energy generation, hence the DWMP needs to recognise this and include how Stakeholder engagement arrangements might have to be amended to cover it.

In the UK the responsibility for the ultimate disposal of radioactive wastes resides with the Nuclear Decommissioning Authority (NDA) and its subsidiary Radioactive Waste Management Ltd (RWM) on behalf of the UK Government. Part of this responsibility is the identification and development of a Geological Disposal Facility (GDF). This work is ongoing and is subject to extensive stakeholder engagement as well as technical development. Hence within the timeframe of a proposed SMR by 2030 it is unlikely that these details will be sufficiently developed to provide certainty in regard to the final disposal arrangements.

As a result, this uncertainty will influence conclusion of the waste transfer contracts which support the DWMP. Such contracts must be agreed between the developer / operator and the UK Government to cover the transfer of title of the high level radioactive wastes (including spent nuclear fuel) which would arise throughout the lifetime of plant operation and decommissioning.

The funding of DWMP and related activities must also be addressed. In the main this will occur after the plant has ceased to provide a revenue stream. To provide assurance to the UK Government that sufficient funds to cover ultimate decommissioning and waste arisings will be available, the Energy Act 2008 requires the developer / operator to establish a FDP. This must be approved by the Secretary for State before construction can begin. Under the FDP, the developer/operator makes regular contributions to a separate fund, commencing immediately on reactor start up. The Act requires the developer / operator to set up an independent entity to hold these funds, including appropriate governance to manage this fund ensuring that the fund receives suitable regular contributions. This includes taking an independent view of DWMP proposals to ensure their practicality, that they account for all the likely waste arisings, that any interim waste storage arrangements have been included, and that appropriate Waste Transfer Contracts are in place. The funding arrangements are overseen by the Nuclear Liabilities Financing Assurance Board (NLFAB), which provides impartial scrutiny and advice to the Secretary of State on the suitability of the FDP, including the financial arrangements and regular review of funding.

A main activity for the developer / operator is the securing of the Secretary of State's timely agreement to the FDP and securing acceptable terms for Waste Transfer Contracts. Failure to achieve timely agreements will cause a programme delay; however successful negotiation of the FDP will be critical for the business case.

In developing the DWMP the developer / operator could encounter resistance from local stakeholders related to the transition from operation to decommissioning when the site effectively becomes a waste storage facility. Mitigation is achieved by the early engagement with stakeholders supported by a clear plan and timeline for the activities leading to the ultimate delicensing of the site, including the consent required under the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1989.

Technical or other external events might lead to premature shutdown and decommissioning of the plant meaning the decommissioning fund is insufficient to cover all liabilities. This risk is highly unlikely and internally is best mitigated by excellence in plant management.

External risks related to the DWMP stem from the delays in defining the GDF arrangements and the related waste packaging details leading to the potential to double handle waste materials. However, if the GDF and its arrangements are available earlier than expected, the potential opportunity to package and dispose of waste material early could reduce planned decommissioning fund contributions.

5.6.5 Obtain Assessment, permitting and consents

The vendor (with married partner developer / operator input) needs to obtain agreement from the Regulators for the timescales for submission of its GDA submissions, including the generic PSR early in the GDA process, and the generic PCSR during steps 3 and 4 of the GDA process, to resource up to deliver that agreed programme, and to put in place funding arrangements to pay for the Regulators work. The Regulators will need to be able to resource up without impacting existing safety activity. Key outcomes would be step-wise regulatory agreement to the GDA, and issue by Regulators of a DAC and SoDA (4 to 5 years into the GDA process), or, building investor confidence, interim DAC and interim SoDA indicating a positive trajectory to future DAC and SoDA.

C9: Regulators will need to be able to resource-up without adverse influence on current UK nuclear safety activity.

The developer / operator (with support from Government and Regulators) will need to make submissions to the European Commission, under the Euratom Treaty, with the aim of receiving positive responses to submissions under Articles 37 (radioactive waste disposal), 41 (new industrial activities) and 78 (safeguards).

Dialogue between the developer / operator (with married partner vendor input) and Regulators will address:

- The safety, security and safeguards documentation and actions required as the submission for a request for a Nuclear Site Licence.
- What is required in developing the generic PCSR into a site-specific one.
- What ground-clearing and construction activity is able to take place ahead of the Consent (under the future Nuclear Site Licence) to start nuclear safety-related construction.
- The documentation and actions required in order to apply for Consent to start nuclear safety-related construction.
- The documentation and actions required to obtain site-specific environment Permits.
- The likely timescales for all of the above.

Each party has its own specific responsibilities:

- Vendor (with married partner developer / operator input) is responsible for the GDA submissions.

- Developer / operator (with support from Government and Regulators) is responsible for the development of submissions to meet Euratom Treaty obligations.
- Developer / operator (with married partner vendor input) is responsible for applying for ALL of the Licences, Permissions, Agreements and Permits to allow construction and future operation of its SMR.
- Regulators have a responsibility to the public (demonstrably independently of Government and industry) to ensure that everything the developer / operator does is safe, secure and environmentally acceptable, and to work openly and transparently to published acceptance criteria.
- Government sets the policy (in this case on issues such as siting and balanced electricity generation needs), and enables actions to address those policies.

The developer / operator / vendor marriage needs to be robust and characterised by a high degree of mutual respect such that the vendor's PCSR will easily develop into the developer / operator's site-specific PCSR without significant modification (either to paperwork or plant) and the associated re-assessment by the Regulators (cost and time issues). If the vendor over-emphasises the passive safety features of its design, without adequate evidence to back up the claims and arguments, then the GDA process will either extend, or, at worse, a DAC will not be provided and the developer / operator will be left without an accepted design. An educational boot camp is essential, together with early discussions on the PSR claims between vendor / developer / operator and Regulators. Regulators will look for claims, arguments, and evidence throughout the GDA and future licensing/permitting processes.

Insufficient dedicated and vendor / developer / operator funded regulatory resource for the GDA and early licensing work will delay the regulatory process, as will insufficiently resourced effort from the vendor / developer / operator to provide the Regulators with high-quality and timely submissions. Regulators are responsible for their forward plans (they publish them), and should agree the basis of any proposed new work with all stakeholders, including existing developer / operators and Government.

Insufficient corporate developer / operator knowledge of the Euratom Treaty obligations would be likely to lead to poor submissions, and would delay the Commission responses, and the knock-on UK safety and environmental permits and consents. Early submissions, together with knowledge transfer via the boot camp will help. There will inevitably be stakeholder challenge to both developer / operator / vendor and Regulators, and this can be addressed by open and transparent communications, and high-quality submissions and decision documents, all following published due process (policy, acceptance criteria and process guidance). Opportunities exist for vendors to seek regulatory design and assessment harmonisation across international borders via discussions at existing international groups under the IAEA and EC.

Key enabling actions are:

- The boot camp (see WBS 1.3 in Appendix II) is an essential early action which may be facilitated by an industry organisation such as the Nuclear Industry Association.
- Early Euratom submissions (developer / operator led) are advisable.
- Vendor / developer / operators should be open to early exploratory discussions with Regulators on timescales, resources and funding arrangements.

5.6.6 Identify and Engage with FOAK Stakeholders

The effectiveness of the developer / operator's engagement with stakeholders is critical to successful consenting of the FOAK project, and will set the tone for the power station's subsequent relationship with its Regulators and the local and regional community through construction into operation.

The key themes are systematically to identify relevant stakeholders; to engage proactively with these, and with the local public more generally, to identify their concerns and the opportunities they present; to demonstrate the developer / operator's values and responsiveness in how these issues are managed; and to establish the foundations for a formal stakeholder engagement framework which will continue through construction into operation.

To achieve this engagement, the developer / operator must first systematically identify those organisations and individuals who may be affected by, or have an interest in, the SMR design and the FOAK project – i.e. its stakeholders. A key enabler is to establish local representation close to the FOAK site as a centre for gathering and disseminating information, and seeking views.

Building on this, the developer / operator must engage with the identified stakeholders, recording and collating the issues and concerns they raise – e.g. on air quality and noise and vibration during construction – and the opportunities they offer – e.g. to contribute to skills training. It must prioritise and optimise the resource spent in addressing concerns, typically seeking to form groups of relevant specialists tasked with seeking to narrow differences or resolve these in advance of the formal applications for consent. In many cases, such as Regulators, their participation will require funding by the developer / operator.

At the same time, the developer / operator must build channels for two-way communication with the wider local public, ranging from face-to-face presentations and drop-in opportunities, through newsletters, to electronic media. As well as gathering and responding to views, this should aim to "beat the grapevine" with authentic progress information on the Government's facilitative actions and the developer / operator's site investigations and consents, and subsequently on construction activities. This is important to build confidence both in the detail of the proposals eventually brought forward, and in the broader values and responsiveness of the developer and future developer / operator.

As mutual experience grows, the developer / operator should develop a forum for representatives of local residents, local authorities, Regulators, and relevant interest groups and NGOs, as a concerted channel for consultation and feedback. Visible involvement of the nuclear Regulators from the outset demonstrates their oversight of the developer / operator's activities and their independent judgement directly to the stakeholders. This is the foundation for an ongoing site stakeholder group, formally constituted under a respected independent chair, and established and resourced as part of the FOAK station's management arrangements. Its terms of reference will define its advisory and consultative rather than executive role.

The key risk in this area to delivery of a FOAK power station by 2030 is lack of commitment to establish an early, effective local presence as prospective developer / operator, present for the long term, with an identity distinct from the vendor. Unless created well in advance of the first formal applications for planning and regulatory consents, this will be a material handicap in building understanding of the Government's actions and the developer / operator's FOAK proposals, and in narrowing differences with local authorities, other agencies and the local community.

C10: A co-ordinated public communications plan is required, led by the prospective Licensee, supported by the vendor and facilitated by Government.

Specifically, in WBS 8, it underpins three further risks. First, that the developer / operator fails to identify one or more key stakeholders with strong local influence or interests, misunderstands their concerns or potential to support the project, or fails to open a timely channel of communication with them. Second, it risks the developer / operator's communication with the local public being out of

touch with local issues and concerns, failing to “beat the grapevine” in timeliness and salience, and being perceived as ”PR-speak” rather than conveyed by an authoritative and credible figure – in short, failing to build trust relative to anti-nuclear NGOs. This risk is especially acute on sites without a history of nuclear development. Third, it misses the opportunity to build a constructive foundation for the future formalised site stakeholder group, risking this becoming antagonistic and ineffective from the outset.

The critical components for early action are to establish a local presence, identify the key local stakeholders, and open channels of two-way communication both with these and with the wider public affected by the FOAK project.

Regarding the range of organisations likely to be involved, key stakeholders throughout the project lifecycle will include the nuclear Regulators ONR, EA and in Wales NRW; members and officials of local authorities; other statutory consultees and official organisations such as the MMO, health authorities, “blue light” services; relevant trades unions; conservation bodies and NGOs such as Natural England / Cadw, the National Trust and RSPB; and local residents and landowners.

However, during initial consenting and construction the range will be broader than during settled-down operation. They will include local companies and Chambers of Commerce wishing to participate in the supply chain directly or by serving construction workers; local educational establishments providing skills training; health and emergency services; highways authorities and drainage boards impacted by the development and its materials and workforce logistics; other local companies, especially nearly nuclear sites, but also industries and residents adjoining the transport route, such as fishermen affected by construction or discharges and factories impacted by traffic congestion; residents subject to noise and vibration; and the planning authorities who will address the conditions necessary to mitigate such nuisances.

5.7 Assumptions in the context of the first five years

Table 2 in Section 4.5 contains the key assumptions that bound the study. In the context of the first five years the key assumptions are those that relate to a) the vendor and developer / operator context and b) the five year timeline itself.

Assumptions A1 and A5 – Vendor / developer / operator: As stated, this project seeks to identify enabling actions that are independent of any specific combination of reactor vendor technology, operator or developer. Without reference to any specific private sector parties, it is assumed that progress would be led by a combination of a UK SMR developer / operator and an SMR reactor vendor at the start of the five year period as represented in Figure 14.

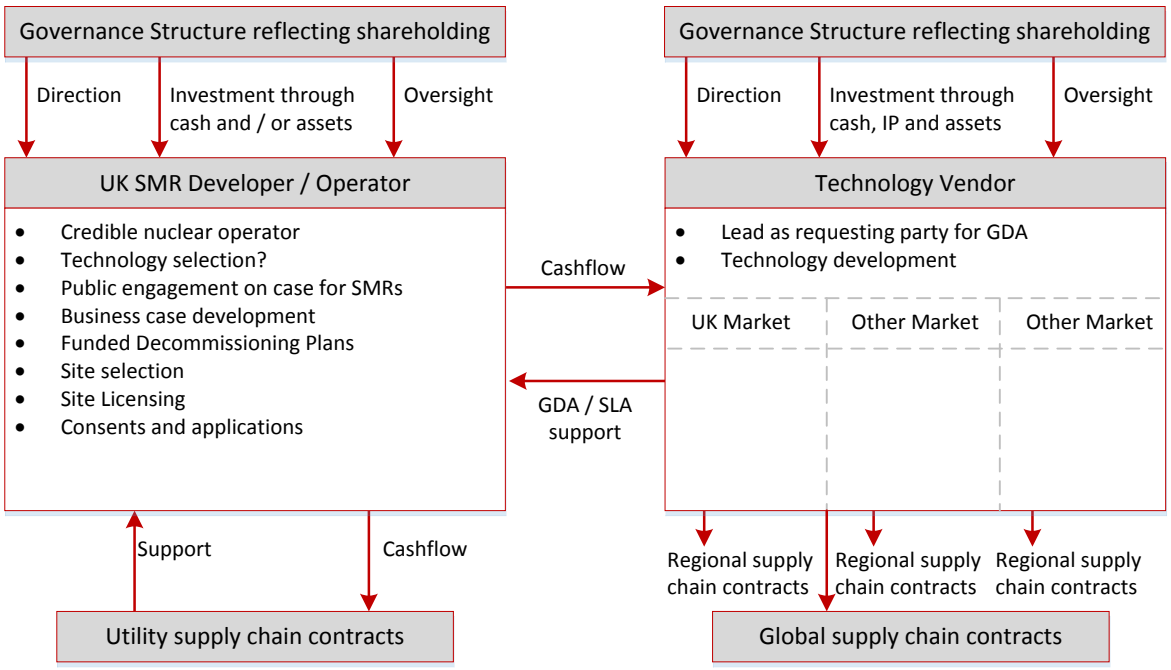


Figure 14: UK FOAK SMR deployment led by a SMR developer / operator and an SMR technology vendor

Assumptions A117 and A118 – Timeline: For the purposes of this study, it was assumed that organisations have been identified both for the reactor vendor and the UK developer / operator, and that the five-year study period schedule commences from this point, in early 2017.

Although the bounding assumptions are unlikely in practice to be totally representative of any specific vendor / developer / operator solution, the project concluded they served as a sound basis upon which to both develop and review the applicability of key findings in the context of FOAK operating SMR by 2030. The assumptions used to define and bound the project have been reviewed at the completion of the project and these remain valid. In particular, the relevance and significance has been demonstrated of the assumption of identification of a vendor and a developer / operator / future licensee from the outset:

- The schedule necessary to achieve first operations in 2030 shows the need for early parallel work by the developer / operator in advance of licensing. This in turn confirms the need for a vendor and future developer / operator to be selected from the outset of the project.
- Delivery against the assumption that GDA is complete within 5 years will depend upon vendor design choices, the maturity of the design, and the quality of the vendor interaction with Regulators and other stakeholders. This confirms early vendor selection is an important decision.

C11: Bounding assumptions were judged to be sound in the context of a deployment schedule leading to a UK FOAK SMR operating by 2030.

5.8 Risk analysis

In Section 5.6, which describes the consequential scope of the first five years, risks are discussed in context of each specific scope area. Instead of focusing on individual risks this section develops insight from the risk information through analysis of the totality of the risk register.

Each of the risks has a defined owner for the risk itself and an owner(s) for the associated mitigation action. Figure 15 and Figure 16 respectively breakdown such ownership for the Government, vendor, Regulators and developer / operator in terms of the likelihood-impact score.

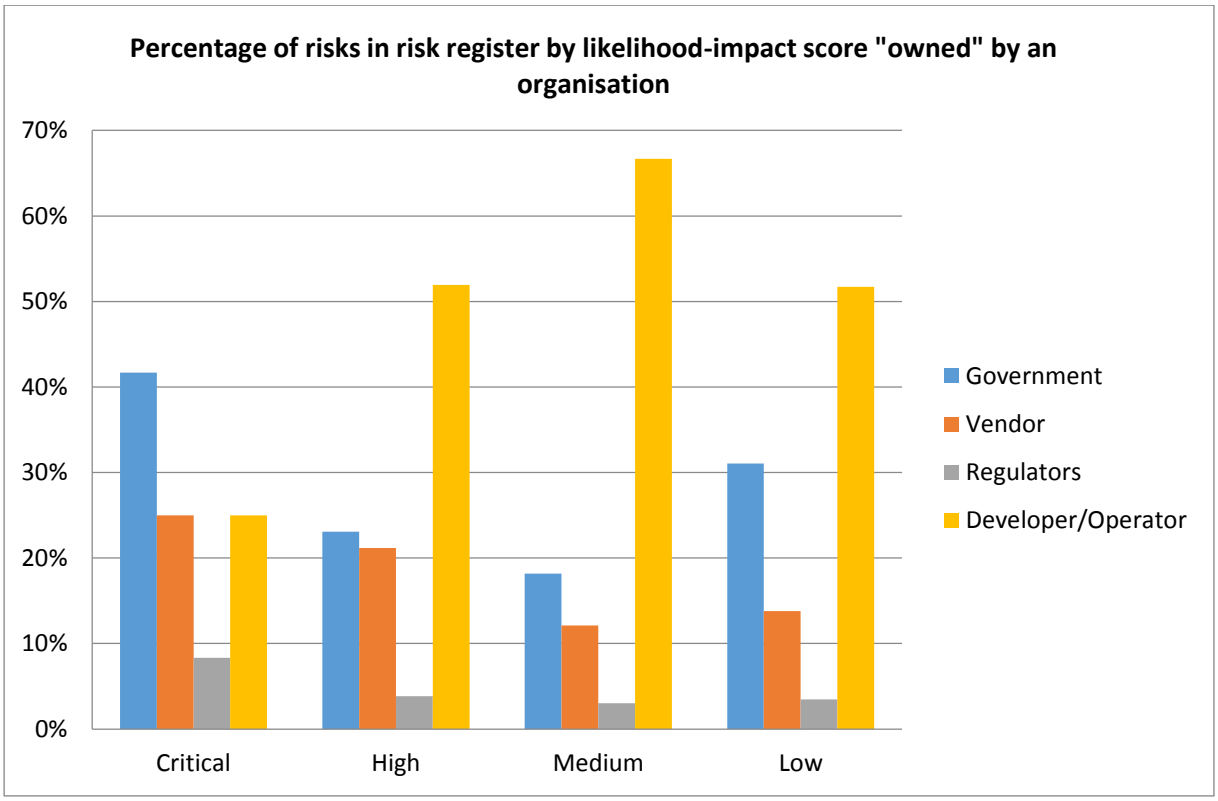


Figure 15: Percentage of risks in risk register by likelihood-impact score "owned" by an organisation

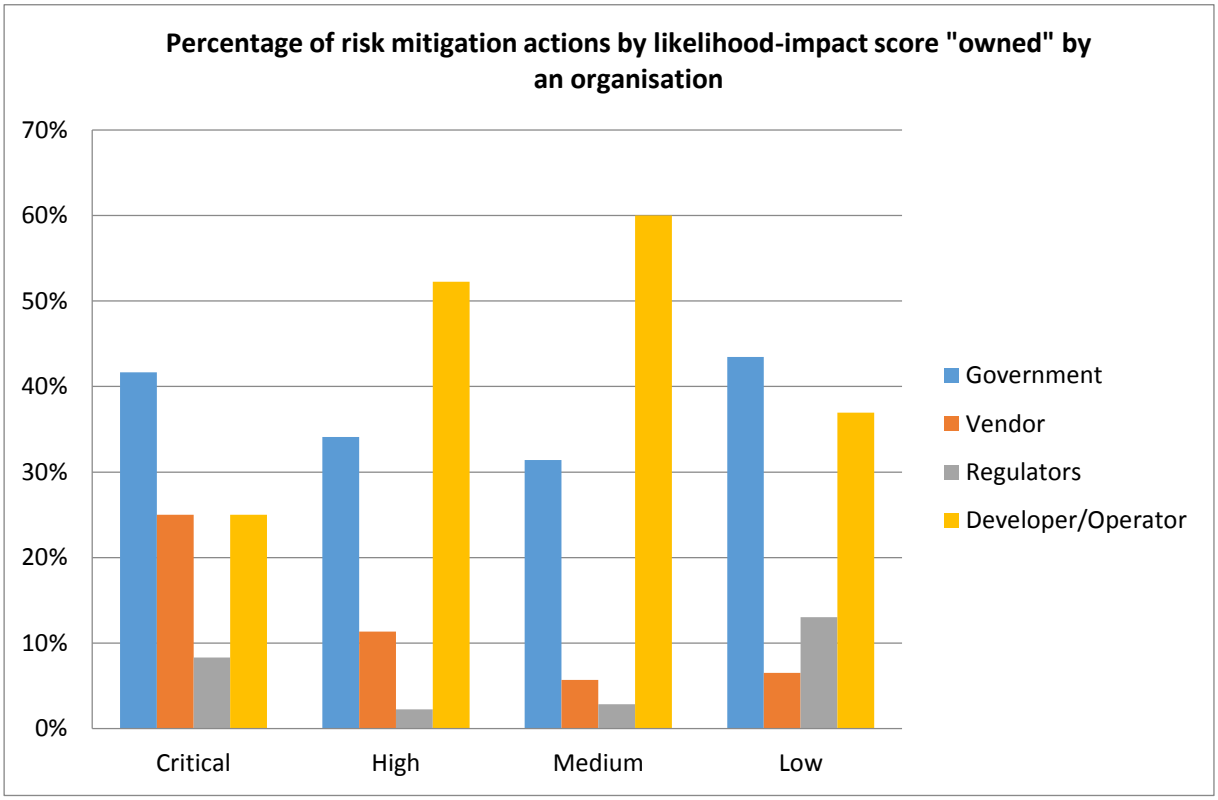


Figure 16: Percentage of risk mitigation actions by likelihood-impact score "owned" by an organisation

It can be seen for critical risks that the Government is the potential owner of a significant percentage of the risks. Across the likelihood-impact score range Government is the potential owner of a

significant number of the mitigations, even for risks it does not own direct. This supports the conclusion that for an effective programme to achieve FOAK SMR deployment, Government commitment and facilitative action is a key programme enabler.

Figure 15 and Figure 16 also show the ownership of a substantive proportion of the remaining risks and associated mitigations lie with the developer / operator. This supports the need for the early engagement of a developer / operator alongside a vendor.

An analysis of the pre-mitigated risk across the WBS for the first five years of an FOAK SMR Deployment programme demonstrates and supports that critical enabling actions are focussed towards Government facilitation actions in the form of policy support and investor confidence (WBS 1). This can be seen in Figure 17.

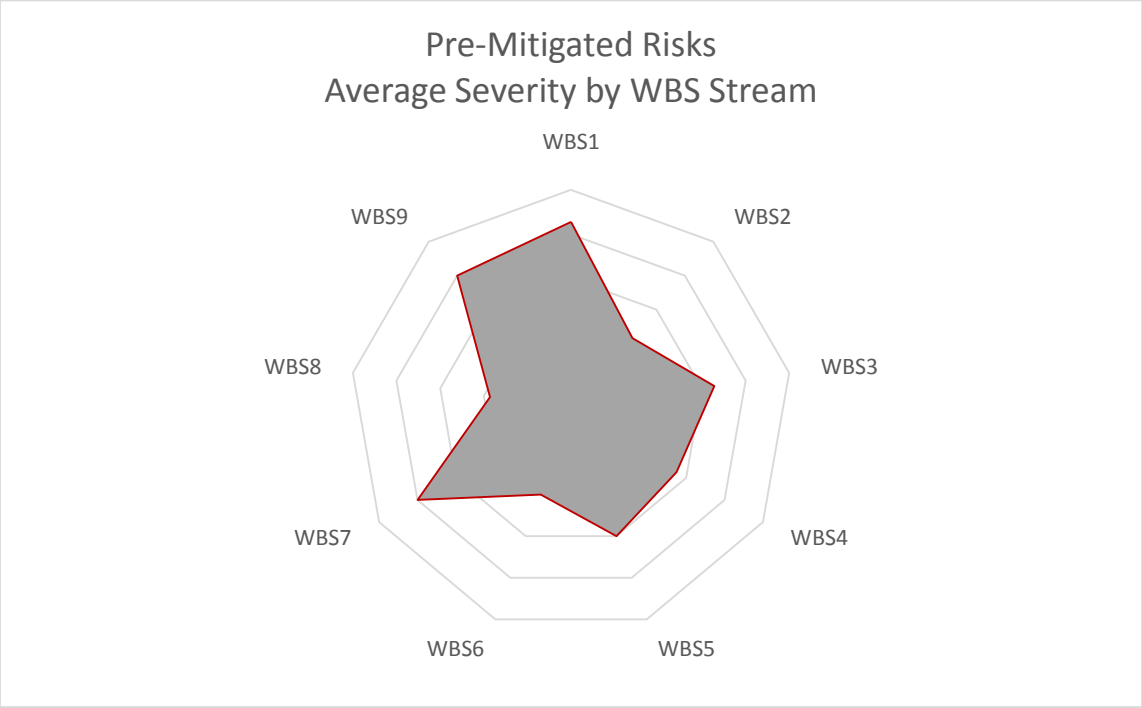


Figure 17: Pre-Mitigated Risks Average Severity by WBS Stream

When looking at risk impact to schedule, Figure 18, it can be seen that technology (WBS 5) is the biggest risk to schedule alongside GDA (WBS 7). This supports the intent to choose a vendor early (Assumption A1 of the SDE Project), and to engage the Regulators both in terms of aiming for a secure GDA time-slot and more widely from a programme perspective to support their ability to "resource up" in a timely manner. It should be noted that risk in WBS 1 does not just impact schedule in terms of delay, but also in terms of a go/no-go, again highlighting the importance of the critical enabling actions in this area.

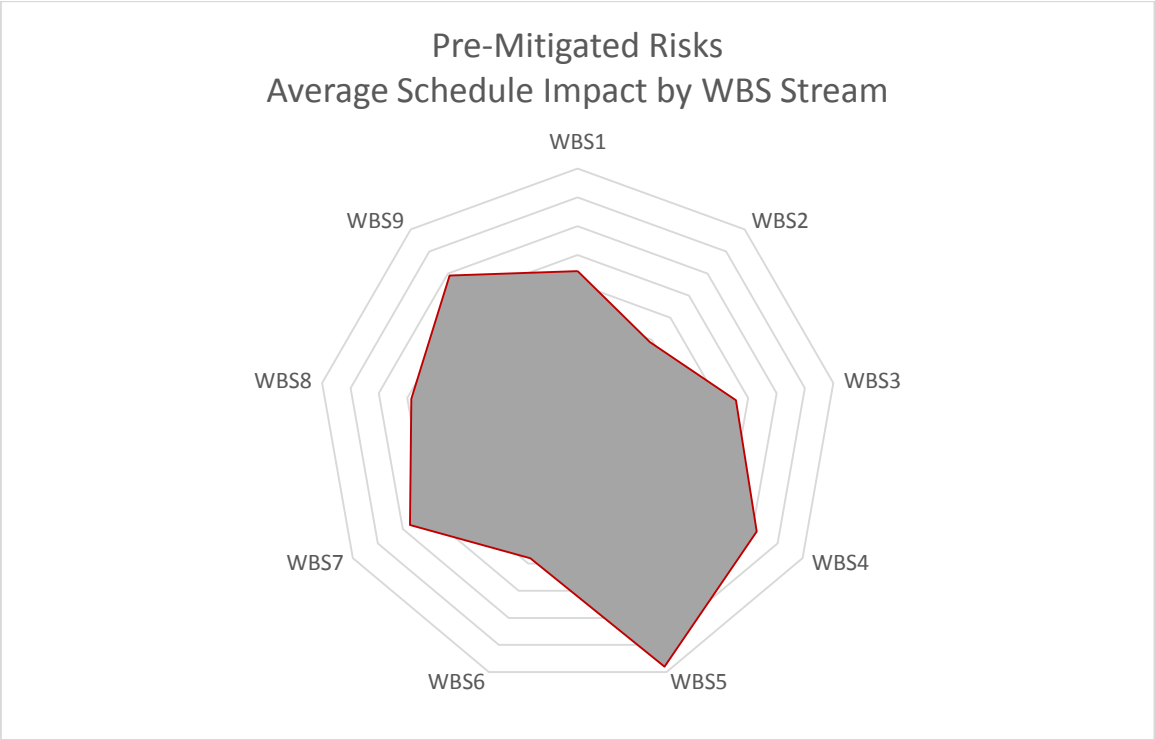


Figure 18: Pre-Mitigated Risks Average Schedule Impact by WBS Stream

This analysis of the risk data demonstrates just one way in which the evidence developed in this study can be used to test or assess proposed solutions for SMR deployment in the UK. The WBS, assumptions and schedules can also support such assessment activity.

C12: The evidence gathered forms the basis of a toolkit which could be used to test or assess the feasibility of specific scenarios for SMR Deployment in the UK.

6 CONCLUSIONS

The project approach described in this report completes the required tasks, meets the project objectives, and incorporates a diverse and robust review process so as to ensure that the ETI can rely on the results. The following conclusions are reached:

1. **Implementation of an FOAK SMR is possible without facilitative action by Government (C1).** However, the complexity and non-prescriptive nature of the UK's consenting processes and the scale of the risks that remain through into first operation make it unlikely to be attractive for investors to make the scale of commitment necessary to achieve FOAK SMR operation by 2030.
2. **Pre-FID investor confidence is of critical importance for achieving the 2030 timeline (C2)**. Securing and maintaining pre-FID investor confidence will dictate whether the necessary commitment to time-critical decisions / actions is made by those leading delivery. Government and the developer / operator play a key role in creating an environment that fosters this confidence through the progressive reduction of perceived risks.
3. **For an effective programme to achieve FOAK SMR deployment, significant Government commitment and facilitative action is required from the outset (C3).**
   Government action to promote investor confidence is required from the outset since the 2030 FOAK timeline requires the private sector to commission a wide range of work (related to technology, site selection and site development) early within the initial five years. Indeed, Government should remain engaged with the progress made and upcoming decision-points of the private sector delivery plan, and ensure that these interactions support the required evolution of the investment case. The specific actions to be considered by Government include:
   - Addressing all potential areas of legal challenge so as to deliver a secure, legally robust framework for investment in a FOAK project. This should recognise the adequacy of existing policy and legislation in light of the proposed plans for SMR FOAK operation by 2030 and the experience gained from recent large reactor new build programmes.
   - Engaging proactively with potential investors so as to understand and act on their perspective on the UK's fitness for investment in SMR design approval and implementation projects.
   - Assessing, reviewing and influencing policy development at UK, European and international level which bears on electricity, nuclear and climate change.
   - Providing a prospective vendor and developer / operator from the outset with comprehensive advice and guidance on negotiating the UK's policy, regulatory, land-use planning, and waste and decommissioning liability funding processes.

   Without such actions being taken, the timeline associated with an entirely market-led deployment could result in FOAK operation nearly a decade late against a 2030 target.
4. **It is insufficient for the first 5 years of the deployment schedule to focus on just GDA and Regulatory Justification (C4)**
   Achievement of FOAK operation by 2030 requires private sector developers undertake a range of activities in parallel, in a manner that increases the complexity of the schedule interactions, and it demands that certain activities be performed at risk. In particular, wider work to develop the site specific aspects and credibility of the operator must commence early if the timeline is to be achieved. To underpin this:
   - The developer / operator should formulate a coherent SMR business case and engage in the Government's strategic siting assessment process so as to establish a portfolio of potentially suitable SMR sites to support this business case.

- Preliminary work will be required ahead of FID (i.e. at risk). This includes work to develop the site (such as non-nuclear construction, non-nuclear safety related grid connection and local infrastructure) as well as to de-risk the SMR manufacture and testing timeline (through early procurement of long-lead items).

5. **A strong and early marriage is required between developer / operator and vendor (C5)**
   Although SMR technology may differ in financial scale from that used in recent large reactor new build programmes**,** the bar to licensing a prospective operator / site in the UK is set to the same consistent standard.
   The prospective licensee must present credible plans that demonstrate Intelligent Customer and Design Authority capability in respect of the SMR technology. This must include adequate oversight of the vendor's design and development (including relevant manufacturing / assembly activity performed by the vendor's supply chain). Therefore, the prospective operator must develop the required competency at an early stage of the deployment programme in order to assure itself of the adequacy of the vendor's generic design; the optimal boundary between generic and site specific aspects; and the plans for achieving economies of multiples beyond the development and deployment of the FOAK. To this end, a strong and early marriage is required between developer / operator and vendor (confirming bounding Assumption A1). This must be credible not only in terms of the individual parties involved but also in the terms of their marriage (complementary offerings without anti-trust concerns, a shared delivery vision, access to the full coverage of required resources such as finance, experienced people, etc.).
6. **The notion of a developer / operator / vendor 'boot camp' is proposed as a near-term risk mitigation activity (C6)**
   This recognises the requirement for close-working between all stakeholders involved in a SMR deployment project. The detailed scope of this boot camp is considered further in WBS 1.3 in Appendix II, however overall it should seek a common understanding by all parties of the required capabilities, information, interactions and timescales. In particular, where parties inexperienced in the UK nuclear market are participating in a SMR deployment project, they may need education in the standards and expectations of the UK regulatory and operating environment.
7. **Deployment of a FOAK SMR in the UK is achievable by 2030 under the bounding scenario considered by this study (C7)**
   This is conditional on facilitative actions being implemented (including those described in items 2 to 6 above). It should be noted that the actual durations, sequencing and overall timeline of SMR deployment will depend on the specific organisational, commercial and financial characteristics of the parties engaged in such a programme and the SMR technology selected. However, the generic scenario considered by this study incorporates the following bounding conditions:
   - That both the developer / operator and the vendor are credible parties to lead an integrated delivery programme:
     i. The vendor's technology is sufficiently mature from the outset of the programme to enable GDA and Regulatory Justification to commence early and progress systematically supported by timely submission of evidence.
     ii. The developer / operator and vendor have access to sufficient funding (equity or debt) to support the staged investment decisions.
     iii. The developer / operator and vendor commit from the outset to a close working arrangement (in whatever commercial / legal structure may be appropriate).
   - That substantive work commences in early 2017 (noting that a later start reduces the credibility of achieving FOAK operation by 2030).

- That the approach to site selection for FOAK deployment avoids potentially contentious locations, in order to avoid creating undue challenges from local / regional stakeholder groups.
- That the local infrastructure development excludes work to supply district heating; with FOAK deployment focussing on electricity generation only. Future District Heating capability may be accounted for within the design on a 'fitted for but not with' basis.

8. **The scale of the recruitment challenge to establish a Nuclear Baseline should not be underestimated, with staged planning essential (C8)**
   A SMR developer / operator must unequivocally establish itself as a credible nuclear operator, including Design Authority and Intelligent Customer capability and the power to be a Controlling Mind.
9. **Regulators will need to be able to resource-up without adverse influence on current UK nuclear safety activity (C9)**
   It is recognised that the UK has finite SQEP resource (both direct and indirect) to support the regulatory processes of GDA, Regulatory Justification and site specific assessment. Concurrent regulatory assessment of SMR and large reactor licensing projects may only be achievable where careful consideration is given to the 'prequalification' of vendors (married to credible developer / operators) entering this process.
10. **A co-ordinated public communications plan is required, led by the prospective Licensee, supported by the vendor and facilitated by Government (C10)**
    The developer / operator will lead many of the activities associated with the deployment programme. Achievement of the 2030 timeline will rest, in part, on the competency of this organisation to plan and drive the delivery of a highly integrated schedule, drawing in the inputs, as required from all parties. This requirement extends to the need for the developer / operator to address issues of public perception concerning the deployment of FOAK SMR technology in the UK: an activity that requires a co-ordinated public communications plan, led by the prospective Licensee, supported by the vendor and facilitated by Government. This is an important factor when considering the risk of potential applications for Judicial Review. A priority for the developer / operator is to establish an early, credible presence local to the FOAK site, with the influence to optimise the project's local benefits and mitigate its impacts.
11. **Bounding assumptions were judged to be sound in the context of a deployment schedule leading to a UK FOAK SMR operating by 2030 (C11)**
    A number of assumptions were used at the outset to bound the study. Although these assumptions are unlikely to be totally representative of any specific vendor / developer / operator solution, it was accepted that they remained sound at the completion of the study.
12. **The evidence gathered forms the basis of a toolkit which could be used to test or assess the feasibility of specific scenarios for SMR Deployment in the UK (C12)**
    While outside the scope of this study, which assumed a single non-specific solution for the vendor / developer / operator, the evidence (WBS, assumptions, risks and schedules) developed could be used to test or assess a wide range of proposed options for SMR deployment in the UK. The schedule for UK FOAK deployment operations would depend upon the associated assumptions. Such options may include:
    - A risk-averse deployment plan which focusses on completion of GDA and Regulatory Justification to establish a credible design before commencing work on site specific aspects and developing a credible nuclear operator. This may suggest a schedule with risk of delay to FOAK first operation beyond 2030.
    - A deployment plan for a less technology/design ready SMR. GDA would not commence until later in the schedule with possible plans to complete manufacturing and

construction in a shorter timeframe. This may suggest a schedule with risk of delay to FOAK first operation beyond 2030.

- Assessment of developer / operators with different characteristics and different working arrangements and modes of engagement with the vendor. For example, a developer with a mature and capable licensee organisation which may suggest an opportunity for an accelerated deployment schedule.
- FOAK deployment at a site identified as potentially suitable for nuclear development in the Nuclear NPS. This may again suggest an opportunity for an accelerated deployment schedule.

APPENDIX I LIST OF ACRONYMS

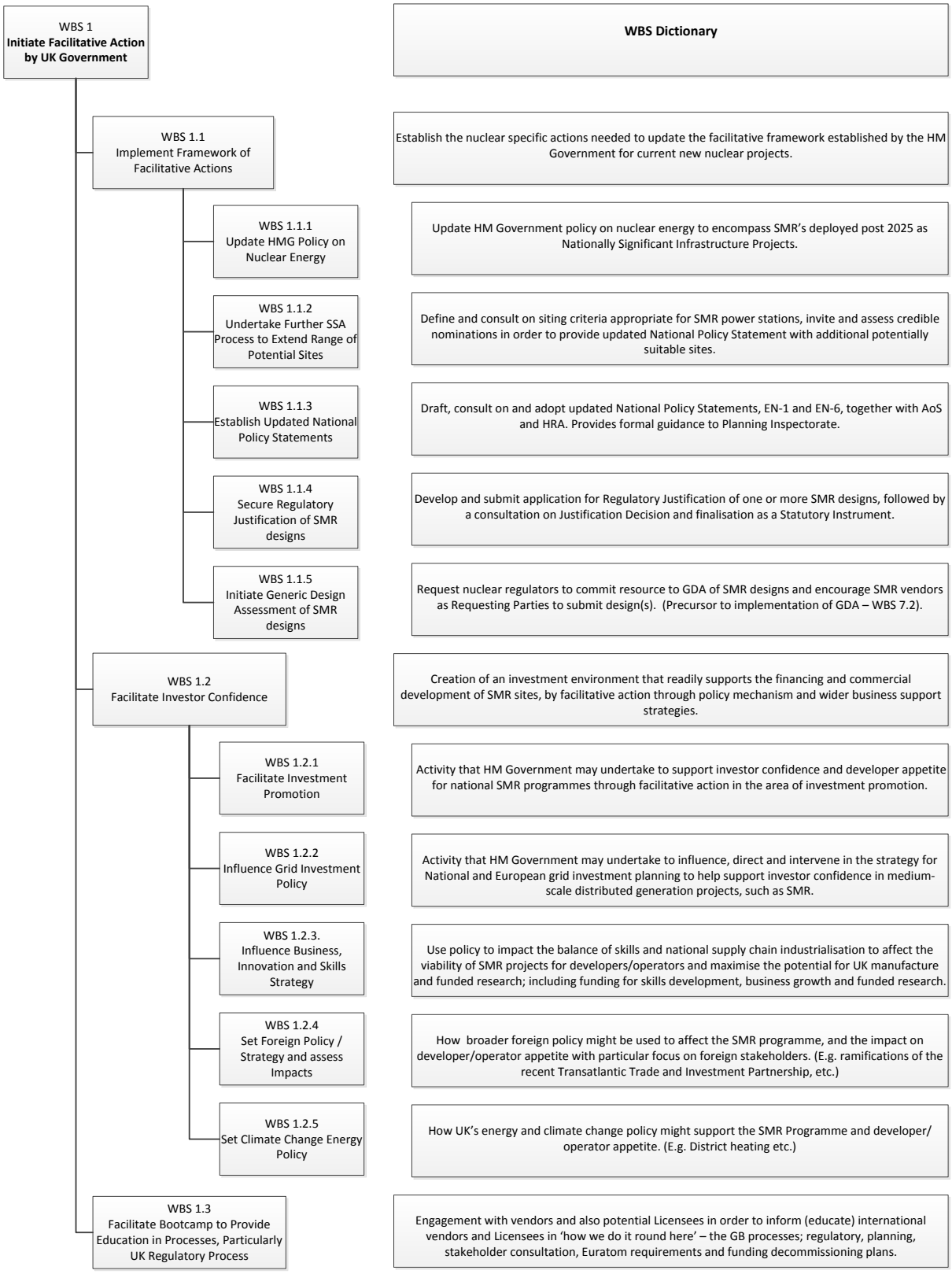
ALARP	As Low As Reasonable Practicable
ANT	Alternative Nuclear Technologies
AoS	Appraisal of Sustainability
AP1000	Advanced Passive 1100MW nuclear reactor (Westinghouse)
BAT	Best Available Techniques
BIS	Department for Business Innovation & Skills
C&I	Control and Instrumentation
CfD	Contract for Difference
CHP	Combined Heat and Power
CIC	Construction Industry Council
CSN	Construction Skills Network
DAC	Design Acceptance Confirmation
DAP	Duly Authorised Person
DAS	Decision Analysis Services Ltd
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DH	District Heating
DWMP	Decommissioning Waste Management Plan
EA	Environment Agency
EC	European Commission
ECITB	Engineering Construction Industry Training Board
EDF	Electricité de France
EFSI	European Fund for Strategic Investments
EIB	European Investment Bank
EMR	Electricity Market Reform
ENTSOE	European Network of Transmission System Operators
EPR	Evolutionary Pressurised Reactor (Areva)
ETI	Energy Technologies Institute
ETS	Emissions Trading System
EU	European Union
FDP	Funded Decommissioning Programme
FID	Final Investment Decision
FiT	Feed in Tariff
FOAK	First of a Kind
GB	Great Britain
GDA	Generic Design Assessment
GDF	Geological Disposal Facility
GIB	Green Investment Bank
GQAS	General Quality Assurance Specification
GW	Gigawatt
GWe	Gigawatt electrical
HLW	High Level Waste
HMG	Her Majesty's Government
HPC	Hinkley Point C
HR	Human Resources
HRA	Habitats Regulations Assessment
HS&E	Health, Safety and Environment
IAEA	International Atomic Energy Agency
ICE	Institution of Civil Engineers
iDAC	Interim Design Acceptance Confirmation
ILW	Intermediate Level Waste
INPO	Institute of Nuclear Power Operators
IP	Intellectual Property
iSoDA	Interim Statement of Design Acceptability
IT	Information Technology
LC	Licence Condition
LCoE	Levelised Cost of Electricity
LR	Large Nuclear Reactor
MRF	Materials Research Facility
MS	Microsoft
MW	Megawatt
NAMRC	Nuclear Advanced Manufacturing Research Centre
NESA	Nuclear Energy Skills Alliance
NIA	Nuclear Industry Association
NIRAB	Nuclear Innovation and Research Advisory Board
NIRO	Nuclear Innovation and Research Office
NLFAB	Nuclear Liabilities Funding Assurance Board
NNB	Nuclear New Build
NOAK	Nth of a Kind
NPS	National Policy Statement
NRW	Natural Resources Wales
NSAN	National Skills Academy for Nuclear
NSANM	National Skills Academy for Nuclear Manufacturing
NSIP	Nationally Significant Infrastructure Project
NSL	Nuclear Site Licence
O&M	Operations and Maintenance
ONR	Office for Nuclear Regulation

OPEX	Operating Experience
PCSR	Pre-Construction Safety Report
PESTLE	Political, Economic, Sociological, Technological, Legal, Environmental
PPA	Power Purchase Agreement
RAE	Royal Academy of Engineering
REPs	Regulatory Environmental Principles
RfP	Request for Proposal
RoM	Rough Order of Magnitude
RPV	Reactor Pressure Vessel
RWE	Rheinisch-Westfälisches Elektrizitätswerk AG
SAPs	Safety Assessment Principles
SLA	Site Licence Application
SMR	Small Modular Reactor
SoDA	Statement of Design Acceptability
SQEP	Suitably Qualified and Experienced Person
SSA	Strategic Siting Assessment
TAGs	Technical Assessment Principles
TSO	Transmission System Operator
TTIP	Transatlantic Trade and Investment Partnership
TYNDP	Ten Year Network Development Plan
UK	United Kingdom
UKTI	United Kingdom Trade and Investment
US	United States (of America)
WANO	World Association of Nuclear Operators
WBS	Work Breakdown Structure
WtE	Waste to Energy

APPENDIX II WBS ONE PAGE DESCRIPTIONS

WBS 1: Initiate Facilitative Action by UK Government

Covers actions needed to update the facilitative framework established by UK Government for current new nuclear projects.



WBS 1.	Initiate Facilitative Action by UK Government	Version: FINAL

Responsible Organisation(s):	Government

Scope:

Build a legally robust framework of Government action, extending that established from the 2008 White Paper, to cover a UK SMR programme.

Objectives:

1. To identify the gap between existing facilitative actions and those needed to make a future SMR programme robust against legal challenge, mitigate other risks to SMR implementation, and thus promote confidence in investors, vendors and operators.
2. To implement a timely programme of renewed policy and facilitative actions by UK Government to close this gap – including updates to White Paper, Strategic Siting Assessment and National Policy Statement, Regulatory Justification and Generic Design Assessment.
3. To promote a timely programme of other actions to secure key enablers for an SMR programme – including skills, potential sites, grid access, radioactive waste disposal capacity, investment guarantees, contracts for output that recognise SMRs' secure low-carbon qualities.
4. To ensure that UK Government's international actions actively communicate the opportunities to potential vendors and investors, educate them on UK regulatory and consenting processes and facilitative actions, and mitigate international risks to a UK SMR programme.

Statement of Work:

1. Gap identification:
   - 1.1. Identify scope of SMR programme desired by Government – including capacity, timescale, siting.
   - 1.2. Identify where desired scope extends beyond existing stated policy in 2008 White Paper and National Policy Statements EN-1 and EN-6 and specify consequent requirement for fresh policy statement and facilitative actions.
   - 1.3. Liaise with vendors and nuclear Regulators to check adequacy of the identified requirement, and establish resourced plan for its delivery.
2. Implement timely policy and Government facilitative actions:
   - 2.1. Establish further Government policy and implement facilitative actions for SMR nuclear tranche in UK energy mix in accord with plan – WBS 1.1
3. Promote other key enablers in UK:
   - 3.1. Liaise with vendors and potential investors and operators on priorities for other key enablers of informed vendors and confident investors.
   - 3.2. Liaise with relevant stakeholders (including Government outside DECC, National Grid) to develop resourced plan for their delivery and promote its implementation – WBS 1.2
4. Ensure positive international action by Government:
   - 4.1. Establish programme to engage potential investors and vendors, educate them on UK opportunity and regulatory / planning regimes including GDA, and identify their concerns – WBS 1.3
   - 4.2. Scan international environment, particularly EU, for potential risks to UK SMR programme and prioritise action to mitigate these.

Key Inputs:	Key Dependencies: WBS 1.1 – 1.3
Assumptions: -	**Risks:** R3, R4, R5

WBS 1.1	Implement Framework of Facilitative Actions	Version: FINAL
Responsible Organisation(s):	**Government**	

Scope:

Ensure that the extended framework of Government action is fully scoped and systematically informed by experience since 2008, so as to maximise legal robustness and hence vendor / investor confidence.

Objectives:

1. To specify the changes / additions required to stated Government policy and facilitative actions on new nuclear power stations established from 2008 in order to encompass the desired SMR programme. This objective is placed into context through a review of the 2008 White Paper on Nuclear Power. There are a range of potential requirements from a) providing update (e.g. in terms of indicative pathway timescale and logic of key activities), b) clarification on policy direction (e.g. SMR potential for distributed heat provision in support of 2050 climate change objectives) and SMR specific implications in areas such as safety/security, waste and decommissioning and industrial supply chain strategy.
2. To review experience since 2008, particularly of legal challenge by nuclear opponents, so as to ensure appropriate provisions are included in updated policy and facilitative actions – WBS 1.1.1-1.1.5

Statement of Work:

1. Specify required changes:
   - 1.1. Drawing on gap analysis and requirements identified in WBS 1, specify the scope and form of updating needed in the key Government and Regulator instruments – policy-setting (White Paper) – WBS 1.1.1; Strategic Siting Assessment and National Policy Statement(s) – WBS 1.1.2-1.1.3; Regulatory Justification – WBS 1.1.4; and Generic Design Assessment by the safety, security and environmental Regulators – WBS 1.1.5
2. Ensure changes are legally robust:
   - 2.1. Assemble history of actual challenges (e.g. applications for Judicial Review, State Aids investigation) to post-2008 nuclear new build programme and identify lessons learned for updated programme for SMRs to maximise legal robustness.
   - 2.2. Feed into scoping and drafting of individual Government and Regulator instruments / actions, particularly White Paper.

Key Inputs:	**Key Dependencies:**
WBS 1	WBS 1.1.1, WBS 1.2
Assumptions: A9, A11, A12	**Risks:** R6

WBS 1.1.1	Update HMG Policy on Nuclear Energy	Version: FINAL
Responsible Organisation(s):	**Government**	
Scope:		
Establish firm Government policy on SMR programme via updated White Paper and legislation approved by parliament.		
Objectives:		
1. To publish a White Paper that updates the 2008 White Paper on nuclear power to encompass the desired SMR programme (e.g. in timescale, range of sites, potential district heating applications) and facilitative actions to support this. 2. To complete parliamentary approval of appropriate primary or secondary legislation giving effect to the updated White Paper.		
Statement of Work:		
1. Develop and publish updated White Paper: 1.1. Draw on specification derived from gap analysis and lessons learned (WBS 1.1), draft and publish updated White Paper on Nuclear Power to encompass the desired SMR programme. 1.2. Identify the legislative requirement to give effect to the White Paper's policy and draft appropriate bill or other instrument. 2. Complete parliamentary approval: 2.1. Introduce a bill or other legislative instrument as required and complete due process to achieve appropriate parliamentary approval or Royal Assent. 3. Feed findings into the WBS for facilitative actions – WBS 1.1.2-1.1.5		
Key Inputs: WBS 1.1	**Key Dependencies:** WBS 1.1.2 – 1.1.5	
Assumptions: A13, A14	**Risks:** R4, R5	

WBS 1.1.2	Undertake Further SSA Process to Extend Range of Potential Sites	Version: FINAL
Responsible Organisation(s):	**Government, Operators**	

Scope:

Define and consult on siting criteria appropriate for SMR power stations, invite and assess credible nominations in order to provide updated National Policy Statement with additional potentially suitable sites.

Objectives:

1. To establish a renewed process and criteria for nominating and assessing potentially suitable sites for SMR deployment.
2. To secure nominations of potentially suitable sites from operators.
3. To assess the nominations individually and collectively as required under European legislation, so as to provide a set of potentially suitable sites for updated National Policy Statement(s) – WBS 1.1.3

Statement of Work:

1. Establish process and criteria:
   - 1.1. Update siting criteria from 2008 SSA to reflect intent of desired SMR programme, including timeframe, demographics recognising the potential to supply district heat, scale of heat sink, and attributes required for nominator to be considered credible.
   - 1.2. Undertake public consultation on criteria and proposed process for nomination and assessment, and amend as necessary.
2. Secure nominations:
   - 2.1. Publish invitation for operators to nominate potential sites with justification against criteria, and receive nominations.
3. Assess nominations:
   - 3.1. Evaluate individual nominations against criteria for credible nuclear operator and site suitability.
   - 3.2. Assess potential impact of emerging set of potentially suitable sites on European environmental designations and appraise its sustainability, as necessary under European legislation.
4. Feed outcome into updated National Policy Statement – WBS 1.1.3

Key Inputs:	**Key Dependencies:**
WBS 1.1.1	WBS 1.1.3, WBS 4.3
Assumptions: A16, A17, A18, A19	**Risks:** R7, R8, R86

WBS 1.1.3	Establish Updated National Policy Statements	Version: FINAL
Responsible Organisation(s):	**Government**	
Scope:		
Draft, consult on and adopt updated National Policy Statement(s) EN-1 and EN-6 to reflect the desired SMR programme.		
Objectives:		
1. To publish and consult on draft updated National Policy Statement(s) and accompanying Appraisal of Sustainability / Habitats Regulations Assessment as required. 2. To present proposed National Policy Statement(s) for parliamentary scrutiny leading to designation by the Secretary of State.		
Statement of Work:		
1. Consult on draft updated NPS(s): 1.1. Publish draft NPS(s) embodying potentially suitable SMR sites, together with AoS and HRA as required, for public consultation; amend as necessary. 2. Designate updated NPS(s): 2.1. Determine appropriate process for parliamentary scrutiny, present updated NPS(s) for scrutiny and amend as necessary. 2.2. Designate NPS(s) in accord with Planning Act 2008. 3. Feed outcome into WBS 4.5 – Develop and submit DCO application.		
Key Inputs: WBS 1.1.2, WBS 4.3	**Key Dependencies:** WBS 4.5 , WBS 4.6	
Assumptions: A20, A21, A22	**Risks:** R4, R5	

WBS 1.1.4	Secure Regulatory Justification of SMR Designs	Version: FINAL
Responsible Organisation(s):	**Government, Vendors**	

Scope:

Application(s) for and granting of decision(s) that SMR practice(s) are justified under the Basic Safety Standards Directive.

Objectives:

1. To develop and submit application(s) one or more SMR practices, with evidence in each case that its benefits outweigh the health detriment due to ionising radiation they may cause, seeking a justification decision.
2. To consult on and assess the application, and develop and consult on a draft justification decision, amending this where necessary.
3. To submit the justification decision to appropriate parliamentary scrutiny as a Statutory Instrument and include the SMR practice in the register of justified practices.

Statement of Work:

1. Submit application(s):
    - 1.1. SMR vendor(s) (probably acting through the Nuclear Industry Association) assemble information to define in each case the practice constituted by their design and to demonstrate that its net benefits, social, economic or other, exceed its potential detriment to health due to ionising radiation.
    - 1.2. SMR vendor(s) apply to the Secretary of State, as justifying authority, for a justification decision for their practice(s).
2. Develop draft justification decision(s):
    - 2.1. In each case, undertake public and regulatory consultation on the application received, assess its content and develop a draft justification decision.
    - 2.2. Undertake public and regulatory consultation on the draft decision and amend as necessary.
3. Finalise justification decision(s):
    - 3.1. Lay a statutory instrument embodying the justification decision before parliament; undertake an appropriate process for its debate and confirmation.
    - 3.2. Add the practice to the Justification Register.
4. Feed findings into WBS 4.5 and WBS 7

Key Inputs:	**Key Dependencies:**
WBS 1.1.1, WBS 1.3	WBS 4.5, WBS 7
Assumptions: A23, A24, A25, A26	**Risks:** R4

WBS 1.1.5	Initiate Generic Design Assessment of SMR Designs	Version: FINAL
Responsible Organisation(s):	**Government, Regulators, Vendors**	
Scope:		
Request nuclear Regulators to commit resource to GDA of SMR designs and encourage SMR vendors as Requesting Parties to submit design(s). (Precursor to implementation of GDA – WBS 7.2)		
Objectives:		
1. To initiate staged assessment of candidate SMR design(s) against the requirements of the UK regulatory regimes for nuclear safety, security and environmental protection.		
Statement of Work:		
1. Initiate GDA: 1.1. Request nuclear Regulators (Office for Nuclear Regulation, Environment Agency, Natural Resources Wales) to commit resources to GDA of SMR design(s). 1.2. Liaise with WBS 1.3 to facilitate one or more credible applications from a competent Requesting Party for GDA of an SMR design. 2. Feed outcome into WBS 7.2		
Key Inputs: WBS 1.1.1, WBS 1.3	**Key Dependencies:** WBS 7	
Assumptions: A27, A28, A29	**Risks:** R11, R12	

WBS 1.2	Facilitate Investor Confidence	Version: FINAL
Responsible Organisation(s):	**Government**	
Scope:		
Creation of an investment environment that readily supports the financing and commercial development of SMR sites, by facilitative action through policy mechanisms and wider business support strategies.		
Objectives:		
1. To facilitate investor confidence and developer appetite for SMR programmes through; a. Investment promotion. b. Influencing strategy for grid investment. c. Using policy to impact the balance of skills and national supply chain industrialisation. d. Fitness for investment reviews. 2. Understand and address how broader foreign policy may be used to affect SMR programme. 3. Understand and exploit how the UK's future energy and climate change policy might support the SMR Programme.		
Statement of Work:		
1. Implement WBS 1.2.1 – 1.2.5		
Key Inputs: WBS 1.1.1 – 1.1.3, WBS 4, WBS 2.7, WBS 5.1, WBS 3.2, WBS 5.2, WBS 8.2	**Key Dependencies:** WBS 2, WBS 5.3, WBS 4, WBS 7.5, WBS 8.11, WBS 3.2.5, WBS 5.3	
Assumptions: -	**Risks:** -	

WBS 1.2.1	Facilitate Investment Promotion	Version: FINAL
Responsible Organisation(s):	**Government**	
Scope:		
Activity that HM Government may undertake to support investor confidence and developer appetite for national SMR programmes through facilitative action in the area of investment promotion.		
Objectives:		
1. Describe how HMG might support investor confidence and developer appetite for national SMR programmes through facilitative action in the area of investment promotion. E.g. via export agencies (UKTI), national public engagement forums, and related policy. 2. Identify key risks, opportunities, sensitivities and interactions of such facilitative action in relation to supporting fundamental investor appetite, the overarching business case, or in the ability of the developer/operator to secure finance (WBS 2).		
Statement of Work:		
1. Understand how HMG currently approaches the promotion of investments of this nature. 1.1. Nationally and internationally (Government to Government, and Government to public). 1.1.1. Leverage contacts within UKTI and BIS to inform conclusions. 2. Understand the view of current Government policy by potential investors (Developers and Financiers) and put in place a "fitness for investment" process that is aligned with SMR programme stages. 3. Understand the impact of future policy on the assumed SMR deployment programme, and make high-level suggestions on what areas of action the Government might look to in order to address any concerns.		
Key Inputs: WBS 1.1.1, WBS 1.2.4	**Key Dependencies:** WBS 2, WBS 5.3	
Assumptions: A114, A115	**Risks:** R14, R15, R17	

WBS 1.2.2	Influence Grid Investment Policy	Version: FINAL
Responsible Organisation(s):	**Government**	

Scope:

Activity that HM Government may undertake to influence, direct and intervene in the strategy for National and European grid investment planning to help support investor confidence in medium-scale distributed generation projects, such as SMRs.

Objectives:

1. Describe how Government influence, direction and intervention in the strategy for National and European grid investment planning might help to support investor confidence in medium-scale distributed generation projects, such as the proposed SMR deployment.
2. Identify key risks, opportunities, sensitivities and interactions of such facilitative action in relation to supporting fundamental investor appetite, the overarching business case, or in the ability of the developer/operator to secure finance (WBS 2).

Statement of Work:

1. Establish the routes by which HMG can guide or influence the national investment strategy (GIB, Paper - 'Delivering UK Energy Investment: Networks – January 2015').
2. Establish the influence that the UK has in guiding European investment plans (See ENTSOE interface).
   - 2.1. ENTSOE and the Ten Year Network Development Plan (TYNDP 2014).
   - 2.2. EIB (owned by European States) funding to National Grid (£1.5bn lent in late-2014).
   - 2.3. Role and impact of the EU Energy Union Framework Strategy.
   - 2.4. Interconnector strategy (10% capacity through interconnection by 2020).
3. Understand the grid readiness implications (siting, bottlenecks, etc.) on the assumed SMR deployment programme, and make suggestions on what areas of action the Government might look to in order to address any concerns.

Key Inputs:	**Key Dependencies:**
WBS 4., WBS 2.7	WBS 2, WBS 4, WBS 7.5, WBS 8.1.1
Assumptions: -	**Risks:** R28, R30

WBS 1.2.3	Influence Business, Innovation and Skills Strategy	Version: FINAL
Responsible Organisation(s):	**Government**	

Scope:

Use policy to impact the balance of skills and national supply chain industrialisation to affect the viability of SMR projects for developers/operators and maximise the potential for UK manufacture and jobs; including funding for skills development, business growth and funded research.

Objectives:

1. Describe how HMG might act to ensure that funding for skills development, business growth and funded research supports the viability of SMR projects for developers/operators.
2. Describe how HMG might act to ensure that funding for skills development, business growth and funded research maximises the potential for UK manufacture and jobs.
3. Identify key risks, opportunities, sensitivities and interactions of such facilitative action in relation to supporting fundamental investor appetite, the overarching business case, or in the ability of the developer/operator to secure finance (WBS 2).

Statement of Work:

1. Understand the current policy for Innovation and Skills (Nuclear and related engineering sectors).
2. Identify any specific skill areas or innovation pipelines that are specific to SMR developments, when compared to GW-scale NNB (Engage with NIRAB/NIRO, NAMRC etc.).
3. Understand the view of current Government policy by potential investors (Developers, Financiers, and Primary Stakeholders – such as Unions or industry bodies).
4. Understand the impact of future policy on the assumed SMR deployment programme, and make high-level suggestions on what areas of action the Government might look to in order to address any concerns.

Key Inputs:	**Key Dependencies:**
WBS 5.1, WBS 3.2, WBS 5.2, WBS 8.2	WBS 2.5, WBS 2.7, WBS 3.2.5, WBS 5.3
Assumptions: -	**Risks:** R19

WBS 1.2.4	Set Foreign Policy Impacts / Strategy	Version: FINAL
Responsible Organisation(s):	**Government**	
Scope:		
How broader foreign policy might be used to affect the SMR programme, and the impact on developer/operator appetite with particular focus on foreign stakeholders. (E.g. ramifications of the recent Transatlantic Trade and Investment Partnership, etc.)		
Objectives:		
1. Describe how HMG might act to ensure that broader foreign policy decisions support the viability of SMR projects for developers/operators. 2. Describe how HMG might act to ensure international agreements support UK growing indigenous capability in terms of skills, knowledge and IP. 3. Identify key risks, opportunities, sensitivities and interactions of such facilitative action in relation to supporting fundamental investor appetite, the overarching business case, or in the ability of the developer/operator to secure finance (WBS 2).		
Statement of Work:		
1. Understand the current foreign policy arrangements relevant to cross-border investment in assets, technology and generation infrastructure programmes. 2. Understand the view of current Government foreign policy by potential investors (Developers and Financiers). 3. Identify key risks in the context of foreign policy that could support or undermine investor confidence ("Brexit", Scottish independence, TTIP etc.). 4. Understand the impact of future policy on the assumed SMR deployment programme, and make high-level suggestions on what areas of action the Government might look to in order to address any concerns.		
Key Inputs: WBS 1.1.1, WBS 1.1.3, WBS 5.1, WBS 1.2.3	**Key Dependencies:** WBS 1.2.1, WBS 2.5 – 2.7, WBS 3.2.5, WBS 5.3	
Assumptions: -	**Risks:** -	

WBS 1.2.5	Set Climate Change Energy Policy	Version: FINAL
Responsible Organisation(s):	**Government**	
Scope:		
How UK's energy and climate change policy might support the SMR Programme and developer/operator appetite. (E.g. District heating etc.)		
Objectives:		
1. Describe how HMG might act to ensure that the UK's future energy and climate change policy supports the viability of SMR projects for developers/operators. 2. Identify key risks, opportunities, sensitivities and interactions of such facilitative action in relation to supporting fundamental investor appetite, the overarching business case, or in the ability of the developer/operator to secure finance (WBS 2).		
Statement of Work:		
1. Understand the roadmap and drivers for future changes to UK and European energy policy. (Determine when changes are likely and what they might be). 2. Understand the view of current Government policy by potential investors (Developers and Financiers). 3. Identify any specific areas where policy could be changed to support investor confidence specifically in the area of SMR investment. (e.g. heightened priority for CHP plants, Flexible grid response generation types, etc.) – Discussions with Developers/DECC 4. Understand the impact of future policy on the assumed SMR deployment programme, and make high-level suggestions on what areas of action the Government might look to in order to address any concerns.		
Key Inputs:	**Key Dependencies:** WBS 1.1.1, WBS 1.1.3, WBS 1.2, WBS 2	
Assumptions: -	**Risks:** R26, R27	

WBS 1.3	Facilitate Bootcamp to Provide Education in Processes, Particularly UK regulatory Process	Version: FINAL

Responsible Organisation(s):	Regulators

Scope:

Engagement with vendors and also potential Licensees in order to inform (educate) international vendors and Licensees in 'how we do it round here' – the GB processes; regulatory, planning, stakeholder consultation, Euratom requirements and funding decommissioning plans.

Objectives:

1. Regulators to educate vendors and potential Licensees, how the GB regulatory process works, and the expectations of both the GB Generic Design Assessment (GDA) process and Regulatory licensing and permitting process.

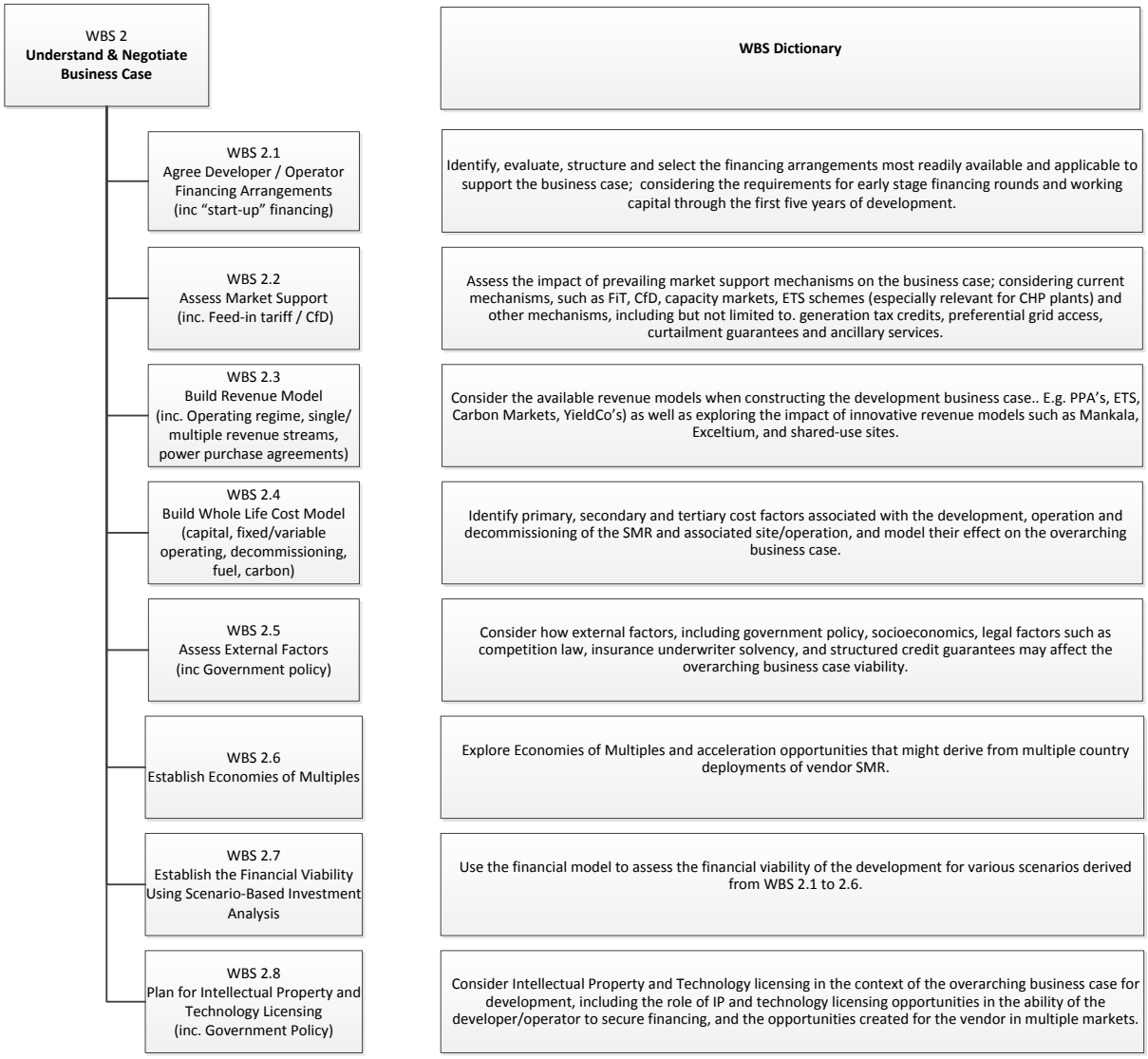
Statement of Work:

1. Office for Nuclear Regulation (ONR)), Environment Agency/NRW and Vendor/Potential Licensee workshops to educate all on the expectations and ways of working of the GB regulatory process and GDA. UK Government (DECC) also involved. The lack of such early engagement was a key learning point from the GDA work on the EPR and AP1000.
2. Education in at least the following relevant Laws, Guidance and Ways of Working would be beneficial to all, in assisting the vendor and operator with base knowledge, and improving engagement and understanding when liaising with the Regulators:
   - Health and Safety at Work Act, Nuclear Installations Act, UK Energy Act, Environment Act
   - Environmental Permitting Regulations (England and Wales), Water Resources Act
   - Euratom Treaty, Ionising Radiations Regulations
   - Radiation (Emergency Preparedness and Public Information) Regulations
   - Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations
   - Control of Major Accident Hazards Regulations
   - Carriage of Dangerous Goods Regulations
   - Environmental Permitting Regulations
   - Nuclear Industries Security Regulations
   - Construction (Design and Manufacture) Regulations
   - ONR Licensing of Nuclear Installations Guidance
   - ONR/Environment Agency Guidance on GDA to Requesting Parties (Vendors)
   - ONR Safety Assessment Principles (SAPs)
   - ONR Technical Assessment Guides (TAGs)
   - Environment Agency Regulatory Environmental Principles (REPs)
   - National Security NORMS Guidance
   - Guidance on International Safeguards and Material Accountancy at UK sites
   - ONR Guidance on Licensing of Nuclear Installations, ONR Guidance on Site Licence Conditions
   - ONR Guidance on applying ALARP (As Low As is Reasonably Practicable)
   - Environment Agency Guidance on applying BAT (Best Available Techniques)
   - Stakeholder consultation, Planning requirements, Funded Decommissioning Plans
   - Liability Insurance Requirements

Key Inputs:	**Key Dependencies:**
WBS 1.1	WBS 3, WBS 7.2.1 - 7.1.2
Assumptions: A28	**Risks:** R11, R32

WBS 2: Understand and Negotiate Business Case

Covers the approach that a prospective SMR developer/operator may be expected to take in constructing a robust business case to justify and underpin the viability of a future development, from conception through to Final Investment Decision.



WBS 2	Understand and Negotiate Business Case	Version: FINAL
Responsible Organisation(s):	**Operator, Vendor, Investor**	
Scope:		
Build a Business Case for the development; considering financing arrangements, market support mechanisms, revenue models, costs factors including economies of multiples, IP and external influences.		
Objectives:		
1. To form a Business Case through the development and use of a financial model to assess the financial viability of the development for a range of scenarios.		
Statement of Work:		
1. Identify, evaluate, structure and select the financing arrangements most readily available and applicable to support the business case – WBS 2.1. 2. Assess the impact of prevailing market support and consider the available revenue models when constructing the business case – WBS 2.2 and WBS 2.3. 3. Identify cost factors associated with the development, operation and decommissioning of the SMR and associated site/operation – WBS 2.4. 4. Consider how external factors, including Government policy, socioeconomics, legal factors such as competition law, insurance underwriter solvency, and structured credit guarantees may affect the overarching business case viability – WBS 2.5. 5. Explore Economies of Multiples and acceleration opportunities that might derive from multiple country deployments of vendor SMR – WBS 2.6. 6. Develop and use the financial model to assess the financial viability of the development for various scenarios – WBS 2.7. 7. Consider Intellectual Property and Technology licensing in the context of the overarching business case for development – WBS 2.8.		
Key Inputs:	**Key Dependencies:** WBS 2.1 – 2.7	
Assumptions: A116	**Risks:** R33, R34, R36, R38	

WBS 2.1	Agree Developer / Operator Financing Arrangements	Version: FINAL

Responsible Organisation(s):	Operator, Vendor, Investor

Scope:

Identify, evaluate, structure and select the financing arrangements most readily available and applicable to support the business case; considering the requirements for early stage financing rounds and working capital through the first five years of development.

Objectives:

1. Describe the reasoning behind the requirement for this component of the business case.
2. Identify the generic steps most likely required to be performed by any future developer/operator in selecting an appropriate financing model and optimal capital structure to:
   a) Fund the project/corporate entity at the early stages of incorporation and development up to FID – circa. T+5 years. (venture/working capital).
   b) To support the long-term business case for development through detail design, construction, commissioning and operation (development/project finance).
3. Identify how the arrangements for the SMR development assumed in this study might differ from or align with those arrangements for conventional GW-scale nuclear programmes.
4. Identify the primary impacts that the final funding arrangements might have on the viability of the overarching business case.

Statement of Work:

1. Understand current funding environment:
   1.1. Available funding models (incl. Government-backed, private financing, or EU central funding routes e.g. EIB, EFSI, as per HPC).
      1.1.1. Discussions with developers and financiers in the Nuclear and Renewables sector.
   1.2. Risk and opportunities of each, and relevance to the SMR programme being considered in our assumptions.
   1.3. Impact of changes to national and global financial governance arrangements (e.g. Basel III, Solvency II) in restricting the availability of finance and insurance.
2. Identify the key factors that influence the selection of a financing model (e.g. investor hurdle rate, debt vs. equity models, investor profiling, creditworthiness etc.).
   2.1. Discussions with developers and financiers in the Nuclear and Renewables sector.
3. Establish the need for funding, and how funding requirements may change over time. Determine what a generic staged funding timeline would look like.
   3.1. Discussions with potential developer/operators to understand RoM requirements for each stage.
   3.2. Look to case studies in the GW Nuclear and Renewable (WtE, Offshore wind) sectors.
   3.3. Determine how the assumed SMR programme would distinguish itself from these case studies in terms of the timing for funding.
   3.4. Liaise with WBS 7.2 to understand the timing for GDA. Determine early-stage funding required to pass through GDA.
   3.5. Liaise with WBS 4.4 to understand the commercial timings for site acquisition. Determine if 'Assigned interest' is sufficient. (Consider deferred purchase)
   3.6. Liaise with WBS 5.3 to understand the timeline for accelerated supply chain selection / mobilisation.
4. Establish what impact the selection of the final funding arrangements would have on a developer/operator business case.

Key Inputs:	Key Dependencies:
WBS 1.1, WBS 1.2, WBS 3.1, WBS 6	WBS 2

Assumptions: A30, A31, A32		**Risks:** R39, R40, R43
WBS 2.2	**Assess Market Support**	**Version: FINAL**
Responsible Organisation(s):	**Operator, Vendor, Investor**	

Scope:

Assess the impact of prevailing market support mechanisms on the business case; considering current mechanisms, such as FiT, CfD, capacity markets, ETS schemes (especially relevant for CHP plants) and other mechanisms, including but not limited to generation tax credits, preferential grid access, curtailment guarantees and ancillary services.

Objectives:

1. Set out the reasoning behind the requirement for this component of the business case.
2. Assess the impact of prevailing market support mechanisms on the business case for development of an SMR programme in relation to:
    a) Electricity supply.
    b) Heat supply.
    c) Carbon markets (and related offset tax relief).
    d) Other non-direct financial support mechanisms (e.g. Generation credits, preferential access).
3. Assess the impact of prevailing ancillary service mechanisms (procured by National Grid to resolve transmission constraints and ensure the security and quality of electricity supply across the Transmission System) on the business case for development of an SMR programme.
4. Consider the broader role of Market Support in underpinning the business case, identifying key risks and sensitivities, related to availability and size of such mechanisms.

Statement of Work:

1. Understand the available UK energy market support mechanisms open to the assumed developer/operator.
    1.1. Discussions with DECC / Review of current literature (EMR etc.).
    1.2. Discussions with regional/local councils on the availability of local supports/subsidies for heat.
2. Understand how a prospective developer/operator may assess the impact of such mechanisms on the overarching business case for development.
    2.1. Review similar risk evaluation / financial impact models from existing developers (e.g. EDF, RWE, Hitachi).
    2.2. Understand how financiers and underwriters perceive the availability and nature of market support mechanisms when evaluating similar business cases.
3. Liaise with WBS 1.1 to understand the potential, and impact of shifts in nuclear related policy.
4. Liaise with WBS 1.2 to understand the potential, and impact of shifts in climate change policy.

Key Inputs: WBS 1.1, WBS 1.2	**Key Dependencies:** WBS 2.3, WBS 2.7
Assumptions: A36, A37, A38	**Risks:** R46, R47, R48

WBS 2.3	Build Revenue Model	Version: FINAL
Responsible Organisation(s):	**Operator, Vendor, Investor**	

Scope:

Consider the available revenue models when constructing the development business case, e.g. PPA's, ETS, Carbon Markets, Yield Co's) as well as exploring the impact of innovative revenue models such as Mankala, Exceltium, and shared-use sites.

Objectives:

1. Describe the reasoning behind the requirement for this component of the business case.
2. Describe the steps that might be taken by the developer/operator in constructing a revenue model for the scenario assumed in this report.
3. Describe the component factors of such a model, and any assumptions that may need to be made in the specific case of SMRs, given that there is no existing plant to be used as a baseline.
4. Describe the impact of the revenue model on the broader business case, identifying key risks, sensitivities and interactions.

Statement of Work:

1. Identify the revenue models most commonly used in similar deployments (UK NNB, early-stage US SMR business cases etc.).
   1.1. Consider revenues from Electricity, Heat, shared-use sites, etc.
2. Identify the most likely revenue model to be adopted in the assumed scenario (daily demand response-shaped electricity generation only for FOAK).
   2.1. Refer to ANT Report. Consider use as a baseline assumption. Other sources to be confirmed.
   2.2. Liaise with WBS 2.2 to ensure consistency with assumptions for market support.
3. Identify the discrete contributing factors that the developer/operator would likely to consider in constructing the revenue model, and the assumptions that may need to be made in the specific case of SMRs, as there is no existing plant to be used as a guide.
   3.1. Define the risks and sensitivities of such assumptions, and the impact on the business case. Investor confidence?
   3.2. Liaise with WBS 2.8 to confirm assumptions for the availability of technology/IP export opportunities, and discuss this factor as a component of the overall revenue model.
4. Identify the availability, and scope for inclusion in the revenue model of Production Tax Credits and Investment Tax Credits.
5. Consider a view for the remainder of WBS 2 on how risk management is addressed in the business case, and how early-stage risk management and mitigation planning (especially in the area of revenue and cost, affects the ability of the developer/operator to secure finance.

Key Inputs:	**Key Dependencies:**
WBS 1.1, WBS 1.2, WBS 2.2, WBS 2.8	WBS 2.7
Assumptions: -	**Risks:** R51, R54

WBS 2.4	Build Whole Life Cost Model	Version: FINAL

Responsible Organisation(s):	Operator, Vendor, Investor

Scope:

Identify primary, secondary and tertiary cost factors associated with the development, operation and decommissioning of the SMR and associated site/operation, and model their effect on the overarching business case.

Objectives:

1. Describe the approach behind the requirement for this component of the business case.
2. Construct a cost model for the scenario assumed in this scope.
3. Document the component factors of such a model, and any assumptions that may need to be made in the specific case of SMRs, given that there is a) no existing plant to be used as a baseline for FOAK CAPEX or OPEX and no existing SMR fleet to provide understanding of economies of multiples on CAPEX and economies of scale on OPEX.
4. Establish the impact of the cost model on the broader business case, identifying key risks, sensitivities and interactions.

Statement of Work:

1. Understand the cost models currently in use.
   - 1.1. GW scale Nuclear, SMR hopefuls (U-Battery, mPower, SMR Start).
   - 1.2. DECC assumptions for LCoE for New Nuclear, IAEA LCoE for the same.
2. Identify the most likely cost model to be adopted in the assumed scenario.
   - 2.1. Refer to ETI's ANT Report and consider the use of this as a baseline assumption. Consider NAMRC as contact point, given their experience in advising SMR developers on cost reduction across learning rates.
3. Identify the discrete factors that the proposed developer/operator would likely to consider in constructing the cost model, and the assumptions that may need to be made in the specific case of SMRs, as there is no existing plant to be used as a guide.
   - 3.1. Assumptions may need to be made in terms of 'lean manning' potential for centralised O&M, learning rates after FOAK etc.
   - 3.2. Define the risks and sensitivities of such assumptions and their impact on the overarching business case.
   - 3.3. Consider options / assumptions on interim storage of spent fuel and ILW pending final disposal - e.g. single stores on each multi-module site, or central stores serving multiple sites.

Key Inputs:	Key Dependencies:
WBS 3, WBS 4, WBS 5, WBS 6, WBS 7, WBS 8	WBS 2.7
Assumptions: -	**Risks:** R55, R60

WBS 2.5	Assess External Factors	Version: FINAL
Responsible Organisation(s):	**Operator / Vendor / Investor**	

Scope:

Consider how external factors, including Government policy, socioeconomics, legal factors such as competition law, insurance underwriter solvency, and structured credit guarantees may affect the overarching business case viability.

Objectives:

1. Describe the reasoning behind the requirement for this component of the business case.
2. Describe some of the primary high-level external factors, including Government policy that the proposed developer/operator may need to consider in constructing the overarching business case for SMR development.
3. Describe the high-level impacts, interactions and sensitivities around these factors, in relation to the overarching business case: e.g. impact on cost model, risk model, or availability of finance.

Statement of Work:

1. Identify the high-level factors likely to be considered as part of the business case.
2. Structure into PESTLE factors (Political, Economic, Social, Technological, Legal and Environmental).
3. Describe how these factors could be quantified and evaluated as part of the business case (Case studies from NNB or WtE/Onshore wind).
4. Identify any external factors that are specific to the SMR deployment model assumed in this study.
5. Define the primary risks, opportunities and sensitivities of any assumptions and their impact on the overarching business case.
6. Identify and discuss the factors associated specifically with the identification and testing of European Treaties and associated legislation pertaining to topics such as IPR (European Atomic Energy Community's Seventh Framework Programme [FP7/2007-2011]), and State Aid (Altmark criteria; Article 107 EU Treaty, EU Utilities Directive 2004).

Key Inputs:	**Key Dependencies:**
WBS 1, WBS 8, WBS 7.3	WBS 2.7, WBS 7.3
Assumptions: -	**Risks:** R46, R47, R64

WBS 2.6	Establish Economies of Multiples	Version: FINAL
Responsible Organisation(s):	**Vendor**	
Scope:		
Explore Economies of Multiples and acceleration opportunities that might derive from multiple country deployments of vendor SMR.		
Objectives:		
1. Establish cost benefit to host nations and vendor of parallel deployment of vendor technology in multiple countries. 2. Establish deployment acceleration opportunities of parallel deployment of vendor technology in multiple countries. 3. If benefits of multiple country deployment set-out proposition to UK Government.		
Statement of Work:		
1. Analyse requirements in each target market to determine if each single market demand, including UK requirement, is sufficient to support the level of investment required to achieve cost economies that may flow from multiple deployment. 2. Determine potential benefits, if any, e.g. cost economies and schedule acceleration, to each target country of proposing co-ordinated multiple market deployment. 3. Understand impact on manufacturing eco-system of co-ordinated multiple market approach from the perspective of each country in terms of local manufacturing content, indigenous capability development and employment.		
Key Inputs:	**Key Dependencies:**	
Assumptions: -	**Risks:** R66	

WBS 2.7	Establish the Financial Viability Using Scenario-based Investment Analysis	Version: FINAL

Responsible Organisation(s):	Operator, Vendor, Investor

Scope:

Use the financial model to assess the financial viability of the development for various scenarios derived from WBS 2.1 to 2.6.

Objectives:

1. Describe the reasoning behind the requirement for this component of the business case.
2. Describe the inputs and outputs of the scenario model.
3. Describe the component factors of such a model, and any assumptions that may need to be made in the specific case of SMRs, given that there is no existing plant to be used as a baseline.
4. Describe the impact of the scenario model on the broader business case, identifying key risks, sensitivities and interactions.

Statement of Work:

1. Review historical scenario modelling exercises from examples of business cases in UK and US NNB for high-level structure and necessary inputs and expected outputs.
2. Identify where the scenario modelling exercise may differ from that of GW-scale nuclear, and consider the impact on the process, if any.
   2.1. Examples of differences could be found in consideration for future district heat supply, 'lean manning', centralised O&M etc.
3. Liaise with WBS 1 to establish the assumptions for changes to Government policy and investment environments.
4. Liaise with WBS 2.1 to establish the assumptions for financial arrangements, costs, revenue models and external factors.
5. Liaise with WBS 4.4 to understand the commercial timings for site acquisition.
6. Liaise with WBS 5.3 to understand the timeline for accelerated supply chain selection / mobilisation.
7. Liaise with WBS 7.2 to understand the timing for GDA.
8. Identify where the scenario model is driven by, impacts, or interacts with other areas of the overarching business case. (especially in cost/revenue models).

Key Inputs:	Key Dependencies:
WBS 1, WBS 2.1 to 2.5, WBS 4.4, WBS 5.3, WBS 7.2	WBS 3.1, WBS 4.4, WBS 6.3
Assumptions: -	**Risks:** R67, R68, R69

WBS 2.8	Plan for Intellectual Property and Technology Licensing	Version: FINAL
Responsible Organisation(s):	**Operator, Vendor, Investor**	

Scope:

Consider Intellectual Property and Technology licensing in the context of the overarching business case for development, including the role of IP and technology licensing opportunities in the ability of the developer/operator to secure financing, and the opportunities created for the vendor in multiple markets.

Objectives:

1. Describe the reasoning behind the requirement for this component of the business case.
2. Describe the considerations that the developer/operator may need to make in assessing the opportunities for IP and technology licensing as part of the overarching business case for development.
3. Describe the impact of IP and technology licensing on the broader business case, identifying key risks, sensitivities and interactions.

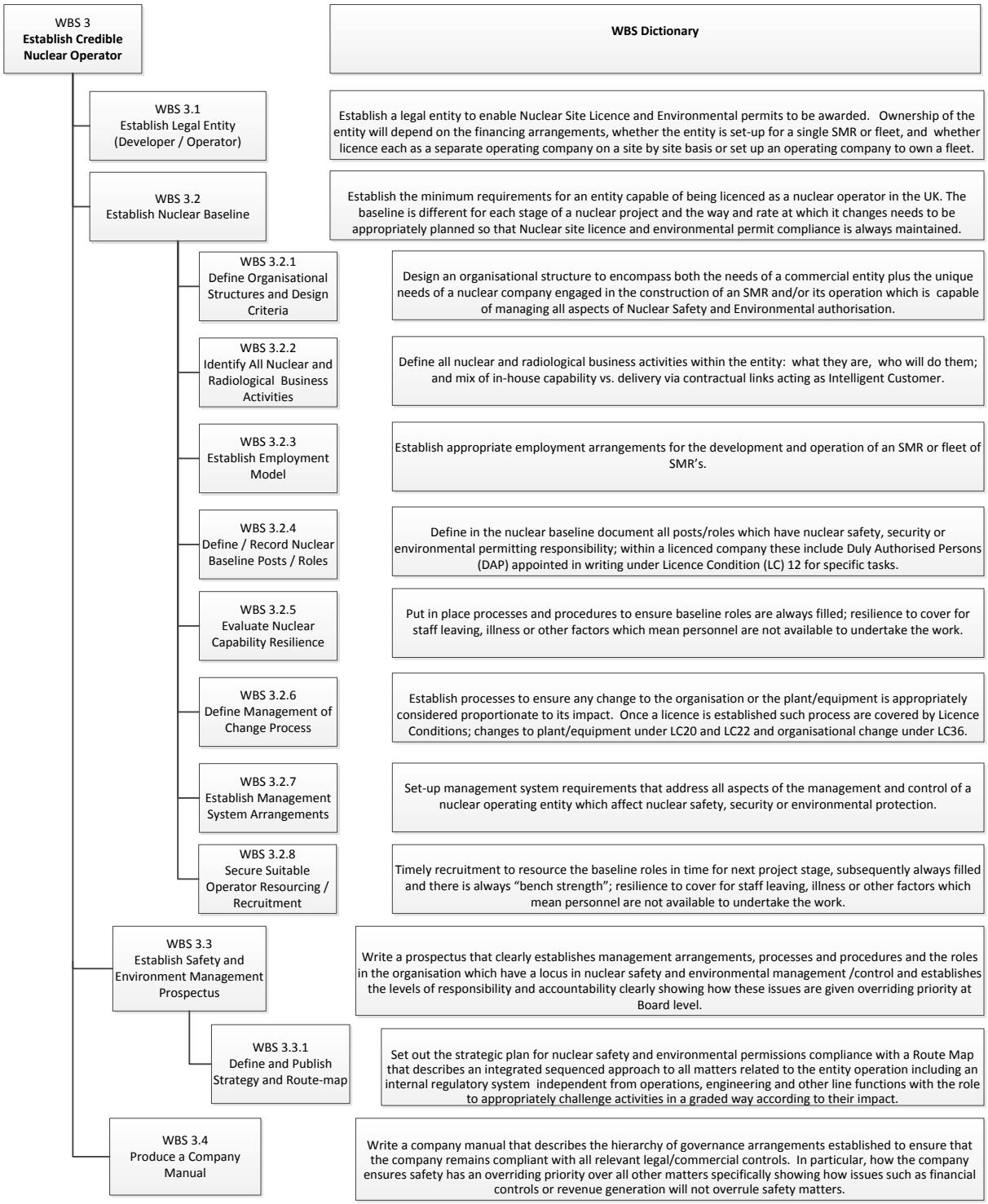
Statement of Work:

1. Identify the primary steps involved in embedding IP considerations into the business case.
   1.1. These considerations may include: catalogue IP/Licensable technology, confirm status and limitations, confirm ownership structure, confirm IP protection strategy, usage restrictions, estimated value etc.
2. Identify the impact that WBS 2.1 – Financing Arrangements, might have on the ability of the developer/operator to leverage IP.
3. Identify the impacts and assumptions from WBS 2.5 – External Factors - that might influence the development of the IP business case (e.g. Legal factors, foreign policy, cross-border trade implications etc.).
4. Identify and discuss the factors associated specifically with the identification and testing of European Treaties and associated legislation pertaining to securing protection of IPR (European Atomic Energy Community's Seventh Framework Programme [FP7/2007-2011]).

Key Inputs:	**Key Dependencies:**
WBS 2.1, WBS 1	WBS 2.3 – 2.8, WBS 5.2 – 5.3, WBS 7.2
Assumptions: -	**Risks:** -

WBS 3: Establish Credible Nuclear Operator

Covers the characteristics, qualities, requirements and culture of an entity which could be licensable under the UK nuclear safety, security and environmental regulations. Considers how these might develop over time recognising how "requirements" will need to adapt as an SMR project progresses from concept through to operation.



WBS 3	Establish Credible Nuclear Operator	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Define the characteristics, qualities, requirements and culture of an entity which could be licensable under the UK nuclear (including security) and environmental regulations. Consider how these might develop over time recognising how "requirements" will need to adapt as an SMR project progresses from concept through to operation.

Objectives:

1. To define the "Must haves" and "Nice to haves" for an organisation/entity which seeks to be a Credible Nuclear Operator in order to be granted a nuclear site licence.
2. To identify the appropriate influencing factors which characterise a "Credible Nuclear Operator".
3. To capture other reasons why to be a Credible Nuclear Operator is significant/essential to successfully taking a nuclear project such as an SMR forward.
4. Identify the range of assumptions which would/may influence a Credible Nuclear Operator e.g.
   4.1. The type of SMR technology selected and its fit previous experience of the proposed Credible Nuclear Operator.
   4.2. The ownership and business structure surrounding the Constructor/operator.
5. Identify the range of risks to project success if Credible Nuclear Operator "status" is not achieved or not achieved in a timely manner.

Statement of Work:

1. Identify limiting factors:
   1.1. Liaise with WBS 6, WBS 7 and WBS 1.1.4 which are precursors to constructing a Credible Nuclear Operator capable of being granted a NSL.
   1.2. Liaise with WBS 2 and WBS 8 regarding the impact of being judged a Credible Nuclear Operator (or not) will have on these issues.
2. Identify externally driven potential events which might impact a "Credible Nuclear Operator":
   2.1. Any nuclear event – i.e. a Fukushima or Chernobyl.
   2.2. Failure, delayed construction or adverse regulatory intervention related to an SMR anywhere in the world; significant if it is the selected technology or less significant if it is an alternative technology.
   2.3. Failure or problems with any nuclear project anywhere in the world.

Key Inputs:	**Key Dependencies:**
WBS 2.2, WBS 2.5, WBS 2.8, WBS 4	WBS 2.7, WBS 3.2, WBS 6.3
Assumptions: A40	**Risks:** R72, R73, R74

WBS 3.1	Establish Legal Entity (Developer / Operator)	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Establish a legal entity (under UK law a Nuclear Site Licence and Environmental permits are awarded to a "body corporate") to enable Nuclear Site Licence and Environmental Permits to be awarded. Ownership of the entity will depend on the financing arrangements whether the entity is set up to develop and construct a single SMR or fleet, and whether licence each as a separate operating company on a site by site basis or set up an operating company to own the fleet.

Objectives:

1. Define the range of potential business models available which would form an acceptable entity to be granted a nuclear site licence.
2. Propose the optimum model for the successful and speedy delivery of an SMR FOAK and subsequent fleet in the UK.
3. Define those characteristics which must reside within the Business (model) to ensure "licensability".
4. Identify the range of assumptions which would/may influence the business model e.g.
   4.1. The potential separation of financial ownership from Licence control (The Controlling Mind issue).
   4.2. That the ownership and business model structure is based on Construct/operate rather than construct and sell the asset immediately.
5. Identify the range of risks to project success if business model is not robust when considered from a licence grant perspective.

Statement of Work:

1. Identify limiting factors:
   1.1. Liaise with WBS 1, WBS 2.1, WBS 2.3, WBS 3 and WBS 6 all of which could influence the organisational model
2. Identify externally driven potential events which might impact the establishment of a legal entity.
   2.1. Another country offers better support for SMR development hence companies do not focus exclusively on the UK or withdraw from the UK to invest elsewhere.
   2.2. Investments in other Energy sources (e.g. Shale Gas exploration) might divert resources.

Key Inputs:	**Key Dependencies:**
WBS 1.1.3, WBS 1.2	WBS 2 in particular WBS 2.7 and WBS 2.2, WBS 3, WBS 5, WBS 6
Assumptions: A40	**Risks:** R72, R73, R74

WBS 3.2	Establish Nuclear Baseline	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Establish the minimum requirements for an entity capable of being licenced as an operator in the UK. The baseline is different for each stage of a nuclear project and the way and rate at which it changes needs to be appropriately planned so that Nuclear site licence and environmental permit compliance is always maintained. The Nuclear baseline does not change after receipt of Licence; changes are then covered under Licence Condition 36.

Objectives:

1. Define the characteristics of the nuclear baseline which will be the basis of the Nuclear Site Licence/Environmental permitting application. The nuclear baseline is the term generally used to cover the minimum requirements for an entity capable of being licenced as an operator in the UK.
2. Define the staged development of the baseline in terms of organisational structure, numbers and roles of staff, and the processes and procedures by which the organisation functions.
3. Define the planned development of the "baseline" beyond Licence Grant recognising that not all 36 licence conditions will come into force immediately e.g. LC 4 and 5 (among others) will not be required from day 1 so a staged approach to consent to particular licence conditions should be proposed along with an indication of what this will mean for the developed "baseline". Typically, these would be denoted as hold points on the master programme which require regulatory consent/approval before progression.
4. Identify the range of assumptions which would/may influence the Nuclear baseline e.g.
    a. The Particular SMR technology selected.
    b. The programme of progression through GDA.
    c. Whether or not the SMR vendor is part of the potential Licensee.
5. Identify the range of risks to project success if the Baseline is not robust when considered from a licence grant perspective.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 2, WBS 2.1, WBS 2.4, WBS 3.2.1 – 3.2.7, WBS 5 and WBS 7 all of which could influence the baseline and its development.
2. Identify externally driven potential events which might impact the establishment of the Nuclear Baseline: Other nuclear projects might engage all suitably qualified and experienced staff (in a market already acknowledged to be short in this area).
3. If member of INPO/WANO use its "Performance Objectives and Criteria for Corporate Reviews" as a reference against which to evaluate aspects of the baseline.

Key Inputs:	Key Dependencies:
WBS 7 in particular WBS 7.2	WBS 2 in particular WBS 2.4, WBS 3 in particular WBS 3.1
Assumptions: A41	**Risks:** R72, R73, R74

WBS 3.2.1	Define Organisational Structure and Design Criteria	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Design an organisational structure to encompass both the needs of a commercial entity plus the unique needs of a nuclear company engaged in the construction of an SMR and/or its operation which is capable of managing all aspects of Nuclear Safety and Environmental authorisation.

Objectives:

1. Establish an organisational structure for the nuclear entity proposing to build and operate SMR's which includes all necessary posts and roles operating within approved arrangements which ensures good business performance is delivered whilst ensuring nuclear safety is the overriding priority and that nuclear site licence and environmental permissioning compliance is maintained. Examples of such unique features of a "nuclear" structure are Nuclear Safety and the Quality function both of which need to have direct access to the Board to emphasize that these can override commercial considerations if necessary. Also such functions as learning from operating experience and nuclear emergency preparedness and nuclear fuel acquisition among others should feature.
2. Establish the key characteristics which underpin the basis of the organisations operation such as (among others): an embedded nuclear safety culture, openness and transparency, a questioning attitude and a "just culture" where genuine errors can be reported as vehicles for learning rather than as issues for blame.
3. Establish a timeline for the development and population of the organisational structure recognising the necessary time taken by recruitment processes, the potential scarce appropriate resource in the established nuclear sector, induction arrangements and training.
4. Identify the range of assumptions which would/may influence the organisational structure: the ownership and financial control of the nuclear entity, whether the organisation is for one SMR or a fleet and whether the entity will be licenced at Corporate level or whether each site will be established as its own limited company and therefore the site licence holder.
5. Identify the range of risks to project success if the organisational structure is not appropriately developed and communicated e.g. (among others): responsibilities and accountabilities are not clearly understood and the decision making process is not followed.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 1, WBS 2, WBS 4, WBS 5, WBS 6, WBS 7 and WBS 8 all of which could influence or be influenced by the Organisational Structure and its development.
2. Identify externally driven potential events which might impact the design of the organisational structure: A lack of understanding within potential partners in the organisation of the UK approach to regulation and a resulting attempt to incorporate arrangements from other jurisdictions. This could be exacerbated if one of the partners is not normally engaged in nuclear issues. (Following good established international practice as per INPO or WANO guidelines should mitigate this).

Key Inputs:	Key Dependencies:
WBS 7, WBS 3.1, WBS 3.2.2 – WBS 3.2.7, WBS 3.3	WBS 2 in particular WBS 2.4, WBS 3, WBS 8
Assumptions: A42, A43	**Risks:** R75, R76

WBS 3.2.2	Identify All Nuclear and Radiological Business Activities	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Define all nuclear and radiological business activities within the entity: what they are, who will do them; and mix of in-house capability vs. delivery via contractual links with the entity acting as Intelligent Customer.

Objectives:

1. To establish the key nuclear and radiological activities to be undertaken by the operator /constructor.
2. With due regard to the organisational structure, to propose which aspect of these activities may be done "in house" and which will be the subject of contractual arrangements. In the former the arrangements to establish the in house capability needs to be identified and in the latter the organisation arrangements to ensure it embraces the "Intelligent Customer" capability need to be established
3. To establish a time line showing how these activities and their respective capabilities change over the construction period leading to operation and ultimately decommissioning.
4. Appropriately defining these nuclear business activities and their timing related to the overall project programme allows the necessary appointments and training provision to be made such that the organisation can be populated with suitably qualified and experienced staff to meet the business need. (This links closely to the Organisational Structure WBS 3.2.1)
5. Identify the range of assumptions which would/may characterise work (activity) as "in house" or appropriate for being done under contract e.g.: a) Day to day plant operation – "in House" and b) Reactor refuelling during an outage – Contractor (probably the original SMR supplier).
6. Identify the range of risks to project success of inappropriate nuclear and radiological business activity definition and allocation: a) Work not being done to time and cost and b) Work not being done to the appropriate quality

Statement of Work:

1. Identify limiting factors: liaise with WBS 4, WBS 5, WBS 7 and WBS 8 all of which could influence or be influenced by Nuclear and radiological activities.
2. Identify externally driven potential events which might impact the nuclear and radiological activities.
   - 2.1. An event such as Fukushima or Chernobyl (or any event with a potential nuclear link) could lead to a change in the normal nuclear and radiological tasks required of a nuclear entity.
   - 2.2. A change in the international approach to radiological monitoring and dose allowances for staff (or the public post an event).

Key Inputs:	Key Dependencies:
WBS 7 in particular WBS 7.2, WBS 3.2.1, WBS 3.2.3 – WBS 3.2.7, WBS 3.3	WBS 5, WBS 4
Assumptions: A45	**Risks:** R77

WBS 3.2.3	Establish Employment Model	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Establish appropriate employment arrangements for the development and operation of an SMR or fleet of SMR's.

Objectives:

1. To establish the optimum employment model for an operator/constructor engaged in an SMR project in the UK recognising it must suit an organisational structure and capability matrix appropriate to a nuclear licenced company.
2. The organisational structure and actual work activities are derived under WBS 3.2.1 and 3.2.2, and within these WBS the ownership arrangements are also aired. Irrespective of the ownership structure which could involve various potential partners in a JV style arrangement the Nuclear Site Licence Company must retain control – defined as the "Controlling Mind". Hence the objective is to adopt an employment model within the defined structure which contains sufficient knowledge, capability and expertise to be considered the Controlling mind.
3. To establish a time line showing how this capability will be acquired (and /or trained) to ensure it exists at the time of critical activities.
4. To establish that the employment model is compatible and consistent with UK IR practices and those arrangements within major suppliers that might be engaged during the plant construction. Noting that operating an SMR is a 24/7 activity so the model will need to include for shift working arrangements with suitable cover capability.

Statement of Work:

1. Identify limiting factors: liaise with WBS 2, WBS 5, WBS 7 and WBS 8 all of which could influence the selected Employment model.
2. Identify externally driven potential events which might impact the selection of an employment model.
   - 2.1. Any change in the UK legislation related to employment law particularly in respect of shift working and pension arrangements.
   - 2.2. The currently utilised models by the large nuclear generators (which are perceived to be generous) could be used as comparison and result in cost increases.

Key Inputs:	**Key Dependencies:**
WBS 2 in particular WBS 2.1 and WBS 2.4, WBS 3.2.1 – 3.2.2, WBS 3.2.4 – WBS 3.2.7, WBS 3.3	WBS 2, WBS 4, WBS 8
Assumptions: A46	**Risks:** R78

WBS 3.2.4	Define / Record Nuclear Baseline Posts / Roles	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Define in the nuclear baseline document all posts/roles which have nuclear safety, security or environmental permitting responsibility; within a licenced company these include Duly Authorised Persons (DAP) appointed in writing under Licence Condition (LC) 12 for specific tasks.

Objectives:

1. Based on the defined organisational structure WBS 3.2.1 identify all posts which have a responsibility related to nuclear safety, security and environmental permitting. These posts must also feature in the nuclear baseline WBS 3.2. Clearly define the post with title, accountability and lines of responsibility (up and down). These are defined as line posts. An example of a post might be the Director of Nuclear Safety which would appear on the staff tree showing the relationship to other posts and to the company board whereas one of the roles which the Director might be appointed to fill could be as "Emergency Controller" within the defined emergency scheme.
2. Identify the roles which must be established on a nuclear site but which do not directly correspond to posts on the structure. Examples would be roles established as part of the emergency arrangements such as Emergency Controller. These roles are often a requirement of the Licence and personnel are appointed in writing in accordance with LC12 and are termed duly authorised persons.
3. To establish a time line showing when these posts and roles need to be formally established within the time frame of the overall project.
4. Define the training needs for both posts and roles.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 2.3, WBS 2.4, WBS 4.2, WBS 5, WBS 7 and WBS 8 all of which could influence nuclear baseline posts and roles.
2. Identify externally driven potential events which might impact the Posts and Roles in the Nuclear Baseline. A perceived need to change the key roles and posts in conventional nuclear companies whether influenced by the Regulators (local or international), a change to the INPO and WANO good practices or other drivers such as nuclear "events".

Key Inputs:	Key Dependencies:
WBS 2, WBS 3.2.1 – 3.2.3, WBS 3.2.5 – WBS 3.2.7 WBS 3.3	WBS 2 in particular WBS 2.4, WBS 7, WBS 8
Assumptions: -	**Risks:** R79

WBS 3.2.5	Evaluate Nuclear Capability Resilience	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Put in place processes and procedures to ensure baseline roles are always filled and there is always "bench strength"; resilience to cover for staff leaving, illness or other factors which mean personnel are not available to undertake the work.

Objectives:

1. Based on the defined organisational structure WBS 3.2.1 and the defined all Nuclear Safety, Security and Environmental Posts and Roles within that structure WBS 3.2.4 identify how the functions of these posts will be maintained at all times appropriate to the phase of the SMR construction and operation.
2. Identify how "cover" for these posts and roles will be achieved both for normal conditions (e.g. 24 hours, 7 days per week operations) and for abnormal conditions which range from illness or other absence of key personnel through to emergency response.
3. Based on the time line objective of WBS 3.2.4 show how functional resilience will be phased to match the overall project programme.
4. Define the additional training needs for particular posts and roles for "cover" purposes.

Statement of Work:

1. Identify limiting factors:
2. Liaise with WBS 2.3, WBS 2.4, WBS 4.2, WBS 5, WBS 7 and WBS 8 all of which could influence Capability resilience.
3. Identify externally driven potential events which might impact nuclear capability resilience.
   3.1. Internationally there is a recognised short fall in the numbers of skilled and experienced staff needed by operators. This will impact any new organisation wishing to establish a resilient baseline and subsequent core of operational expertise. The result could be that higher than expected salary offers or other incentives may be required to attract and retain the necessary staffing levels. (Note the potential impact on the revenue and cost models).

Key Inputs:	Key Dependencies:
WBS 7, WBS 3.2.1 – 3.2.4, WBS 3.2.6 – WBS 3.2.7 WBS 3.3	WBS 2 in particular WBS 2.3 and WBS 2.4 WBS 3.2.1, 3.2.4 and 3.2.3
Assumptions: -	**Risks:** R79

WBS 3.2.6	Define Management of Change Process	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Establish processes, at an early stage in the organisations life, to ensure any change to the organisation or the plant/equipment is appropriately considered proportionate to its impact. Once a licence is established such process are covered by Licence Conditions; changes to plant/equipment under LC20 and LC22 and organisational change under LC36.

Objectives:

1. Clearly define the process or processes for the "management of change" covering all aspects of the organisation, plant and equipment. Of particular importance is a change control system for the plant and equipment being constructed/installed as this will be a main feature of the Pre-Construction Safety Report (PCSR) a document which takes the GDA output through to a site specific proposal and is the baseline for all future safety cases.
2. Show how the processes address and appropriately graded to changes according to their impact on nuclear safety, security and the environment.
3. Illustrate how these processes might "morph" into the post Licence Grant arrangements to satisfy LC 20, LC22 and LC36.
4. As part of the establishment of the Credible Nuclear Operator/constructor organisation show how these processes will be developed and utilised early such that the reasoning behind the organisational structure and arrangements and any changes there to are clearly recorded.
5. Define the training needs to ensure these processes and procedures are understood and embedded within the organisation.
6. Define how the Management of Change processes will be incorporated into any arrangements set up with the supply chain.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 3.1, WBS 3.2, WBS 5, WBS 6 and WBS 7 all of which could influence organisational and deliverable processes.
2. Identify externally driven potential events which might impact the establishment of a Management of Change process.
   2.1. This is an internal matter and there are no real external influences other than it would be good practice to build on the INPO and WANO guidelines.

Key Inputs:	Key Dependencies:
WBS 7, WBS 3.2.1 – 3.2.5, WBS 3.2.7, WBS 3.3	WBS 4, WBS 5, WBS 5.3, WBS 6, WBS 7
Assumptions: A48	**Risks:** R80, R81

WBS 3.2.7	Management System Arrangements	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Set-up management system requirements that address all aspects of the management and control of a nuclear operating entity which affect nuclear safety, security or environmental protection. Although generally illustrated through the processes and procedures they also encompass the culture, ethos and leadership within the organisation which encourages (and in some cases mandates) the use of the processes and procedures.

Objectives:

1. Clearly define the management system arrangements embodying the culture, ethos, corporate governance and leadership within the Credible Nuclear Operator/constructor. Show how these appropriately link the activities of all sections (departments) of the organisation and how productive external links are established and maintained.
2. Show how individual functions within the company such as Quality, HS&E, Licensing, Engineering, Operations, Safety Case Management, Radiological Protection, Project Services, HR, Training and Commercial integrate together with appropriate reporting within the agreed organisational structure.
3. Define the key high level processes and procedures to be established within the entity to ensure its optimum functioning. That is such that each section of the organisation can appropriately discharge its functions and responsibilities as defined under the organisational structure WBS 3.2.1.
4. Identify links to external arrangements particularly showing how relationships with the regulatory organisations are established and function. In this context it would also include the establishment of and links to the Funded Decommissioning Plan arrangements required by the Government.
5. Define the training needs to ensure these processes and procedures are understood and embedded within the organisation.
6. Show how the management system arrangements might change over the project life time reflecting for example initially during early project establishment operations will be a small organisation but this will need to develop to hold a dominant position for plant commissioning and beyond.
7. Establish a robust IT system to manage record keeping and storage. The system must have the necessary longevity to ensure recoverable records are kept for the plant life time (including complete decommissioning) and for potentially 30 years or more beyond that.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 3.1, WBS 3.2, WBS 5, WBS 6 and WBS 7 all of which could influence the Management system and associated processes and procedures.
2. Identify externally driven potential events which might impact the management system development. These are internal matters and apart from following good nuclear industry practices as per INPO and WANO along with any guidance from the Financial sector there are no other significant external issues.

Key Inputs:	Key Dependencies:
WBS 2, WBS 3.2.1 – 3.2.6, WBS 3.3.1, WBS 3.4	WBS 4, WBS 6, WBS 7, WBS 8
Assumptions: -	**Risks:** R82, R83

WBS 3.2.8	Secure suitable Operator Resourcing / Recruitment	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Timely recruitment to resource the baseline roles in time for next project stage, subsequently always filled and there is always "bench strength"; resilience to cover for staff leaving, illness or other factors which mean personnel are not available to undertake the work.		
Objectives:		
1. Secure the resource required to evolve operator/licensee capabilities and capacity by the stage of development of the SMR Programme from design through to operation, alongside the corresponding process of licensing and permitting from pre-application consultation through formal application to grant.		
Statement of Work:		
1. Set out and implement recruitment plan to deliver in appropriate numbers to staff organisational structure timed to match the required growth of organisational capabilities and capacity of a licensee by stage of development of the SMR programme. 2. Set out and implement training plan to develop and deliver resilience in organisational capabilities and capacity of a licensee by stage of development of the SMR programme.		
Key Inputs: WBS 3.2.1, WBS 3.2.4	**Key Dependencies:** WBS 3.2.5	
Assumptions: -	**Risks:** R83	

WBS 3.3	Establish Safety and Environment Management Prospectus	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Write a prospectus that clearly establishes management arrangements, processes and procedures and the roles in the whole organisation which have a locus in nuclear safety and environmental management /control and establishes the levels of responsibility and accountability clearly showing how these issues are given overriding priority at Board level.

Objectives:

1. To define the all the characteristics which need to be the basis of the Operator/constructors approach to nuclear safety and which establishes the ethos ensuring it always has the overriding priority in all decision making processes, the nuclear baseline which will be the basis of the Nuclear Site Licence/Environmental permitting application (note once granted, changes are then covered under LC36).
2. The prospectus promotes such behaviours as adopting a "questioning attitude" at all times and at all levels with all staff questioning or expecting to be questioned in an open and honest way irrespective of grade difference or position in the organisation.
3. To propose the arrangements by which the characteristics referred to in 1 above are introduced, trained, reinforced and established as the "normal way of doing business".
4. To define the arrangements by which this nuclear safety ethos is promulgated and regularly communicated to contractors and sub-contractors throughout the build /construction process. (The ICE Nuclear Lesson Learned project published by RAE illustrated the impact of how this was not successfully achieved at Olkiluoto).
5. Identify the range of assumptions which would/may influence the Safety and Management Prospectus
6. Identify the range of risks to project success if the Safety and Management Prospectus is not appropriately developed and communicated.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 2, WBS 4, WBS 5, WBS 7 and WBS 8 all of which could influence or be influenced by the Safety and Management Prospectus.
2. Identify externally driven potential events which might impact the Safety and Environment Management prospectus. This is a uniquely nuclear sector document required as part of a submission for nuclear licence application. The only external factors which could realistically impact this would be a change of regulatory requirements.

Key Inputs:	**Key Dependencies**:
WBS 7, WBS 3.1, WBS 3.2.1 – WBS 3.2.7	WBS 2 in particular WBS 2.4, WBS 3 in particular WBS 3.1, WBS 8
Assumptions: -	**Risks:** R72, R73, R84

WBS 3.3.1	Define and Publish Strategy and Route-map	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Set out the strategic plan for nuclear safety and environmental permissions compliance with a Route Map that describes an integrated sequenced approach to all matters related to the entity operation including an internal regulatory system independent from operations, engineering and other line functions with the role to appropriately challenge activities in a graded way according to their impact.

Objectives:

1. Identify the key elements of a strategy for the development of a Credible Nuclear Operator/constructor. Specifically show how key organisational attributes such as the intelligent customer capability, the design authority and the controlling mind are established and maintained. The route map will also show how internal functions link to external arrangements particularly showing how relationships with the regulatory organisations are established, function and develop over time. In this context it would also include the establishment of and links to the Funded Decommissioning Programme arrangements required by the Government under the Energy Act 2008.
2. Define a route map showing how key organisational attributes and the populated organisational structure supported by robust management system arrangements come together to deliver the strategic intent of a credible nuclear operator constructor over the first five years of a UK SMR project. A key feature of the route map will be to show the staged development of the safety case initially the production of a PCSR showing how this develops from the GDA output taking into account site specific aspects. This becomes the baseline for the long term plant safety case and the starting point for the periodic safety reviews required by LC 15.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 2, WBS 3.2, WBS 5, WBS 6 and WBS 7 all of which could influence organisational strategy.
2. Identify externally driven potential events which might impact the organisational strategy.
   2.1. This is an internal matter and there are no obvious external influences other than a major shift in UK energy policy.

Key Inputs:	Key Dependencies:
WBS 2, WBS 3.2, WBS 3.2.1 – 3.2.7, WBS 3.3 in particular WBS 3.4	WBS 6, WBS 7
Assumptions: A50	**Risks:** -

WBS 3.4	Produce a Company Manual	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Write a company manual that describes the hierarchy of governance arrangements established to ensure that the company remains compliant with all relevant legal/commercial controls. In particular, how the company ensures safety has an overriding priority over all other matters specifically showing how issues such as financial controls or revenue generation will not overrule safety matters.

Objectives:

1. Identify the key elements which combine to form the content of the Company Manual in particular, the company financial and ownership structure.
2. Define how within the ownership model the company (a Nuclear Site Licence company) conducts business with particular regard to nuclear safety, establishing it as an overriding priority.
3. Illustrate how within the defined financial and ownership structure the company retains the "controlling mind" with respect to all matters related to Nuclear Safety and specifically the Nuclear Site Licence (i.e. that owners with Financial stakes in the organisation cannot for financial or other reasons override decisions taken from a Nuclear Safety perspective.
4. Define the characteristics which should be highlighted within the company manual and which will reinforce the nuclear safety focus; such issues as having a Questioning Attitude among all staff, being a learning organisation and embracing a just culture i.e. genuine errors (i.e. not wilful ones) are blame free and treated as learning opportunities.
5. Illustrate how this ethos will be communicated to and enforced upon, all sub-contractors within the supply chain.
6. Recommend the appropriate Company manual governance arrangements to be set up to monitor and reinforce to the main board that Company processes and procedures are being followed by all such that compliance is not compromised in regulatory areas (Nuclear site licence, environmental permissions, security arrangements and financial / commercial / legal regulation).

Statement of Work:

1. Identify limiting factors: Liaise with WBS 2, WBS 3.2, WBS 5, WBS 6, WBS 7 and WBS 8 all of which could influence the style and content of the Company Manual.
2. Identify externally driven potential events which might impact the establishment of a Company Manual. Although this document is a requirement for licence application it is a standard document for all companies hence guidance from other companies should be followed in constructing this.

Key Inputs:	Key Dependencies:
WBS 2, WBS 3.2.1 – 3.2.7, WBS 3.3 in particular WBS 3.3.1.	WBS 5, WBS 6, WBS 7, WBS 8
Assumptions: -	**Risks:** R85

WBS 4: Select and Acquire Site(s) and Seek Consent for Preliminary Works

Covers the work required to achieve a legally robust designation of potentially acceptable sites for SMR deployment, to develop and submit a competent application for development consent, and to establish necessary commercial terms for deployment together with local planning applications for any necessary advance works.

WBS 4.	Select and Acquire Site(s) and Seek Consent for Preliminary Works	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Identification of suitable SMR sites, ensuring that these are designed as potentially suitable in an updated NPS, establishing commercial terms for access, and securing development consent for the power stations and any necessary preliminary works.

Objectives:

1. To determine the overall scope of the potential operator's intended SMR deployment in the UK.
2. To identify the First of a Kind site and scope of plant within this deployment.
3. To identify the site attributes needed to support SMR deployment – WBS 4.1
4. To screen potential sites against the required attributes, so as to establish a preferred portfolio – WBS 4.2
5. To nominate the portfolio of potentially suitable preferred sites into an updated SSA – WBS 4.3
6. To establish commercial terms for developing the FOAK site – WBS 4.4
7. To develop, submit and support an application for development consent for the FOAK site – WBS 4.5
8. To develop, submit and support any local planning application needed in advance of a DCO for the FOAK site – WBS 4.6

Statement of Work:

1. Overall scope of UK deployment: Drawing on the business case (WBS 2.), scope and schedule the potential operator's intended SMR programme in the UK, including the number of sites, number of reactor units comprised in the plant on each site, strategy for interim storage of higher level wastes (e.g. one ILW/ spent fuel store per site), extent of participation in district heating.
2. Identify initial step / First of a Kind plant: Specify the initial site and plant in the intended programme for the potential operator's First of a Kind development of a specific vendor's design.
3. Identify necessary site attributes – WBS 4.1: Determine the site attributes needed to support development in accord with the potential operator's intended SMR programme, anticipated consenting requirements, and recognised stakeholder issues and concerns (WBS 8.2).
4. Screen potential sites – WBS 4.2: Identify a set of potential sites; screen these against the required site attributes to establish a portfolio of preferred sites.
5. Nominate sites into SSA – WBS 4.3: Undertake investigations and assemble information as required to characterise the preferred sites so as to support and justify their nomination into the updated Strategic Siting Assessment (as well as subsequent regulatory permitting).
6. Establish commercial terms for FOAK site – WBS 4.4: Negotiate exercisable options or other appropriate commercial agreements for supplies for the FOAK site beyond those provided by the technology vendor.
7. Apply for DCO for FOAK site – WBS 4.5: Develop and submit application for development consent as a Nationally Significant Infrastructure Project, including compliance with all procedural requirements – especially pre-application consultation – under the Planning Inspectorate's process.
8. Apply for preliminary works consent for FOAK site – WBS 4.6: Develop and submit applications to local planning authorities for any works required to prepare the FOAK site before DCO grant.

Key Inputs:	**Key Dependencies:**
WBS 1, WBS 2, WBS 8.2	WBS 4.1 – 4.3
Assumptions: A51, A52, A53	**Risks:** -

WBS 4.1	Define Key Aspects of Project Relevant to Site Selection	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Determine the site attributes needed to support development in accord with the potential operator's intended SMR programme, anticipated consenting requirements, and recognised stakeholder issues and concerns.

Objectives:

1. To determine criteria for site selection that reflect the prospective operator's intended SMR programme.
2. To identify criteria for site selection that reflect anticipated consenting requirements.
3. To identify criteria for site selection that reflect valid stakeholder issues and concerns.

Statement of Work:

1. Identify criteria reflecting potential operator's requirements:
   - 1.1. Determine criteria for site selection that reflect requirements inherent in the project scope and the need to make safety and environment cases (WBS 5.1). Includes space for the requisite number of reactor units and interim ILW / spent fuel storage, ground conditions and seismicity; meteorology; access to cooling water, grid capacity and where appropriate district heating capacity.
2. Identify criteria reflecting consenting requirements:
   - 2.1. Review criteria used in initial SSA / NPS and consenting, licensing and permitting of previous nuclear new build projects to derive relevant site selection criteria for SMRs. Includes surrounding demographics, military and other hazardous or sensitive facilities, and environmental designations.
3. Identify criteria reflecting stakeholder concerns:
   - 3.1. Liaise with WBS 8.2 to identify emerging stakeholder issues and concerns; sentence these for validity; derive appropriate criteria for site selection.
4. Feed findings into WBS 4.2.

Key Inputs:	**Key Dependencies:**
WBS 4, WBS 5.1, WBS 8.2	WBS 4.2 – WBS 4.3
Assumptions: A54	**Risks:** R88, R89

WBS 4.2	Characterise Potential Site Against Key Project, Consenting and Stakeholder Requirements	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Identify a set of potential sites; screen these against the required site attributes to establish a portfolio of preferred sites to take forward to SSA.		
Objectives:		
1. To scan England and Wales at high level for candidate SMR sites for consideration. 2. To screen the set of candidate sites against the criteria from WBS 4.1 so as to identify a portfolio of credible potential SMR sites.		
Statement of Work:		
1. High level scanning: 1.1. Identify high level criteria for scanning for potential candidate sites in England and Wales, prioritising where possible sites with a history of nuclear or energy industry employment. 1.2. Apply criteria at desk-study level to identify a shortlist of candidate sites. 2. Screening against project, consenting and stakeholder criteria: 2.1. Drawing on the criteria from WBS 4.1, undertake more detailed site investigation and characterisation to establish consistency with the requirements. 2.2. Select a portfolio of credible potential sites to take forward. 3. Feed findings for portfolio into WBS 4.3 – nominate sites into new Strategic Siting Assessment and WBS 8.4 – local and regional stakeholder engagement. 4. Feed findings for FOAK site into WBS 4.4-4.6		
Key Inputs: WBS 4.1, WBS 7.5, WBS 8.2	**Key Dependencies:** WBS 4.3 – 4.6, WBS 8.4	
Assumptions: A55	**Risks:** R90, R91	

WBS 4.3	Nominate Site into New Strategic Siting Assessment	Version: FINAL
Responsible Organisation(s):	**Potential operator with vendor support**	

Scope:

Assemble information to characterise the preferred sites so as to support and justify their nomination into the updated Strategic Siting Assessment (as well as subsequent regulatory permitting).

Objectives:

1. To assemble information needed to justify the compliance of each preferred site against the exclusionary and discretionary criteria.
2. To deliver nomination of each preferred site into Strategic Siting Assessment with supporting justification.

Statement of Work:

1. Assemble justification against SSA criteria:
   - 1.1. Drawing on information derived in WBS 4.2 and criteria published in WBS 1.1.2, assemble evidence that each preferred site complies with the SSA exclusionary and as many as possible of the discretionary criteria.
   - 1.2. Liaise with WBS 8.1.2 and WBS 8.4 and to ensure that nuclear Regulators and local stakeholders are aware, and as far as possible supportive, of the intent to nominate and the evidence supporting this.
2. Deliver SSA nomination:
   - 2.1. Deliver nomination within specified window, including evidence of compliance with criteria and of a reasonable prospect that, if designated as potentially suitable, that each site will actually be used.

Key Inputs:	**Key Dependencies:**
WBS 4.2, WBS 8.1.2, WBS 8.4	WBS 1.1.3
Assumptions: A56, A57, A58	**Risks:** -

WBS 4.4	Establish Key Commercial Terms for Site Development	Version: FINAL

Responsible Organisation(s):	Operator, Vendor

Scope:

Negotiate exercisable options or other appropriate commercial agreements for supplies for the FOAK site beyond those provided by the technology vendor.

Objectives:

1. To identify and engage with suppliers (other than the SMR vendor).
2. To establish commercial options capable of exercise following the decision to invest in a FOAK plant.

Statement of Work:

1. Identify and engage with suppliers:
   - 1.1. Undertake appropriate pre-qualification and invitation to tender processes to identify and select potential preferred suppliers for the intended SMR programme.
   - 1.2. Engage with preferred suppliers to establish the scope and method of supply, potential schedule and cost of implementing SMR plant on the FOAK site, including provisions for interim storage of spent fuel and ILW.
2. Establish commercial options:
   - 2.1. Negotiate commercial terms for options, especially for long lead time items, capable of being exercised following a final investment decision on the FOAK plant.
3. Feed findings into WBS 2.4

Key Inputs:	**Key Dependencies:**
WBS 4.2, WBS 5.3	WBS 2.4, WBS 4.5, WBS 4.6
Assumptions: A59, A60	**Risks:** R94, R95

WBS 4.5	Develop and Submit DCO Application	Version: FINAL

Responsible Organisation(s):	Operator, Vendor

Scope:

Develop and submit application for development consent as a Nationally Significant Infrastructure Project, including compliance with all procedural requirements – especially pre-application consultation – under the Planning Inspectorate's process.

Objectives:

1. To complete effective pre-application consultation with Regulators and stakeholders on the FOAK plant satisfying Planning Inspectorate's requirements.
2. To prepare and deliver a competent formal application for development consent.
3. To engage with Regulators, stakeholders and Planning Inspectors through the examination phase to secure recommendation to grant with acceptable conditions.

Statement of Work:

1. Complete effective pre-application consultation:
   - 1.1. Engage with nuclear Regulators and local stakeholders, especially local authorities, in accord with expectations and requirements for effective community consultation.
   - 1.2. Establish and communicate detailed plans for the development, including socio-economic as well as technical and regulatory aspects, through one or more stages of formal pre-application consultation and response.
   - 1.3. Adapt the plans where appropriate to mitigate stakeholder concerns and capitalise on opportunities.
2. Deliver a competent application:
   - 2.1. Assemble final plans and proposals and formally submit to Planning Inspectorate alongside the Statement of Community Consultation.
3. Engage to secure consent with acceptable conditions:
   - 3.1. Engage with stakeholders, Regulators and Planning Inspectors through to end of examination phase, responding to representations and seeking to mitigate concerns and agree acceptable conditions on any grant of development consent.

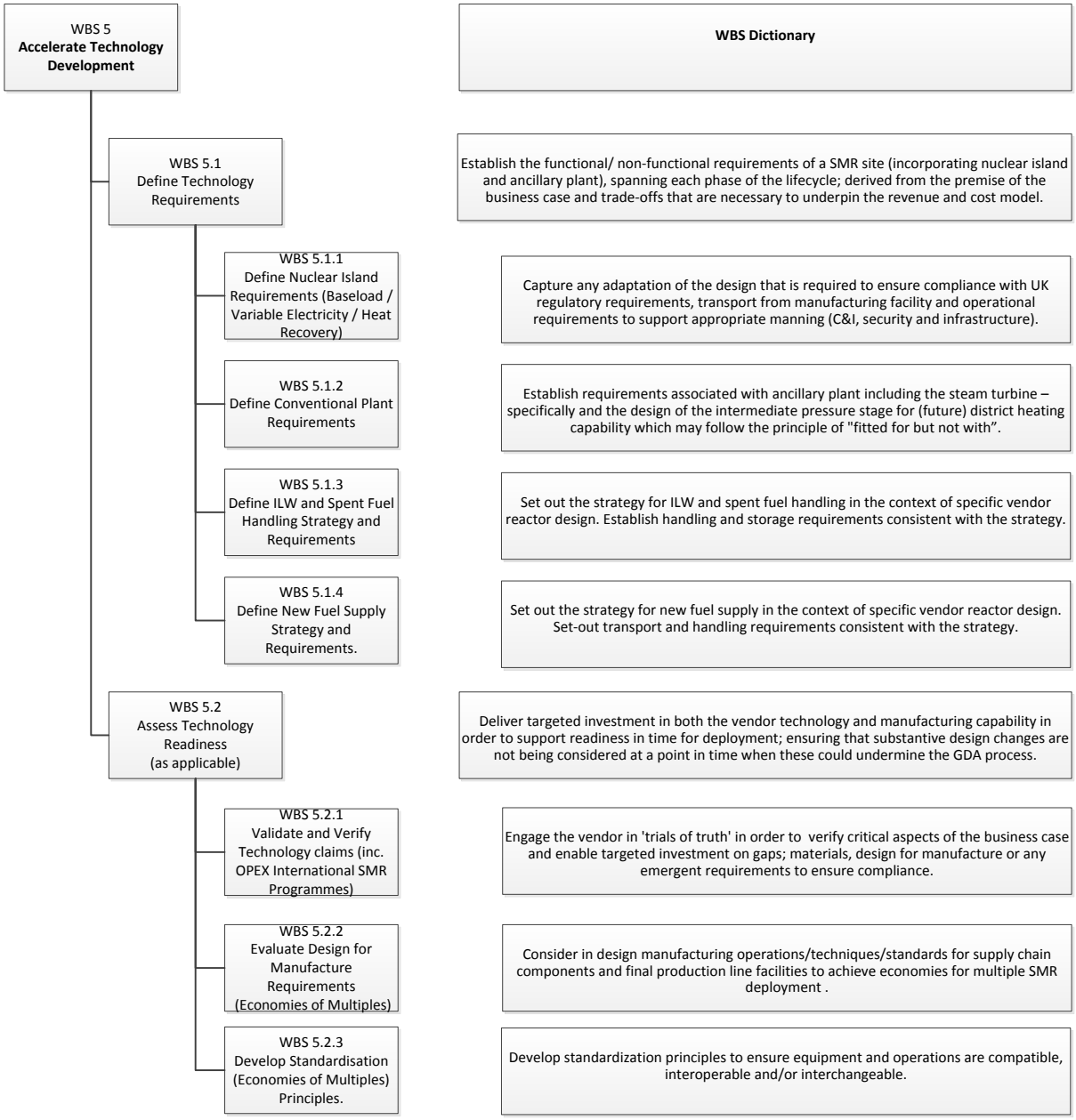
Key Inputs:	**Key Dependencies:**
WBS 1.1.3, WBS 4.2, WBS 7, WBS 8	WBS 2
Assumptions: A61, A62, A63	**Risks:** R96, R97, R98

WBS 4.6	Secure Consents for Any Works Needed in Advance of DCO Grants	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Develop and submit applications to local planning authorities for any works required to prepare the FOAK site before DCO grant; including develop application for relevant works, recognising local stakeholder concerns and including remedial action if DCO is not granted.		
Objectives:		
1. To scope the need for site preparation work in advance of full development consent. 2. To establish the willingness of the local planning authority to consent to such work. 3. To deliver competent applications.		
Statement of Work:		
1. Scope need for pre-DCO work: 1.1. Identify and scope work that is reversible, does not pre-empt grant of full development consent, and would materially enhance the business case. 2. Establish willingness to consent: 2.1. Liaise with WBS 8.1.1 and WBS 8.4 to establish willingness of local planning authority to entertain consenting, and if so on what conditions. 3. Deliver competent applications: 3.1. Assemble plans and formally submit to local planning authority, seeking to agree acceptable conditions on any grant of consent.		
Key Inputs: WBS 2, WBS 4, WBS 4.5, WBS 8.1, WBS 8.4	**Key Dependencies:** WBS 2	
Assumptions: A64	**Risks:** R99, R100, R101	

WBS 4.7	Submit Early Application for Grid Connection	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Submit an application as soon as possible to National Grid Electricity Transmission plc for the purpose of securing an Offer to enter into an agreement for connection to and use of the National Electricity Transmission System.		
Objectives:		
1. Secure connection offer whose implementation is timetabled to support overall Operator schedule for FOAK operation.		
Statement of Work:		
1. Understand the grid readiness implications (siting, connection resource bottlenecks etc.) on the assumed SMR programme keeping Government informed. 2. Make application for transmission connection to the National Electricity Transmission System to National Grid and secure connection offer noting large generators are classified as 100MW or greater in National Grid's transmission network.		
Key Inputs: WBS 7.5	**Key Dependencies:** WBS 1.2.2	
Assumptions: -	**Risks:** -	

WBS 5: Accelerate Technology Development

Covers development of the maturity of a given vendor technology (rather than any process associated with selecting it) and supply chain, in a manner that supports the premise of the business case.



WBS 5	Accelerate Technology Development	Version: FINAL

Responsible Organisation(s):	Vendor, Operator

Scope:

Through targeted investment, develop the existing SMR technology and the associated manufacturing operations to meet the business case requirements of the operator and the compliance requirements of UK Government regulatory bodies.

Objectives:

1. De-risk the programme delivery through identifying the gaps between SMR operating requirements and vendor technology maturity by characterising the design of the plant and engaging with the vendor to gain a robust understanding of the capability and readiness of the technology, the associated manufacturing capability and proposed operating principle.
2. Facilitate progressive technological development by understanding and identifying the business objectives and limitations of the vendor and associated supply chain to ensure collaborative working with achievable goals.
3. Deliver targeted investment in areas identified as potential shortfalls in order to accelerate technology readiness and capability to ensure successful deployment in line with the business plan and GDA process.

Statement of Work:

1. Define Plant Requirements – WBS 5.1
   - 1.1. Characterise the high level plant functional and non-functional requirements based on business case objectives and regulatory guidance.
   - 1.2. Define the functional and non–functional requirements of the key plant areas (nuclear island, conventional plant, refuelling and waste management).
2. Understand Technology Readiness – Technology Maturity, Manufacturing and Operating Principles - WBS 5.2
   - 2.1. Understand the maturity of the vendor technology and the associated supply chain and identify the technology readiness level of key features required to underpin the business case. Ensure that conventional plant capability aligns with the SMR technology readiness level. Ensure that 'design for manufacture' and 'design for operation' objectives are viable and support future activities.
   - 2.2. Identify areas of technical development that are unviable or underdeveloped may threaten the business case or regulatory compliance if not addressed promptly.
3. Identify Areas for Development:
   - 3.1. Engage with the vendor to ensure business plans are aligned. Determine the minimum viable production rate for the vendor over the SMR programme lifetime.
   - 3.2. Identify the gaps between the business plan objectives (vendor and operator), regulatory requirements and technology readiness level to determine areas for targeted investment.
4. Accelerate Technology Readiness:
   - 4.1. Develop a business plan and source finances to justify and deliver investment in the areas required to accelerate the technology readiness level and/or manufacturing processes.
   - 4.2. Using the output of 3.2, liaise with WBS 1.2 and WBS 2 to deliver targeted investment in the vendor technology and manufacturing capability in order to underpin shortfalls in the business case and regulatory requirements.
   - 4.3. Monitor vendor technology development and manufacturing operations to ensure that the investment objectives are achieved and the GDA process is not undermined.

Key Inputs:	**Key Dependencies:**
WBS 1, WBS 2	WBS 9, WBS 6
Assumptions: A67, A68, A69, A70	**Risks:** R102, R103, R104, R105

WBS 5.1	Define Technology Requirements	Version: FINAL
Responsible Organisation(s):	**Vendor, Operator**	

Scope:

Establish the functional/ non-functional requirements of a SMR site (incorporating nuclear island and ancillary plant), spanning each phase of the lifecycle; derived from the premise of the business case and trade-offs that are necessary to underpin the revenue and cost model.

Objectives:

1. Drawing on the business case (WBS 2), characterise the design of the plant and define the key functional and non-functional requirements that are necessary to achieve business plan objectives.
2. Drawing on the Government's preliminary SMR policy work (WBS 1), existing ONR policy and the preliminary SMR permitting requirements (WBS 7) define the key functional and non-functional plant requirements that are necessary to ensure regulatory compliance.

Statement of Work:

1. Characterise the plant design with respect to the business case:
   - 1.1. Liaise with WBS 2 to identify the business case operating principle and generation targets of the plant accounting for both electricity and heat demand profiles over plant life.
   - 1.2. Define the key high-level plant requirements based on the output of 1.1. Ensure each phase of the plant life is accounted for including construction, operation, refuelling, fuel storage and decommissioning.
2. Characterise the plant design with respect to regulatory requirements:
   - 2.1. Liaise with WBS 1 and WBS 7 to identify the plant operating principle with respect to regulatory requirements accounting for construction, operation, refuelling, defueling and decommissioning.
   - 2.2. Define the key high level plant requirements that are necessary to comply with UK regulation ensuring each phase of the plant life is accounted for.
3. Characterise a common plant design and define high level requirements
   - 3.1. Combine the outputs from 1.2 and 2.2 into a collated high level requirements document. Ensure any conflicting requirements are resolved through engaging with WBS 1 and WBS 2.
4. Identify nuclear island requirements - WBS 5.1.1
   - 4.1. Using the output of 3.1 and through further engagement with WBS 2, define the technological requirements of the nuclear island for the complete plant lifecycle.
5. Identify conventional plant requirements – WBS 5.1.2
   - 5.1. Using the output of 3.1 and through further engagement with WBS 2, define the technological requirements of the conventional plant ensuring that the requirement for the use of heat for district heating is well defined as required.
6. Identify ILW and spent fuel handling requirements – WBS 5.1.3
   - 6.1. Using the output of 3.1 and through further engagement with WBS 6, define the waste management requirements including waste processing, local storage, transport and long term storage.
7. Identify refuelling requirements – WBS 5.1.4
   - 7.1. Using the output of 3.1 and through further engagement with WBS 2, define the refuelling requirements including the identification of a strategic fuel manufacturing partner.

Key Inputs:	**Key Dependencies:**
WBS 1, WBS 2, WBS 7, WBS 6	WBS 5, WBS 9

Assumptions: A71		**Risks:** -
WBS 5.1.1	**Define Nuclear Island Requirements (Baseload/Variable Electricity / Heat Recovery)**	**Version: FINAL**
Responsible Organisation(s):	**Vendor, Operator**	

Scope:

Capture any adaptation of the design that is required to ensure compliance with UK regulatory requirements, transport from manufacturing facility and operational requirements to support appropriate manning (C&I, security and infrastructure).

Objectives:

1. Identify the key components, enabling activities and operating regime of the nuclear island.
2. Identify the constituent parts of the plant life cycle phases for each of the key components.
3. Categorise the requirements into manageable groups.
4. Establish the functional and non-functional requirements for the nuclear island plant components for each lifecycle phase based on the output from WBS 5.1 section 3.

Statement of Work:

1. Define the scope of the nuclear island:
   - 1.1. Define the operating regime (baseload power, flex power and heat etc.) of the nuclear island as per WBS 2 and the output of WBS 5.1 section 3. Ensure this aligns with WBS 5.1.2.
   - 1.2. Define the key components of the nuclear island and characterise their function.
2. Identify plant lifecycle phases and define the key activities:
   - 2.1. Develop a nuclear island plant life cycle map based on input from WBS 1, WBS 2 and WBS 4.
   - 2.2. Identify the key activities for each phase of the lifecycle with a view to fulfilling business plan objectives and achieving regulatory compliance.
3. Define the requirements categories:
   - 3.1. Based on the nuclear island operating regime, key components, plant lifecycle and associated activities define the categories which the requirements specification will be developed from. (E.g. transport, control systems, security, etc.). Assign a category to each component of the nuclear island.
4. Define nuclear island requirements:
   - 4.1. Using the output of WBS 5.1 section 3, define the requirements specification for each component and associated activity within the nuclear island to ensure that business plan objectives and regulatory requirements are achievable.
   - 4.2. Feed the requirements specification to WBS 5.

Key Inputs: WBS 1, WBS 2, WBS 4, WBS 5.1	**Key Dependencies:** WBS 5, WBS 9
Assumptions: -	**Risks:** -

WBS 5.1.2	Define Conventional Plant Requirements	Version: FINAL
Responsible Organisation(s):	**Vendor, Operator**	

Scope:

Establish requirements associated with ancillary plant including the steam turbine – specifically and the design of the intermediate pressure stage for (future) district heating capability which may follow the principle of "fitted for but not with".

Objectives:

1. Identify the key components, enabling activities and operating regime of the conventional plant.
2. Identify the constituent parts of the plant life cycle phases for each of the key components.
3. Categorise the requirements into manageable groups.
4. Establish the functional and non-functional requirements for the ancillary plant components for each lifecycle phase based on the output from WBS 5.1 section 3.

Statement of Work:

1. Define the scope of the conventional plant including the steam turbine:
   - 1.1. Define the operating regime (baseload power, flex power and heat etc.) of the conventional plant as per WBS 2 and the output of WBS 5.1 section 3. Ensure this aligns with WBS 5.1.1
   - 1.2. Define the key components of the conventional plant and characterise their function.
2. Identify conventional plant lifecycle phases and define the key activities:
   - 2.1. Develop a conventional plant life cycle map based on input from WBS 1, WBS 2 and WBS 4.
   - 2.2. Identify the key activities for each phase of the lifecycle with a view to fulfilling business plan objectives and achieving regulatory compliance.
3. Define the requirements categories:
   - 3.1. Based on the conventional plant operating regime, key components, plant lifecycle and associated activities define the categories which the requirements specification will be developed from. (E.g. power profile, transport, control systems, security, etc.). Assign a category to each component of the conventional plant.
4. Define conventional plant requirements:
   - 4.1. Using the output of WBS 5.1 section 3, define the requirements for each component and associated activity within the conventional plant to ensure that business plan objectives and regulatory requirements are achievable.
   - 4.2. Feed the requirements specification to WBS 5.

Key Inputs:	**Key Dependencies:**
WBS 1, WBS 2, WBS 4, WBS 5.1	WBS 5, WBS 9
Assumptions: A72, A73	**Risks:** -

WBS 5.1.3	Define ILW and Spent Fuel Handling (Strategy and Requirements)	Version: FINAL
Responsible Organisation(s):	**Vendor, Operator**	

Scope:

Set out the strategy for ILW and spent fuel handling in the context of specific vendor reactor design. Establish handling and storage requirements consistent with the strategy.

Objectives:

1. Identify the key stakeholders involved in the waste management process and develop a working group to facilitate the delivery of a robust waste management strategy.
2. Define the waste management strategy based on business plan objectives, Government policy and regulatory requirements.
3. Identify the scope of the plant's waste management infrastructure.
4. Define the technical requirements of the waste management infrastructure necessary to support the waste management strategy.

Statement of Work:

1. Identify and liaise with key stakeholders:
   - 1.1. Identify the key stakeholders involved in waste classification, waste processing, waste handling, short term waste storage and long term waste storage.
   - 1.2. Develop a working group comprising key stakeholders who will help to form the waste management strategy.
2. Define the waste management strategy:
   - 2.1. Liaise with WBS 2, WBS 4 and WBS 6 to develop a robust waste management strategy (including a decommissioning strategy) based on business plan objectives and regulatory requirements.
3. Identify the scope of the waste management infrastructure:
   - 3.1. Liaise with the vendor to identify key components within the waste management infrastructure.
   - 3.2. Characterise the function of each component within the waste management infrastructure.
4. Define the technical requirements necessary to achieve the strategy:
   - 4.1. Using the waste management strategy as defined in 2, define the technical requirements of the components of the waste management infrastructure.

Key Inputs:	**Key Dependencies:**
WBS 2, WBS 4, WBS 6	WBS 5, WBS 9
Assumptions: -	**Risks:** -

WBS 5.1.4	Define New Fuel Supply (Strategy and Requirements)	Version: FINAL
Responsible Organisation(s):	**Operator, Vendor, Fuel Supplier**	

Scope:

Set out the strategy for new fuel supply in the context of specific vendor reactor design. Set-out transport and handling requirements consistent with the strategy.

Objectives:

1. Identify the key stakeholders involved in the refuelling process and develop a working group to facilitate the delivery of a fuel management strategy.
2. Define the fuel supply strategy based on business plan objectives, Government policy and regulatory requirements.
3. Identify the scope of the plant's fuel transport and handling infrastructure and liaise with WBS 5.1.1 to ensure alignment with nuclear island requirements.
4. Define the technical requirements of the fuel transport and handling infrastructure necessary to support the waste management strategy.

Statement of Work:

1. Identify and liaise with key stakeholders:
   - 1.1. Liaise with WBS 9 to identify the key stakeholders involved in fuel transport, short term fuel storage and fuel handling.
   - 1.2. Develop a working group comprising key stakeholders who will help to form the new fuel supply strategy.

2. Define the new fuel supply strategy:
   - 2.1. Liaise with WBS 2, WBS 4 and WBS 6 to develop a robust fuel management strategy based on business plan objectives and regulatory requirements.

3. Identify the scope of the refuelling infrastructure:
   - 3.1. Liaise with the vendor to identify key components within the refuelling infrastructure.
   - 3.2. Characterise the function of each component within the refuelling infrastructure.

4. Define the technical requirements necessary to achieve the strategy:
   - 4.1. Using the fuel management strategy as defined in 2, define the technical requirements of the components of the refuelling infrastructure.

Key Inputs:	**Key Dependencies:**
WBS 2, WBS 4, WBS 6	WBS 5, WBS 9
Assumptions: -	**Risks:** -

WBS 5.2	Assess Technology Readiness	Version: FINAL
Responsible Organisation(s):	**Vendor, Operator**	

Scope:

Deliver targeted investment in both the vendor technology and manufacturing capability in order to support readiness in time for deployment; ensuring that substantive design changes are not being considered at a point in time when these could undermine the GDA process.

Objectives:

1. Understand the level of maturity of the technology and identify any shortfalls that may undermine the operator's business case, regulatory requirements or delay deployment.
2. Ensure manufacturing operations/plans are viable considering the vendor's business plan, operator's business plan, technological limitations, regulatory requirements and UK supply chain limitations. Identify any shortfalls in the 'design for manufacture' that may undermine the business plan or the GDA process.
3. Ensure that the design will facilitate the desired plant operating principle and to identify any shortfalls in the 'design for operation' that may undermine the business plan and regulatory compliance.
4. Identify areas as potential risks to the business plan or regulatory compliance in order to inform an investment decision to mitigate the risks and accelerate technology readiness, design for manufacture capability and design for operation capability.

Statement of Work:

1. Reactor technology – WBS 5.2.1
   - 1.1. Conduct a performance assessment and technology readiness level assessment of the vendor technology and compare against the output of WBS 5.1
   - 1.2. Engage the vendor in verification and validation of critical areas of the business case.
   - 1.3. Identify gaps between the operator's plant requirements and business case and the vendor's technology readiness.
2. Design for manufacture – WBS 5.2.2
   - 2.1. Identify and understand the vendor's manufacturing plan including plant location, supply chain logistics, production line facilities, transport arrangements, manufacturing techniques and standards and economies of scale.
   - 2.2. Identify gaps in the plan against business plan objectives and develop options to address any shortfalls.
3. Design for operation – WBS 5.2.3
   - 3.1. Develop standardisation principles to ensure that the vendor's equipment and operator's plant operations plan are compatible.
   - 3.2. Identify any shortfalls in the standardisation requirements which may undermine the business case or regulatory compliance.
4. Investment areas:
   - 4.1. Using the outputs of WBS 5.2.1, WBS 5.2.2, WBS 5.2.3, identify the areas which currently pose a risk to the viability of the business plan and regulatory compliance which would benefit from targeted investment.
   - 4.2. Report findings to WBS 5.

Key Inputs:	**Key Dependencies:**
WBS 2, WBS 5.1, WBS 9	WBS 5
Assumptions: -	**Risks:** -

WBS 5.2.1	Validate and Verify Technology Claims (Inc. OPEX International SMR Programmes)	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Engage the vendor in verification and validation of claims to satisfy the business case and regulatory compliance. Identify any gaps in the technology which may undermine these claims.

Objectives:

1. Engage with the vendor to conduct a technology capability assessment and technology readiness level assessment to verify overall system performance claims are valid and will be delivered on time. Liaise with conventional plant vendor.

2. Identify the critical areas of the business case and conduct in-depth validation and verification of the performance claims.

3. Review international OPEX to compare findings in order to identify fundamental design limitations or vendor specific design limitations.

4. Identify gaps in the development of the technology that may undermine the business case or regulatory compliance.

Statement of Work:

1. Technology assessment:
   - 1.1. Using a suitable model, define a strategy for engaging the vendor in a technology assessment process using the business case in WBS 2 and requirements from WBS 5.1.1 as a benchmark.
   - 1.2. Conduct the technology assessment of the entire system, taking in to account technology maturity, novelty level and ability to meet business case and regulatory requirements.
   - 1.3. Engage with THE conventional plant supplier to ensure technology developments are aligned.
2. Verification and validation:
   - 2.1. Liaise with WBS 2 and WBS 5.1.1 to define the critical areas of the business case where a more in-depth trial is required to verify the technology claims.
   - 2.2. Define the strategy for engaging the vendor in in depth technological trials.
   - 2.3. Conduct the trials and collate data and evidence to support business case requirements as defined in WBS 5.1.1
3. OPEX review:
   - 3.1. Gather data, research or experience from other vendors/operators on international SMR programmes on the equivalent assessment parameters to facilitate a verification exercise.
   - 3.2. Review the findings of 1.2 and 2.3 and compare against the findings in 3.1 to determine if the results are acceptable or anomalous.
   - 3.3. Repeat the technology assessment for aspects which have been found to be anomalous.
4. Gap analysis:
   - 4.1. Compare the results of the technology assessment to the requirements of the business case and the requirements as defined in WBS 5.1.1
   - 4.2. Identify the gaps between the requirements of the business case and 5.1.1 and the outcome of the technology assessment and verification/validation.
   - 4.3. Report findings to WBS 5.2

Key Inputs:	Key Dependencies:
WBS 2, WBS 5.1.1	WBS 5.2
Assumptions: A74	**Risks:** R107

WBS 5.2.2	Evaluate Design for Manufacture Requirements (Economies of Multiples)	Version: FINAL

Responsible Organisation(s):	Vendor

Scope:

Evaluate the manufacturing requirements and review the current manufacturing strategy (including techniques, standards and production line facilities) that will be developed to achieve economies of scale for multiple SMR deployment.

Objectives:

1. Develop an optimised manufacturing strategy model based on WBS 4.2 - site selection, WBS 9 - supply chain development and WBS 2 - business case requirements.
2. Review the existing vendor manufacturing strategy and evaluate vendor's business case to determine minimum viable production requirements over the plant lifecycle.
3. Identify the gaps between the operator model and the vendor's strategy and iterate the model collaboratively to achieve common objectives to ensure suitable economies of scale are realised.
4. Identify areas where further development and investment is required to meet objectives and feed this into WBS 5.2

Statement of Work:

1. Develop the manufacturing strategy model:
   - 1.1. Liaise with WBS 9 to identify the key stakeholders involved in the manufacturing process including manufacturers, suppliers, financiers and Regulators.
   - 1.2. Liaise with WBS2, WBS 4.2 and WBS 5.1 to identify the parameters required to develop an ideal manufacturing strategy model based on business plan objectives, nuclear island plant requirements and regulatory compliance.
   - 1.3. Determine the model output variables that will influence decisions and develop the model over the entire plant lifecycle accounting for, amongst others, supply chain requirements, infrastructure and transport limitations, manufacturing techniques, raw material availability, skill and workforce availability and production line location.
2. Review vendor manufacturing plan:
   - 2.1. Engage with the vendor and review their existing manufacturing strategy and supply chain and identify critical business case requirements that influence the viability of their investment in the manufacturing process. Understand the minimum viable SMR production rate profile that is required to ensure investment viability.
   - 2.2. Review existing manufacturing arrangements against the design to determine 'design for manufacture' feasibility.
   - 2.3. Review the how manufacturing strategy for the nuclear island links to the manufacturing strategy for the conventional plant.
3. Gap analysis:
   - 3.1. Compare the vendors' manufacturing strategy and supply chain limitations with the 'ideal manufacturing model' and identify the limitations and gaps between the two.
   - 3.2. Develop the model iteratively to meet common objectives. Identify areas where there are potential shortfalls.
4. Development areas:
   - 4.1. Based on the output of 3.2 identify the areas where additional investment is required to accelerate the manufacturing capability in order to meet the required economies of scale objectives and reduce risk.
   - 4.2. Provide feedback to WBS 5.2.

Key Inputs:	Key Dependencies:
WBS 2, WBS 4.2, WBS 5.1, WBS 9	WBS 5.2, WBS 9

Assumptions: A76	**Risks:** -

WBS 5.2.3	Develop Standardisation (Economies of Multiples)	Version: FINAL

Responsible Organisation(s):	Vendor

Scope:

Develop standardization principles to ensure equipment and operations are compatible, interoperable and/or interchangeable.

Objectives:

1. Define the areas of the plant which are to be standardised through a categorisation process.
2. Determine the operations and equipment that require standardisation through liaising with the wider supply chain.
3. Determine the associated processes and interactions required to facilitate standardisation.
4. Identify plant design features or processes that require modification to enable standardisation between operator, vendor and the wider supply chain.

Statement of Work:

1. Categorisation:
   - 1.1. Break down the SMR operation into defined categorises (e.g. reactor, pressure vessel, fuel, primary circuit, people,).
   - 1.2. Break down the conventional plant operation into defined categories (e.g. steam turbine, safety systems, and control systems).

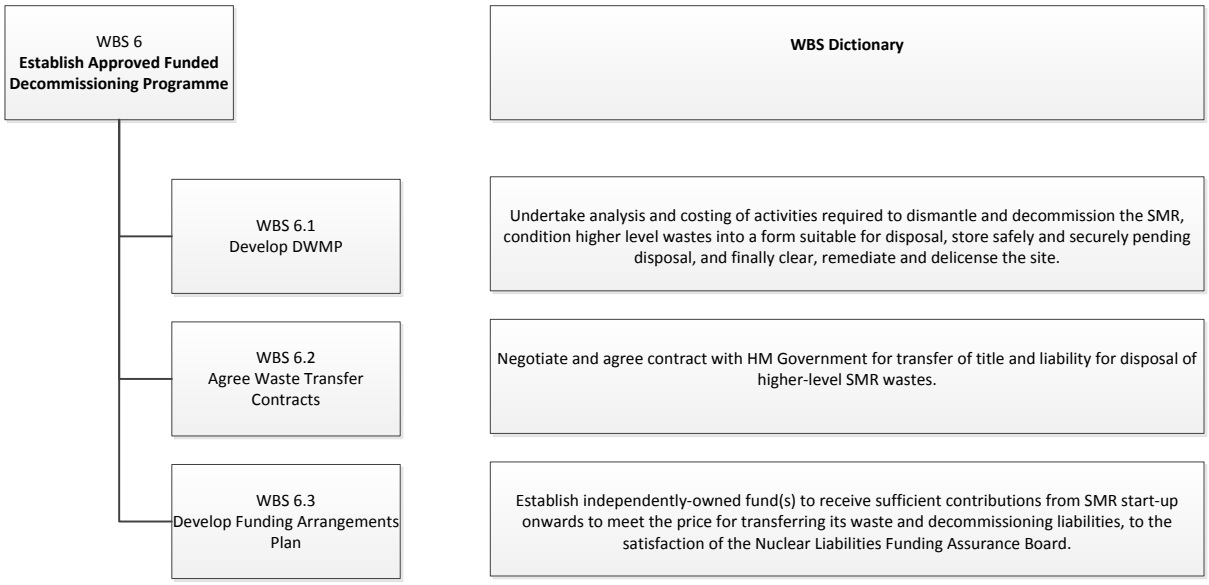
2. Determine areas to be standardised:
   - 2.1. Determine which areas of the nuclear island require standardisation between the operator, SMR vendor conventional plant supplier and wider supply chain.
   - 2.2. Determine the standardisation requirements for conventional plant areas as per the categories defined in 1.

3. Identity potential shortfalls:
   - 3.1. Identify the shortfalls of the proposed strategy and determine which areas require modification to ensure standardisation principles are achieved between the supply chain.
   - 3.2. Provide feedback to WBS 5.2.

Key Inputs:	Key Dependencies:
WBS 2, WBS 5, WBS 9	WBS 5.2, WBS 9
Assumptions: -	**Risks:** -

WBS 6: Establish Approved Funded Decommissioning Programme

Covers establishment and Secretary of State approval of the Decommissioning and Waste Management Plan and Funding Arrangements Plan, together with agreement on associated Waste Transfer Contracts – the essential components necessary to transfer nuclear liabilities away from the operator at the end of operating lifetime at a known price.



WBS 6	Establish Approved Funded Decommissioning Programme	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Covers the establishment and Secretary of State approval of the Decommissioning and Waste Management Plan and the Funding Arrangements Plan together with the agreement on associated Waste Transfer Contracts – the essential components necessary to transfer liabilities away from the operator at the end of the operating life time at a known price.

Objectives:

1. The Credible Nuclear Operator / Constructor to Establish a Standalone Independent Funded Decommissioning "company".
2. The Funded Decommissioning Company then to:
    a. Establish that the decommissioning and waste management arrangements for the selected SMR are technically robust.
    b. Develop and gain approval of a Funded Decommissioning programme as required by the Energy Act 2008.
    c. Establish that the Decommissioning and Waste Management Plan of the operator is practical and in place.
    d. Develop the Funding Arrangements Plan.
    e. Identify the necessary transfer of liabilities arrangements and contracts.
3. The Credible Nuclear operator /constructor to develop interim waste facilities (including the funding arrangements) linked to the FDP.
4. Develop a timeline for the above noting that the FDP approval is required before start of SMR construction works on site.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 1.1 and 1.2 WBS 2, WBS 3, WBS 4, WBS 5, WBS 7 and WBS 8 all of which could influence the Funded Decommissioning Programme.
2. Identify externally driven potential events which might impact the Funded Decommissioning Programme.
    2.1. The arrangements for the funded decommissioning programme are established by the Energy Act 2008 any change in this brought about by the UK Government would be an external influence.
    2.2. The other nuclear new build organisations in the UK have already established or are establishing arrangements in this area and have therefore set precedence.

Key Inputs:	Key Dependencies:
WBS 2, WBS 3.2.1 – 3.2.7, WBS 3.3 in particular WBS 3.3.1	WBS 4, WBS 5, WBS 6, WBS 7, WBS 8
Assumptions: A77	**Risks:** R108, R109, R110

WBS 6.1	Develop Decommissioning Waste Management Plan (DWMP)	Version: FINAL

Responsible Organisation(s):	Operator

Scope:

Undertake analysis and costing of activities required to dismantle and decommission the SMR, condition higher level wastes into a form suitable for disposal, store safely and securely pending disposal, and finally clear, remediate and delicense the site.

Objectives:

1. The Credible Nuclear Operator / Constructor in liaison with the Funded Decommissioning Company to Establish a DWMP.
2. Establish that the Decommissioning and Waste Management Plan is practical and links to the arrangements required under LC 35, LC 32, LC33 and LC34.
3. Secure agreement on Waste Transfer Contracts.
4. Develop proposals for interim waste facilities (including the funding arrangements).
5. Develop a timeline for the above noting that the FDP approval is required before start of SMR construction works on site.

Statement of Work:

1. Identify limiting factors: Liaise with WBS 1.1 and 1.2 WBS 2, WBS 3, WBS 4, WBS 5, WBS 7 and WBS 8 all of which could influence the DWMP.
2. Identify externally driven potential events which might impact the establishment of a DWMP:
   - 2.1. The Lack of a GDF in a timely manner could adversely impact the contracts for transfer of liabilities similarly for the transport of waste materials.
   - 2.2. The inability to engage suitably qualified and experienced staff (not available as they are already contracted to the established nuclear “players”.
   - 2.3. The impact of long term storage of waste materials on the SMR site could be challenged by local stakeholders.
   - 2.4. The Government might change the arrangements for the establishment of an FDP which might adversely impact the setting up of arrangements for a DWMP.

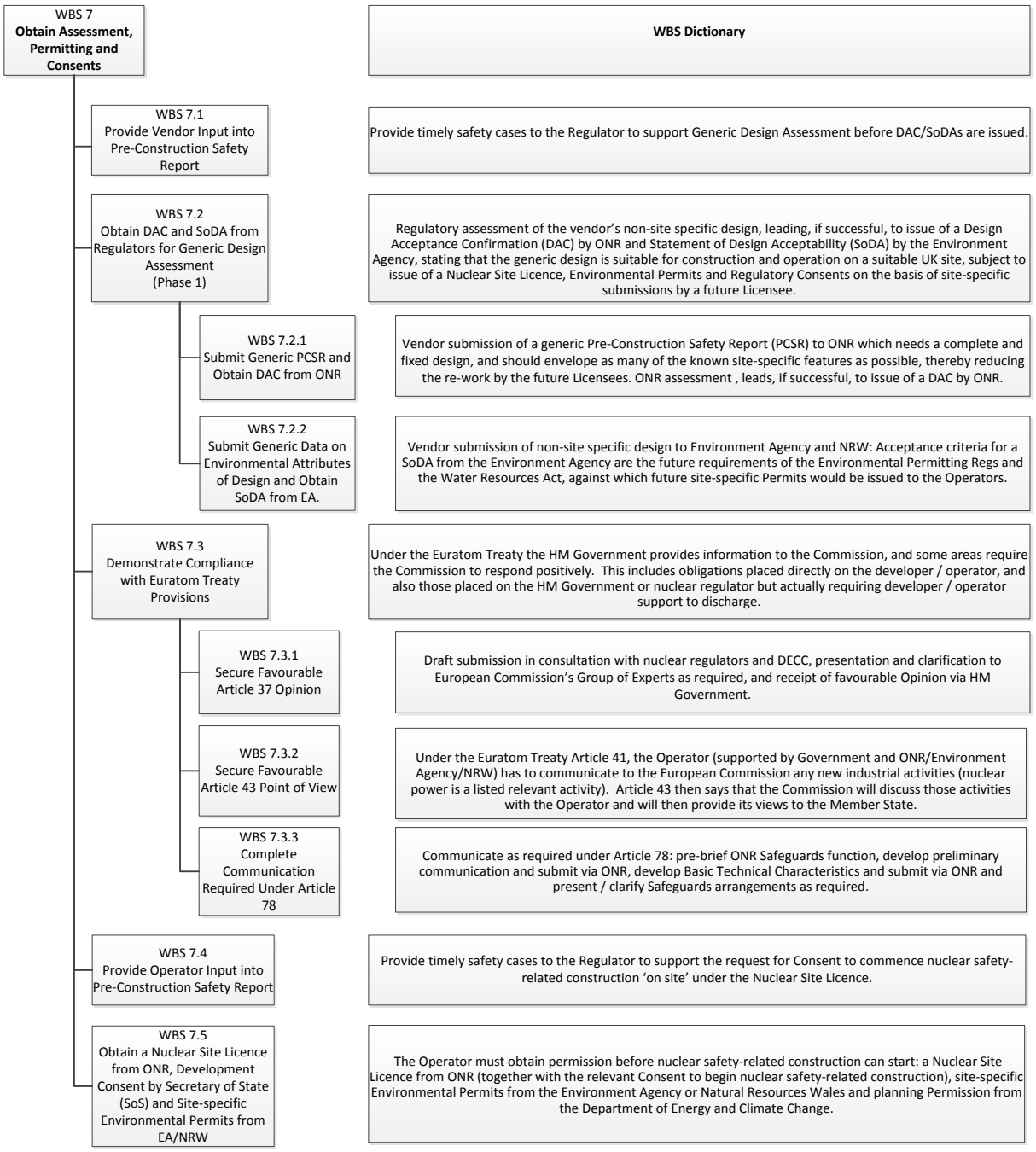
Key Inputs:	Key Dependencies:
WBS 2, WBS 3.2.1 – 3.2.7, WBS 3.3 in particular WBS 3.3.1	WBS 4, WBS 5, WBS 6, WBS 7, WBS 8
Assumptions: A78, A79	**Risks:** -

WBS 6.2	Agree Waste Transfer Contracts	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Negotiate and agree contract with HM Government for transfer of title and liability for disposal of higher-level SMR wastes.		
Objectives:		
1. The Credible Nuclear Operator / Constructor to negotiate with HMG to establish the transfer of title and liability for disposal of higher – level nuclear wastes from the proposed SMR site or sites. 2. Develop a timeline for the above noting that the FDP approval is required before start of SMR construction works on site.		
Statement of Work:		
1. Identify limiting factors: Liaise with WBS 1.1, WBS 1.2, WBS 2, WBS 3, WBS 4, WBS 5, WBS 7 and WBS 8 all of which could influence the Waste Transfer Contracts. 2. Identify externally driven potential events which might impact the Waste Transfer contracts: 2.1. The Lack of a GDF in a timely manner could adversely impact the contracts for transfer of liabilities similarly for the transport of waste materials. 2.2. The constraints and legislation around the transport of nuclear wastes and their acceptable type approved packages might change (particularly to align with international requirements). 2.3. The inability to engage suitably qualified and experienced staff (not available as they are already contracted to the established nuclear "players". 2.4. The impact of long term storage of waste materials on the SMR site could be challenged by local stakeholders. 2.5. The Government might change the arrangements for the establishment of an FDP which might adversely impact the setting up of arrangements for a DWMP.		
Key Inputs: WBS 2, WBS 3.2.1 – 3.2.7, WBS 3.3 in particular WBS 3.3.1	**Key Dependencies:** WBS 4, WBS 5, WBS 6, WBS 7, WBS 8	
Assumptions: A80	**Risks:** R111, R112	

WBS 6.3	Develop Funding Arrangements Plan	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Establish independently-owned fund(s) to receive sufficient contributions from SMR start-up onwards to meet the price for transferring its waste and decommissioning liabilities, to the satisfaction of the Nuclear Liabilities Funding Assurance Board.		
Objectives:		
1. The Independent Funded decommissioning company in conjunction with the Credible Nuclear Operator / Constructor to establish the arrangement for the independent fund(s) and their management including the estimates of regular contribution from the funds following SMR start up. 2. Develop to the satisfaction of the NLFAB a management structure, systems and procedures with the appropriate governance arrangements for managing the Funding plan.		
Statement of Work:		
1. Identify limiting factors: Liaise with WBS 1.1 and 1.2 WBS 2, WBS 3, WBS 4, WBS 5, WBS 7 and WBS 8 all of which could influence the Funding plan. 2. Identify externally driven potential events which might impact the Funding plan: 2.1. If the fund (s) structure, the Funding company personnel and the associate governance arrangements are inadequate the NLFAB might not agree its suitability. This would delay the start of construction for the SMR. 2.2. The Government might change the arrangements for the establishment of an FDP which might adversely impact the setting up of arrangements for a Funding plan.		
Key Inputs: WBS 2, WBS 3.2.1 – 3.2.7, WBS 3.3 in particular WBS 3.3.1	**Key Dependencies:** WBS 4, WBS 5, WBS 6, WBS 7, WBS 8	
Assumptions: A81, A82, A83	**Risks:** R111, R112	

WBS 7: Obtain Assessment, permitting and consents

Covers securing Design Acceptance Confirmation, Statement of Design Acceptability and compliance with Euratom Treaty provisions, then a Nuclear Site Licence, environmental permits and development consent for the FOAK site.



WBS 7	Obtain Assessment, Permitting and Consent	Version: FINAL
Responsible Organisation(s):	**Vendor, Regulators**	
Scope:		
Securing Design Acceptance Confirmation, Statement of Design Acceptability and compliance with Euratom Treaty provisions, then a Nuclear Site Licence, environmental permits and development consent for the FOAK site.		
Objectives:		
To obtain the necessary Assessment, Permitting and Consent documentation to allow the SMR project to move forward.		
Statement of Work:		
1. Provide Vendor Input to Pre-Construction Safety Report This involves provision of timely safety cases to the Regulator to support Generic Design Assessment before DAC/SoDAs are issued (WBS7.1) 2. Regulatory assessment of the design vendor's developing Pre-Construction Safety Report (PCSR) and supporting documents, with the desired output (for the SMR vendor) being two Certificates (a Design Acceptance Certificate (DAC) from ONR and a Statement of Design Acceptability (SoDA) from the Environment Agency. (WBS 7.2) 3. Demonstrate Compliance with Euratom Treaty Provisions. Under the Euratom Treaty the Operator and Government (supported by each other and ONR) has to provide a number of submissions to the Commission, and some require the Commission to respond positively with a 'decision', which can take between 6-12 months). (WNS 7.3) 4. Obtain a Nuclear Site Licence from ONR, Development Consent by Secretary of State (SoS) and Site-specific Environmental Permits from EA/NRW. This will include submission, to the Regulators, of site-specific documentation/requests, including the site-specific PCSR and Environmental Permitting Applications, requesting a Nuclear Site Licence and Environmental Permits relating specifically to the Operator's site. (WBS 7.5) 5. Provide Operator Input to Pre-Construction Safety Report. This involves provision of timely safety cases to the Regulator to support the request for Consent to commence nuclear safety-related construction 'on site' under the Nuclear Site Licence. (WBS 7.4)		
Key Inputs: WBS 3.2.6	**Key Dependencies:** WBS 7.2	
Assumptions: -	**Risks:** R118	

WBS 7.1	Provide Vendor Input to Pre-Construction Safety Report	Version: FINAL
Responsible Organisation(s):	**Vendor**	
Scope:		
Provide timely safety cases to the Regulator to support Generic Design Assessment before DAC/SoDAs are issued		
Objectives:		
The key output derived from the Pre-Construction Safety Report is confidence that the generic SMR plant design will meet with regulatory expectations and will not require modification by the future operator before requesting Regulatory Consent for nuclear safety-related construction.		
Statement of Work:		
1. Develop and submit safety cases during the GDA process: 1.1. Preliminary Safety Report (PSR), or the information that would traditionally be included in a PSR, submitted to Regulator during early steps of GDA, to support a broad case that the safety objectives and criteria associated with design can most likely be achieved. Regulator will undertake review of claims. 1.2. Pre-Construction Safety Report; submitted to Regulator during Steps 3 and 4 of GDA to 'demonstrate' the detailed SMR design 'will' meet the safety objectives and that risks are ALARP, and will be a design that the future operator will be able to 'operate' without significant modifications. The Regulator will undertake review of the claims, arguments, and, importantly, the evidence provided to back up those claims and arguments, during Steps 3 and 4 of GDA, and will reflect on the evidence to support the arguments in Step 4. 1.3. Finalised the generic Pre-Construction Safety Report during GDA Step 4, such that the Regulator can refer to it in its conclusions to Step 4 and in the Design Acceptance Confirmation (DAC).		
Key Inputs: WBS 3.2.6	**Key Dependencies:** WBS 7.2	
Assumptions: -	**Risks:** -	

WBS 7.2	Obtain DAC and SoDA from Regulators for Generic Design Assessment (Phase 1)	Version: FINAL
Responsible Organisation(s):	**Vendor, Regulators**	

Scope:

Regulatory assessment of the design vendor's developing Pre-Construction Safety Report (PCSR) and supporting documents, with the desired output (for the SMR vendor) being two Certificates (a Design Acceptance Certificate (DAC) from ONR and a Statement of Design Acceptability (SoDA) from the Environment Agency.

Objectives:

1. To achieve receipt (by the vendor) of both a DAC and SoDA stating that the generic design is suitable for construction and operation on a suitable GB site, subject to issue of a Nuclear Site Licence, Environmental Permits and Regulatory Consents on the basis of site-specific submissions by a future Licensee.
2. Vendor to work with the operator (Licensee) throughout the GDA process in an open and transparent way in order to achieve an effective and efficient knowledge transfer during that GDA process such that the Licensee can produce a site-specific PCSR that meets with regulatory expectations without significant re-work.
3. To achieve open and transparent regulatory engagement, step-wise improved clarity of regulatory requirements, potential for reduced site-specific work by future Licensee (because the generic design has been assessed by Regulators), improved public/stakeholder engagement and confidence, and the potential for global harmonisation of standards.

Statement of Work:

1. Preparation of a Generic (non-site-specific) PCSR and supporting documents (by the vendor):
   - 1.1. Documentation to cover pre-identified safety, security and environmental technical areas (ref ONR/Environment Agency GDA Guidance) and likely to involve 2500-3500 increasingly detailed documents over a 4/5-year period (ref ONR/Environment Agency EPR/AP1000 GDA Step 4 reports). Cost likely to be in the region of £100m. Liaise with WBS 1.3 regarding establishing an informed vendor, and WBS 3.2 to ensure effective and efficient knowledge transfer to future Licensee.
2. Vendor publication (on website) of details of the SMR Design and Safety Case:
   - 2.1. Publication of Design and Safety Case (without compromising commercial ity or security issues), and linking to Regulator and Government websites. Vendor's website to include comments and engagement arrangements, so liaise with most aspects of WBS 8 as the future Licensee develops.
3. Regulatory Assessment by ONR and Environment Agency, and publication of assessment findings and interim issues:
   - 3.1. Regulatory assessment, over 4/5 years, of vendor's generic PCSR. Cost (recovered from vendor) likely to be in the region of £25m-£30m (ref ONR/Environment Agency EPR/AP1000 GDA Step 4 reports), although ANT Report suggests £45.3m-£81.9m.
   - 3.2. Publication of regulatory assessment findings and issues during the GDA process, together with close scrutiny by the media and anti-nuclear lobby (in particular), so liaise with most aspects of WBS 8 as the future Licensee develops.
   - 3.3. International liaison and collaboration by Regulators and industry (vendors and potential operators) to ensure commonality and harmonisation of design and operability outputs, together with the application of best international standards during the design and Regulatory assessment process. ANT report suggests standardising Regulatory processes, which is not possible, although harmonisation of regulatory outputs is possible, and was a positive factor in the EPR/AP1000 GDA process (ref ONR/Environment Agency EPR/AP1000 GDA Step 4 reports).
4. Quarterly publication of developing findings, issues, progress and projections by ONR and Environment Agency:

4.1. Public Quarterly Progress Reports published by ONR/Environment Agency, showing positive and negative progress, with 'traffic light' summary, forward projections, and cost profiles. Significant media attention can be expected. 5. Publication by ONR and Environment Agency of Reports at the end of each of the 4 stages of GDA, including that supporting the DAC and SoDA at the end of the GDA process. Vendor/Operator might wish to explore with the Regulators whether the Regulator would consider issuing interim DAC and SoDA in order to add to public and stakeholder confidence in the GDA process (need to balance the delays to the overall timescales to DAC and SoDA against the added confidence of the interim statements). 6. Preparation, Publication and Promotion of the DAC and SoDA supplied to SMR Vendor.	
Key Inputs: WBS 1.1.4 – 1.1.5, WBS 2.1	**Key Dependencies:** WBS 1.3, WBS, WBS 5.2
Assumptions: A84	**Risks:** R113, R114, R115, R117

WBS 7.2.1	Submit Generic PCSR and Obtain DAC from ONR	Version: FINAL

Responsible Organisation(s):	Vendor, Regulator

Scope:

ONR regulatory assessment of the design vendor's developing Pre-Construction Safety Report (PCSR) and supporting documents, with the desired output (for the SMR vendor) of a Design Acceptance Certificate (DAC) from ONR.

Objectives:

1. To achieve receipt (by the vendor) of a DAC stating that the generic design is suitable for construction and operation on a suitable GB site, subject to issue of a Nuclear Site Licence, on the basis of site-specific submissions by a future Licensee.
2. Vendor to work with the operator (Licensee) throughout the GDA process in an open and transparent way in order to achieve an effective and efficient knowledge transfer during that GDA process such that the Licensee can produce a site-specific PCSR that meets with regulatory expectations without significant re-work.
3. To achieve open and transparent regulatory engagement, step-wise improved clarity of regulatory requirements, potential for reduced site-specific work by future Licensee (because the generic design has been assessed by Regulators), improved public/stakeholder engagement and confidence, and the potential for global harmonisation of standards.

Statement of Work:

1. Educate the vendor and operator (Licensee) in GB law, GB nuclear regulation, and ONR's 'ways of regulating':
   1.1. As they are likely to be non-GB-based, liaise with WBS 1.3 to ensure that vendor and Licensee understands how things work in GB.

2. Preparation of a Generic (non-site-specific) PCSR and supporting documents (by the vendor), regulatory assessment by ONR (liaising with the Environment Agency (WBS 7.2.2)), and publication of assessment findings, interim issues, and ultimately a DAC:
   2.1. Documentation to cover pre-identified safety and security technical areas (ref ONR/Environment Agency GDA Guidance) and likely to involve increasingly detailed documents over a 4-year period (ref ONR/Environment Agency EPR/AP1000 GDA Step 4 reports). Liaise with WBS 1.3 regarding establishing an informed vendor, and WBS 3.2 to ensure effective and efficient knowledge transfer to future Licensee. Full cost recovery by ONR – paid for by vendor.
   2.2. ONR's GDA process includes a process to seek and respond to public comments (ref ONR/Environment Agency GDA).
   2.3. Acceptance criteria for a DAC from ONR are the published Safety Assessment Principles and Technical Assessment Guides, the Security Regulations and the Safeguards requirements, which are consistent with IAEA Safety Requirements and Guidance. The vendor's generic PCSR needs a complete and fixed design, and should envelope as many of the known site-specific features as possible, thereby reducing the re-work by the future Licensees. The purpose of a PCSR is to demonstrate (by claims, arguments and evidence) that:
   - the detailed design proposal will meet the safety objectives and that risks are ALARP,
   - the facility is capable of being operated within safe limits,
   - sufficient analysis has been performed to prove that the facility will be safe,
   - that construction and installation will result in a facility of appropriate quality, and
   - the feasibility of decommissioning.

3. The DAC is only valid for 10 years, and only for GB sites.

Key Inputs:	Key Dependencies:
WBS 1.1.4, WBS 1.1.5, WBS 2.1	WBS 1.3, WBS 3, WBS 5, WBS 7.2.2, WBS 7.3.3

Assumptions: -	**Risks:** R119, R120, R121

WBS 7.2.2	Submit Generic Data on Environmental Attributes of Design and Obtain SoDA from EA	Version: FINAL

Responsible Organisation(s):	SMR Vendor, Environment Agency and National Resources Wales (NRW)

Scope:

Environment Agency/NRW regulatory assessment of the design vendor's developing Safety Reports and supporting documents, working closely with the Office for Nuclear Regulation (ONR), with the desired output (for the SMR vendor) of a Statement of Design Acceptability (SoDA) from the Environment Agency and/or National Resources Wales.

Objectives:

1. To achieve receipt (by the vendor) of a SoDA stating that the Environment Agency/NRW is satisfied that the vendor has demonstrated the acceptability for environmental permitting of the SMR on the generic site.
2. Vendor to work with the operator throughout the GDA process in an open and transparent way in order to achieve an effective and efficient knowledge transfer during that GDA process such that the operator can produce site-specific permit requests that meets with regulatory expectations without significant re-work.
3. To achieve open and transparent regulatory engagement, step-wise improved clarity of regulatory requirements, potential for reduced site-specific work by the operator (because the generic design has been assessed by Regulators), improved public/stakeholder engagement and confidence, and the potential for global harmonisation of standards.

Statement of Work:

1. Educate the vendor and operator in UK law, UK nuclear and environmental regulation and permitting, and the environmental Regulators' 'ways of regulating':
   1.1. As they are likely to be non-UK-based, liaise with WBS 1.3 to ensure that vendor and operator understands how things work in UK.

2. Preparation of a Generic (non-site-specific) Safety Reports and supporting documents relating to environmental permitting (by the vendor), regulatory assessment by the Environment Agency/NRW (liaising with ONR (liaison with WBS 7.2.1)), and publication of assessment findings, interim issues, and ultimately a SoDA:
   2.1. Documentation to cover pre-identified safety and environmental technical areas and likely to involve increasingly detailed documents over a 4-year period. Liaise with WBS 1.3 regarding establishing an informed vendor, and WBS 3.2 to ensure effective and efficient knowledge transfer to the operator. Full cost recovery by the Environment Agency/NRW – paid for by vendor.
   2.2. The Environment Agency and NRW work to GB Government laws, and to their published Guidance and Requirements - vendors and the operators need to understand them. Acceptance criteria for a SoDA from the Environment Agency/NRW are the Radioactive Substances Regulation Environmental Principles, together with the Environmental Permitting Regulations, the Environmental Protection Act, the Water Resources Act, the Water and Waste Framework Directives, and the COMAH Regulations, against most of which future site-specific Permits would be issued to the Operators. The Environment Agency/NRW processes include a formal Public Consultation on their preliminary view following detailed assessment, and particularly on the:
      - disposal of radioactive waste (gaseous, aqueous and solid),
      - discharge of non-radioactive substances to water,
      - operation of conventional plant (for example, combustion plant used as auxiliary boilers),
      - disposal or recovery of non-radioactive waste,
      - abstraction of water from inland waters or groundwater,
      - acceptability of the design with respect to the environmental requirements of the COMAH regulations.
   2.3. The SoDA is only valid for 10 years, and only for sites in England and Wales.

Key Inputs:	Key Dependencies:
WBS 1.1.4 - 1.1.5, WBS 2.1	WBS 1.3, WBS 3, WBS 7.2.1, WBS 7.3.1

Assumptions: A88, A90	**Risks:** R121, R122

WBS 7.3	Demonstrate Compliance with Euratom Treaty Provisions	Version: FINAL
Responsible Organisation(s):	**Operator, Government, Regulator**	

Scope:

Under the Euratom Treaty the Operator and Government (supported by each other and ONR) has to provide a number of submissions to the Commission, and some require the Commission to respond positively with a 'decision', which can take between 6-12 months).

Objectives:

1. To receive positive opinions/decisions from the European Commission on the provisions of Euratom Articles.
2. In particular, Article 37, which requires providing the Commission with data on plans to dispose of radioactive waste and what effect that might have on other Member States. The Commission has 6 months to deliver its opinion.
3. Also, Article 41, which requires the Operator to communicate to the Commission any new industrial activities (nuclear power is a listed relevant activity). Article 43 of the Euratom Treaty states that the Commission will discuss all aspects of the investment with the operator. The Commission provides its Point of View to the Member State, i.e. the UK Government.
4. Also, Articles 77–85 cover safeguards arrangements, and the need for the Commission to satisfy itself that ores, source materials and special fissile materials are not diverted from their intended uses as declared by the users.

Statement of Work:

1. Preparation (by the Operator) of dossiers covering the relevant Euratom Articles (see WBS 7.3.1, 7.2.2 and 7.2.3), and submission and presentation to the Commission.
2. Operator to ensure support from UK Government and ONR for their submissions. UK Government to seek support from across relevant EU countries, and to explore the possibility of collaborative submissions from several EU countries.
3. ONR assistance and support is particularly necessary for Articles 77-85 (link to WBS 7.3.3 - safeguards).
4. Operator to ensure that the Commission has responded positively to all Articles where such a positive response is essential.

Key Inputs:	**Key Dependencies:**
WBS 1.1	WBS 3
Assumptions: -	**Risks:** R123, R124

WBS 7.3.1	Secure Favourable Article 37 Opinion	Version: FINAL
Responsible Organisation(s):	**Operator, Government, Regulators**	
Scope:		
Draft and provide the European Commission under the Euratom Treaty, supported by nuclear Regulators and DECC, with data on plans to dispose of radioactive waste, and what affect that might have on other Member States. The Commission has 6 months to deliver its opinion.		
Objectives:		
1. To receive positive and timely opinion from the European Commission on the provision of Euratom Article 37 information.		
Statement of Work:		
1. Preparation (by the Operator) of dossier covering Euratom Article 37 requirements, and submission and presentation to the Commission and its Group of Experts: 1.1. Operator to ensure that it supports and 'owns' the information received from the vendor. 1.2. Operator to seek support from ONR and Environment Agency/NRW for the information on radioactive waste management included within the dossier, together with the claims and arguments as to the extent of cross-border effects from accident scenarios. 1.3. Operator to seek Government support for the dossier. **2.** Operator/Government to answer any queries from the Commission (or from Member States). **3.** Operator/Government to receive positive opinion from the European Commission.		
Key Inputs: WBS 1.1	**Key Dependencies:** WBS 1.3, WBS 3, WBS 7.2.1, WBS 7.2.2, WBS 7.5	
Assumptions: A93	**Risks:** -	

WBS 7.3.2	Secure Favourable Article 43 Point of View	Version: FINAL
Responsible Organisation(s):	**Operator, Government, Regulators**	

Scope:

Under the Euratom Treaty Article 41, the Operator (supported by Government and ONR/Environment Agency/NRW) has to communicate to the European Commission any new industrial activities (nuclear power is a listed relevant activity). Article 43 then says that the Commission will discuss all aspects of those activities with the Operator and will then provide its views to the UK Government.

Objectives:

1. To receive positive and timely point of view from the European Commission on the provision of Euratom Article 41 information

Statement of Work:

1. Preparation (by the Operator) of dossier covering Euratom Article 41 requirements, and submission (and presentation, if requested) to the Commission, not later than three months before the first contracts are concluded with the suppliers or, if the work is to be carried out by the operator with its own resources, three months before the work begins:
   1.1. Operator to ensure that it supports and 'owns' the information received from the vendor.
   1.2. Operator to seek support from ONR and Environment Agency/NRW for the information being submitted.
   1.3. Operator to seek Government support for the dossier.
2. Operator to answer any questions from the Commission on relevance of project to Euratom Treaty objectives.
3. Government to receive positive point of view from the European Commission.

Key Inputs:	**Key Dependencies:**
WBS 1.1	WBS 1.3, WBS 3, WBS 7.2.1 - 7.1.2
Assumptions: -	**Risks:** -

WBS 7.3.3	Compliance with Euratom Treaty Provisions – Articles 77-85 (Safeguards)	Version: FINAL

Responsible Organisation(s):	Operator, Government, Regulator

Scope:

Operator (supported by Government and ONR) to provide to the European Commission information on its activities relating to ensuring that ores, source materials and special fissile materials are not diverted from their intended uses, together with specific technical information on the SMR and its support fuel and waste facilities, before construction commences. Arrangements must also be developed to keep operating and transfer/transport information, to install monitoring facilities, and to provide access to European Commission Inspectors and representatives from the International Atomic Energy Agency (IAEA) for invasive and unfettered verification checks

Objectives:

1. To receive positive confirmation from the Euratom Safeguard Inspectorate and the European Commission that they are satisfied that the Operator has:
   - submitted all that is expected by the Inspectorate and Commission, as required by Articles 78-79
   - arrangements in hand to implement defined and agreed nuclear material accountancy and safeguards arrangements in a timely manner, including a process and timeline for specifying and installing Euratom surveillance and sealing equipment, and a means of transmitting data from the equipment to Luxembourg
   - arrangements in place to allow unfettered access to Euratom Inspectors (from the European Commission) at any time. Representatives from IAEA may also accompany the Euratom Inspectors, as will ONR's Safeguards Inspectors.
2. The process of agreeing the above could take several years, so should be started early in the process.

Statement of Work:

1. Preparation (by the Operator) of dossier covering Euratom Articles 77-85, and submission and presentation to the Commission at least 200 days before either construction commences or nuclear material (fuel) is due to be received (see below).
   The European Commission (Euratom) 302/2005 reporting requirements include the following:
   - for new installations with an inventory or annual throughput of nuclear material of more than one effective kilogram, all relevant information relating to the owner, operator, purpose, location, type, capacity and expected commissioning date shall be communicated to the Commission at least 200 days before construction begins
   - the declaration of the basic technical characteristics of new installations shall be communicated to the Commission in accordance with Article 3(1) at least 200 days before the first consignment of nuclear material is due to be received
2. Operator to ensure support from UK Government and ONR for its submission. In particular, ONR Safeguards Inspectors to work in conjunction with the Operator, Euratom Safeguards Inspectorate and IAEA, to ensure that the Operator understands the Euratom Requirements and is ahead of the required timescales for submitting the required information and for ensuring and maintaining compliance.
3. Operator to ensure that the Commission has responded positively to all Articles where such a positive response is essential.

Key Inputs:	Key Dependencies:

WBS 1.1	WBS 3
Assumptions: -	**Risks:** -

WBS 7.4	Provide Operator Input to Pre-Construction Safety Report	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Provide timely safety cases to the Regulator to support the request for Consent to commence nuclear safety-related construction 'on site' under the Nuclear Site Licence.		
Objectives:		
The key output derived from the site-specific Pre-Construction Safety Report is the confidence that the generic SMR plant design, accepted by the Regulators in their DAC/SoDA, has been 'carried forward' into the site-specific Pre-Construction Safety Report with minimal, or justified changes, and will not require significant modification either during or after construction.		
Statement of Work:		
1. Develop and submit safety cases as part of the Licensing process: 1.1. Site-specific Pre-Construction Safety Report, submitted to Regulator as part of the demonstration that the Operator (now a Licensee as a result of being granted a Nuclear Site Licence by the ONR Regulator), has examined and justified the design, and is ready to commence nuclear safety-related construction on a design that is 'complete', with risks demonstrated to be ALARP.		
Key Inputs: WBS 3.2.6	**Key Dependencies:** WBS 7.2	
Assumptions: -	**Risks:** -	

WBS 7.5	Obtain a Nuclear Site Licence from ONR, Development Consent by Secretary of State (SoS) and Site-specific Environmental Permits from EA/NRW	Version: FINAL

Responsible Organisation(s):	Operator, Regulators

Scope:

Submission, to the Regulators, of site-specific documentation/requests, including the site-specific PCSR and Environmental Permitting Applications, requesting a Nuclear Site Licence and Environmental Permits relating specifically to the Operator's site.

Objectives:

1. To receive from ONR a Nuclear Site Licence (and thereby the projected route to future Consent to commence nuclear safety-related construction at the site), agreement to the site-specific PCSR, and positive responses to Environmental Permitting Applications:
   1.1. Before nuclear safety-related construction can start, in addition to the reactor design satisfying the GDA process (receiving both a DAC and SoDA), the Operator must obtain permission from Regulators and Government by:
   - a Nuclear Site Licence from ONR, together with the relevant Consent to begin nuclear safety-related construction,
   - site-specific Environmental Permits from the Environment Agency or Natural Resources Wales,
   - Planning Permission from the Department of Energy and Climate Change.
   - Approval, by Government, of the rules relating to the operator's contribution to the Funded Decommissioning Plan for the site.

   1.2. The Nuclear Site Licence will only be issued after, as a minimum, the ONR is satisfied that:
   - the site satisfies the Governments siting criteria,
   - the site-specific PCSR from the Operator, demonstrates that the generic safety case, as listed in WBS 7.2.1, has been carried through into the operator's safety case,
   - the site-specific security and safeguard requirements are satisfactory,
   - a Safety Management Prospectus and a Company Manual satisfies ONR that the company can safely build and operate the reactor, and provides the guarantees (to Government) as to compliance with international treaty financial liability requirements,
   - all 36 Nuclear Site Licence Requirements have appropriately detailed Compliance Arrangements in place to match the status of the company at that time.
   - sufficient confidence has been provided that it is likely that the Operator and Local Authority can provide appropriate Emergency Arrangements to ensure the safety of the public and protection of the environment.
   - the Environment Agency/NRW has no objections to ONR providing the operator with a Nuclear Site Licence.
2. Operator expectation of carrying through to Licensing and Permitting a 'successful' GDA in that the Operator will adopt the GDA design into the site-specific Licensing documents and the Regulator will then, on an 'area by area' basis, commit to NOT re-assess what has been assessed in GDA unless substantial differences are introduced by the operators.

Statement of Work:

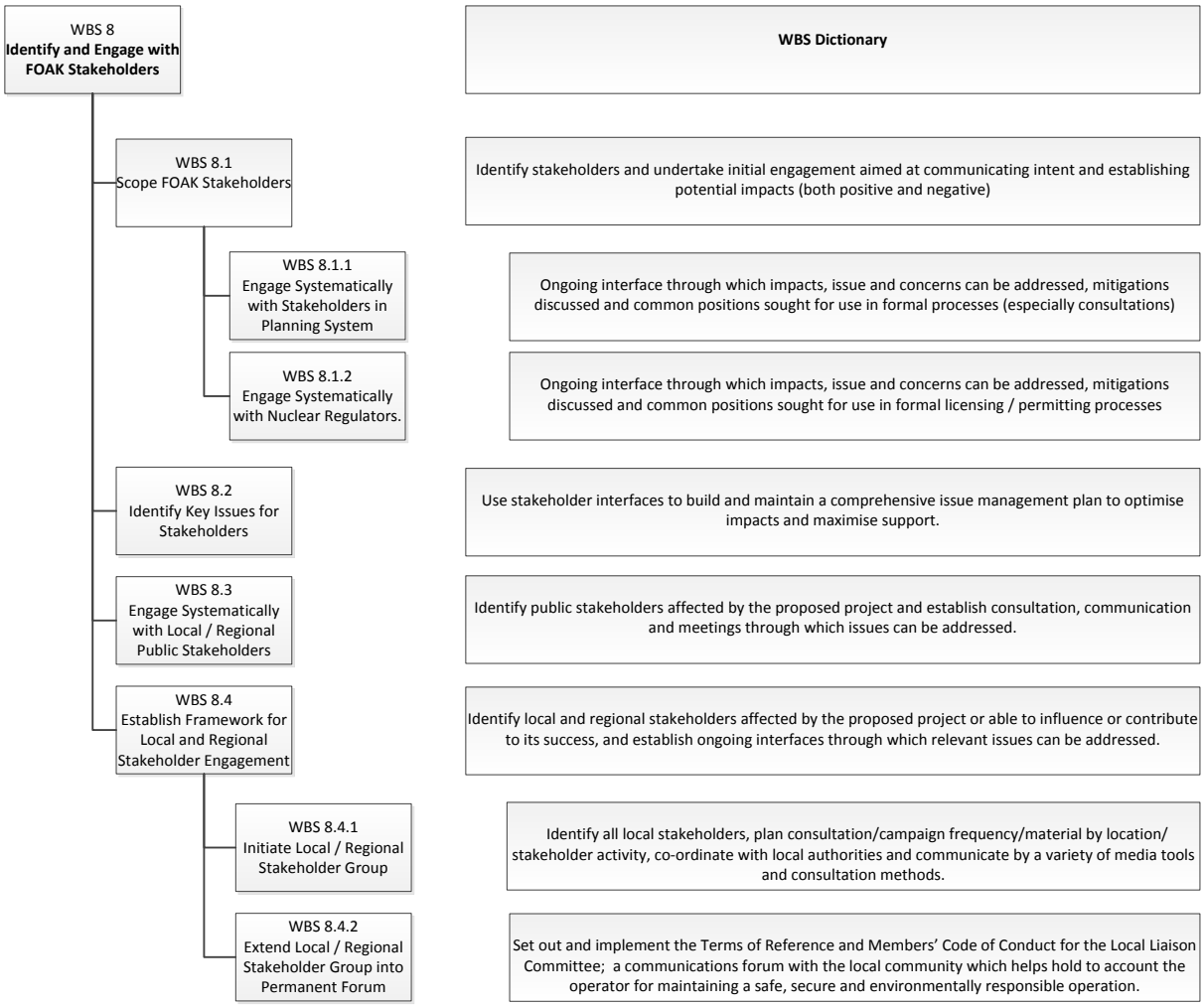
1. Operator submits to ONR and Environment Agency/NRW site specific proposals that carry through the generic GDA proposals to the site-specific application, without significant modification, thereby receiving early and positive regulatory assurance of safety and environmental considerations.

Key Inputs:	Key Dependencies:
WBS 1.1	WBS 1.3 and WBS 3, WBS 7.2.1 - 7.1.2

Assumptions: -	**Risks:** R127, R128

WBS 8: Identify and Engage with FOAK Stakeholders

Covers identification of stakeholders affected by a proposed project or able to influence or contribute to its success, and establishment of ongoing interfaces through which relevant issues can be addressed.



WBS 8	Identify and Engage with FOAK Stakeholders	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Identify stakeholders and undertake initial engagement aimed at communicating intent and establishing potential impacts (both positive and negative) on stakeholders affected by / with potential to influence the FOAK project.

Objectives:

1. To identify Regulators, local authorities and other stakeholders who may be impacted by the FOAK project, and / or may have influence on the Government's facilitative actions or the consenting, licensing and permitting of SMR developments
2. To identify issues, concern and opportunities which are significant to stakeholders and enable the prospective operator to demonstrate its values and responsiveness
3. To engage with the wider public, particularly those in the vicinity of the proposed FOAK site
4. To establish a framework for ongoing engagement with local and regional stakeholders over the life cycle of the FOAK SMR power station

Statement of Work:

1. Identify and engage stakeholders – WBS 8.1:
   - 1.1. Extend engagement with nuclear Regulators from GDA arena.
   - 1.2. Approach local authorities responsible for the preferred FOAK site.
   - 1.3. Approach a wide range of organisations and key individuals to identify significant local stakeholders.
   - 1.4. Establish local presence enabling interested parties to self-identify as stakeholders.
2. Identify issues – WBS 8.2:
   - 2.1. Draw on engagement to assemble a database of issues significant to stakeholders, together with a management plan enabling the prospective operator to demonstrate its values and responsiveness.
3. Engage local public – WBS 8.3:
   - 3.1. Mount public and media events to introduce FOAK SMR proposals and receive feedback.
   - 3.2. Produce explanatory publications for local / web / library distribution.
   - 3.3. Establish a circulation list of interested parties for ongoing communication (compliant with data protection requirements).
4. Establish ongoing framework – WBS 8.4:
   - 4.1. Set up a group representative of local stakeholders as a vehicle for two-way communication.
   - 4.2. Extend the group's formal remit to become an ongoing Site Stakeholder Group / Local Liaison Committee for the full power station life cycle.

Key Inputs:	**Key Dependencies:**
WBS 1.1.1, WBS 4.1, WBS 7.2	WBS 1.1.2, WBS 4.5 - 4.6, WBS 7
Assumptions: A96	**Risks:** R131, R132, R133, R134

WBS 8.1	Scope FOAK Stakeholders	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Identify and engage with stakeholders impacted by / with potential to influence the FOAK project.

Objectives:

1. To approach and engage local planning and other authorities with responsibilities covering the FOAK site.
2. To extend GDA engagement with nuclear Regulators into FOAK project.
3. To approach and engage a full range of other industry, official and non-Governmental organisations and key individuals relevant to the FOAK site.
4. To establish a presence local to the FOAK site enabling interested parties to self-identify as stakeholders.

Statement of Work:

1. Engage relevant local authorities – WBS 8.1.1:
    1.1. Identify authorities with directly responsibility for the proposed FOAK site (local Government, drainage etc.).
    1.2. Meet with senior staff / members to introduce project, identify potential impacts (positive and negative).
    1.3. Establish framework for addressing these impacts in advance of DCO application.
2. Extend GDA engagement with nuclear Regulators – WBS 8.1.2:
    2.1. Meet with senior staff to introduce project, especially prospective operator and characteristics of proposed site.
    2.2. Establish framework for addressing development towards competent site-specific applications by operator.
3. Identify other local stakeholders:
    3.1. Approach other nuclear organisations, official bodies including emergency services, local elected representatives, trade unions; scan local media and responses to consultations.
    3.2. In each case, offer opportunity to introduce project and explore potential impacts (positive and negative).
4. Establish local presence:
    4.1. Establish local office, appoint local representative to enable those with an interest to self-identify, provide authentic information and identify emerging concerns.
5. Feed findings into WBS 8.2 and WBS 8.3

Key Inputs:	**Key Dependencies:**
WBS 8	WBS 8.1.1 - 8.1.2, WBS 8.2, WBS 8.3
Assumptions: -	**Risks:** R135, R136

WBS 8.1.1	Engage Systematically with Stakeholders in Planning System	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Engage with local and other authorities with responsibility or influence on the land-use planning process for the FOAK site.

Objectives:

1. To establish a common understanding of the process, timescales and state of progress in preparing and submitting formal applications.
2. To identify and explore potential constraints, opportunities and concerns.
3. To seek agreement on means of optimising mutual benefits for the FOAK project and local communities, and of mitigating or compensating its adverse impacts.

Statement of Work:

1. Establish common understanding:
   - 1.1. Liaise with WBS 8.1 to identify appropriate counterparts in local authorities, Regulators and other agencies.
   - 1.2. Identify, discuss and agree common understanding of the process to be followed in scoping, preparing and submitting formal applications.
   - 1.3. Share and maintain a common plan for investigation and other work by the prospective operator and assessments by the relevant authorities.
   - 1.4. Ensure all parties are kept informed of the progress of Government's enabling actions, particularly SSA and designation of an updated NPS, of actions by the Planning Inspectorate, and of the prospective operator's progress towards formal application for consents.
2. Explore potential issues and opportunities:
   - 2.1. Identify potential impacts of the FOAK project over the power station life cycle, including technical, environmental and socioeconomic impacts, and their consequences as opportunities or constraints / concerns.
3. Seek agreement:
   - 3.1. Seek to agree means of optimising the mutual benefits of the development for both the project and the local communities, and of mitigating or compensating for material adverse impacts.
4. Feed outcome into WBS 4.5 and 4.6

Key Inputs:	**Key Dependencies:**
WBS 8.1	WBS 4.5, WBS 4.6, WBS 8.2, WBS 8.3, WBS 8.4
Assumptions: -	**Risks:** R137

WBS 8.1.2	Engage Systematically with Nuclear Regulators.	Version: FINAL

Responsible Organisation(s):	Operator, Vendor

Scope:

Extension of vendor-led involvement in GDA to build relationship between prospective operator and nuclear Regulators.

Objectives:

1. To establish a common understanding of the process, timescale and state of progress towards FOAK site-specific applications for a licence and permits.
2. To share and maintain common plans for development and assessment of the safety, security and environmental capability and capacity of the prospective operator as future licence and permit holder.
3. To communicate an adequate understanding of the suitability of the FOAK site and its environment, and of the work programme building on GDA to establish and assess the safety and environmental case for SMR implementation at this site.
4. To ensure that ONR, EA and NRW are kept fully informed of the project and issues of concern in support of their role and effective independent Regulators.

Statement of Work:

1. Establish common understanding:
   - 1.1. Building on WBS 7.2 and in support of WBS 3, establish arrangements (including funding) enabling an ongoing co-ordinated interface between the prospective operator and the nuclear Regulators.
   - 1.2. Share and maintain common plans for work by the prospective operator towards site-specific applications for a nuclear site licence and environmental permits, and the assessment of this work by the relevant Regulators.
2. Development of prospective operator:
   - 2.1. Communicate plan for development and assessment of the safety, security and environmental capability and capacity of the prospective operator as credible future licence and permit holder – WBS 3
3. Safety / environment case for SMR at preferred site:
   - 3.1. Communicate plan for development and assessment of an adequate understanding, founded on GDA, of the safety, security and environmental characteristics of the FOAK SMR when implemented at the preferred site – WBS 7.5
4. Enable effective independent regulation:
   - 4.1. Develop and maintain a common understanding of the programme of other consultations or stakeholder events requiring input from ONR, EA and NRW as independent nuclear Regulators, and ensure all information they require is available to support this – WBS 1, WBS 4 and WBS 8

Key Inputs:	Key Dependencies:
WBS 7.2, WBS 7.5, WBS 8.1	WBS 3, WBS 7, WBS 8.2 – 8.4
Assumptions: A98	**Risks:** R139, R140

WBS 8.2	Identify Key Issues for Stakeholders	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Planned and co-ordinated management of issues significant to stakeholders, enabling the prospective operator to demonstrate distinctive values and responsiveness.		
Objectives:		
1. To develop and maintain a database of issues known to be significant to stakeholders. 2. To identify and characterise the costs and benefits of options for responding to these, and prioritise an optimised set. 3. To deploy the optimised set of responses in adapted project plans, ensuring that these are effectively communicated.		
Statement of Work:		
1. Identify issues: Draw on engagement to assemble and maintain a database of issues known to be significant to stakeholders (local, regional and National) and how SMRs may influence them – including opportunities for supply chain, logistics, skills, moving to a low carbon economy, discounted local district heat as well as concerns on safety, environmental or socio-economic impacts. 2. Identify, characterise and prioritise options for response: Systematically assess the materiality of the issues and the costs / benefits of options for responding to them, so as to build and maintain an optimised issue management plan. 3. Modify project plans to implement optimum response: Modify project plans and consent applications to take up assessed and prioritised responses, and ensure these are effectively and widely communicated – WBS 8.3		
Key Inputs: WBS 8.1.1 – 8.1.2, WBS 8.3, WBS 8.4	**Key Dependencies:** WBS 4.5 – 4.6, WBS 8.3	
Assumptions: -	**Risks:** R141, R142	

WBS 8.3	Engage Systematically with Local / Regional Public Stakeholders	Version: FINAL
Responsible Organisation(s):	**Operator, Regulators, Government**	

Scope:

Engagement of / communication with local public around FOAK SMR site.

Objectives:

1. To develop broad awareness of the FOAK SMR project in the local population, with rapid direct feedback of views.
2. To ensure ready access to authentic project information, so as to facilitate informed response to consultation.
3. To establish systematic means of proactive communication with interested members of the public.

Statement of Work:

1. Develop broad understanding and feedback on FOAK project proposals:
    - 1.1. Building on local presence (WBS 8), mount public meetings / surgeries to introduce both the prospective operator and the proposed FOAK SMR project face-to-face to the local public in the travel-to-work and other relevant areas around the preferred site.
    - 1.2. Seek to maximise constructive exposure of leading representatives of prospective operator in local media and representative organisations such as Chamber of Commerce, highlighting opportunities to respond to consultations by Government, Regulators or the prospective operator as part of facilitative actions or consenting processes.
    - 1.3. Where practicable, seek association with locally credible figures such as MP.
    - 1.4. Ensure systematic collection and analysis of feedback from face-to-face interactions and social media (WBS 8.2).
2. Ensure ready access to greater detail to facilitate consultation responses:
    - 2.1. Produce explanatory publications and regular newsletters for deployment in local outlets (e.g. local office, libraries) and via internet, providing opportunities for feedback face-to-face and via post / email / social media.
3. Enable systematic proactive communication:
    - 3.1. Establish and maintain a circulation list of interested parties (compliant with data protection requirements) for direct electronic and postal communication, e.g. on progress, consultation opportunities, or modification of project proposals in response to stakeholder views.

Key Inputs:	**Key Dependencies:**
WBS 8.1.1 – 8.1.2, WBS 8.4	WBS 1.1.2, WBS 4.5 - 4.6
Assumptions: A99. A100	**Risks:** R143, R144

WBS 8.4	Establish Framework for Local and Regional Stakeholder Engagement	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Establish a formal framework for stakeholder engagement and communication to continue throughout the power station life cycle.		
Objectives:		
1. To promote and co-ordinate initial engagement of local and regional stakeholders in a single forum. 2. To extend the forum's remit into an ongoing Site Stakeholder Group / Local Liaison Committee. 3. Potential members of the forum include the blue light services, any local military base representatives, representatives of the Regulators, the local and regional authorities, appropriate trade unions, special interest groups in the area such as the National Trust, Countryside Commission, any local NGO's etc. [NOTE this is not a comprehensive list but provided only as a guide].		
Statement of Work:		
1. Establish single forum – WBS 8.4.1: 1.1. Identify and establish a group representative of local and regional stakeholders, including local residents, local authorities, site Regulators, alongside local representatives of the prospective operator. **2. Extend and formalise forum as SSG / LLC – WBS 8.4.2:** 2.1. Extend the group's formal remit (membership, Terms of Reference) to become an ongoing Site Stakeholder Group / Local Liaison Committee meeting for the entire power station life cycle.		
Key Inputs: WBS 4.1, WBS 8.1 – 8.2	**Key Dependencies:** WBS 4.5 – 4.6, WBS 8.4.1 – WBS 8.4.2	
Assumptions: A99, A100, A101	**Risks:** R145	

WBS 8.4.1	Initiate Local / Regional Stakeholder Group	Version: FINAL
Responsible Organisation(s):	**Operator**	

Scope:

Promote formation of a group of representative local and regional stakeholders for the FOAK site.

Objectives:

1. To identify local and regional stakeholders prepared to act as representatives of all groups relevant to the FOAK project.
2. To form a stakeholder group prepared to meet regularly with representatives of the prospective operator in order to receive, respond to and disseminate information on the project.

Statement of Work:

1. Identify representative stakeholders and communication means:
   - 1.1. Identify, approach and appoint representative of local and regional stakeholders, including local residents, local authorities, elected representatives, statutory consultees, and nuclear Regulators for the prospective FOAK site, alongside senior representatives of the prospective operator.
   - 1.2. Identify consultation/campaign frequency/material by location/stakeholder activity, co-ordinate with local authorities and communicate by a variety of media tools and consultation methods.
2. Form a group which meets to receive, respond to and disseminate project information:
   - 2.1. Propose terms of reference and other administrative arrangements which facilitate regular meetings as a group.
   - 2.2. Provide the group with face-to-face information on the prospective operator's intent, the results of site events, investigations and other progress, current national and local consultations, reports from nuclear Regulators, local authorities and statutory consultees.
   - 2.3. Ensure that, as far as possible, the group is first to be informed, and that the prospective operator responds to questions face-to-face or, where this is impracticable, as a priority after the meeting.

Key Inputs:	**Key Dependencies:**
WBS 8.1.1 – 8.1.2	WBS 8.4.2
Assumptions: -	**Risks:** R145

WBS 8.4.2	Extend Local / Regional Stakeholder Group into Permanent Forum	Version: FINAL
Responsible Organisation(s):	**Operator**	
Scope:		
Extension of representative group to become ongoing Site Stakeholder Group / Local Liaison Committee for FOAK power station lifecycle.		
Objectives:		
1. To review and formalise the status of the stakeholder group in preparation for completion of consenting and the onset of major construction, commissioning and operation. 2. To establish the group as a formal part of the power station's management arrangements. 3. It should be noted that Local Stakeholder Groups are advisory and not part of the Management construct.		
Statement of Work:		
1. Formalise membership and status of the Local Liaison Committee: 1.1. Review terms of reference and members code of conduct, membership and experience since the group was formed to ensure it continues to represent stakeholder groups effectively, particularly including ONR / EA / NRW site inspectors and site Regulators. 2. Incorporate group in project / power station management arrangements: 2.1. Ensure that Site Stakeholder Group / Local Liaison Committee is formalised within the project and subsequently power station's management arrangements.		
Key Inputs: WBS 4.2, WBS 8.4.1	**Key Dependencies:**	
Assumptions: -	**Risks:** -	

WBS 9: Initiate Supply Chain Development

Covers de-risking actions to ensure a capable and qualified UK supply chain with the capacity to provide long-term support to a UK SMR programme, accounting for the anticipated future demands on the wider UK nuclear supply chain, and enabling the basis of a future supply chain system to harness the longer-term benefits of a UK SMR programme (economies of multiples, standardisation, future export).

WBS 9 **Initiate Supply Chain Development**	**WBS Dictionary**
WBS 9.1 Develop Manufacturing Resource and Infrastructure Strategy.	Establish clear plans and implement de-risking actions to ensure a capable and qualified UK supply chain with the capacity to provide long-term support to a UK SMR programme, accounting for the anticipated future demands on the wider UK nuclear supply chain, and enabling the basis of a future supply chain system to harness the longer-term benefits of a UK SMR programme (economies of multiples, standardisation, future export).
WBS 9.2 Develop Construction Methodology and Infrastructure Strategy.	Establish the FOAK SMR manufacturing system strategy, with inbound logistics and delivery integration planned as appropriate to enable an on-time FOAK, and prepare the basis of a robust, reliable, qualified and diversified manufacturing capability to support NOAK production as an integrated enterprise ensuring to harness the longer-term benefits of a UK SMR programme (standardised modular components and systems).
WBS 9.3 Develop Skills, Employment and Training	Establish the construction methodology/infrastructure for SMR construction, planning a risk-balanced and phased approach for stages such as preliminary site works, non-nuclear construction, nuclear construction, and commissioning activities, addressing the expectation of a changing workforce profile and a skills shortage in the area of new nuclear construction, in order to de-risk the delivery schedule of a UK SMR programme.
WBS 9.4 Develop Preparedness for Supplier Qualification	Develop, attract, and retain the necessary skilled talent with nuclear plant construction, operation and manufacturing experience in the face of significant demand from other nuclear programmes, in order to support a FOAK SMR and the longer-term UK SMR programme.
WBS 9.5 Develop Long lead Item Procurement Strategy.	Ensure thorough supply chain awareness of nuclear qualification through targeted improvement programmes to develop supply chain readiness, particularly in areas for key components (e.g. Reactor Pressure Vessel) and those components and systems of focus during Generic Design Assessment

WBS 9	Initiate Supply Chain Development	Version: FINAL
Responsible Organisation(s):	**Industry Initiatives / Bodies (Government), Operator, Vendor**	

Scope:

Establish clear plans and implement de-risking actions to ensure a capable and qualified UK supply chain with the capacity to provide long-term support to a UK SMR programme, accounting for the anticipated future demands on the wider UK nuclear supply chain, and enabling the basis of a future supply chain system to harness the longer-term benefits of a UK SMR programme (economies of multiples, standardisation, future export).

Objectives:

1. Gain engagement with industry initiatives in order to influence their direction and ensure targeted benefits for a UK SMR programme.
2. De-risk the programme schedule, drawing on lessons learned, and minimise supply chain related items on the programme critical path.
3. Develop a reliable, robust and diverse supply chain with particular commitment to a long-term UK SMR programme, establishing partnerships / alliances as appropriate to secure long-term interest, commitment, and investment.
4. Ensure that the supply chain is initially adequate and appropriate to deliver an on-time FOAK UK SMR and also has a sound long-term vision and implementable action plan to support NOAK SMRs and enable the longer-term benefits of a UK SMR programme.

Statement of Work:

1. Gain engagement with industry initiatives in order to influence their direction and ensure targeted benefits for a UK SMR programme:
   - 1.1. Communicate the outline plan and the overall benefits of a UK SMR programme.
   - 1.2. Identify the needs and objectives, relative to each industry initiative, of a UK SMR programme.
   - 1.3. Establish and support, through resource and investment, a SMR Working Group within each relevant industry initiative responsible for developing an agenda and outcome-focussed actions to support the needs of a UK SMR programme.
2. De-risk programme deliverables and minimise supply chain activities on the critical path, drawing on lessons learned, by identifying and mitigating against capacity issues, pinch-points, technical risks, and schedule risks, for areas including:
   - 2.1. Manufacturing – WBS 9.1
   - 2.2. Construction – WBS 9.2
   - 2.3. Qualification – WBS 9.4
   - 2.4. Long-lead items – WBS 9.5
3. Develop a reliable, robust and diverse supply chain with particular commitment to a long-term UK SMR programme, establishing partnerships / alliances as appropriate to secure long-term interest, commitment, and investment:
   - 3.1. Communicate the outline plan for a UK SMR programme describing the opportunities and benefits specific to the supply chain and communicate the unique and special requirements of a nuclear industry supply chain, working with industry initiatives (e.g. Civil Nuclear Sharing in Growth, NS4P) and existing operators where appropriate, to strengthen industry and academic links and engagement.
   - 3.2. Identify opportunities where the supply chain can more readily be diversified (i.e. supply chain related to non-nuclear components of low safety classification components) and develop a supply chain strategy for these areas (such as low-volume supply trials to build nuclear experience).
   - 3.3. Identify funding opportunities which would support supply chain development in-line with Government initiatives (e.g. Green Grants, SME policy, UK manufacturing).

3.4. Identify synergies and establish partnerships / alliances with the supply chain and stakeholders in order to promote a UK SMR programme and secure long term interest, commitment, and investment within the supply chain. 3.5. Develop supply chain engagement plans and strategies with discrete focus on local (local economic growth), regional (regional economic growth), and national (UK content) elements of the supply chain, further accounting for the longer-term benefits of a UK SMR programme. 4. Ensure that the supply chain is initially adequate and appropriate to deliver an on-time FOAK UK SMR and also has a sound long-term vision and implementable action plan to support NOAK SMRs and enable the longer-term benefits of a UK SMR programme: 4.1. Identify supply chain requirements for an FOAK SMR compared to NOAK SMRs. 4.2. Establish a staged process of supply chain development aligned to key project milestones and investment.	
Key Inputs: WBS 1, WBS 2.7, WBS 5	**Key Dependencies:** WBS 3.2.8, WBS 8, WBS 9
Assumptions: A102, A103	**Risks:** R146, R147

WBS 9.1	Develop Manufacturing Resource and infrastructure Strategy	Version: FINAL
Responsible Organisation(s):	**Vendor, Industry Initiatives / Bodies (UK Government), Operator, Regulators**	

Scope:

Establish the FOAK SMR manufacturing system strategy, with inbound logistics and delivery integration planned as appropriate to enable an on-time FOAK, and prepare the basis of a robust, reliable, qualified and diversified manufacturing capability to support NOAK production as an integrated enterprise ensuring to harness the longer-term benefits of a UK SMR programme (standardised modular components and systems).

Objectives:

1. Gain engagement with industry initiatives, including Nuclear Advanced Manufacturing Research Centre (NAMRC), National Skills Academy for Nuclear Manufacturing (NSANM), and the Materials Research Facility (MRF) in order to influence their direction and ensure targeted benefits for a UK SMR programme.
2. Establish, specifically for SMR manufacturing, the common manufacturing standards and surveillance frameworks, including testing and inspection plans, appropriate for the stringent and specific requirements of the nuclear industry.
3. Identify options and develop implementation plans for the standardisation of processes, systems and methodologies in support of appropriate lean manufacturing.
4. Develop a phased approach to building the SMR manufacturing system, which both supports timely delivery of the FOAK SMR and is well prepared to develop into a robust and reliable solution for NOAK SMRs which supports the longer-term benefits of an SMR programme.

Statement of Work:

1. Gain engagement with industry initiatives, including Nuclear Advanced Manufacturing Research Centre (NAMRC), National Skills Academy for Nuclear Manufacturing (NSANM), and the Materials Research Facility (MRF) in order to influence their direction and ensure targeted benefits for a UK SMR programme:
   1.1. Establish and support, through resource and investment, a SMR Working Group within each relevant industry initiative responsible for developing an agenda and outcome-focussed actions to support the needs of a UK SMR programme.
2. Establish, specifically for SMR manufacturing, the common manufacturing standards and surveillance frameworks, including testing and inspection plans, appropriate for the stringent and specific requirements of the nuclear industry:
   2.1. Promote and ensure understanding of nuclear quality manufacturing (“General Quality Assurance Specification “(GQAS), Reference ECUK100053.), including full traceability (from raw material to final component), “right first time” quality, independent assurance, and dedicated manufacturing surveillance that continues into commissioning, and where appropriate, operations.
   2.2. Establish and implement a pre-qualification framework for SMR component and system manufacturers, aligned with initiatives such as “Fit4Nuclear”, to support the down-selection of approved suppliers.
   2.3. Conduct low-volume manufacturing trials to develop full production lifecycle nuclear manufacturing awareness and experience.
3. Identify options and develop implementation plans for the standardisation of processes, systems and methodologies in support of appropriate factory production and lean manufacturing:
   3.1. Review technology requirements and manufacturing plans.
   3.2. Establish a working group comprising multi-industry manufacturers to explore options based on best practice and lessons learned from within and outside of the nuclear industry, conducting feasibility studies which model benefit against risk for each option.
   3.3. Implement pilot programmes (phased from mock-up through to line manufacture) for options which have higher feasibility.

4. Develop a phased approach to building the SMR manufacturing system, which both supports timely delivery of the FOAK SMR and is well prepared to develop into a robust and reliable solution for NOAK SMRs which supports the longer-term benefits of an SMR programme: 4.1. Identify schedule scenarios, drivers and risks associated to the phasing of this development, accounting for pre-FID and post-FID activities and other key programme milestones. 4.2. Determine the most suitable balance of investment, time, benefit and risk to maximise the success of delivering an on-time FOAK SMR. 4.3. Assign a staged review and decision process, tied to FID, to trigger investment in the manufacturing system which ensures the longer-term benefits of a UK SMR programme.	
Key Inputs: WBS 1, WBS 2.7, WBS 5, WBS 7.2	**Key Dependencies:** WBS 8, WBS 9
Assumptions: A104, A105	**Risks:** R148, R149

WBS 9.2	Develop Construction Methodology and Infrastructure Strategy	Version: FINAL
Responsible Organisation(s):	**Operator, Industry Initiatives / Bodies (UK Government), Vendor, Regulators**	

Scope:

Establish the construction methodology/infrastructure for SMR construction, planning a risk-balanced and phased approach for stages such as preliminary site works, non-nuclear construction, nuclear construction, and commissioning activities, addressing the expectation of a changing workforce profile and a skills shortage in the area of new nuclear construction, in order to de-risk the delivery schedule of a UK SMR programme.

Objectives:

1. Gain engagement with industry initiatives, including the Construction Skills Network (CSN), Construction Industry Council (CIC), and Engineering Construction Industry Training Board (ECITB) in order to influence their direction and ensure targeted benefits for a UK SMR programme.
2. Establish, specifically for SMR construction, the common construction standards and surveillance frameworks, including through commissioning, appropriate for the stringent and specific requirements of the nuclear industry especially required for permitting and consents.
3. Identify options and develop implementation plans for construction modularisation (non-nuclear and nuclear).
4. Develop a phased approach to construction, aiming for local / site infrastructure, preliminary works, and non-nuclear construction to take place before the Final Investment Decision (FID) in order to reduce the length of the construction programme post-FID and ensure an on-time FOAK SMR.
5. Minimise schedule risk due to the changing workforce profile of the nuclear industry (operation and decommissioning to construction), and the potential shortfall in resource for regulating new build construction.

Statement of Work:

1. Gain engagement with industry initiatives, including the Construction Skills Network (CSN), Construction Industry Council (CIC), and Engineering Construction Industry Training Board (ECITB) in order to influence their direction and ensure targeted benefits for a UK SMR programme:
   - 1.1. Establish and support, through resource and investment, a SMR Working Group within each relevant industry initiative responsible for developing an agenda and outcome-focussed actions to support the needs of a UK SMR programme.
2. Establish, specifically for SMR construction, the common construction standards and surveillance frameworks, including through commissioning, appropriate for the stringent and specific requirements of the nuclear industry especially required for permitting and consents:
   - 2.1. Build and maintain a knowledge database, collating key observations and lessons learned from recent nuclear construction programmes (conventional nuclear new build and other programmes), focussing on delivery certainty and compliance.
   - 2.2. Build and maintain a knowledge database, collating key observations and lessons learned from recent major infrastructure programmes to focus on the capture of best-practice in construction modularisation.
   - 2.3. Working with prospective operator / developer organisations, develop and communicate a best-practice nuclear construction framework drawing on the identified information, knowledge and lessons learned and incorporating UK regulation.
3. Identify options and develop implementation plans for construction modularisation (non-nuclear and nuclear):
   - 3.1. Review technology requirements, manufacturing plans, and construction plans.
   - 3.2. Establish a working group comprising multi-industry infrastructure developers to explore options based on best practice and lessons learned from within and outside of the nuclear industry, conducting feasibility studies which model benefit against risk for each option.
   - 3.3. Implement pilot programmes (phased from mock-up through to scaled construction) for options which have higher feasibility.

4. Develop a phased approach to construction, aiming for local / site infrastructure, preliminary works, and non-nuclear construction to take place before the Final Investment Decision (FID) in order to reduce the length of the construction programme post-FID and ensure an on-time FOAK SMR: 4.1. Identify schedule scenarios, drivers and risks associated to the phasing of this development, accounting for pre-FID and post-FID activities and other key programme milestones. 4.2. Determine the most suitable balance of investment, time, benefit and risk to maximise the success of delivering an on-time FOAK SMR. 5. Minimise schedule risk due to the changing workforce profile of the nuclear industry (operation and decommissioning to construction), and the potential shortfall in resource for regulating new build construction: 5.1. Identify and address this risk through WBS 9.3	
Key Inputs: WBS 1, WBS 2.7, WBS 4, WBS 5, WBS 7.2, WBS 7.5	**Key Dependencies:** WBS 8, WBS 9
Assumptions: -	**Risks:** R150, R151

WBS 9.3	Develop Skills, Employment and Training	Version: FINAL
Responsible Organisation(s):	**Industry Initiatives / Bodies (UK Government), Industry supply chain**	

Scope:

Develop, attract, and retain the necessary skilled talent with nuclear plant construction, operation and manufacturing experience in the face of significant demand from other nuclear programmes, in order to support a FOAK SMR and the longer-term UK SMR programme.

Objectives:

1. Gain engagement with industry initiatives, including National Skills Academy for Nuclear Manufacturing (NSAN), Nuclear Energy Skills Alliance (NESA), and Cogent Skills in order to influence their direction and ensure targeted benefits for a UK SMR programme.
2. Capture and understand capability requirements in order to proactively inform industry and develop an action plan to address shortfalls.
3. Ensure a sufficient life-cycle (pool and flow) of suitably qualified and experienced personnel (SQEP) to support a FOAK SMR and the longer-term SMR programme in order to ensure efforts are sufficiently resourced to avoid programme delay.

Statement of Work:

1. Gain engagement with industry initiatives, including National Skills Academy for Nuclear Manufacturing (NSAN), Nuclear Energy Skills Alliance (NESA), and Cogent Skills in order to influence their direction and ensure targeted benefits for a UK SMR programme:
   1.1. Establish and support, through resource and investment, a SMR Working Group within each relevant industry initiative responsible for developing an agenda and outcome-focussed actions to support the needs of a UK SMR programme.
2. Capture and understand capability requirements and create an action plan to address shortfalls:
   2.1. Review the Nuclear Industry Council Skills Work stream assessment of the current skills initiatives and their forecast on the influx of skills into the sector in coming years.
   2.2. Identify capability requirements for a UK SMR programme across engineering support, manufacturing, construction, and operation.
   2.3. Ensure the update of the Nuclear Workforce Assessment, a detailed analysis of the future skills demands of the UK nuclear programme and existing available skills, accounts for the intention of a UK SMR programme.
   2.4. Conducting a gap analysis, accounting for other demands on resource, and draw up an action plan to address shortfalls.
   2.5. Identify key capacity issues / points of concern (pinch-points) and ensure targeted efforts and an initiative to address strain.
3. Ensure a sufficient life-cycle (pool and flow) of suitably qualified and experienced personnel (SQEP) to support a FOAK SMR and the longer-term SMR programme in order to ensure efforts are sufficiently resourced to avoid programme delay:
   3.1. As a flagship technology, support engagement with schools and universities to foster relevant learning in STEM subjects and attract the right people to careers in nuclear.
   3.2. As an advocate for UK manufacturing and construction, support apprenticeship routes (Trailblazers – Future of apprenticeships in England), to secure the long-term development of necessary industry skills.
   3.3. Develop a best-in-industry personnel development strategy to address and accelerate the long lead-time for developing a nuclear expert.
   3.4. Develop a strong retention strategy to ensure talent is not lost to other advancing and attractive industries.
   3.5. Develop and continuously improve a detailed Nuclear Safety Culture education / training programme to support those entering the nuclear industry from other sectors.

Key Inputs: WBS 1.2.3, WBS 3.2, WBS 5, WBS 9.1, WBS 9.2	**Key Dependencies:** WBS 8, WBS 9
Assumptions: A108	**Risks:** R152

WBS 9.4	Develop Preparedness for Supplier Qualification	Version: FINAL

Responsible Organisation(s):	Operator, Vendor

Scope:

Ensure thorough supply chain awareness of nuclear qualification through targeted improvement programmes to develop supply chain readiness, particularly in areas for key components (e.g. Reactor Pressure Vessel) and those components and systems of focus during Generic Design Assessment.

Objectives:

1. Ensure an adequate supply chain, prepared to address the unique and special requirements of a nuclear industry supply chain, is up to speed with the detailed intention of a UK SMR programme.
2. Ensure prospective suppliers understand the specific requirements and constraints related their supply.
3. Encourage competition and improvement to ensure a choice of nuclear qualified suppliers categorised by component and system.
4. Ensure the existence of a nuclear qualified Reactor Pressure Vessel supplier and secure the associated plan for supply.

Statement of Work:

1. Ensure an adequate supply chain, prepared to address the unique and special requirements of a nuclear industry supply chain, is up to speed with the detailed intention of a UK SMR programme:
   1.1. As soon as is appropriate, publish the detailed intent of a UK SMR programme including a delivery roadmap and outline the needs and opportunities related to the supply chain.
2. Ensure prospective suppliers understand the and specific requirements and constraints related their supply:
   2.1. Publish literature for key supply categories and hold supplier information days to allow early engagement throughout the supply chain, highlighting key constraints, requirements, standards and regulations.
3. Encourage competition and improvement to ensure a choice of nuclear qualified suppliers categorised by component and system:
   3.1. Publish a commercial pre-qualification framework, initially in engagement with the supply chain, to identify and down-select several suppliers through evidence provided based on category of supply.
   3.2. Develop and execute supplier trials for key elements of nuclear qualified supply.
   3.3. Identify areas for specific development programmes with pre-qualified suppliers in order to de-risk major deliverables.
   3.4. Ensure that nuclear qualification and nuclear safety culture permeates the whole supply chain ("suppliers of suppliers").
4. Ensure the existence of a nuclear qualified Reactor Pressure Vessel (RPV) supplier and secure the associated plan for supply:
   4.1. Evaluate options for RPV supply based on technology requirements and identify the most commercially viable option, in-line with the business case and policy drivers.

Key Inputs:	**Key Dependencies:**
WBS 1.2.4, WBS 1.3, WBS 2, WBS 5, WBS 7.2,	WBS 8, WBS 9
Assumptions: A110, A111	**Risks:** R153, R154

WBS 9.5	Develop Long Lead Item Procurement Strategy	Version: FINAL
Responsible Organisation(s):	**Operator, Vendor**	
Scope:		
The vendor (in consultation with the operator) may seek to identify long-lead items within the mature (but not frozen) design and consider whether the risks of early procurement may by justified, in terms of achieving a 2030 operating date.		
1. De-risk the schedule where possible through early procurement of long-lead items ensuring that these items do not form the critical path. An interim investment decision will be required in order to secure the funding necessary for an accelerated programme – including procurement (at risk) of long-lead items.		
Statement of Work:		
1. De-risk the schedule where possible through early procurement of long-lead items ensuring that these items do not form the critical path: 1.1. Identify and categorise long-lead items (design maturity, supplier qualification, manufacturing). 1.2. Assign risk-level to long-lead items in terms of financial risk (procurement at risk) and schedule risk (critical path analysis). 1.3. Develop an interim investment case (pre-FID) to outline the strategy and trigger points for accelerated procurement of long-lead items. 1.4. Liaise with suppliers of long-lead items to ensure capability (supplier qualification) and capacity (manufacturing resource), agreeing commercial terms as appropriate (phased commitment). 1.5. Liaise with WBS 7.2 to inform decision trigger point and action accordingly.		
Key Inputs: WBS 1.2, WBS 1.3, WBS 2, WBS 5, WBS 7.2, WBS 9.1, WBS 9.4	**Key Dependencies:** -	
Assumptions: A113	**Risks:** R155, R156	

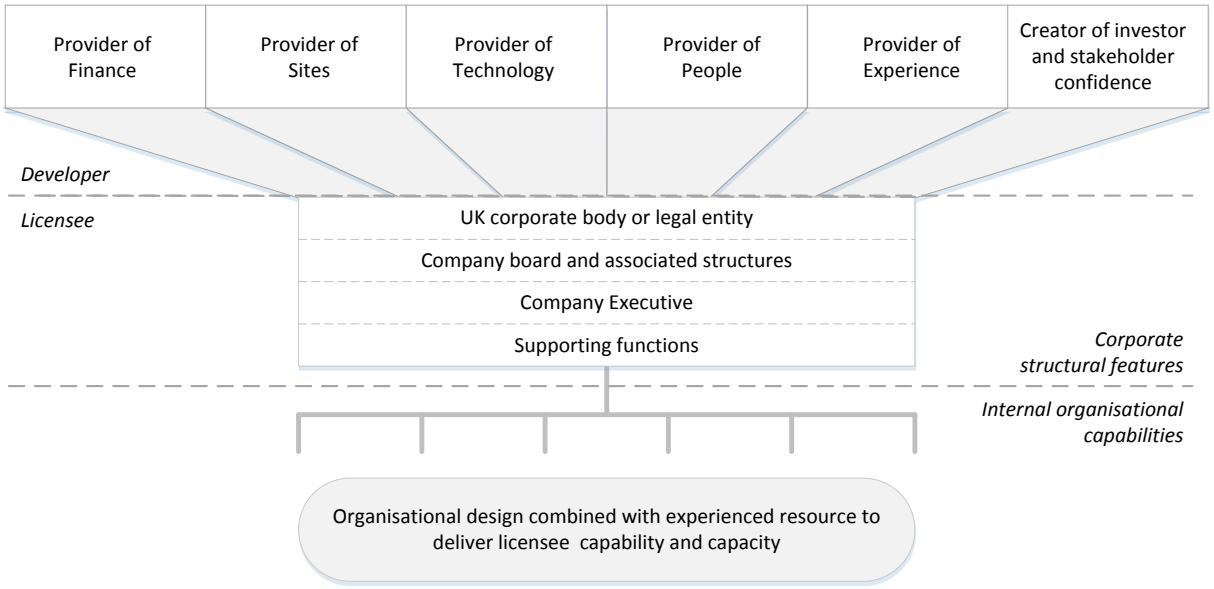
APPENDIX III ORGANISATIONAL DESIGN

This appendix presents the work carried out to determine the necessary capability of an SMR developer / operator organisation during the first 5 years of a UK SMR development programme.

This work covers two discrete perspectives; one upward-looking, focussed on the corporate structural features of the SMR developer / operator, and one inward-looking, focussed on the internal organisational capabilities required within the SMR developer / operator organisation.

An illustration of these perspectives is shown in the following figure.

Key notes are provided in the following sections, with detailed information structured in specific tables.



Corporate Structural Features

Developer vs Licensee

The distinction between the developer organisation and the prospective nuclear site licensee is critical, and needs to be fully appreciated.

In order to secure a Nuclear Site Licence, the prospective licensee needs to establish to the Regulators' confidence that it understands the characteristics and hazards of the plant it proposes to construct and operate, and has or will have the capability to control these effectively by the time they arise. Once its licence is granted, it is subject to a wide range of duties and controls, together with absolute technical and financial liabilities for example in the case of accidents. Furthermore, it cannot end its period of responsibility for its licensed site until it can satisfy the Regulator that there is no longer any danger from radioactivity on the site.

For a developer whose business is wider than the development and operation of one or more UK SMRs, these duties and controls may be unduly restrictive. In such cases, the developer(s) will generally establish the prospective licensee as a separate subsidiary.

However, in this case the relationship between the parent and its subsidiary is different from the norm under company law. In particular, to enable the subsidiary to be licensed, the parent itself will need to ensure that it will have access to the resources it needs to support the licensee to maintain the safety of the licensed site – noting, the licensee cannot devolve its responsibility for safety. The parent will

also need to ensure that the subsidiary has the information and power to satisfy itself on the nuclear and radiological acceptability in UK environment of the plant design and the systems, structure and components procured, and to require these to be changed where it has not been satisfied.

In this situation, it is apparent that there is a significant risk of redesign, rework or even project failure if the prospective licensee is not created until after the safety-significant design and procurement decisions have been made.

Nevertheless, there are a range of other aspects of project initiation which the developer can initiate without needing the licensee to participate actively at the outset. Indeed, where the developer wishes to retain unfettered ownership of intellectual property, for example in the reactor design and any generic regulatory approval gained to support this, it may be essential for the parent to take the lead. However, it will still be necessary for the future operator (Licensee) to be provided with the necessary information for it to understand the SMR it is then responsible for.

Accordingly, the work in this area focuses on the capabilities and experience which, based on experience of other UK nuclear projects, the developer must embody in order to progress an SMR project with minimum risk of failure or delay.

The work will then identify the activities and processes which it is essential that the developer addresses, and where it can take an early lead.

These requirements may be met in a number of ways, depending on whether the developer organisation is a single corporate entity with a full range of in-house capabilities, experience and resources, or alternatively a partnership or joint venture in which each participant makes its own contribution. The key point is that, collectively or individually, all the requirements should be addressed.

Legal and third party liability considerations

This section is not intended to be a comprehensive discussion of the legal requirements to be addressed by a licensee but sets out a few key areas that may impact corporate structural features.

A licence applicant needs to be a legal entity which is a corporate body. Incorporation outside of the European Union will require discussion with the UK Government to ensure the requirements of the Nuclear Installations Act 1965 (NIA 1965) are met. NIA 1965 requires the licencing of sites used for nuclear power generation and the storage/handling of nuclear fuel and waste. NIA 1965 also addresses third party liability for a nuclear incident addressing the international nuclear liability regime of the Paris Convention of 1960 and the Brussels Supplementary Convention of 1963. These Conventions established an international regime governing liability to pay compensation for damage following a nuclear incident. The Conventions are also implemented through a number of instruments made under NIA 1965, in particular:

- The Nuclear Installations (Prescribed Sites) Regulations 1983
- The Nuclear Installations (Insurance Certificate) Regulations 1965
- The Nuclear Installations (Excepted Matter) Regulations 1978 (SI 1978/1779)

The Nuclear Installations (Liability for Damage) Order 2016 amends the Nuclear Installations Act 1965 in order to implement changes made in 2004 to the Conventions on nuclear third party liability. The changes to the Conventions upgrade the existing liability protocols so more compensation would be available to a wider category of claimants in respect of a broader range of damage over extended timescales than is currently the case.

UK Government intends to impose liabilities on nuclear power plant operators with an immediate increase from the current £140 million to €700 million, rising by a further €100 million annually up to €1200 million. On ratification of the protocols (expected at the start of 2017) the changes to the UK liability regime will come into force and there is no grace period. The corporate structural features will need to develop to address these liability requirements.

Further the corporate body will need to be structured to discharge the obligations the Energy Act 2008 places on it to prepare and submit a Funding Decommissioning Plan (FDP). The objective of the FDP is to ensure that a licensee has funding arrangements to discharge the total costs of decommissioning including waste management and waste disposal costs. Approval, with or without modification, or rejection of a FDP lies with the UK Government. The Nuclear Decommissioning and Waste Handling Regulations 2013 set out in detail the charging conditions and reporting/verification requirements associated with licensee financing arrangements of an FDP.

Key capabilities and experience of the developer

- **Provider of finance**:
  Taking into account the profile over time of increasing financial commitment versus reducing risk to the lifetime value of the project, and including the financial commitment necessary to support the licensee.
  In particular, the timing of the start of revenue-earning operation will be subject to regulatory permissioning in which nuclear safety rather than commercial considerations will be over-riding. Also, once active commissioning has started, substantial further costs are likely to be incurred even if the project is aborted.
  These factors will bear on the extent to which conventional financing arrangements can be used, as well as the point at which restructuring towards a more efficient debt-equity ratio can be undertaken.
- **Provider of secure access to a suitable site or sites:**
  With geographical, demographic, geological and meteorological characteristics and access to transport networks, cooling water and grid connections that make them capable of being successfully nominated into any new Strategic Siting Assessment and subsequently licensed, permitted and consented under the UK's regulatory and land-use planning systems.
- **Provider of key nuclear technology:**
  Certainly for the reactor, and also where appropriate for the lifetime storage technology for spent fuel and higher level wastes designed for that reactor. This includes the intellectual property necessary to enable licensing, permitting and consenting in the UK regulatory and planning environment.
- **Provider of suitably qualified and experienced staff:**
  For both the developer and the licensee, particularly with experience in developing and undertaking major projects, major infrastructure-scale procurement and supplier engagement, and building constructive relationships with Government, financial and public stakeholders at all levels.
- **Direct experience of construction and/or electricity generation:**
  Preferably nuclear construction or operation in a regulated environment somewhere in the world, and/or management of major infrastructure projects in the UK or a similarly regulated environment somewhere in the world, and/or participation as generator in the UK electricity industry.
- **Creator of investor and stakeholder confidence:**
  Experienced in investor relationship management and interfacing with various stakeholders.

Internal Organisational Capabilities

Key features of Developer / Operator as licensee

The structural features of the developer / operator as a licensee include:

- Establishment as a UK corporate body / legal entity.
- Appointment of a company board with associated structures.
- Appointment of a company executive team.
- Supporting functions to provide capability and capacity.

To become a credible steward of an SMR installation, compliant with the requirements and expectations of the nuclear Regulators, the licensee must embody a number of key features. These cover its organisational structure (such as Design Authority and Intelligent Customer functions), its culture (such as questioning and learning attitudes), its management processes (such as robust governance and management of organisational change), and its financial and commercial arrangements.

In particular, its agreements with fund providers – including its own parent – must ensure it has secure access to the resources needed to ensure safety, and those with safety-significant vendors – including the owner of the SMR design – must ensure it is the controlling mind in specifying and accepting designs for the key systems, structures and components of the SMR. That is, it has the autonomous decision making capability for all issues related to nuclear safety.

Staged development of key features

UK regulatory requirements are applied in a proportionate way. The SMR installation will pass through successive stages of development from design definition through pre-construction, nuclear construction, inactive commissioning, active commissioning and commercial operation. At each stage, the arrangements expected to be in place within the potential licensee will be proportionate to the hazards and risks to the public and the environment at that stage. In the early stages, a potential or candidate licensee is not expected to have all the features in place that will be required to support future operation.

Nevertheless, the licensee must have a clear view and forward plan for the progressive development of its breadth of capability and depth of resource capacity, so as to convey confidence that it has a coherent development pathway, with new capability implemented in good time in advance of need.

Interaction with Generic Design Assessment

Furthermore, certain requirements – in particular, Design Authority and Intelligent Customer functions – are essential at the outset. This arises from the licensee's role with respect to Generic Design Assessment.

Here the Requesting Party engaging with the regulators would be the SMR technology vendor, rather than the licensee. Accordingly, the vendor will submit information on the design and performance of the structures, systems and components that make up the SMR, together with assumptions on how it will be operated and maintained. It is critical that the licensee has the capability and power to ensure that this information is consistent with its own expectations and requirements.

Contractor resourcing

For a prospective new licensee which cannot benefit from a history of nuclear operation under the UK regulatory regime, and which therefore has limited scope to provide or develop competent and experienced staff from its own resources, it will be essential to draw on support from contract partners.

The nuclear Regulators draw an important distinction between, on the one hand, staff seconded under contract but located within the licensee's own organisational roles and management arrangements; and on the other, staff providing safety-related services from positions within a contractor's organisation and management arrangements. In the former case, the resource is considered as an integral part of the licensee; in the latter, the specification of the work and acceptance of its outputs must be subject to a formal Intelligent Customer process.

Relating development stage to timeline

The required evolution of the organisational capabilities and capacity of a potential / candidate licensee is determined by the stage of development of the SMR installation from design through to operation, alongside the corresponding progress of licensing and permitting from pre-application consultation through formal application to grant.

This evolution will be shown through discrete stages of the programme development and mapped against the indicative timeline of the integrated schedule.

Comprehensive information defining the organisational capability and capacity is shown in the following tables, presented systematically according to the information flow shown in the following figure.

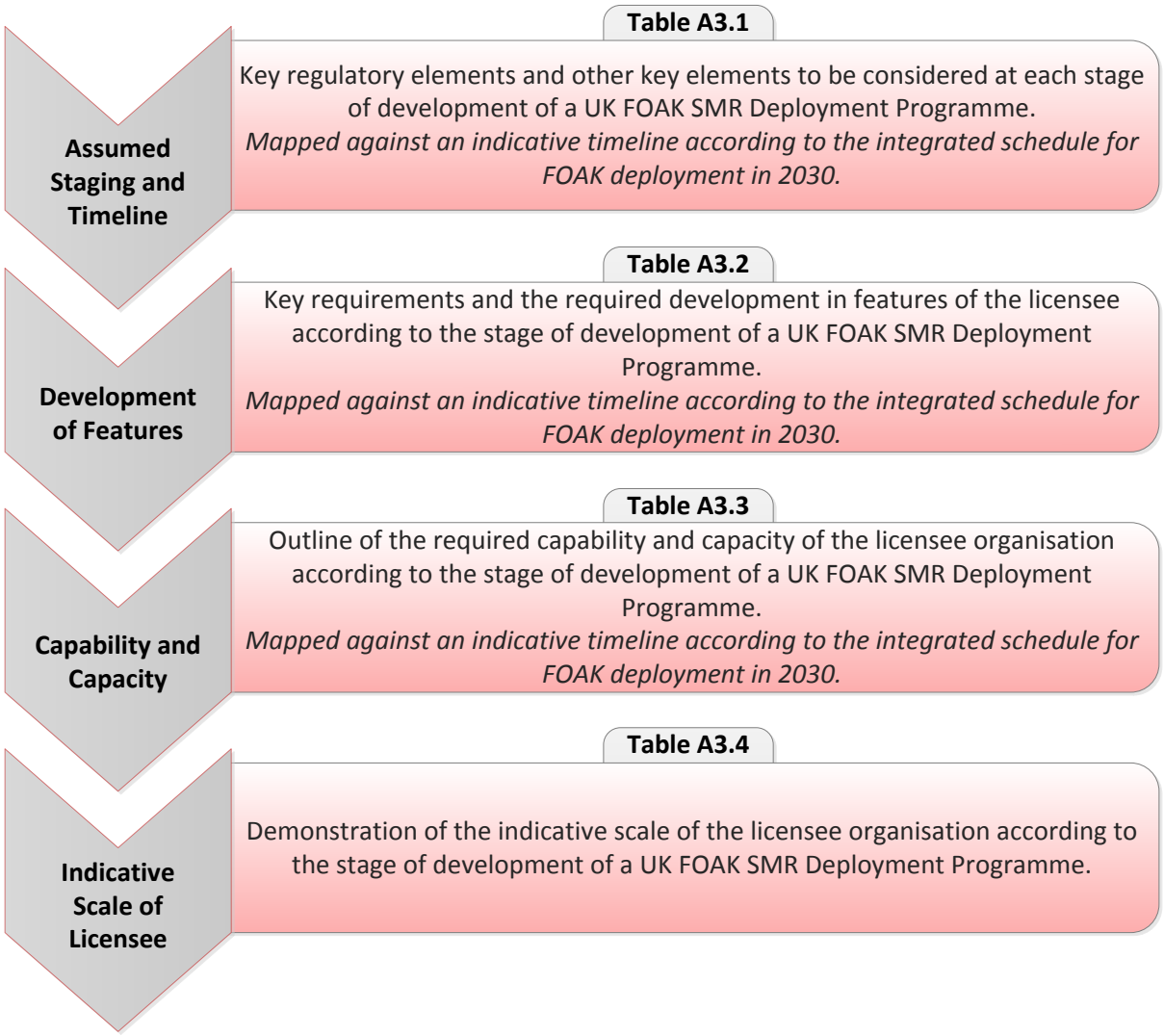


Table A3.1: Assumed Staging and Timeline

Phase			Stage (Project Milestones)	Key regulatory elements	Other key elements	Timeline (Year) Facilitated Schedule
Design development	Licensee and site development		GDA (pre iDAC / iSoDA)	Design vendor initiates GDA as Requesting Party, preferably with involvement by licensee-to-be staff, funded by cost recovery agreements with Regulators Grant of interim Design Acceptance Confirmation / Statement of Design Acceptability (iDAC / iSoDA)	HMG requests Regulators to undertake GDA Design vendor applies to HMG (DECC) for Regulatory Justification decision (probably via Nuclear Industries Association), with involvement by licensee-to-be staff HMG initiates renewed Strategic Siting Assessment (SSA) Design vendor and licensee-to-be staff nominate intended implementation site(s) into renewed SSA, including public consultation Design vendor initiates UK supply chain qualification, with involvement by licensee-to-be staff **Completion of these stage elements – especially iDAC / iSoDA – is expected precondition for Initial Investment Decision**	Years 1 to 4
			GDA (post iDAC / iSoDA)	Grant of full Design Acceptance Confirmation / Statement of Design Acceptability (DAC / SoDA) Licensee-to-be staff content that GDA assumptions bound intended implementation sites and is a secure foundation for the Pre-Construction Safety Report (PCSR)	HMG consults on Regulatory Justification decision, Statutory Instrument completes parliamentary process HMG completes SSA, consults on revised National Policy Statement for Nuclear Power Generation Licensee-to-be staff progress supply chain qualification and readiness	Years 4 to 6
			Initial establishment of licensee	Regulators consider whether memorandum / articles of association, access to funding and SQEPness of directors are appropriate for licensee-to-be Licensee-to-be initiates development of safety, security and environmental management arrangements and interface with Regulators (including funding agreements) Good practice to establishes shadow Nuclear Safety Committee	Project sponsor establishes licensee-to-be as legal body corporate, memorandum / articles of association Project sponsor / vendor establishes licensee funding agreements and terms for use of design Licensee-to-be appoints credible independent directors Project sponsor / licensee-to-be select FOAK site, define project scope including associated developments and ILW / spent fuel lifetime stores	Years 1 to 3
			Preparation for consent applications	Licensee-to-be develops Company Manual, Safety and Environment Management Prospectus, Nuclear Baseline, safety and environment case – particularly PCSR, including extensive pre-application engagement with Regulators and progressive recruitment of SQEP staff Licensee-to-be undertakes qualification of suppliers to depth reflecting safety / environmental / project significance Licensee-to-be and project sponsor initiate negotiation of terms for Funded Decommissioning Programme and Waste Transfer Contracts	Licensee-to-be engages with local planning authorities, Natural England, Marine Management Organisation and other stakeholders, secures Scoping Opinion, commissions site characterisation studies, undertakes pre-application consultations Licensee-to-be negotiates terms for grid connection agreement, electricity (and heat) offtake agreements / Contracts for Difference Sponsor and licensee-to-be negotiate with HMG / Infrastructure UK on terms for project guarantee Licensee-to-be, project sponsor and vendor negotiate terms for supply from top-tier supply chain for construction and fuel Licensee-to-be establishes company manual and plan for progressive development of supporting management arrangements	Years 4 to 5

			Formal agreements, applications and consents	Licensee-to-be finalises and submits applications for Nuclear Site Licence, Environmental Permits for construction and operation 'Competent authority' undertakes Appropriate Assessment if required under Habitats Regulations Licensee-to-be drafts and HMG (DECC) makes Euratom Article 37 submission to the European Commission Licensee-to-be drafts and develops Site Security Plan, drafts Euratom Article 78 Safeguards notifications for ONR to submit Licensee-to-be finalises Decommissioning and Waste Management Plan, submits Funded Decommissioning Programme to Secretary of State for approval	Licensee-to-be develops and submits Euratom Article 41 Communication to the European Commission Licensee-to-be submits application to the Planning Inspectorate for a Development Consent Order for full project, and to local planning authorities, drainage boards, etc. for any justifiable pre-DCO consents to prepare sites National Grid Electricity Transmission submits corresponding DCO application for necessary grid works **Grant of licence, permits, consents in this stage – including "ready to grant" where immediate grant would be unnecessarily onerous – is expected precondition for Further Investment Decision** **Note that grant of the licence does not in itself give permission for nuclear-significant work to start**	Years 4 to 7
		Project execution	Non-nuclear site preparation	To accelerate programme, licensee undertakes site preparation (e.g. clearance, earthworks) which has no nuclear safety significance and – if in advance of grant of DCO – could be reversed if required Licensee initiates Local Liaison Committee / Site Stakeholder Group	To accelerate programme, licensee undertakes preparation work on associated developments which – if in advance of grant of DCO – could be reversed if required **Note that such work is undertaken at risk if DCO is not subsequently granted**	Years 6 to 8
			Nuclear construction	Licensee establishes Baseline organisational structure with SQEP staffing, progressively develops safety / environmental compliance arrangements as appropriate for current and upcoming hazards requiring to be managed Regulators undertake readiness reviews Licensee secures Permissions under NSL to start nuclear safety significant works and pass through successive regulatory hold points Licensee engages with local authorities, Regulators, blue light services, Food Standards Agency etc. to support develop of the local authority's emergency plan and to establish necessary facilities	Business case (including expected construction schedule, construction, operational and liability costs, revenues, access to finance, uncertainties and risks) acceptable to sponsor, vendor and licensee **Sponsor, design vendor and licensee make Final Investment Decision and enter funding agreements accordingly** Licensee enters firm contracts with supply chain	Years 9 to 14
			Inactive commissioning	Licensee establishes full management and compliance arrangements with NSL and permits Licensee establishes full operational capability of plant components, structures and systems, and finalises Pre-Commissioning Safety Report (PCmSR) Licensee implements and exercises emergency arrangements Regulators undertake readiness reviews for bringing fuel onto site and starting active commissioning, and provide Regulatory Permissions for licensee to commence these activities	Licensee commissions independent review of readiness for active commissioning	Years 12 to 14
			Active commissioning ("all-in" – end of organisational growth for FOAK)	Licensee secures Permissions to fuel reactor, achieve criticality and progressively demonstrate performance of systems in service Licensee finalises Pre-Operational Safety Report (POSR) and supporting safety and environmental cases		Years 13 to 14

			Operation	Licensee enters normal operation Licensee undertakes organisational restructuring to reflect needs for operational phase under LC36 process	Sponsor and licensee undertake financial restructuring following period of proven operation to reflect elimination of construction and performance risks	Year 14 on

Table A3.2: Development of Features

Stage	Activities, hazards and risks (licensee to be)	Legal requirements (bearing on licensee)	Key requirements / features			Timeline
			Organisation structure	Governance arrangements / leadership	Capability / capacity	
GDA (pre iDAC / iSoDA)	**Activities:** •Initiation of GDA, Justification, SSA •Nomination of site(s) •Initiation of supply chain qualification **Hazards and risks:** •Failure of UK project credibility to justify HMG resources •Design / site parameters inconsistent with UK requirements •Inadequate information and/or Regulator and stakeholder engagement to justify design / site(s) •Inadequate supply chain qualifications / specifications for UK requirements	**Limited while licensee is not yet formed as legal person.** Focus is on establishing foundations for competent licensee and project in UK environment, which requires licensee to be "controlling mind" independent of vendor and parent company	**Skeleton must include:** •Design Authority – identifying requirements to underpin future safety / environment case, procuring independent technical support where needed •Intelligent Customer – understanding safety / environmental significance of design / supply chain / siting proposals, with authority not to accept if inadequate for UK implementation	**Skeleton focused on:** •Clear leadership on distinct role and responsibility of licensee-to-be in UK environment, determination to exercise this •Clear leadership in developing nuclear safety culture and behaviours appropriate for credible licensee •Exercise of Design Authority and Intelligent Customer roles supported by initial quality and records arrangements	**Head of licensee-to-be credible to HMG and Regulators as potential Chief Nuclear Officer.** **Early recruitment of credible independent safety / environment director-to-be.** **Core personnel for future licensee must be SQEP for:** •Exerting leadership role vis à vis promoter / sponsor, HMG / Regulators, vendor / supply chain •Exercising Design Authority and Intelligent Customer roles	**Years 1 to 4**
GDA (post iDAC / iSoDA)	**Activities:** •Completion of GDA, Justification, SSA / Nuclear NPS •Development and finalisation of PCSR •Progress towards finalising design and top-tier supply chain •Progress in building local stakeholder confidence in safety and benefits of project at nominated site(s) **Hazards and risks:** •Design / site parameters committed to secure UK approvals not implementable in practice •PCSR for site-specific SMR implementation not acceptable to Regulators •Inadequate Regulator and/or local stakeholder engagement to secure confidence in potential project	•Participation as shadow licensee-to-be alongside promoter / sponsor in negotiating commercial terms for site acquisition, grid connection, project supply (especially nuclear safety-significant long-lead items), electricity (and heat) offtake	**Shadow structure includes:** •Technical – role to support Design Authority •Consenting – roles to progress land-use planning and safety / security / environmental regulatory requirements (note: 'consenting' includes licensing and permitting) •Corporate – Commercial, Finance, Legal, Communications	**Shadow organisation focused through Shadow Board** •Initial management system – policies to set requirements and expectations, key procedures to ensure consistency •Deploy tools for strategic development and deployment of strong nuclear safety culture	**Resourcing route contingent on duration of requirement and need to represent Licensee-to-be:** •Technical, regulatory and site-based communications resource is ongoing requirement, able to engage authoritatively making commitments on behalf of Licensee-to-be •Planning resource must also engage authoritatively, but is shorter-term requirement peaking through consenting and discharge of planning conditions – major role for expert consultants •Other corporate functions may be resourced outside licensee-to-be	**Years 4 to 6**
Initial establishment of licensee	**Activities:** •Engagement with Regulators to ensure acceptability of legal structure and leadership of licensee-to-be and its tenure of its site(s) •Development of shadow organisation elements and management arrangements required by prospective licensee, including Nuclear Safety Committee	•Formal establishment of UK-registered licensee company, Memorandum and Articles, Board of Directors •Development of Company Manual •Access to experienced legal advice on adequacy and	**Broaden structure; depth depends on timing of need:** •Internal Regulation – oversight / challenge role anticipating external regulation. Key element to ensure formation of credible shadow Nuclear Safety Committee •Training – anticipating growth in staffing and need to ensure consistent mission, values and behaviours as well as technical qualifications	**Formalise Board and initial management system:** •Directors appointed, including at least one credible independent •Formal target and progress reporting system •Formal budgeting and accounting system •Initiate development of proportionate compliance arrangements anticipating NSL, permit conditions	**Start building capacity to support credible consenting applications, including:** •Regulatory and planning requirements – engagement with HMG, local authorities and Regulators; also generation of evidence – to be fully in place for next stage •Commercial requirements – engagement with supplier qualification, supply specification	**Years 1 to 3**

	• Further engagement with local stakeholders to build confidence in licensee at nominated site(s) **Hazards and risks:** • Regulators lack confidence in motivation, organisation, capability and/or capacity of licensee-to-be, including its tenure of the proposed licensed site(s) • Regulators lack confidence that the proposed project(s) and site(s) are bounded by GDA assumptions • Local stakeholders lack confidence in the licensee-to-be as a trustworthy partner for decades to come	completeness of scope of preparation against formal consenting requirements • Formal agreements with sponsor / promoter on access to funds, with vendors and supply chain on IC powers, with Regulators on pre-application engagement, and with site owner on secure tenure • Start of negotiation on terms for nuclear insurance, project guarantees	• Project – anticipating need to oversee / control nuclear safety-significant construction work • Operations – anticipating need for SQEP staff to advise on commitments in consenting and gain plant experience during commissioning	• Focus on arrangements that ensure specifications for supply contract negotiations reflect nuclear safety, environmental and operational requirements • Maintain and reinforce tools for co-ordinating, directing and motivating licensee-to-be staff • Maintain and reinforce engagement as licensee-to-be with Regulators, HMG and local stakeholders	• Project and Operations – sufficient to ensure future requirements are recognised • Training – to ensure consistency in licensee-to-be nuclear safety culture as staffing increases – especially in key experts implanted for limited term	
Preparation for consent applications	**Activities:** • Undertake full site characterisation studies (including for necessary associated developments) • Develop safety and environment management prospectus, company manual and management arrangements for licensee-to-be • Develop safety and environment case for the proposed project(s), with pre-application engagement with Regulators • Progress supplier qualification, specification and terms for supply • Progress negotiation on terms for Waste Transfer Contracts, Contracts for Difference and other financial agreement • Consult local stakeholders in accord with Planning Inspectorate expectations • Plan and progress implementation of progressive increase in licensee-to-be staff resources (directly employed and agency provided) **Hazards and risks:** • Inconsistency between information and commitments provided to planning and regulatory authorities, leading to loss of confidence in reliability of licensee-to-be	• Note distinction between agency / contractor staff working within licensee's management structure and arrangements – considered by Regulators as licensee resources – and those working under contractor's management structure, considered as external supplier	**Extend depth in functions needed through and beyond consenting** • Central functions – extension focused on development of key documents (e.g. Environmental Report for DCO, Safety and Environment Management Prospectus) and documented management arrangements • Site-based team – extend to include project, technical and regulatory expertise in preparation for oversight / control of work	**Establish track record as credible licensee-to-be body corporate via focus on:** • Further reinforcing engagement as licensee-to-be with Regulators, HMG and local stakeholders • Implementing proportionate compliance arrangements anticipating NSL, permit conditions • Reinforcing tools for ensuring consistent nuclear safety culture across staff, supporting consultants and supply chain • Implementing shadow Management of Change processes for organisational resources, design configuration	**Secure capacity to support consenting, start building capacity beyond grant of consents. Includes:** • Consenting – need resource to sustain very high level of pre-application engagement with local authorities, Regulators and HMG, and in assembling and testing supporting evidence • Corporate functions – need resource to progress high level of engagement with HMG and other parties on key financial terms (FDP and WTC, CfD, nuclear insurance, project guarantees) • Identify organisational nuclear baseline and resource plan to achieve this	**Years 4 to 5**

	• Unsustainable mix of employed vs agency staff, leaving licensee-to-be excessively vulnerable to withdrawal of key post holders					
Formal agreements, applications and consents	**Activities:** • Develop formal application documents for NSL, environmental permits, DCO, Funded Decommissioning Programme agreement, Euratom Article 41 Opinion; draft Articles 37, 78 submissions for HMG • Competent Authority undertakes Appropriate Assessment if necessary • Together with project sponsor and investors, review emerging business case once applications are granted to sanction next phase spend • Increase staff resourcing towards nuclear baseline structure • Prepare for mobilisation of preferred suppliers **Hazards and risks:** • Inadequate pre-application engagement and consultation, leading to demand for further information / justification before applications are accepted • Applications granted only subject to excessively onerous conditions • Risk of refusal or Judicial Review if administrative procedures and requirements are not fully followed and met	• Establish terms for nuclear insurance, project guarantees • Submit and pursue formal applications as licensee-to-be company through to grant • Continued access to experienced legal advice in progressing consenting processes	**Focus on demonstrating credibility and effectiveness of licensee structure in place**	**Focus on demonstrating credibility and effectiveness of management arrangements and culture in place, alongside:** • Further reinforcing engagement as licensee-to-be with Regulators, HMG and local stakeholders • Engaging as prospective operator alongside promoter / sponsor with HMG and other parties on financing of project • Engaging with vendor and prospective top-tier contractors to ensure strong common understanding of procedures, scope, schedule and readiness for start of construction	**As confidence grows in likelihood of consent, continue growth of capacity for post-consent phase** • Includes resourcing of project execution team (contractors / licensee-to-be)	**Years 4 to 7**
Non-nuclear site preparation	**Activities:** • Define scope of work that does not require NSL grant and does not pre-empt DCO, but materially de-risks or accelerates project schedule • Engage with Regulators and local planning authorities and stakeholders to ensure justification for preparation work is robust and understood • Contract with selected contractors to implement preparation work • Oversee and control implementation on proposed licensed site as demonstrable "controlling mind" **Hazards and risks:**	• Submit and pursue formal applications as licensee-to-be company through to grant	**Deploy project team (licensee / contractors) to execute work** **Deploy site team to oversee / control contractors**	**Focus on using site preparation to demonstrate credibility of licensee-to-be's control of future nuclear construction** • Ongoing strong engagement as licensee-to-be with Regulators and local stakeholders	**Extend site and project team capacity in accord with scope of site preparation works**	**Years 6 to 8**

	• Inadequate pre-application consultation or excessive scope, leading to rejection as pre-empting DCO or Judicial Review by objectors • Scope impacts on safety of future nuclear plant, leading to objection by Regulators • Performance on early works (e.g. causing nuisance) contradicts previous assurances, resulting in loss of confidence in licensee-to-be and growth in opposition					
Nuclear construction	**Activities:** • Together with project sponsor and investors, review business case to make Final Investment Decision • Implement planned progressive increase in manpower resources • Exercise oversight and control over all activities proportionate to their potential safety / environmental significance, including delayed impacts only apparent during operation • Ensure compliance with specifications, conditions of consents, and assumptions underpinning safety and environment case • Maintain strong, open interfaces with Regulators and local stakeholders **Hazards and risks:** • Failure to apply best practice, e.g. BAT, investigate events, learn from own and other's experience • Insufficient SQEP staff or contractors, leading to schedule delay or loss of quality • Inadequate licensee oversight and intervention over activities on licensed site e.g. over rogue contractor, leading to loss of Regulator and stakeholder confidence	• All necessary consents granted • Agree commercial terms with vendor and all top-tier suppliers, including National Grid • Agree financial terms for Funded Decommissioning Programme, nuclear insurance, electricity (and heat) offtake Contracts for Difference • Agree terms for project funding with sponsor and equity / debt investors • Following FID, enter contracts and agreements	**Project team structure in place** **Site and central oversight / control functions fully established, including internal regulation and NSC**	**Focus on oversight and support for project implementation in accord with conditions of consents and nuclear safety culture** • Focused use of tools for ensuring consistent nuclear safety culture across staff, contractors and supply chain • Demonstrating priority on safety, quality, timeliness rather than cost alone • Ongoing strong engagement as licensee with Regulators and local stakeholders	**Rebalance resources as project progresses** • Consenting function refocuses onto safety / environmental regulation once planning conditions discharged • Environmental radiological monitoring capability established • Future operations staff deployed / recruited to benefit from nuclear operational experience • Site team and operations function evolve towards operations and maintenance teams for future commissioning and station operation • Technical function progressively develops robust safety cases for commissioning and operation	**Years 9 to 14**
Inactive commissioning	**Activities:** • Implement and exercise management arrangements for commissioning and operation (including emergency arrangements)	• Necessary permissions secured under NSL • Grid connection contractual arrangements implemented to support major loads	**Refocus towards structure for station operation** • Station operation structure fully populated • Commercial organisation develops towards sale of electricity (and heat)	**Board refocuses towards station operation** • Uses performance as plant systems are handed over to demonstrate fitness as nuclear licensee and operator • Continued strong leadership on nuclear safety culture	**Continued rebalance towards station operation** • Station operation teams fully established, participating in commissioning	**Years 12 to 14**

	• Satisfy hold points for handing over plant from construction to operations • Confirm safety and operational performance of plant components and systems • Confirm non-radiological environmental impacts are consistent with expectation **Hazards and risks:** • Unexpected performance deficit requiring diagnosis and correction • Over-focus on schedule adherence over safety and open recognition and considered responses to problems, leading to loss of Regulator confidence and risk of plant damage • Inadequate preparation and training for emergencies, leading to loss of stakeholder and Regulator confidence			• Continued strong open engagement with nuclear Regulators and local stakeholders	• Corporate functions, especially commercial, increase to support station operation • Project teams reduce as plant and systems are accepted for hand-over to station operation team	
Active commissioning ("all-in" – end of organisational growth for FOAK)	**Activities:** • Satisfy hold points and secure Regulatory permissions for bringing fuel onto site, loading to reactor, first criticality, staged increase in reactor power • Confirm safety and operational performance of reactor systems and components • Confirm operational radiological environmental impacts are consistent with expectation **Hazards and risks:** • Unexpected performance deficit requiring diagnosis and correction • Over-focus on schedule adherence over safety and open recognition and considered responses to problems, leading to loss of Regulator confidence and risk of events with major commercial and reputational damage	• Necessary permissions secured under NSL • Grid connection contractual arrangements optimised in light of plant performance	**Station operation structure in place**	**Full compliance arrangements in place**	**Stable station operation / maintenance resourcing, project function progressively ended**	**Years 13 to 14**
Operation	**Activities:** • Sustain routine operation, maintenance and refuelling in accord with conditions of NSL and permits and all other legal requirements • Positively maintain strong nuclear safety culture	**Continuing compliance with legal requirements on nuclear generator**	**Stable structure for station operation, training, technical and corporate support, internal regulation and regulatory interface**	**Stable governance and strong leadership on nuclear culture**	**Stable resourcing through settling down phase**	**Year 14 on**

	• Positively maintain open “no surprises” interface with Regulators and local stakeholders **Hazards and risks:** • Complacency, loss of questioning attitude and willingness to learn from own and others’ OPEX • Over-focus on short term production over safety, quality and compliance with procedures, risking events with major commercial and reputational damage					

Table A3.3: Capability and Capacity

Stage	Organisation component function (description of key capabilities and indication of capacity)										Timeline
	Board	**DA**	**Technical (inc. Safety and Environment) (ultimately forms Engineering function)**	**Licensing and Consenting**	**Training**	**Operations and maintenance**	**Internal Regulation**	**Pre-Licence Nuclear Safety Committee**	**Corporate (Finance, Commercial, Legal, HR, Communications)**	**(Integrated safety, security and environmental case)**	
GDA (pre iDAC / iSoDA)	Establish the ownership of the entity to be licensed with appropriate board representation. Identify/early appoint independent non-Exec Directors Appoint the initial directors and minimal support staff. (1) Define the systems and processes and appropriate Governance arrangements Establish High level links to the Regulators, including role in vendor's GDA funding agreements. Appoint a nuclear safety director early Select the Reactor Vendor (likely to be part of the ownership group!)	Establish the engineering function (inc. all technical disciplines) sufficient to track the GDA processes and submissions Develop the organisation to internalise the submissions to clearly understand the reactors design and its safety and environmental envelope. Note aspects of this work can be managed through Contractors initially but ultimately the expertise is generally held "in house"	This grouping should include all technical functions including Engineering (all disciplines), Physics, Chemistry and link closely to the DA and safety case functions. This develops and carries out the Intelligent Customer function for the licensee Appreciate the wider technical issues to ensure sufficient expertise exists "in house" to specify any essential plant and services which may be required under contract. Note aspects of this work can be managed through Contractors initially but ultimately the expertise is generally held "in house"	Appoint a Licensing Director plus staff to develop the arrangements for Licence and permit applications (a) If necessary appoint specific advisors to support the applications. Take the lead in constructing the Package required to support Application including (but not limited to) the Nuclear Baseline, the Corporate organisation, The Demonstration of Design Authority	Develop the induction training arrangements for all staff. Provide training on Nuclear Safety Culture utilise INSAG 4 and INSAG 15. (b) Able to provide training relevant to Nuclear Site Licence Plan future training strategy to meet programme objectives. Develop detailed training for all staff and personnel in the Supply chain to ensure safety culture is understood and that issues such as "Questioning Attitude" are embedded in to the normal way of doing business	Appoint an experienced Head of Operations to ensure the operation and maintenance functions are appropriately addressed during design and construction	Establish a Quality Assurance organisation to embrace the Internal regulation arrangements to deliver oversight, advice and guidance. Establish the processes and procedures for Internal regulation. Along with Licensing develop early links to the Regulators such that their expectations are clearly understood and communicate across the organisation	Strictly a Nuclear Safety Committee is not a requirement until Licence Grant when it is called for under LC13. (c) However good custom and practice indicates the early establishment of a Pre-Licence NSC as an advisory body along with the related processes and procedures is favoured by the Regulators. Such an arrangement supported by suitably experienced independents can offer valued advice during the period of Licence application	The standard functions to support any corporate body. At the initial stages numbers would be small but very important would be HR in order to support the acquisition of the right staff in all areas. Similarly, the early development of a security-compliant IT communication system to enable document control	Outline the structure of the safety case and its links to the GDA submissions Begin to develop the structure for the PCSR. Develop the processes and procedures for managing the development of safety cases including graded approach and the "change procedure" (note this will be required as part of the Licence application and is covered by various licence conditions notably LC20, LC22, and LC36 (c))	**Years 1 to 4**

	Develop company strategy for progression from FOAK to fleet, including waste and spent fuel storage Develop plan for staged financial commitments to support the strategy										
GDA (post iDAC / iSoDA)	Establish the operational executive / board to include nuclear construction expertise. This would report to the main board and will have some common membership. (CEO as a minimum) Agree initial financial commitment on FOAK plant Oversee the acquisition of the FOAK site for construction Scope benefits of early works (non-nuclear) – proceeding at risk! Lead on the local Stakeholder engagement once the site is identified (a continuous activity over the whole period).	Further enhance the Engineering team to encompass the site specific aspects of the Design Authority	Establish the Make/buy decision point. Enhance the technical departments to encompass the necessary capability to specify and oversee the detailed design and construction of the SMR power station. This needs to include Balance of plant issues as well as nuclear plant. Identify Long Lead time items and initiate procurement Working with Commercial formulate the Contractual agreements with suppliers for the plant construction (EPC contract?) and grid connection	Prepare and engage Regulators on Licence and permit applications and respond to any regulatory questions. Agree a potential graded approach recognising some conditions will apply from day 1 of licence grant e.g. LC2 marking the site boundary and some will be the subject of future consents e.g. LC 4 Restrictions of nuclear matter on site.	Develop training focussed towards construction arrangements e.g. the CDM Regs etc. Begin to develop thoughts on Operational training	Begin to structure the operations and maintenance working arrangements (with support from HR) to: 1. Develop the employment arrangements 2. To appoint early to take advantage of any potential external training possibilities.	Develop the internal challenge capability and begin to evaluate tasks on the basis of a graded proportionate approach related to their impact on nuclear safety	Develop the Pre-NSC seeking advice on issues arising during the licence application period. Also seek Pre-NSC advice on all issues related to nuclear safety particularly in the PCSR	Finalise the commercial, communication (IT systems) and archiving capability in support of Licence and permit applications	Develop the PCSR submission to accompany the Licence application	**Years 4 to 6**

Initial establishment of licensee	Consider the essential posts and roles which must be filled if licence application is to be successful. Specifically, the appointment of a Chief nuclear operating officer (CNO) Establish links/contracts with outside organisations to facilitate cross organisational learning. Such organisations might be INPO, WANO, IAEA," SMR Owners Group", the reactor vendor and other operators using equivalent plants. (2)	Consolidate the Design authority capability to become an effective "owner" of the Site based PCSR	Continue to develop the technical capability ready to support the construction oversight and subsequent commissioning. Some of these roles will be contractual as the numbers should reduce once routine operation is established following active commissioning.	Confirm the actual Licencing and permitting programme Ensure compliance with all LC's which will become active from day 1. (i.e. that they are in place for Licence Grant) Establish the programme for Consents and ensure that arrangements will be in place to meet all requirements when they arise	Organise for staff to be seconded to relevant organisations to gain early experience. Utilising the personnel who have gained experienced on secondments establish the training function to deliver programmes for subsequent employees	Begin to populate the staffing structures for operations and maintenance. Actual numbers will depend on the specific SMR design selected	Independently review the arrangements for establishing the licence.	Provide advice on all relevant submissions depending on nuclear safety significance	Offer support to the main operational areas. Specifically, this will be a time of significant recruitment hence HR activity, of legal activity linked to planning applications, the Site Licence, and environmental permits, hence Legal activity and it will be a period of significant commercial activity	Develop the PCSR and consider its further development to a Pre-Commissioning safety report (PCmSR).	**Years 1 to 3**
Preparation for consent applications	Oversee the preparation and maintain links with the Regulators at High Level Establish relationship with Ownership group to reinforce the needs for the licensee to be the controlling mind Establish links with the Grid operators related to ultimate grid connection.	Consolidate the Design Authority by the appointment of appropriate expertise perhaps supplemented by contractors	Build up the Technical capability to enable operations and maintenance support. Integrate with the Design Authority capability	Finalise and submit applications and monitor their progression of Consent applications and that arrangements are in place to ensure compliance Respond to any Regulator questions arising from applications)	Able to develop and operate plant simulator Deliver training and refresher training related to construction activities, likely through contracted training arrangements	Populate the staffing structures for operations and maintenance. Actual numbers will depend on the specific SMR design selected	Independently review the applications for consents	Provide advice on all relevant submissions depending on nuclear safety significance	Provide business support functions as required	Develop the PCSR and consider its further development to a PCmSR.	**Years 4 to 5**
Formal agreements, applications and consents	Oversee the preparation and maintain links with the	Consolidate the Design Authority.	Build up the Technical capability to enable operations and maintenance	Monitor the issue of the licence, consents, permits and licence	Able to provide training relevant to Operations and maintenance	Finalise the recruitment to operations and maintenance.	Independently review the applications for consents	Provide advice on all relevant submissions depending on	Provide business support functions as required	Confirm the PCSR is viable and then develop the	**Years 4 to 7**

	Regulators at High Level		support. Totally Integrate with the Design Authority capability	instruments attached to the licence. Note once all Licence conditions are in place the licencing organisation can be potentially run down to low numbers with the functions transferring to other sections.	Deliver training and refresher training related to construction activities, likely through contracted training arrangements	Actual numbers will depend on the specific SMR design selected	Morph the Pre-NSC to form the Nuclear Safety Committee under LC13	nuclear safety significance	Negotiate Funding Arrangements Plan and Funded Decommissioning Programme	PCmSR ready to commence plant commissioning	
Non-nuclear site preparation	Evaluate the financial, technical and regulatory risk of commencing this work in advance of final DCO and FID. Progress financial commitment for advance works	Consolidate the Design Authority.	Monitor the early construction works required to prepare the site for actual nuclear new build.	Limited involvement related to non - nuclear environmental discharges.	Able to provide training relevant to Operations and maintenance Deliver training and refresher training related to construction activities, likely through contracted training arrangements	Facilitate operations and maintenance staff training	Independently review the claims made on those aspects of construction which could have an impact on or role to play in nuclear safety/emergency arrangements	Receive advice on progress	Provide business support functions as required particularly related to contract arrangements	Confirm the PCSR is viable and then develop the PCmSR ready to commence plant commissioning	**Years 6 to 8**
Nuclear construction	Receive Nuclear Site Licence Initiate/Conclude negotiations on power purchase and Waste Transfer agreements and FDP Take the FID in order to commence the reactor construction activity Establish a power trading function in the organisation	Consolidate the Design Authority.	Oversee the construction works led by the reactor vendor under contract.	Establish the arrangements to accept the consents due for the commencement of and during nuclear related construction	Reinforce training for all construction personnel on the relevance of the works to Nuclear Safety (3) (d) Commence training on working with Ionising radiation in preparation for active commissioning (4) (e)	Deploy Trained Maintenance and operations staff on oversight activities	Independently review the claims made on those aspects of construction which could have an impact on or role to play in nuclear safety/emergency arrangements	Receive progress reports and respond with advice as requested (probably related to deviations to claims made in the PCSR) Review proposed commissioning approaches and related procedures	Provide business support functions as required particularly related to contract arrangements, including agreements with Government on CfD and FDP to secure revenues and liability costs for FID. Develop the detailed power trading arrangements and associated legal requirements	Monitor progress against the PCSR and lead the preparation and grading of any changes required Finalise the PCmSR ready to commence plant commissioning	**Years 9 to 14**

Inactive commissioning	Monitor progress and ensure readiness to move to active operations Receive regulatory consents for fuel to site and for non-radiological environmental discharges	Consolidate the Design Authority.	Oversee inactive commissioning and ensure appropriate records are kept Ensure that the appropriate Radiation Protection Advisors (RPA) and Radioactive Waste Advisors (RWAs) are trained and appointed [(e)]	Accept consents for non-active commissioning Establish the arrangements to accept the consents due after non-active commissioning	Utilise inactive commissioning activity as appropriate to enhance training of operations and maintenance personnel. Develop and ongoing training programme to be available for normal operation	Ensure a leading involvement in all inactive commissioning activities Ensure all Radiation Protection Supervisors (RPS) are trained appointed and in place. Ready for active commissioning	Independently review the claims made on those aspects of inactive commissioning which could have an impact on or role to play in nuclear safety/emergency arrangements Independently review inactive commissioning reports to confirm readiness for active commissioning	As requested provide advice on the claims made on those aspects of inactive commissioning which could have an impact on or role to play in nuclear safety/emergency arrangements Provide advice on inactive commissioning reports to confirm readiness for active commissioning	Provide business support functions as required	Monitor progress against the PCSR and the PCmSR and lead the preparation and grading of any changes required as a result of inactive commissioning	**Years 12 to 14**
Active commissioning ("all-in" – end of organisational growth for FOAK)	Receive the regulatory consent for active commissioning and for radiological environmental discharges noting the change in status of the organisation this implies Begin to plan the structural organisational changes related to normal operations. This implies that Operations and Maintenance becomes the dominant department with support from Engineering, training and safety case management. From a business perspective	Consolidate the Design Authority to ensure effective "ownership" of the POSR.	Oversee active commissioning and ensure appropriate records are kept	Establish the arrangements to request and accept the consents following active commissioning	Oversee active commissioning and amend training programmes accordingly for future training purposes.	Take a "hands on" role as a precursor to actual operations and "live" maintenance. Facilitate systematic phased hand-over process leading up to commencement of normal operation	Independently review the claims made on those aspects of active commissioning which could have an impact on or role to play in nuclear safety/emergency arrangements Independently review active commissioning reports to confirm readiness for normal operations	As requested provide advice on the claims made on those aspects of active commissioning which could have an impact on or role to play in nuclear safety/emergency arrangements Provide advice on active commissioning reports focussing on any necessary changes required to safety arguments to confirm readiness for normal operations Specifically provide advice on the S3SR (see final column) the document which is the basis of a request for consent to move	Provide business support functions as required	Monitor progress against the PCSR and the PCmSR and lead the preparation and grading of any changes required as a result of active commissioning Based on the commissioning create the Pre-Operation Safety Report (POSR, often called the Stage Three Safety Report (S3SR) [(5)]) as the basis of the request for consent to move to normal operations	**Years 13 to 14**

	ensure that the Electricity trading arrangements are functioning							to normal operations			
Operation	Oversee normal operations Optimise the electricity trading arrangements based on actual plant performance Review the overall strategy of moving from FOAK to a fleet and progress the next investment decisions this implies	Manage the design authority role now part of Engineering	Provide the Engineering/technical support to operations and maintenance	Establish the arrangements to accept consents related to operations e.g. LC 24	Provide a programme of ongoing training and refresher training in support of normal operations	Operate and Maintain the plant with Operations and maintenance focussed on compliance with all aspects of the Licence and discharge permits	Functions as a normal internal Regulator overseeing all aspects of operation and maintenance	The NSC reverts to a standard role under LC13 providing advice as requested on all aspects related to plant operations	Provide business support functions as required	As part of the Engineering function maintain the plant safety case utilising the agreed S3SR as the starting point. Commence planning of the first periodic safety review in line with LC15.	**Year 14 on**

Table A3.4: Indicative Scale of Licensee

	Board	DA	Technical (inc. Safety and Environment) (ultimately forms Engineering function)	Licensing and Consenting	Training	Operations and maintenance	Internal Regulation	Pre-Licence Nuclear Safety Committee	Corporate (Finance, Commercial, Legal, HR, Communications)
GDA (pre iDAC / iSoDA)									
GDA (post iDAC / iSoDA)									
Initial establishment of licensee									
Preparation for consent applications									
Formal agreements, applications and consents									
Non-nuclear site preparation									
Nuclear construction									
Inactive commissioning									
Active commissioning ("all-in" – end of organisational growth for FOAK)									
Operation		*DA Function subsumed into Technical Function to become Engineering*							

KEY:

= 1 to 5 people = 5 to 10 people = 10 to 50 peop = More than 50 people

Notes on table:

- Board and NSC includes part-time independent members counted as fractions
- DA merges with Technical into Engineering when design acceptance / modification demand reduces with commissioning and settled down operation
- Licensing and Consenting demand is extreme in preparation for and during DCO, licensing and permitting processes – significant demand on Technical too. Reduces to some extent during discharge of planning conditions
- Environmental aspects also substantial through construction and commissioning
- Training for all consultants and workers fundamental to nuclear safety culture in consenting stages and especially throughout construction
- Operations and Maintenance staffs up early to gain experience through installation and commissioning of plant systems
- Internal Regulation advice and oversight demand heavy through construction and commissioning
- Corporate support very heavy during negotiation of critical financial and commercial framework justifying FID, and when maintaining control through construction

Whilst the precise organisational structure is a matter for the SMR Developer / Operator company and this could change over the initial five-year period being considered, there are some common themes to nuclear operational companies which should be used as guidance. For example:

- The normal corporate positions, including those required under the Companies Acts, such as CEO, Company Secretary, COO, and CFO all apply.
- Custom and Practice shows that Non-Executive Directors of nuclear companies are appointed for their specific areas of expertise e.g. one would have very strong nuclear capability/experience, one would have strong Government association/influence, one would have strong financial credentials (audit). However, the licensee Board collectively is responsible for compliance with the nuclear site licence and environmental permits
- A Chief Nuclear Officer (CNO) which is often the COO but not necessarily as it depends on background and experience. The CNO will have direct authority over the operation of the plant. This position will generally have an element of control over training
- A Director of Nuclear Safety with direct access to the licensee's main board. This position generally covers all aspects of Safety (nuclear and conventional), Environment, Health, Radiological Protection, and Quality
- A Director of Engineering to cover all technical disciplines including the Design Authority, Intelligent Customer, Safety Case, etc.
- A Director of HR to cover recruitment and aspects of training.

APPENDIX IV GANTT CHART – MARKET-LED SCHEDULE

Key to Gantt Chart durations and interdependencies:

Term	Description
Activity durations	Represented as elapsed months (identifier: emons) or days (identifier: days)
Activity interdependencies	The nature of the relationship between a predecessor task and a successor task: • Successor starts following the completion of the predecessor task (a Finish-To-Start relationship, identified by "FS") • Two tasks commence at the same time (a Start-To-Start relationship, identified by "SS") • Two tasks complete at the same time (a Finish-To-Finish relationship, identified by "FF")

APPENDIX V GANTT CHART – FACILITATED SCHEDULE

Key to Gantt Chart durations and interdependencies:

Term	Description
Activity durations	Represented as elapsed months (identifier: emons) or days (identifier: days)
Activity interdependencies	The nature of the relationship between a predecessor task and a successor task: • Successor starts following the completion of the predecessor task (a Finish-To-Start relationship, identified by "FS") • Two tasks commence at the same time (a Start-To-Start relationship, identified by "SS") • Two tasks complete at the same time (a Finish-To-Finish relationship, identified by "FF")

APPENDIX VI ASSUMPTIONS REGISTER

It is necessary to define a conceptual scenario upon which to frame and develop a deployment route map, WBS and schedule. In-order to create this scenario some key bounding assumptions have been applied in the work. These bounding assumptions include assumptions provided by ETI at the start of the project and assumptions jointly agreed between DAS and ETI as output of project workshops.

The following table contains only the key assumptions that bound the study, extracted from the project MDAL. The full list of assumptions, including these bounding assumptions, is shown later.

Ref	Assumption description
A1	The programme start point assumes that organisations have been identified both for the Reactor vendor and the UK Operator, and that the five year schedule commences from this point.
A3	The UK deployment of a FOAK SMR is considered to be part of a first tranche of SMRs equating to a capacity of 5 to 10 GWe.
A4	The WBS shall represent the key enabling activities for all parties involved with the 5 year horizon. Some activities set out in the WBS may start before the five year window and some may continue after the five year window.
A5	Work undertaken will avoid a presumed assumption for a specific Reactor Vendor, Developer, Operator or Owner. It will also avoid a presumed solution for how these roles may combine.
A6	Schedule will be based on most likely activity durations, based on published timescales/industry experience. Where uncertainty and risks/opportunities are known these will be noted and drawn out as necessary on critical paths.
A42	Once licenced, organisational structure becomes the subject of LC 36 should further changes be required.
A43	Nuclear safety is an all-encompassing term covering specific nuclear safeguards & safety, industrial safeguards & safety, radiological protection, health, transport and security within the organisation.
A51	SMR development will need sites beyond those identified and delineated in the existing NPS for Nuclear Power Generation.
A67	CHP capability is an opportunistic rather than planned revenue for FOAK as district heating connection is not within the scope of the SMR plant investment.
A68	Single technology selected for UK SMR deployment.
A69	The vendor will be well advanced with safety case and feasibility design, but with detailed design, design for manufacture and procurement specifications yet to be detailed. This assumption recognises the required level of maturity required to make a credible GDA application within the timescales associated with the 5-year window.
A70	The technology will be developed for UK deployment as the principal aim; however, tertiary revenue may subsequently be sought from overseas export. The technology will therefore be designed to meet UK regulatory requirements; but the development programme may also pay cognisance to the potential regulatory requirements of a given target market.
A84	Government continues its tradition to only request ONR and the Environment Agency to undertake GDA on vendor designs that have a credible nuclear operator identified against it, who has experience also of operating nuclear reactors somewhere in the world.
A117	It is necessary that at the end of the five year schedule, GDA would be substantially complete, and it is assumed that GDA is a 5-year process.
A118	The desired timeline for FOAK SMR operation in the UK is by 2030.

Alongside bounding assumptions, throughout the course of this project assumptions have been developed for specific WBS areas associated with the deployment of a FOAK SMR in the UK. As the project has progressed, assumptions have been tested to accept or reject them, test each WBS scope and to explore if they form opportunities for schedule/activity enhancement or risk reduction.

The following table contains all of the accepted assumptions, including the bounding assumptions, extracted from the project MDAL along with the assumption source and its associated WBS. It should be noted that where an assumption was rejected the reference number has been retired and will not appear.

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A1	Bound	Identified both vendor and operator	The programme start point assumes that organisations have been identified both for the Reactor vendor and the UK Operator, and that the five year schedule commences from this point.	ETI
A3	Bound	FOAK part of first tranche	The UK deployment of a FOAK SMR is considered to be part of a first tranche of SMRs equating to a capacity of 5 to 10 GWe.	ETI
A4	Bound	5-year horizon - WBS	The WBS shall represent the key enabling activities for all parties involved with the 5 year horizon set out within the RfP. Some enabling activities may start before the five year window and some may continue after the five year window.	ETI
A5	Bound	No presumed solution	Work undertaken will avoid a presumed assumption for Reactor Vendor, Developer, Operator or Owner. It will also avoid a presumed solution for how these roles may combine.	ETI
A6	Bound	Activity duration basis	Schedule will be based on most likely activity durations, based on published timescales/industry experience. Where uncertainty and risks/opportunities are known these will be noted and drawn out as necessary on critical paths.	DAS Proposal
A9	WBS 1.1	Opponent legal intervention	Legal intervention by nuclear opponents at UK, European and potentially wider level is to be expected.	Judgement
A11	WBS 1.1	SSA delivers sites	A further round of SSA will enable designation of further sites including those where a large nuclear reactor could not be accommodated.	EN6

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A12	WBS 1.1	GDA/ Reg Justification facilitation essential	Non site specific facilitate actions, e.g. GDA and Regulatory Justification are essential for early deployment of SMR.	Government Website on new Nuclear Build.
A13	WBS 1.1.1	Parliamentary time committed	UK Government commit parliamentary time for a White Paper, legislation or other means of giving legal force to SMR policy.	Judgement
A14	WBS 1.1.1	Robust legal policy	Material updates to the 2008 White Paper and associated legislation are needed to cover the desired SMR programme in legally robust way.	EN6 and Government website and 2008 White Paper.
A16	WBS 1.1.2	Vendor co-operation if more than one	SMR vendors co-operate in common SSA programme if more than one vendor.	Judgement
A17	WBS 1.1.2	SSA Process	A further SSA process is necessary to establish a legally robust set of potential SMR sites.	EN6
A18	WBS 1.1.2	Credible nominators	Credible nominators (e.g. prospective operators supported by vendors) will generate sufficient information to justify their nominations.	Judgement
A19	WBS 1.1.2	Nominator stakeholder interaction	Nominators will adequately communicate their intent to local stakeholders and address issues of concern.	Judgement
A20	WBS 1.1.3	Update National Policy Statements	Precedent set by process leading to designation of EN-1 and EN-6 will be followed by updated NPS's.	2008 White Paper and Energy Act +EN1
A21	WBS 1.1.3	Planning Act 2008 applicable	SMR power stations constitute Nationally Significant Infrastructure Projects under the Planning Act 2008.	EN1 and Planning Act 2008
A22	WBS 1.1.3	Advance site designation	Designation of potentially suitable sites in advance of the need for investment in site-specific planning and regulatory applications adds to vendor / investor confidence.	Judgement
A23	WBS 1.1.4	Regulatory Justification efficiency	Lessons learnt from successive justifications of large nuclear reactors will be applied to SMR programme.	Judgement
A24	WBS 1.1.4	NIA sponsorship	Nuclear Industry Association will co-ordinate applications from SMR vendors supported by prospective operators.	Judgement

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A25	WBS 1.1.4	Build on extant Justification Process	The justification process will build on that established for large new nuclear reactor designs.	Judgement
A26	WBS 1.1.4	Fuel type	As for large new reactor designs, the SMR practices will not include reprocessing or mixed oxide fuel.	Judgement
A27	WBS 1.1.5	Prioritisation of Regulator resource	UK Government will request nuclear Regulators to commit resources necessary to undertake timely assessment of SMR designs.	Judgement
A28	WBS 1.1.5, WBS 1.3	GDA process efficiency	Lessons learnt from GDA of large nuclear reactors will be applied to SMR programme and used in Vendor education	Judgement
A29	WBS 1.1.5	GDA Operator Engagement	SMR vendor is supported by prospective operator to ensure that statements made in GDA are consistent with expectations of future licensee.	Judgement based on ETI assumption that the Operator / Vendor has been chosen.
A30	WBS 2.1	Availability of financing	The availability of financing, and cost of capital risk-free-rate will remain broadly in-line with current market conditions, or generally accepted long-range forecasts.	Input to Workshop 1
A31	WBS 2.1	No Government Full Funding Scenario	No consideration will be given to the scenario in which the UK Government agrees to provide full funding (except state-backed guarantees) for the development, construction and ongoing operation of an SMR site. (i.e. private sector led finance for construction).	Input to Workshop 1
A32	WBS 2.1	Export finance	Does not consider the availability, or lack of availability of export finance for foreign vendors. This would be vendor-specific (or at least country specific) and therefore out with the scope of this study.	Input to Workshop 1
A36	WBS 2.2	Continuity of financial mechanisms	Financial mechanisms currently provided for in UK energy policy, will remain available for consideration by any future Government.	Input to Workshop 1
A37	WBS 2.2	Continuity of carbon trading	Carbon Trading markets remain operational throughout the life of the programme.	Input to Workshop 1

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A38	WBS 2.2	Market support mechanism availability	Foreign developers and operators have the same access to market support mechanisms as those that are UK based.	Input to Workshop 1
A40	WBS 3, WBS 3.1	Arrangements dependence (note MDAL ref 5)	Arrangements might depend on the type of SMR selected and on the commercial arrangements established recognising that in one possible scenario the constructor/operator could be the same entity whereas in another they could be different.	Judgement
A41	WBS 3.2	Timing of LCs	For a particular site / project initially not all Licence Conditions will come into force together as for example not all are relevant to say first nuclear concrete. As the project progresses licence instruments will be granted to enforce particular conditions for example on first nuclear fuel brought to site.	Judgement
A42	WBS 3.2.1, Bound	Organisational Structure	Once licenced structure becomes the subject of LC 36 should further changes be required.	LC 36
A43	WBS 3.2.1, Bound	Nuclear safety is all encompassing	Nuclear safety is an all-encompassing term covering specific nuclear safeguards & safety, industrial safeguards & safety, radiological protection, health, transport and security within the organisation.	Judgement
A45	WBS 3.2.2	Scope	Only high level nuclear and radiological activities are covered at this stage.	Judgement
A46	WBS 3.2.3	Expertise in Ownership Companies	Expertise held within the ownership company, or companies, would define the work to be covered by the “nuclear entity” directly and the work which might be undertaken from within the ownership companies. [Wherever work is covered under contract (say from within the ownership companies) total responsibility lies with the Licensee hence the nuclear entity must have knowledge and capability within its management structure to ensure it retains the Controlling Mind role]	Judgement

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A48	WBS 3.2.6	Early evidence of effective change management	In order for a company to be licensable change processes need to be robust and embedded and visible at an early stage of the company development as the normal way of doing business.	Judgement
A50	WBS 3.3.1	Route map as baseline for LC 15	Route map will show the staged development of the safety case commencing with the PCSR showing how this develops from the GDA output taking into account site specific aspects. This becomes the baseline for the long term plant safety case and the starting point for the periodic safety reviews required by LC 15.	Judgement
A51	WBS 4, Bound	New sites	SMR development will need sites beyond those identified and delineated in the existing NPS for Nuclear Power Generation.	ANT Report.
A52	WBS 4	Designation of SMR as Nationally Significant Infrastructure Projects	SMRs will be designated as Nationally Significant Infrastructure Projects benefiting from the Planning Inspectorate's process for recommending consent to the SoS (Secretary of State).	EN1 and EN6.
A53	WBS 4, WBS 8	Sufficient number of sites	Sites identified as potentially suitable in a further NPS will need to be sufficient for envisaged SMR programme – not just FOAK.	Judgement
A54	WBS 4.1	Project requirement information	Adequate information on project requirements (e.g. strategy for interim storage of spent fuel / ILW) is available.	Judgement - Necessity for FDP.
A55	WBS 4.2	Timely information on site characteristics	Adequate information is available on site characteristics on timescales to meet scanning and site investigation needs.	Judgement
A56	WBS 4.3	SSA process fixed	New SSA follows similar process to before, so as to ensure legally robust outcome.	Judgement
A57	WBS 4.3	SSA process is necessary	Provision of a site by HMG without going through SSA process would not be legally robust.	Judgement
A58	WBS 4.3	Local stakeholders willing to engage	Local stakeholders are prepared to engage with the prospective operator.	Judgement

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A59	WBS 4.4	Demonstrate financial viability	Although commercial contracts cannot be entered until an SMR project is consented, it will be essential to establish exercisable options in order to demonstrate financial and schedule viability.	Judgement
A60	WBS 4.4	Site development supply chain	Adequate supply chain capability and capacity available.	Judgement
A61	WBS 4.5	DCO application process fixed	DCO for SMRs follows similar process to earlier new nuclear projects, so as to ensure legally robust outcome.	Planning Inspectorate website.
A62	WBS 4.5	Engagement on DCO	Regulators and stakeholders willing to engage constructively.	Judgement
A63	WBS 4.5	DCO concerns	No material concerns that cannot be addressed by mitigation or compensation measures.	Judgement
A64	WBS 4.6	Consents outside NSIP process	Being outside NSIP process, timescale for determination vulnerable to protracted delays.	Town and Country Planning Act process.
A67	WBS 5, Bound	CHP capability	CHP capability is an opportunistic rather than planned revenue for FOAK as DH connection is not within the scope of the SMR plant investment.	Input to Workshop 1
A68	WBS 5, Bound	Single technology selected.	Single technology selected for UK SMR deployment.	System Requirements For Alternative Nuclear Technologies - Mott MacDonald
A69	WBS 5, Bound	Technology status.	The vendor will be well advanced with safety case and feasibility design, but detailed design, design for manufacture and procurement specifications yet to be detailed. This assumption recognises the required level of maturity required to make a credible GDA application within the timescales associated with the 5-year window.	System Requirements For Alternative Nuclear Technologies - Mott MacDonald

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A70	WBS 5 Bound	UK deployment focus	The technology will be developed for UK deployment as the principal aim; however, tertiary revenue may subsequently be sought from overseas export. The technology will therefore be designed to meet UK regulatory requirements; but the development programme may also pay cognisance to the potential regulatory requirements of a given target market (however, this will only be pursued where timescales / cost allow).	Input to Workshop 1
A71	WBS 5.1	Business case sufficient for requirements facilitation	Business case objectives are sufficiently developed to facilitate requirements definition.	WBS 2
A72	WBS 5.1.2	Extension of Modular Manufacture	The modular design requirements for the nuclear island may apply equally to the conventional plant.	Input to Workshop 1
A73	WBS 5.1.2	Extension of appropriate manning objective	Requirements associated with delivering appropriate manning apply to conventional plant.	Input to Workshop 1
A74	WBS 5.2.1	OPEX supports claim validation	OPEX is available from other international SMR programmes.	Judgement
A76	WBS 5.2.2	Sustainment of UK supply chain	Export policy/vendor UK access agreement will ensure UK manufacturing base is sustained beyond UK deployment.	Input to Workshop 1
A77	WBS 6	FDP requirement basis	Operators will be subject to the same FDP requirements as for large nuclear stations, and will need to make their own physical (interim storage) and financial provisions. In the context of SMR's Spent Nuclear Fuel is considered Nuclear waste and treated in the same way as ILW.	Judgement
A78	WBS 6.1	Waste form	Waste forms are consistent with future Geological Disposal Facility for higher level wastes.	Judgement
A79	WBS 6.1	Waste disposal route	All waste streams, including HLW liquor and solids can be processed and stored within the UK, using existing vitrification, disposition and storage facilities.	Judgement

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A80	WBS 6.2	Waste contracts	Developer / operator will secure Letters of Compliance from Radioactive Waste Management Limited covering technical requirements for disposal of SMR waste forms in the UK GDF.	NDA GDF Requirements.
A81	WBS 6.3	Funding arrangement plan liability	SMR developer / operator will be required to establish its own fund.	Government arrangements for FDP.
A82	WBS 6.3	Funding arrangement plan arrangements	SMR developer / operator will be required to replicate arrangements already developed for large nuclear stations.	Judgement.
A83	WBS 6.3	Funding arrangement price variation	Funding arrangements will allow for adjustment up or down of the price of liability transfer part-way through operating life, within a high cap set at the outset.	Judgement
A84	WBS 7.2, Bound	GDA link to credible nuclear operator	Government continues its tradition to only request ONR and the Environment Agency to undertake GDA on vendor designs that have a credible nuclear operator identified against it, who has experience also of operating nuclear reactors somewhere in the world.	2008 Energy Whitepaper "Meeting the Energy Challenge"
A88	WBS 7.2.2	Regulator liaison	The Environment Agency, NRW and ONR, continue to work closely and ‘as one project team’ on GDA.	Joint Guidance on the GDA. Reference ONR/EA GDA Guidance. ONR Website.
A90	WBS 7.2.2	Scottish Government Policy	The Scottish Environmental Protection Agency (SEPA) is not involved, as Scottish Government Policy is that development of further nuclear power options in Scotland is unlikely.	Electricity Generation Policy Statement – 2013
A93	WBS 7.3.1	Reference accident favourable	Reference Accident agreed by ONR results in minimal off-site and cross-border impacts.	ONR Process of agreeing the HIRE (ONR Safety Assessment Principles - 2014 edition)
A96	WBS 8	Clear Stakeholder Interface	The prospective operator (and nuclear site licensee) is able to establish its distinctive voice at the outset of the FOAK proposal	Judgement

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A98	WBS 8.1.2	Regulator commitment	Regulators requested by Government to commit resources, and willing and able to do so	Judgement
A99	WBS 8.3, 8.4	Early stakeholder engagement	Potential site(s) are identified at the early stage, enabling stakeholder engagement well before formal consultations	Judgement
A100	WBS 8.3, 8.4	Personal stakeholder engagement	Project developer / prospective operator establishes a local presence at an early stage to enable proactive personal contact with key individuals	Judgement
A101	WBS 8.4	Recognise importance of willing authorities	Local authorities, regional authorities and other participants in planning system, e.g. statutory consultees, are willing to engage constructively.	Judgement
A102	WBS 9	Government support of supply chain development	Government supports industry supply chain development initiatives.	Judgement
A103	WBS 9	Conflicts of interest managed	Other operator conflict of interests are managed to ensure a supportive environment.	Judgement
A104	WBS 9.1	UK content (Vendor)	SMR vendor aligned with specific UK content aims.	Government Phase 1 SMR Competition. (Gov Website)
A105	WBS 9.1	Post FOAK implementation of final manufacturing capability	FOAK SMR delivery is sooner if the full manufacturing eco system comes only at NOAK stages.	Workshop 1
A108	WBS 9.3	Skilled talent access	Resourcing initiatives started for Giga-watt scale UK nuclear new build progress as planned. This provides enabling infrastructure for SMR resource initiatives.	Judgement
A110	WBS 9.4	Longest lead time component	Reactor Pressure Vessel is longest lead item.	Judgement
A111	WBS 9.4	Timely supply chain qualification	Early supply chain qualification engagement, prior to 5-year enabling window.	Judgement
A113	WBS 9.5	Confidence for long lead item procurement	At risk procurement is not undermined by lack of progress on site acquisition and consents (as site location is irrelevant to procured item).	Judgement

Ref	Related WBS	Assumption Title	Details of assumption	Assumption source
A114	WBS 1.2.1	Geo-political impact on investor confidence.	Wider geopolitical or socio-political factors are monitored to limit the effect on Government policy aimed at improving investor confidence - e.g. EU exit, Trade embargoes, increased restrictions on cross-border capital flows.	Judgement
A115	WBS 1.2.1	UKTI / BIS coordinate with foreign stakeholders	Adequate co-ordination of UKTI and BIS with foreign stakeholders, financial communities, or credit export agencies results in a confused message to these parties and reduced investor confidence.	Judgement
A116	WBS 2	Financial Control Impact.	It is assumed that the impact of financial controls such as BASEL 3 and Solvency 2 do not fundamentally effect the ability of the project to secure competitive financing.	Judgement
A117	Bound	GDA timescale	It is necessary that at the end of the five year schedule, GDA would be substantially complete, and it is assumed that GDA is a 5-year process.	ETI
A118	Bound	FOAK operation	The desired timeline for FOAK SMR operation in the UK is 2030.	ETI

APPENDIX VII RISK REGISTER

A high level risk analysis has been used in this project to support and challenge the development of the programme scope and schedule, and introduce and verify thought on enabling actions. The risk analysis has not been exhaustive, and nor was it required or intended to be. Rather, it has been used to inform and substantiate the conclusions as part of the underpinning knowledge and evidence on which this project is based.

Throughout the course of this project risks and opportunities have been identified for specific WBS areas associated with the deployment of a FOAK SMR in the UK. As the project has progressed, risks and opportunities have been tested to accept or reject them, test each WBS scope and to explore if the mitigating actions form the enabling activities for the deployment of a FOAK SMR in the UK.

The criteria used to classify each risk are given in the Likelihood and Impact tables below. In terms of impact of risk only the schedule impact was assessed within the remit of the SDE Project.

Likelihood	
Almost Certain	The risk can be expected to occur (> 80%)
Likely	The risk will quite commonly occur (50-80%)
Possible	The risk could occur occasionally (25-50%)
Unlikely	The risk could occur infrequently (5-25%)
Rare	The risk may occur in exceptional circumstances (<5%)
Nil	-

Schedule Impact (SMR Deployment)	
Extreme	Cannot achieve major project milestone *(> 6 months slip)*
Major	Major slip in key milestone or critical path impacted *(4-6 months slip)*
Moderate	Minor slip in key milestones. Not able to meet delivery date (*2-4 months slip*)
Minor	Additional resources or re-planning required to meet key dates (*1-2 months* slip)
Negligible	Minimal or no impact on key dates *(< 1 months* slip)
Nil	-

The risk analysis criteria used to evaluate risk in terms of their likelihood and impact was developed into a single risk weighting. This enables the relative comparison of all risks to be undertaken. By using a reference matrix, as shown below, the likelihood and impact for each risk was converted into a likelihood-impact score/weighting.

	Impact				
Likelihood	**Negligible**	**Minor**	**Moderate**	**Major**	**Extreme**
Almost Certain	Medium	Medium	High	Critical	Critical
Likely	Medium	Medium	High	Critical	Critical
Possible	Low	Medium	High	High	High
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	Medium

The risk register grades risks into four categories: critical, high, medium and low. In the final risk register there are 7 critical, 46 high, 28 medium and 30 low active risks.

The following table presents all risks, as risk titles only, ordered by this categorisation based on likelihood-impact score.

The final risk register is presented in full following this categorised list of risk titles. It should be noted that where a risk was rejected the reference number has been retired and will not appear.

Ref	Likelihood-Impact Score (H/M/L)	Risk Title
R3	Critical	Nuclear NGO intervention.
R84	Critical	Inadequate Safety and Environmental Management prospectus.
R4	Critical	Requirement for parliamentary time.
R113	Critical	Over emphasising passive safety.
R118	Critical	PCSR evidence insufficient.
R146	Critical	Lack of supply chain investment appetite.
R152	Critical	SQEP recourse not available in sufficient quantities.
R5	High	Cross-party political consensus.
R6	High	Shortcutting of legal processes.
R7	High	Compliance with SSA criteria.
R11	High	Adaption of design to UK regulatory requirements.
R15	High	Investor confidence impacted by poorly defined, or unfocused policies.
R19	High	Investment in Nuclear Skills.
R32	High	Limited stakeholder engagement.
R39	High	Impaired credit worthiness.
R60	High	Foreign Nation policy changes.
R74	High	Impact of other operator's nuclear event.
R75	High	Compliance focused construction and operation.
R79	High	Inadequate appointment and training.
R81	High	Inadequate design change records.
R83	High	Inadequate processes and procedures.
R86	High	No site available.
R88	High	Inappropriate sites are selected.
R89	High	Too few sites.
R90	High	Inadequate justification of site.
R91	High	Insufficient credible sites
R94	High	Timeliness of long lead items.
R96	High	Inadequate application for DCO.
R97	High	Objection based on material considerations.
R98	High	Onerous DCO planning conditions.
R102	High	Accelerated SMR Programme impacts manufacturing.
R104	High	Regulation change influence on design.
R105	High	Timing of funding.
R107	High	Vendor IP.
R108	High	FDP approval delayed.
R109	High	Inadequate stakeholder management associated with interim stores

Ref	Likelihood-Impact Score (H/M/L)	Risk Title
R114	High	Insufficient regulatory resource.
R115	High	No funding of GDA Regulator costs.
R116	High	Regulator resource focused on SMR.
R117	High	Vendor appetite for standardisation.
R119	High	Security of Information.
R123	High	Lack of operator knowledge of Euratom.
R127	High	Regulator fails to follow due process.
R131	High	Stakeholder challenge in planning system.
R134	High	Establishing trust with local stakeholders in new site area.
R136	High	Early engagement as credible nuclear operator.
R139	High	Delayed development of credible nuclear operator.
R140	High	Inadequate site characterisation to justify regulatory applications consistent with GDA.
R148	High	Adaptation to UK manufacturing regulation.
R149	High	GDA Challenge.
R151	High	Insufficient recent nuclear construction experience.
R153	High	Suppler qualification timescale.
R155	High	Late GDA challenge.
R8	Medium	Local entrenched opposition.
R33	Medium	Alternative technology economics.
R34	Medium	Natural resource economics.
R40	Medium	Availability of flexible working capital.
R43	Medium	Availability of Government financing.
R47	Medium	Government priorities for market support.
R48	Medium	Successful EU challenge on State aid.
R66	Medium	Time scales for securing IP.
R73	Medium	New characteristics of High performing nuclear operating organisations.
R80	Medium	Management of change processes.
R85	Medium	Inadequate Company Manual.
R95	Medium	Sourcing of critical supply other than SMR itself.
R99	Medium	Onerous pre-DCO planning conditions.
R100	Medium	Challenge to pre-DCO consent.
R103	Medium	SMR not designed for economies of multiples.
R110	Medium	Unbudgeted costs in FDP.
R111	Medium	Potential changes to the arrangements for transportation of nuclear material.
R120	Medium	Comments process flooded.
R124	Medium	Member States challenge Euratom submissions.
R132	Medium	Stakeholder opposition throughout the programme.
R133	Medium	Stakeholder identification.
R135	Medium	Operator fails to establish credible identity.
R143	Medium	Communication effectiveness of supportive stakeholders.
R144	Medium	Optimise stakeholder impacts.
R145	Medium	Site stakeholder group ineffective.

Ref	Likelihood-Impact Score (H/M/L)	Risk Title
R150	Medium	Objection to infrastructure disruption.
R154	Medium	Challenge to the Business Case.
R156	Medium	Lack of supplier qualification or insufficient manufacturing resource.
R12	Low	Credibility of Vendor for UK implementation.
R14	Low	Investor confidence impacted by Public opposition.
R17	Low	Change in Administration.
R26	Low	Carbon reduction targets.
R27	Low	Clarity on Climate Change Action Plan.
R28	Low	Unfocused strategy for grid investment.
R30	Low	Availability of Grid funding post EU Referendum.
R36	Low	Availability of finance post EU Referendum.
R38	Low	FOAK economic case.
R46	Low	State support.
R51	Low	"Unknown unknowns".
R54	Low	Asset lifetime costs for SMRs.
R55	Low	Availability of long term waste repository.
R64	Low	Robustness of scenario modelling approach.
R67	Low	IP Structuring.
R68	Low	IP due diligence.
R69	Low	EU treaty testing of IP.
R72	Low	Changes to the Nuclear Installations Licencing Guidance.
R76	Low	Nuclear Baseline structure.
R77	Low	Intelligent customer not embedded.
R78	Low	Inconsistent employment model.
R82	Low	Management system arrangements
R101	Low	Investment in pre-DCO works.
R112	Low	Radioactive waste arisings.
R121	Low	DAC and SoDA run out.
R122	Low	SoDA not issued due to safety / security issues.
R128	Low	Inconsistent Safety Cases.
R141	Low	Inability to demonstrate timely influence over design.
R137	Low	Planning gains expectations.
R142	Low	Inability to demonstrate effective influence over design.

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R3	WBS 1,	Critical	Other (See Comments)	Nuclear NGO intervention	NGOs	Legal intervention by nuclear NGOs building on experience from 2008 programme.	Almost Certain	Extreme	Ensure all requirements are identified and carried out.	Other (See Comments)	Ensure effective contingency arrangements agreed with Government	Owner Operator / Vendor / Government
R4	WBS 1, WBS 1.1.1, WBS 1.1.3, WBS 1.1.4	Critical	Government	Requirement for parliamentary time.	Competing pressure on Parliamentary time.	There is a risk that if you don't apply for Parliamentary time early enough, PT will not be allocated.	Likely	Major	Coordinated and timely planning for Parliamentary time by DECC.	Government	None identified at the time of forming the Risk Register.	
R5	WBS 1, WBS 1.1.1, WBS 1.1.3	High	Government	Cross-party political consensus	Cross-party disagreement.	Extent of cross-party political support.	Possible	Major	Mobilisation of favourable stakeholders	Other (See Comments)	Ensure effective contingency arrangements agreed with Government	Mitigation Owner Developer/Operator with Government support
R6	WBS 1.1	High	Government	Shortcutting of legal processes	SMR Schedule	Desire to accelerate SMR programme will lead to processes that are less robust against challenge.	Possible	Major	Education of vendor and early initiation of credible nuclear operator	Other (See Comments)	None identified at the time of forming the Risk Register.	Mitigation owner Government / Regulators / Operator
R7	WBS 1.1.2	High	Other (See Comments)	Compliance with SSA criteria.	Inappropriate framing of sites criteria and inadequate characterisation of the sites.	Nominators unable to demonstrate compliance with SSA exclusionary of discretionary criteria.	Possible	Extreme	Engage early with Government and early site characterisation. Also, nominate more sites than required.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner Government/Operator
R8	WBS 1.1.2	Medium	Operator	Local entrenched opposition	Local opposition	Stakeholders (e.g. Regulators or local authorities) strongly oppose nominations, especially at sites with no history of nuclear development.	Almost Certain	Minor	Effective early engagement with local stakeholders. Also, early site characterisation to justify SSA and planning criteria.	Operator	Involving Government.	

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R11	WBS 1.1.5, WBS 1.3 , *WBS 1.3*	High	Vendor	Adaption of design to UK regulatory requirements	Vendor unfamiliar with UK requirements	Vendor unwilling to adapt design where necessary to meet UK regulatory requirements. *International vendors/operators try to follow their national laws, practices and regulatory arrangements, and challenge either GB Laws the ONR/Environment Agency/NRW safety/environmental guidance and/or principles.*	Possible	Moderate	Early education of Vendor and early consideration of UK requirements in design. Also, operator flags up site specific sensitivities.	Other (See Comments)	None identified at the time of forming the Risk Register.	Mitigation owner All
R12	WBS 1.1.5	Low	Government	Credibility of Vendor for UK implementation.	Attraction of getting UK GDA approval for worldwide marketing without serious intent to proceed in UK.	Vendor enters GDA without intent or prospect of its implementation in UK.	Possible	Negligible	Ensure vendor supplies adequate evidence of intent as a gateway to GDA.	Other (See Comments)	Multiple vendors approaching GDA.	Mitigation owner Vendor/ Government
R14	WBS 1.2.1	Low	Government	Investor confidence impacted by Public opposition	Poor stakeholder engagement and management.	Insufficient focus given to the management of public sentiment results in significant public opposition to the SMR programme, reducing investor confidence, and the ability of Government to support	Unlikely	Minor	Clear public and investor engagement planning.	Government	None identified at the time of forming the Risk Register.	
R15	WBS 1.2.1	High	Government	Investor confidence impacted by poorly defined, or unfocused policies	Poor stakeholder engagement and management.	Poorly defined, or unfocused policies result in minimal, or adverse effects on investor sentiment.	Possible	Moderate	Clear industry and investor engagement planning.	Government	Rewrite policies.	
R17	WBS 1.2.1	Low	Government	Change in Administration	Elections (Local and Central)	Local/national elections force a change in administration, or in MPs leading the implementation of the strategy, resulting in a dilution of the message to investors, or a de-railment of the strategy.	Unlikely	Negligible	All PARTY agreements	Government	None identified at the time of forming the Risk Register.	

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R19	WBS 1.2.3	High	Government	Investment in Nuclear Skills	Poorly forecasting of skills requirement.	A lack of clear strategy and investment provision for relevant training (Nuclear skills, engineering, construction etc.) results in a lack of readiness within the UK supply chain to respond to demand, undermining the SMR programme, introducing significant additional cost, risk and delay.	Possible	Moderate	Clear strategy for investment in SMR Manufacturing and Nuclear skills. Informed by better engagement with NIA.	Government	Incentivising of industry priorities.	
R26	WBS 1.2.5	Low	Government	Carbon reduction targets	Change in political trade-off between the need for affordable energy and carbon reduction targets	A step down from European commitments to carbon reduction targets, Europe 2020, or a change in the strategy for NREAPS (National Renewable Energy Action Plan Scenarios) undermines the viability of SMR programmes, or reduces their attractiveness to the investment community.	Possible	Negligible	Reduce the financial impact to investors to maintain viability.	Government	None identified at the time of forming the Risk Register.	
R27	WBS 1.2.5	Low	Government	Clarity on Climate Change Action Plan	Insufficient consideration of SMR specific factors.	A lack of a clear overarching climate change action plan, and specific mention of SMR technologies as a component of that plan, confuses or undermines investor confidence in UK commitments to nuclear power.	Unlikely	Negligible	Industry consultation prior to policy release.	Government	None identified at the time of forming the Risk Register.	
R28	WBS 1.2.2	Low	Other (See Comments)	Unfocused strategy for grid investment	Government does not consider the effect of SMR rollout on the Grid	HMG does not exert sufficient influence or oversight over the ENTSOE Ten Year development plan, resulting in unfocused investment in UK and European transmission infrastructure, adding delays and costs to the SMR programme	Possible	Negligible	Coordination with TSOs for to develop national strategy for SMR grid investment	Other (See Comments)	Government/ National Grid fund investment.	Government and Transmission Systems Operators.

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R30	WBS 1.2.2	Low	Other (See Comments)	Availability of Grid funding post EU Referendum	Referendum	A British exit from the EU may result in significant reductions in the ability of UK TSOs to source finance for further grid investment (EIB currently contributes majority of lending facilities to National Grid) resulting in delayed investment programmes, and knock on effects to the availability of infrastructure for SMR sites.	Possible	Negligible	UK Credit facility extended to TSO development.	Government	Look for private investors.	Owner TSO
R32	WBS 1.3	High	Operator	Limited stakeholder engagement.	Public acceptability of NP and foreign investors. "NIMBY"	Long-term depressed pricing for natural resources results in a reduction in the attractiveness of SMR technology in preference to conventional power projects	Unlikely	Major	Bootcamp (WBS 1.3)	Government	No fall-back plan as project is unlikely to proceed.	
R33	WBS 2	Medium	Other (See Comments)	Alternative technology economics	Falling costs of alternative clean energy	Accelerating learning rates from green technologies results in a reduction in the attractiveness of SMR technology in preference to PV Solar, Offshore floating wind, Geothermal etc.	Possible	Minor	Justification based on Grid Ancillary Services	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner Developer/operator
R34	WBS 2	Medium	Other (See Comments)	Natural resource economics	Falling costs of alternative clean energy	Long-term depressed pricing for natural resources results in a reduction in the attractiveness of SMR technology in preference to conventional power projects	Likely	Minor	Robust disincentives for carbon generation.	Government	None identified at the time of forming the Risk Register.	Owner Developer/Operator
R36	WBS 2	Low	Other (See Comments)	Availability of finance post EU Referendum	Referendum	A UK exit from the European Union introduces unforeseen financing challenges and could restrict the ability of foreign entities to invest in a UK SMR programme.	Unlikely	Minor	Diversify financing options.	Other (See Comments)	Balance sheet funding or Government contribution.	Owner Developer/Operator

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R38	WBS 2	Low	Other (See Comments)	FOAK economic case.	Investor expectations on ROI.	An inability to prove a suitable return on investment within the FOAK programme results in difficulties sourcing finance, or critical failure of the business case	Unlikely	Negligible	Clear strategy for exploiting export market potential.	Other (See Comments)	Greater Government contribution.	Owner Developer/Operator
R39	WBS 2.1	High	Other (See Comments)	Impaired credit worthiness	Solvency 2	The financial strength (credit worthiness) of the developer/operator entity is insufficient to source competitive financing, adding cost and delay to the programme	Likely	Moderate	Alternative project structures	Other (See Comments)	Greater Self funding (Balance Sheet)	Owner Developer/Operator
R40	WBS 2.1	Medium	Other (See Comments)	Availability of flexible working capital	Unpredictable expenditure.	Insufficient allowances/assumptions on the requirement for working capital / flexible credit facilities undermines the programme, resulting in delay, or critical failure.	Unlikely	Moderate	Agree flexible credit facilities with creditors	Other (See Comments)	Government top up or parent company loan.	Owner Developer/Operator
R43	WBS 2.1	Medium	Other (See Comments)	Availability of Government financing.	National policies and finances.	HMG refuses, or is unable to provide finance or loan guarantees for the project, resulting in reduced viability of the SMR programme.	Unlikely	Moderate	Government agrees strategy for financial support.	Government	Secure new investors	Owner Developer/Operator and Government
R46	WBS 2.2, WBS 2.5	Low	Government	State support.	EU Referendum	The EU referendum outcome may have a significant effect on the nature of market support available and the degree to which the state can financially incentivise, support or exercise part/full ownership of such projects.	Possible	Negligible	Mitigation to be reviewed post-EU Referendum.	Government	None identified at the time of forming the Risk Register.	

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R47	WBS 2.2. WBS 2.5	Medium	Government	Government priorities for market support.	Change in Government policy.	Shifts in Government priorities or administration results in a fundamental change to the extant arrangements for market support (CfD) which could reduce the viability of the business case	Possible	Minor	Cross party agreements and the SMR White Paper.	Government	Consider other market support mechanisms.	
R48	WBS 2.2	Medium	Government	Successful EU challenge on State aid.	EU Member States.	A successful challenge by EU nations on the legality of the UK CfD mechanism with regard to compliance with State Aid regulations undermines the current NNB programme, and the viability of the business case	Rare	Major	Government / EU engagement	Government	Restructure energy market support mechanisms.	
R51	WBS 2.3	Low	Other (See Comments)	"Unknown unknowns"	External factors	Inadequate or incomplete consideration of external factors leads to risks on revenue streams from unforeseen events or changing market conditions. E.g. a unified European Grid.	Unlikely	Negligible	Lessons learned from other major infrastructure programmes.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner Developer/Operator
R54	WBS 2.3	Low	Other (See Comments)	Asset lifetime costs for SMRs.	No operational experience with SMRs.	Insufficient experience in estimating, or lack of data from historical data results in inaccurate, or misleading estimates on the cost of asset lifetime ownership, resulting in the potential for funding shortfalls over the asset's life.	Possible	Negligible	Robust economic parametric costing.	Other (See Comments)	Explore insurance options (if any available)	Owner Developer/Operator

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R55	WBS 2.4	Low	Government	Availability of long term waste repository.	Government funding and availability of GDF.	Changes to waste pricing, or the availability of a long-term waste repository significantly affects the assumptions and strategy of the lifetime cost model, potentially undermining the viability of the project in the mid to long-term.	Rare	Negligible	Clear Government policy on GDF.	Government	None identified at the time of forming the Risk Register.	
R60	WBS 2.4	High	Government	Foreign Nation policy changes.	Changes in Foreign Nation policies/priorities.	Changes in foreign nations trade and investment policies may adversely affect the viability or fundamental timing of the business case.	Possible	Moderate	Close monitoring of foreign nation policies.	Government	None identified at the time of forming the Risk Register.	
R64	WBS 2.5	Low	Other (See Comments)	Robustness of scenario modelling approach.	Inadequate consideration of external factors.	Inadequate or incomplete consideration of external factors leads to risks on revenue streams from unforeseen events or changing market conditions. E.g. a unified European Grid.	Possible	Negligible	Robust economic parametric costing.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner Developer/Operator
R66	WBS 2.6	Medium	Vendor	Time scales for securing IP.	Need to secure IP.	Inadequate provisions for the cost and timescale for securing IP result in cost overruns, delays to delivery, or legal challenge on IP	Unlikely	Moderate	Timely legal advice.	Vendor	Use of limited emergency measure for IP protection	
R67	WBS 2.7	Low	Vendor	IP Structuring	Inadequate consideration to structuring IP.	Inadequate consideration to structuring IP for export, or financing, results in an inability to exploit export potential for technology or processes at a later date, potentially undermining alternative revenue streams for the business case, or UK plc.	Unlikely	Negligible	Consider IP at early stages.	Vendor	None identified at the time of forming the Risk Register.	

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R68	WBS 2.7	Low	Vendor	IP due diligence	Lack of commercial IP experience.	Inadequate commercial diligence or strategy around the topics of IP acquisition, exploitation, monitoring or protection result in a lack of investor confidence, or a threat to the ability of the project to retain control of its IP.	Rare	Negligible	Timely legal advice.	Vendor	None identified at the time of forming the Risk Register.	
R69	WBS 2.7	Low	Vendor	EU treaty testing of IP	Complex EU policy environment.	EU Policy and treaties on IP and technology licensing may restrict or remove protections, unless tested in court prior to the business case authoring, resulting in uncertainty and potential loss of IP control.	Unlikely	Minor	Timely legal advice.	Vendor	None identified at the time of forming the Risk Register.	
R72	WBS 3, WBS 3.1, WBS 3.2, WBS 3.3	Low	Other (See Comments)	Changes to the Nuclear Installations Licencing Guidance.	Changes to the Nuclear Installations Licencing Guidance may be significant if they occur.	The arrangements for Licensing in the UK as defined by “Licencing Nuclear Installations – ONR January 2015” and linked to this the Energy Act 2008 are significantly amended.	Unlikely	Negligible	Keep a watching brief on the licensing arrangements in the UK arena and stay as flexible in the approach to licencing.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner Regulator and Government. Mitigation Owner Vendor/Operator
R73	WBS 3, WBS 3.1, WBS 3.2, WBS 3.3	Medium	Operator	New characteristics of High performing nuclear operating organisations.	INPO/WANO plant evaluations and investigations.	INPO/WANO identify new characteristics of High performing nuclear operating organisations resulting in potential changes to the Organisational structure or plant construction.	Rare	Major	Best practice is for Operator to join INPO/WANO	Operator	None identified at the time of forming the Risk Register.	Mitigation should be Developer/operator.
R74	WBS 3, WBS 3.1, WBS 3.2	High	Operator	Impact of other operator's nuclear event.	Other operator's experience.	A nuclear “event” or construction delays related to nuclear facilities of another operator.	Unlikely	Major	Best practice is for Operator to join INPO/WANO	Operator	None identified at the time of forming the Risk Register.	Mitigation should be Developer/operator.

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R75	WBS 3.2.1	High	Operator	Compliance focused construction and operation.	Organisational culture.	The organisation becomes too focused on “Compliance” rather than continuous improvement as required by the goal setting regulatory arrangements in the UK. Leading to a breach of trust with the Regulator or, in the worst case, a licence breach.	Possible	Moderate	To develop an embedded Nuclear safety culture.	Operator	None identified at the time of forming the Risk Register.	Mitigation should be Developer/operator.
R76	WBS 3.2.1	Low	Operator	Nuclear Baseline structure.	When insufficient work has been done up front to establish a viable nuclear baseline against which a licence can be granted.	There is insufficient evidence of organisational structure application resulting in Licence Grant being delayed.	Unlikely	Minor	Early engagement with the Regulator and Bootcamp.	Other (See Comments)		Mitigation owner Operator and Government.
R77	WBS 3.2.2	Low	Operator	Intelligent customer not embedded.	Intelligent customer concept and function not sufficiently embedded in operator.	Work or activity inappropriately identified and specified could lead to it being carried out by non SQEP personnel and result in undesirable outcomes with the potential for: Programme time and cost penalties, radiological events and licence non-compliance (regulatory action).	Unlikely	Minor	Early adoption of the intelligent customer concept within the Operator construct and education through Bootcamp.	Other (See Comments)	None identified at the time of forming the Risk Register.	Mitigation owner Operator and Government.
R78	WBS 3.2.3	Low	Operator	Inconsistent employment model.	Employee contracts not consistent with project priorities.	Inconsistent employment models lead to Industrial Relations difficulties which result in programme delays and cost over runs.	Unlikely	Minor	Review employment models across contractors.	Operator	None identified at the time of forming the Risk Register.	Mitigation should be Developer/operator.

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R79	WBS 3.2.4, WBS 3.2.5	High	Operator	Inadequate appointment and training.	Resourcing and training not sufficient and timely to support programme requirements. Availability of SQEP people is restricted.	Not appointing and training various Posts and Roles within the baseline in to programme could result in a delay to LC grant or after grant to the issue of appropriate consent /approvals.	Likely	Moderate	Early Identification of the posts and roles required in the organisation and initiate sourcing of the individuals and capabilities.	Operator	None identified at the time of forming the Risk Register.	Mitigation should be Developer/operator.
R80	WBS 3.2.6	Medium	Operator	Management of change processes.	Importance of the management of change processes not understood. This is an integral requirement for the granting of the nuclear licence.	In order for a company to be licensable management of change processes need to be robust and embedded and visible at an early stage of the company development as the normal way of doing business.	Unlikely	Moderate	Early establishment of management of change processes covering all aspects of the business.	Other (See Comments)	None identified at the time of forming the Risk Register.	Mitigation should be Developer/operator.
R81	WBS 3.2.6	High	Other (See Comments)	Inadequate design change records.	Importance of tracking design changes is not appreciated.	Inadequate Management of Change processes may not adequately record differences between the GDA output and the actual plant as described in the PCSR. This could delay approval of the PCSR and consent for construction to commence.	Possible	Moderate	Early establishment of management of change processes covering the plant design changes leading to a substantiated PCSR.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner is Operator/Vendor/Developer
R82	WBS 3.2.7	Low	Other (See Comments)	Management system arrangements	A lack of appreciation for the importance of management system arrangements.	Inadequate Management system arrangements result in a lack of clarity of who does what within an organisation. Such an organisation would not be licensable.	Rare	Minor	Early establishment of Management of Systems arrangements and governance.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner and Mitigation owner is Operator/Vendor/Developer

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R83	WBS 3.2.7, WBS 3.2.8	High	Other (See Comments)	Inadequate processes and procedures.	The processes and procedures are not appropriately established in support of the systems requirements.	Good System arrangements supported by the necessary processes and procedures are essential for the production of a robust PCSR. Without an approved PCSR construction would not receive consent under the NSL.	Possible	Moderate	Early establishment of management processes leading to a substantiated PCSR.	Other (See Comments)		Owner and Mitigation owner is Operator/Vendor/Developer
R84	WBS 3.3	Critical	Other (See Comments)	Inadequate Safety and Environmental Management prospectus.	Lack of appreciation of the importance of the Safety and Environmental Management prospectus.	If the Safety and Environmental Management Prospectus document does not meet the required standards and/or there is insufficient evidence of its application then Licence Grant has the potential to be delayed by the Regulators.	Likely	Major	Education of vendor and operator. Bootcamp	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner and Mitigation owner is Operator/Vendor/Developer/ Regulators / Government
R85	WBS 3.4	Medium	Operator	Inadequate Company Manual.	Company Manual does not give sufficient priority to nuclear safety.	The Company manual does not robustly establish nuclear safety as an overriding priority as a result site licence grant is delayed.	Unlikely	Moderate	Bootcamp	Other (See Comments)		Mitigation is Operator/Government
R86	WBS 1.1.2	High	Government	No site available.	All available sites are owned by third parties.	SMR programme stifled by lack of designated potentially suitable sites.	Possible	Major	Action by Government to facilitate site availability.	Government		
R88	WBS 4.1	High	Other (See Comments)	Inappropriate sites are selected.	Criteria do not meet planning requirements.	Inappropriate sites are selected and nominated into SSA because of inadequate criteria.	Possible	Extreme	Site characterisation and SSA criteria are bolted together.	Operator	None identified at the time of forming the Risk Register.	Owner Government / Operator
R89	WBS 4.1	High	Other (See Comments)	Too few sites.	Over rigid SSA criteria	Insufficient sites are nominated because of over-rigid criteria.	Possible	Extreme	Site characterisation and SSA criteria are bolted together.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner Government / Operator

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R90	WBS 4.2	High	Operator	Inadequate justification of site.	Data not available or inadequately presented.	Inadequate information leads to sites being inappropriately sentenced.	Possible	Extreme	Site characterisation and SSA criteria are bolted together.	Operator	None identified at the time of forming the Risk Register.	
R91	WBS 4.2	High	Operator	Insufficient credible sites	Sufficient sites to meet programme needs and with margin in hand to allow some sites to fail.	Insufficient credible sites are identified to meet operator's programme intent.	Possible	Moderate	Clear programme in mind at outset.	Operator	None identified at the time of forming the Risk Register.	
R94	WBS 4.4	High	Other (See Comments)	Timeliness of long lead items	Congestion in critical manufacturing facilities.	Critical / long lead supplies (e.g. RPV forgings) not available to desired schedule.	Possible	Major	Scoping of the overall programme and providing investor confidence through securing commercial options.	Other (See Comments)	None identified at the time of forming the Risk Register.	Owner Vendor and Developer
R95	WBS 4.4	Medium	Developer	Sourcing of critical supply other than SMR itself.	Congested supply chain and suppliers not committed to UK.	Suppliers unwilling to offer acceptable terms (Price and delivery time scales).	Unlikely	Moderate	Early engagement with supply chain to secure multiple options in critical areas of supply.	Developer	None identified at the time of forming the Risk Register.	
R96	WBS 4.5	High	Operator	Inadequate application for DCO.	Data not available or inadequately presented.	Inadequate application (e.g. inadequate evidence of pre-application consultation) not accepted by Planning Inspectorate.	Possible	Extreme	Early and consistent site presence. Early site characterisation. Compliance with Planning requirements.	Operator	None identified at the time of forming the Risk Register.	
R97	WBS 4.5	High	Operator	Objection based on material considerations.	Data to rebut concern not available or inadequately presented	Irreconcilable opposition by key stakeholders on grounds of a material consideration.	Possible	Major	Early and consistent site presence. Early site characterisation. Compliance with Planning requirements.	Operator	None identified at the time of forming the Risk Register.	

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R98	WBS 4.5	High	Operator	Onerous DCO planning conditions.	DCO granted subject to onerous conditions.	Onerous conditions imposed, prejudicing project viability.	Possible	Moderate	Early engagement with local planners to work with them to agree acceptable conditions.	Operator	Deal with the onerous planning conditions.	
R99	WBS 4.6	Medium	Operator	Onerous pre-DCO planning conditions.	Consent for pre-DCO work granted subject to onerous conditions.	Local consent for pre-DCO work is subject to more onerous conditions.	Possible	Minor	Early engagement with local planners to work with them to agree acceptable conditions.	Operator	Wait for DCO.	
R100	WBS 4.6	Medium	Operator	Challenge to pre-DCO consent.	Nuclear opponents challenge pre-DCO consent based on pre-empting DCO	Consent outside DCO is subject to legal challenge by nuclear opponents.	Possible	Minor	Engage with local planners to identify work which advances project but does not pre-empt DCO n (has other local benefit)	Operator	Wait for DCO.	
R101	WBS 4.6	Low	Operator	Investment in pre-DCO works.	DCO not subsequently granted	Investment is stranded if DCO is not granted.	Unlikely	Minor	Due diligence on benefit of early work.	Operator	Write off investment.	
R102	WBS 5	High	Government	Accelerated SMR Programme impacts manufacturing.	Insufficient time for robust manufacturing processes.	Desire to accelerate SMR programme will lead to manufacturing processes that are less robust against challenge.	Unlikely	Extreme	Robust planning prior to project start up and sufficient resourcing. (Owner Government)	Government	None identified at the time of forming the Risk Register.	
R103	WBS 5	Medium	Vendor	SMR not designed for economies of multiples.	Design process is already established and not flexible for change.	Vendor technology may be too far advanced to enable design changes to facilitate economies of multiples based on predicted demand.	Unlikely	Moderate	Inclusion of economies of multiples assessment criteria for the assessment of the FOAK. (Owner Government)	Government	None identified at the time of forming the Risk Register.	

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R104	WBS 5	High	Government	Regulation change influence on design.	Government policies or unforeseen accident and change of Government.	Regulation may change which will influence design decisions	Unlikely	Extreme	Public-Private SMR policy development. Government	Government	None identified at the time of forming the Risk Register.	
R105	WBS 5	High	Vendor	Timing of funding.	Change in Government/policy. Other energy source become more economic.	Lack of available funding will prohibit technology development and delay or prevent delivery.	Unlikely	Extreme	Early contract agreements between Government and vendor. Vendor must be transparent with costs during development.	Government	None identified at the time of forming the Risk Register.	
R107	WBS 5.2.1	High	Vendor	Vendor IP	Vendor safeguarding of data.	Vendor IP or NDAs may prevent accessibility to technology causing delays to the deployment.	Possible	Major	Robust agreements for data sharing through bilateral planning.	Government	None identified at the time of forming the Risk Register.	
R108	WBS 6	High	Operator	FDP approval delayed.	FDP approval authority does not respond in a timely manner.	Delayed approval of the FDP can result in delays to construction commencement.	Possible	Moderate	Dependant on reason for delay in approving the FDP.	Other (See Comments)		Mitigation owner Operator/Government.
R109	WBS 6	High	Operator	Inadequate stakeholder management associated with interim stores	Philosophy Interim stores inadequately explained.	Public opinion local to proposed SMR sites who might see the inclusion of Interim stores as constructing Local “waste dumps”.	Likely	Moderate	Early engagement and continued liaison with local stakeholder group to explain philosophy of long term site utilisation.	Operator	None identified at the time of forming the Risk Register.	
R110	WBS 6	Medium	Operator	Unbudgeted costs in FDP	An inadequate evaluation of Decommissioning and Waste handling costs.	An inadequate assessment of Decommissioning and Waste handling costs leading to unbudgeted costs in FDP.	Unlikely	Moderate	Deployment of appropriate resource to evaluate the costs of waste disposal.	Operator	None identified at the time of forming the Risk Register.	

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R111	WBS 6.2, WBS 6.3	Medium	Government	Potential changes to the arrangements for transportation of nuclear material.	Changes to transport arrangements for nuclear materials requires redesigned packaging.	Changes to the transport arrangements and acceptable package type could impact the waste handling and disposal costs.	Likely	Negligible	Keep abreast of all potential changes to transport arrangements.	Operator	None identified at the time of forming the Risk Register.	
R112	WBS 6.2, WBS 6.3	Low	Operator	Radioactive waste arisings.	Unplanned operational activity leading to radioactive waste inventories that may be different in volume and characteristics.	The estimates of waste arisings in terms of both quantity (volume) and characteristics (isotopic content) may not be accurate adversely impacting contract scope.	Rare	Minor	Achieve Normal reactor operation, hence dominating the long term waste arisings.	Operator	None identified at the time of forming the Risk Register.	
R113	WBS 7.2	Critical	Vendor	Over emphasising passive safety.	Vendor attempting to maximise (operator) affordability with poor safety claims.	Over emphasising passive safety.	Likely	Major	Initially Bootcamp then GDA. Regulator setting out clear expectations throughout GDA process.	Regulator	No fall-back plan as project will not get iDAC and DAC.	
R114	WBS 7.2	High	Regulator	Insufficient regulatory resource.	Wide sector demand for nuclear expertise.	Insufficient regulatory resource.	Unlikely	Major	Government is responsible for ensuring the Regulator is sufficiently manned.	Government	Reprioritise regulatory effort.	
R115	WBS 7.2	High	Vendor	No funding of GDA Regulator costs.	High early "at risk" cost of GDA.	Vendor refuses to fund Regulator's costs of GDA.	Unlikely	Extreme	Operator underwrites GDA costs.	Operator	Government considers underwriting GDA costs.	If Regulator costs are not paid, the Regulator will stop the GDA process.
R116	WBS 7.2	High	Government	Regulator resource focused on SMR.	Government procurement policy.	Regulatory resource is disproportionally moved to SMR.	Possible	Moderate	Government to ensure that the future programme is able to be resources by the Regulator without undue impact on other Nuclear programmes.	Government	Regulator to reprioritise effort in consultation with Government and other Operators.	

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R117	WBS 7.2	High	Vendor	Vendor appetite for standardisation.	Non-UK Vendor and drive for economies of multiples.	Vendor appetite for standard internationally accepted Safety Case.	Possible	Major	Bootcamp (WBS 1.3)	Government	UK Regulators to have discussions with other International Regulators to agree common approaches.	
R118	WBS 7	Critical	Vendor	PCSR evidence insufficient.	Design justification is incomplete.	PCSR evidence insufficient.	Likely	Extreme	Bootcamp (WBS 1.3) and detailed technical dialogue with Regulators early in the GDA process.	Vendor	No fall-back as project cannot proceed without Regulator acceptance of PCSR.	Vendor and Regulator to have detailed technical discussions on specific topics.
R119	WBS 7.2.1	High	Vendor	Security of Information.	Security of Information.	International transfer of protectively marked material.	Possible	Moderate	Preplanning by Government.	Government	Temporary transfer team to overseas location.	
R120	WBS 7.2.1	Medium	Other (See Comments)	Comments process flooded.	Comments process flooded by extent of comments.	Project delayed by extensive comments from public.	Almost Certain	Minor	Deal with comments by dedicated media / stakeholder liaison group.	Other (See Comments)	Government to address	To be addressed by all parties.
R121	WBS 7.2.1, WBS 7.2.2	Low	Operator	DAC and SoDA run out.	DAC and SoDA have limited validity.	DAC and SoDA run out.	Unlikely	Minor	Plan future activities to ensure timely construction.	Operator	Re-evaluate and update Site specific PCSR and engage with Regulator.	DAC likely to be valid for only 10 years.
R122	WBS 7.2.2	Low	Vendor	SoDA not issued due to safety / security issues.	Environment Agency does not issue SoDA due to ONR concerns.	SoDA not issued due to safety / security issues.	Unlikely	Minor	ONR and EA work closely together throughout the project.	Regulator	Government to influence and enable action by Vendor.	SODA is important for some of the EURATOM submissions which could commence ahead of the DAC.
R123	WBS 7.3	High	Operator	Lack of operator knowledge of Euratom.	Lack of corporate knowledge of Euratom treaty.	Lack of operator knowledge of Euratom.	Unlikely	Major	Bootcamp (WBS 1.3) and discussions with Government	Operator	Operator to engage with external legal advisors.	

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R124	WBS 7.3	Medium	Operator	Member States challenge Euratom submissions.	National opinions of member states.	Member States challenge Euratom submissions.	Likely	Minor	Government to interface with other Governments.	Government	No fall-back option.	The European Commission can seek sanctions via the Court of Justice of the European Union should access be refused or if the agreed arrangements are not followed.
R127	WBS 7.5	High	Other (See Comments)	Regulator fails to follow due process.	Regulatory process allows for this risk.	Any or all of the required Licences, Permits or Permissions are not provided.	Unlikely	Extreme	Regulator follows due process.	Regulator	No fall-back option as would have to follow the judicial review process.	Risk could be owned by the Regulator or the Operator depending on circumstances.
R128	WBS 7.5	Low	Operator	Inconsistent Safety Cases.	See Comments	The Operator's PCSR inconsistent with the Vendor's input to PCSR.	Unlikely	Minor	Operator and Vendor work closely together throughout the GDA and licencing process so the inconsistencies should be minor.	Operator	Discuss inconsistencies with Regulator and resolve.	One of the Bounding assumptions provided by the ETI is that the Vendor / Operator combination is selected at the start of the 5 year enabling period.
R131	WBS 8	High	Operator	Stakeholder challenge in planning system.	Failure to anticipate entrenched opposition or onerous demands by local stakeholders.	Entrenched opposition or onerous demands by local stakeholders impact adversely on consenting processes and the business case.	Possible	Moderate	Early engagement with local stakeholders and planners to agree acceptable proposals.	Operator	None identified at the time of forming the Risk Register.	
R132	WBS 8	Medium	Operator	Stakeholder opposition throughout the programme.	Failure to anticipate entrenched opposition or onerous demands by local stakeholders.	Construction, commissioning and operation proceed only in the teeth of substantial local opposition.	Unlikely	Moderate	Continued engagement with local stakeholders and planners to establish trust.	Operator	None identified at the time of forming the Risk Register.	

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R133	WBS 8	Medium	Operator	Stakeholder identification.	Influential stakeholder not identified and addressed.	Important / influential stakeholder inadvertently missed, leading to avoidable opposition.	Unlikely	Moderate	Scan widely and early for stakeholders. Early local presence on site.	Operator	None identified at the time of forming the Risk Register.	
R134	WBS 8	High	Operator	Establishing trust with local stakeholders in new site area.	No history and experience of nuclear operation.	At site with no history of nuclear development, opponents are judged more credible than operator.	Almost Certain	Moderate	Engage early with credible team members, people who have experience of nuclear operation.	Operator	None identified at the time of forming the Risk Register.	
R135	WBS 8.1	Medium	Operator	Operator fails to establish credible identity.	Prospective operator is not visibly distinct from vendor.	Prospective operator is not visible distinct from vendor, or is unable to fund proactive investment in stakeholder identification and engagement, allowing local rumours and opposition to become entrenched.	Unlikely	Moderate	Engage early with credible team members, people who have experience of nuclear operation.	Operator	None identified at the time of forming the Risk Register.	
R136	WBS 8.1	High	Operator	Early engagement as credible nuclear operator.	Limited advanced engagement with Regulators with respect to future operation.	Preparation for site and operator-specific aspects of consenting, licensing and permitting are started too late to be effective, delaying necessary consents.	Unlikely	Major	Early engagement at senior level.	Operator	None identified at the time of forming the Risk Register.	
R137	WBS 8.1.1	Low	Operator	Planning gains expectations.	Mismatch of developer resources and local expectations.	Engagement raises unrealistic expectations of costly “planning gain”, challenging project viability	Possible	Negligible	Clear communication of operator planning gain resources and justification criteria to manage expectation of local stakeholders.	Operator	Government investment in local region or sharing of business rates.	Main impact is on financial viability.

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R139	WBS 8.1.2	High	Operator	Delayed development of credible nuclear operator.	Operator not in a position to be an intelligent customer for the design requiring changes where required for UK implementation.	Prospective operator (as opposed to vendor) lacks capability to understand significance of design.	Possible	Extreme	Develop a capable operator at an early stage that is able and empowered to insist on design changes.	Other (See Comments)	Catching up and retrospective design change.	Mitigation Owner is Operator but must have Vendor buy-in.
R140	WBS 8.1.2	High	Operator	Inadequate site characterisation to justify regulatory applications consistent with GDA.	Inadequate site characterisation in context of the SMR safety/environment design case.	FOAK site characteristics found inadequate to justify safety / environment case for SMR design approved in GDA.	Unlikely	Major	Ensure that GDA assumption bound the site characteristics.	Other (See Comments)	Make a separate case for regulatory applications.	Mitigation owner is Vendor and operator.
R141	WBS 8.2	Low	Operator	Inability to demonstrate timely influence over design.	Late changes and delayed development of an operator.	Key elements of the FOAK project are decided, or are fundamentally changed, too late for effective communication.	Unlikely	Minor	Accept delay to achieve key changes in design.	Other (See Comments)	None identified at the time of forming the Risk Register.	Mitigation owner is operator with Vendor buy-in.
R142	WBS 8.2	Low	Operator	Inability to demonstrate effective influence over design.	Late development of an operator with power to influence.	Prospective operator lacks the authority or capability to implement an effective response.	Unlikely	Minor	The organisational capability and influence over design to respond.	Other (See Comments)	None identified at the time of forming the Risk Register.	Mitigation owner is operator with Vendor buy-in.
R143	WBS 8.3	Medium	Operator	Communication effectiveness of supportive stakeholders.	Lack of focus on potential supporters.	Potential supporters are not well informed relative to nuclear opponents.	Possible	Minor	Identify and nurture supporters with credible and timely information.	Other (See Comments)	None identified at the time of forming the Risk Register.	Mitigation owner is operator with Government buy-in.
R144	WBS 8.3	Medium	Operator	Optimise stakeholder impacts.	Failure to consider stakeholder impacts in project decisions.	Opportunities to optimise project impacts are missed.	Unlikely	Moderate	Consider stakeholder impacts in project decisions.	Operator	None identified at the time of forming the Risk Register.	

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R145	WBS 8.4, WBS 8.4.1	Medium	Operator	Site stakeholder group ineffective.	Undermined site stakeholder group ineffective.	Site Stakeholder Group perceived as “in the pocket” of the prospective operator – potentially mitigated by employing credible independent chair.	Unlikely	Moderate	Employ credible independent chair and build trust via quality information and senior representation.	Operator	None identified at the time of forming the Risk Register.	
R146	WBS 9	Critical	Government	Lack of supply chain investment appetite.	Lack of substantial nuclear new build market causes supply chain to become cautious about further investment.	Lack of supply chain appetite to invest in nuclear.	Likely	Major	Investment promotion WBS 9 and early engagement with Supply Chain.	Government	Investigate extended supply chain (e.g. outside UK). Investigate use of alternative supply chain (e.g. Oil & Gas).	
R147	WBS 9	Critical	Government	Insufficient appropriately skilled people resource.	Increase workforce demand if other nuclear new build programmes go ahead and high rate of attrition.	Insufficient people resource due to significant increase in workforce demands combined with high rate of attrition.	Likely	Major	WBS 9.3	Other (See Comments)	Accept a delay on the Programme.	Mitigation owner Supply Chain and Government
R148	WBS 9.1	High	Vendor	Adaptation to UK manufacturing regulation.	Foreign involvement is likely and these will come from different environment and culture of regulation and standards.	Adaptation to UK manufacturing regulation takes longer than expected.	Possible	Extreme	Vendor to attend Bootcamp	Vendor	Accept a delay on the Programme.	
R149	WBS 9.1	High	Vendor	GDA Challenge.	Lack of understanding ahead of the GDA process.	Design challenge at GDA affects manufacturing strategy.	Unlikely	Major	Vendor to attend Bootcamp and engagement through the Investment Promotion WBS.	Vendor	Accept a delay on the Programme.	
R150	WBS 9.2	Medium	Developer	Objection to infrastructure disruption.	Stakeholder (Likely public) objection to infrastructure plans.	Objection to infrastructure disruption causes delay during stakeholder engagement.	Possible	Minor	Public engagement WBS.	Developer	Re-plan the infrastructure.	

Ref	Related WBS	Likelihood-Impact Score (H/M/L)	Owner	Risk Title	Source of Risk	Risk Description	Likelihood	Impact on Time	Mitigation	Mitigation owner	Fall-back Plan	Comments
R151	WBS 9.2	High	Developer	Insufficient recent nuclear construction experience.	Nuclear power station not been built in UK since 1995. Global experience and success varies dramatically.	Insufficient experience of recent nuclear construction experience does not allow comprehensive input with regards to lessons learned.	Likely	Moderate	Purposeful compilation and evaluation existing Operational experience.	Developer	Tackle problems as they arise.	
R152	WBS 9.3	Critical	Developer	SQEP recourse not available in sufficient quantities.	Increase workforce demand if other nuclear new build programmes go ahead and high rate of attrition.	Skills are not be available in sufficient quantities in some vocations and professions due to demand elsewhere (nuclear and non-nuclear).	Likely	Major	Early start of WBS 9.3.	Developer	Accept a delay on the Programme.	
R153	WBS 9.4	High	Developer	Suppler qualification timescale.	The nature of FOAK and the likelihood of an unfamiliar supply chain.	Delay to programme due to speed of learning within supply chain.	Possible	Moderate	Start the WBS 9.4 early. Engage with the GDA process and existing industry initiatives.	Developer	Accept a delay on the Programme.	
R154	WBS 9.4	Medium	Developer	Challenge to the Business Case.	No existing SMR supply chain.	Insufficient supplier pool leads to unanticipated higher costs and an unforeseen commercial dynamic at FID.	Unlikely	Moderate	Produce robust Business Case based on interlinkages of the rest of the Programme.	Developer	Accept an increase to the cost of the programme and/or a delay to the Programme.	
R155	WBS 9.5	High	Developer	Late GDA challenge.	Until DAC is achieved through the GDA process, nothing is certain.	Late GDA challenge results in an over-risked position causing pressure to the demands of the business case.	Possible	Moderate	Seek an iDAC ahead of the DAC to provide confidence.	Vendor	Revisit the Business Case.	
R156	WBS 9.5	Medium	Vendor	Lack of supplier qualification or insufficient manufacturing resource.	No existing qualified SMR supply chain.	Lack of supplier qualification or insufficient manufacturing resource causing a delay to the programme even although early procurement has been agreed and actioned.	Unlikely	Moderate	WBS 9.4 and WBS 9.1	Developer	Accept a delay on the Programme.	

APPENDIX VIII SOURCES OF INFORMATION

MDAL Reference	WBS / Task Reference	Source Document	Source Organisation/location	Link
A68, A69	WBS 5	System Requirements For Alternative Nuclear Technologies - Mott MacDonald	Held by Client	http://www.eti.co.uk/wp-content/uploads/2015/10/ANT-Summary-Report-with-Peer-Review.pdf
A84, A14, A20	WBS 7.2, WBS 1.1.1, WBS 1.1.3	2008 Energy Whitepaper "Meeting the Energy Challenge"	UK Government	https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/228944/7296.pdf
A88	WBS 7.2.2	New Nuclear Reactors: Generic Design Assessment - Guidance for Requesting Parties	Office for Nuclear Regulation	http://www.onr.org.uk/new-reactors/ngn03.pdf
A90	WBS 7.2.2	Electricity Generation Policy Statement – 2013	Government of Scotland	http://www.gov.scot/Resource/0042/00427293.pdf
A93	WBS 7.3.1	Safety Assessment Principles - 2014 edition	Office for Nuclear Regulation	http://www.onr.org.uk/saps/saps2014.pdf
A11, A14, A17	WBS 1.1, WBS 1.1.1, WBS 1.1.2	EN6	UK Government	https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/47859/2009-nps-for-nuclear-volumeI.pdf
A12	WBS 1.1,	ONR Strategic Plan 2016-2020	UK Government	https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/509753/office-for-nuclear-regulation-strategic-plan-2016-2020.pdf
A39	WBS 3.2	European IPR helpdesk Fact Sheet	European IPR Helpdesk Website	http://www.iprhelpdesk.eu/Fact-Sheet-IP-and-Bussiness-Plans
A33	WBS 3.1	Nuclear New Build: Insights into Financing and Project Management	OECD Website	https://www.oecd-nea.org/ndd/pubs/2015/7195-nn-build-2015.pdf
No Specific MDAL Reference	WBS 3.2	Overcoming Transatlantic differences on Intellectual Property.	European Parliament Website	http://www.europarl.europa.eu/RegData/bibliotheque/briefing/2014/140760/LDM_BRI(2014)140760_REV1_EN.pdf
No Specific MDAL Reference	WBS 5.3.2	Report on the protection and enforcement of intellectual property rights in third countries	European IPR Office Website	https://euipo.europa.eu/ohimportal/documents/11370/0/Report+on+the+protection+and+enforcement+of+intellectual+property+rights+in+third+countries
No Specific MDAL Reference	WBS 2.4	Nuclear Power Economics and Project Structuring,		http://www.world-nuclear.org/uploadedFiles/org/WNA/Publications/Working_Group_Reports/REPORT_Economics_Report%20(1).pdf
No Specific MDAL Reference	WBS 5.2	Structuring Nuclear Projects for Success - An Analytic Framework.	WNA Website	http://www.world-nuclear.org/uploadedFiles/org/WNA/Publications/Working_Group_Reports/Structuring%20Projects%20Report.pdf
No Specific MDAL Reference	WBS 2.7	WIPO STANDING COMMITTEE ON THE LAW OF PATENTS - TRANSFER OF TECHNOLOGY*	WIPO Website	http://www.wipo.int/meetings/en/details.jsp?meeting_id=17461
No Specific MDAL Reference	WBS 3	Challenges in Licensing Small Modular Reactors	Nuclear Futures Laboratory Princeton University, USA	http://www.andrew.cmu.edu/user/ayabdull/Ramana_ChallengesWithRegulation.pdf

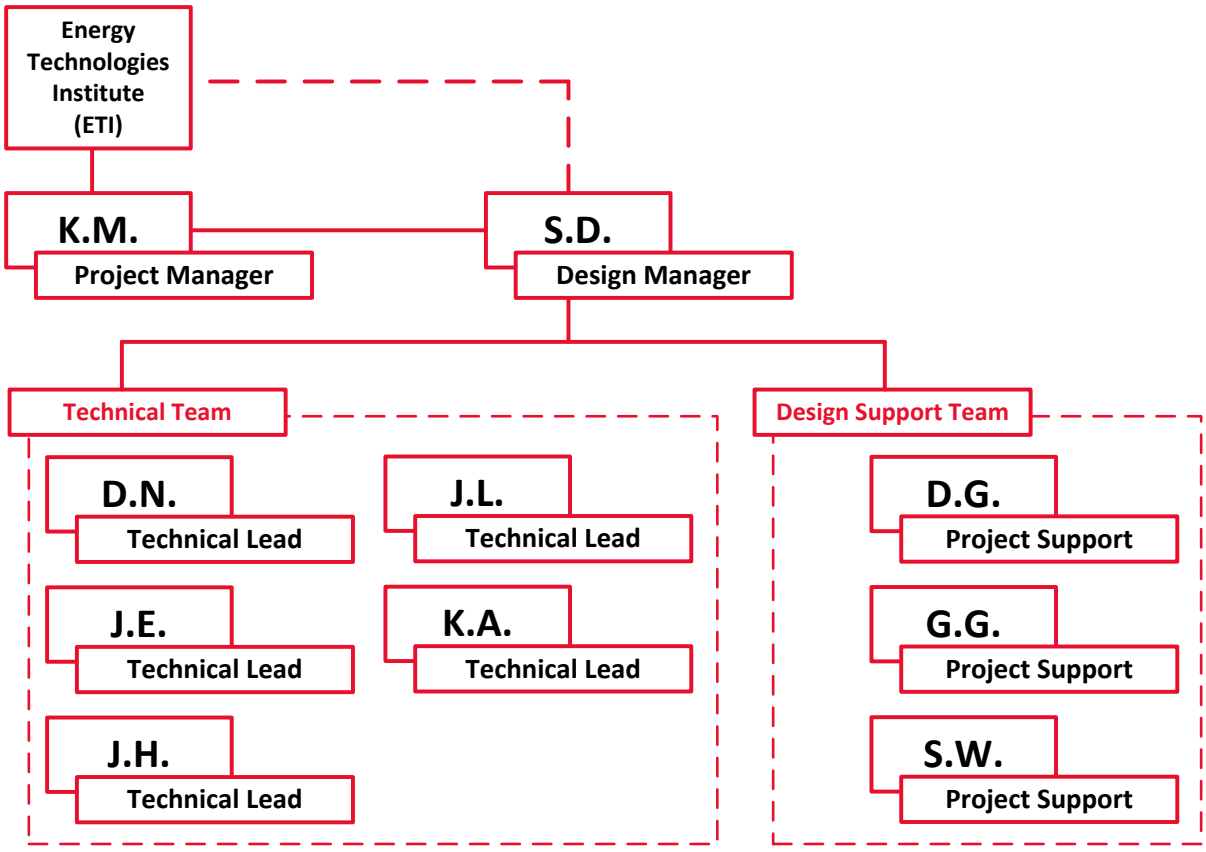
MDAL Reference	WBS / Task Reference	Source Document	Source Organisation/location	Link
No Specific MDAL Reference	Background / Supporting Information.	Small Nuclear Power Reactors	World Nuclear Association	http://www.world-nuclear.org/info/nuclear-fuel-cycle/power-reactors/small-nuclear-power-reactors/
No Specific MDAL Reference	WBS 2	Feasibility Study for SMR	Consortium led by national nuclear laboratory	http://www.nnl.co.uk/media/1627/smr-feasibility-study-december-2014.pdf
No Specific MDAL Reference	WBS 3, WBS 3.1, WBS 3.2, WBS 3.3	Generic licencing issues for Small and Medium reactor	American Nuclear Society	http://www2.ans.org/pi/smr/ans-smr-report.pdf
No Specific MDAL reference	WBS 3	Nuclear baseline and the Management of Organisational Change	Nuclear Industry Code of Practice	http://www.nuclearinst.com/write/MediaUploads/SDF%20documents/NICOP_nuclear_baseline_and_MoC.pdf
No Specific MDAL Reference	WBS 2 and Background / Supporting Information.	Small Modular Reactors – Their potential role in the UK	National Nuclear Laboratory	http://www.nnl.co.uk/media/1048/nnl__1341842723_small_modular_reactors_-_posit.pdf
No Specific MDAL Reference	WBS1.1 and Background / Supporting Information.	Small Nuclear Power – Government Response	Parliamentary Publications	http://www.publications.parliament.uk/pa/cm201415/cmselect/cmenergy/1105/110504.htm
No Specific MDAL Reference	Background / Supporting Information.	SMR - Overview of Economics and Strategic Aspects	Lincoln University	http://www.nuclearinst.com/write/MediaUploads/Small_modular_reactors_A_comprehensive_overview_-_Copy.pdf
No Specific MDAL Reference	Background / Supporting Information.	SMR Licensing Technical Support Program Overview	US DOE	http://www.ncsl.org/documents/environ/TBeville52014.pdf
No Specific MDAL Reference	Bound	SMR – UK Energy System Requirements	Energy Technologies Institute	http://www.eti.co.uk/wp-content/uploads/2015/03/2015-03-26-Nuclear-Institue-Presentation-FINAL-1.pdf
No Specific MDAL Reference	WBS 5, WBS 9	Nuclear Regulation in the UK	ONR	http://www.onr.org.uk/documents/a-guide-to-nuclear-regulation-in-the-uk.pdf
No Specific MDAL Reference	WBS 3	Infrastructure Horizons: Nuclear – Practical Guide for contractors seeking to enter the nuclear civil engineering sector	CECA	https://www.ice.org.uk/getattachment/disciplines-and-resources/best-practice/nuclear-toolkit/ceca-infrastructure-horizons-nuclear-may-2014.pdf.aspx
No Specific MDAL Reference	Background / Supporting Information.	UK's Nuclear Industrial Strategy	UK Government	https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/168048/bis-13-627-nuclear-industrial-strategy-the-uks-nuclear-future.pdf
No Specific MDAL Reference	Background / Supporting Information.	Horizon Nuclear Gears up for expansion	World Nuclear news	http://www.world-nuclear-news.org/C-Horizon-gears-up-for-expansion-2003144.html
No Specific MDAL Reference	WBS 9	The essential Guide to the new build supply chain	NIA	http://www.hinkleysupplychain.co.uk/wp-content/uploads/2010/12/NewNuclearSC_Essential_guide.pdf

MDAL Reference	WBS / Task Reference	Source Document	Source Organisation/location	Link
No Specific MDAL Reference	Background / Supporting Information.	Delivering Nuclear new Build: UK Case Study	NIA	http://www.svensktnaringsliv.se/Bilder_och_dokument/alastair-evans_ukpdf_634626.html/BINARY/Alastair%20Evans_UK.pdf
No Specific MDAL Reference	Background / Supporting Information.	UK New Build nuclear Power: Delivering Best Value	Centre Forum	http://www.centreforum.org/assets/pubs/uk-new-build-nuclear-power-web.pdf
No Specific MDAL Reference	Background / Supporting Information.	Various Nuclear Case Studies		https://www.iea.org/media/freepublications/technologyroadmaps/AnnexNuclearRoadmapcasestudies_finalforweb.pdf
No Specific MDAL Reference	Background / Supporting Information.	Financing arrangements and industrial organisation for new nuclear build in electricity markets	University of Cambridge – Electricity Policy Research Group	http://www.eprg.group.cam.ac.uk/wp-content/uploads/2008/11/eprg08262.pdf
No Specific MDAL Reference	WBS 3, WBS 3.1, WBS 3.2, WBS 3.3	Licence Condition Handbook	Office for Nuclear Regulation	http://www.onr.org.uk/documents/licence-condition-handbook.pdf
No Specific MDAL Reference	WBS 7 and Background / Supporting Information.	Moorside New Reactor Application strategy	Office for Nuclear Regulation	http://www.onr.org.uk/civil-nuclear-reactors/nugen-pre-application-intervention-strategy.pdf
No Specific MDAL Reference	WBS 7 and Background / Supporting Information.	Wylfa New Reactor Strategy	Office for Nuclear Regulation	http://www.onr.org.uk/civil-nuclear-reactors/newydd-wylfa-intervention-strategy.pdf
No Specific MDAL Reference	WBS 3	Nuclear Power Plant Licencing Process	US NRC	http://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0298/br0298r2.pdf
No Specific MDAL Reference	Background / Supporting Information.	Licencing Process for New Nuclear Power Plants in Canada	Canadian Nuclear Safety Commission	http://nuclearsafety.gc.ca/pubs_catalogue/uploads/I0756_R1_e.pdf
No Specific MDAL Reference	Task 6/7	Radioactive Substances Regulation: Management Arrangements at Nuclear Sites	Environment Agency	https://www.gov.uk/Government/publications/rsr-management-arrangements-for-nuclear-sites
No Specific MDAL Reference	Task 6/7	Licensing of Nuclear Installations (Jan 2015)	Office for Nuclear Regulation	http://www.onr.org.uk/licensing-nuclear-installations.pdf
No Specific MDAL Reference	Task 6/7	INSAG 4 and INSAG 15	IAEA	INSAG 4 - http://www-pub.iaea.org/MTCD/publications/PDF/Pub882_web.pdf INSAG 15 - http://www-pub.iaea.org/MTCD/publications/PDF/Pub1137_scr.pdf
No Specific MDAL Reference	Task 6/7	Licence Condition Handbook	Office for Nuclear Regulation	http://www.onr.org.uk/documents/licence-condition-handbook.pdf
No Specific MDAL Reference	Task 6/7	Nuclear Lesson Learned	RAEng	http://www.engineeringthefuture.co.uk/Government/pdf/Nuclear_Lessons_Learned_Oct10.pdf

MDAL Reference	WBS / Task Reference	Source Document	Source Organisation/location	Link
No Specific MDAL Reference	Task 6/7	Working with Ionising Radiation, Ionising Radiations Regulations 1999	UK Government	www.legislation.gov.uk
No Specific MDAL Reference	Task 6/7	Radioactive Substances Regulation– Environmental Principles	Environment Agency Regulatory Guidance Series, No RSR 1	https://www.gov.uk/Government/publications/radioactive-substances-regulation-environmental-principles
No Specific MDAL Reference	Task 6/7	Best Available Techniques (BAT) for the Management of the Generation and Disposal of Radioactive Wastes – Nuclear Industry Code of Practice		http://www.nuclearinst.com/write/MediaUploads/SDF%20documents/Best_Available_Techniques_for_the_Management_of_the_Generation_and_Disposal_of_Radioactive_Wastes_-_NICoP.pdf
No Specific MDAL Reference	Task 6/7	RSR: Principles of Optimisation in the Management and Disposal of Radioactive Waste	Environment Agency	https://www.gov.uk/Government/publications/rsr-principles-of-optimisation
No Specific MDAL Reference	Task 6/7	How to comply with your environmental Permit for Radioactive Substances on a Nuclear Licensed	Environment Agency	https://www.gov.uk/Government/publications/nuclear-licensed-site-how-to-comply-with-your-rsr-environmental-permit
No Specific MDAL Reference	Task 6/7	Environmental Radiological Monitoring – Radiological monitoring technical guidance note	SEPA, the Food Standards Agency and Environment Agency	https://www.sepa.org.uk/media/101506/radiological_monitoring_technical_guidance_note_2_environmental-radiological-monitoring.pdf
No Specific MDAL Reference	Task 6/7	Nuclear Installations Act 1965	UK Government	www.legislation.gov.uk
No Specific MDAL Reference	Task 6/7	Paris Convention of 1960		https://www.oecd-nea.org/law/paris-convention.html
No Specific MDAL Reference	Task 6/7	Brussels Supplementary Convention of 1963		https://www.oecd-nea.org/law/brussels-supplementary-convention.html
No Specific MDAL Reference	Task 6/7	The Nuclear Installations (Liability for Damage) Order 2016	UK Government	http://www.legislation.gov.uk/uksi/2016/562/article/9/made
No Specific MDAL Reference	Task 6/7	Energy Act 2008	UK Government	http://www.legislation.gov.uk/ukpga/2008/32/contents
No Specific MDAL Reference	Task 6/7	The Nuclear Decommissioning and Waste Handling Regulations 2013	UK Government	http://www.legislation.gov.uk/uksi/2013/126/impacts

APPENDIX IX PROJECT TEAM

A simple organogram of the project team is given below:



The relevant competence and experience of each project team member, identified by their initials and in alphabetical order, is given in the following pages.

D.G. MBA BEng CEng MIET MAPM

Competence:

- Systematic definition of scope and requirements
- Nuclear new build management systems strategy
- Major programme definition and strategy
- Project and programme management

Previous experience:

- Led large multi-disciplinary teams to deliver major projects / programmes for SLCs, both outside and within nuclear licensed sites. This has included both supplier and client-side delivery roles, encompassing design, systems / safety engineering, management consulting, procurement, and manufacture / construction.
- Worked across the UK civil nuclear sector in project, programme, and engineering management consulting roles for clients in decommissioning, generation and nuclear new build.
- Project manager within the UK nuclear new build sector, supporting the early stages of organisational development for a new nuclear power company, formulating and leading the establishment of compliance arrangements for the suite of ONR Licence Conditions and EA Permit Conditions.
- Supported major UK Ministry of Defence programmes through the development of acquisition strategy and programme delivery frameworks. This has included work to consider the strategic investment in private sector research and development, in order to accelerate the maturity of novel technology for future insertion into front-line equipment.
- Development of procurement strategies, the selection of contractors through competitive tender / competitive dialogue, contract negotiation, contract management, and claims/dispute resolution.
- Experience includes planning technology route maps and the management of Technology Demonstrator Programmes (TDPs) for the UK MoD.

D.N. MA MBA PhD FRSC CChem

Competence:

- New nuclear power programme development
- Corporate structure and organisational capability development
- Regulator engagement and complex stakeholder management
- Government engagement and policy development for new nuclear power

Previous experience:

- Operated in a wide range of executive and internal consultant roles in the nuclear industry for over 40 years; optimising the value of power station operation day-to-day, building a robust case for lifetime extension over the next 10 years, minimising nuclear liabilities over the next 100+ years, and establishing a credible new nuclear operator in the UK regulatory environment.
- Engaged with DTI / BERR / DECC officials and their advisors, environmental and safety regulators, National Grid and local authority stakeholders through the emergence of Government policy support from 2006 onwards for a restart in the UK nuclear power programme. This included encouraging confidence in feasibility of generic design and strategic site assessment (GDA and SSA) processes in Government and regulators, and the preparation by planning authorities for actual implementation of new designs at potential nuclear sites.
- Substantial role in developing and progressing enabling activities at Government level, including regulatory justification, and at site level, securing grid connection agreements at candidate sites.
- Led the team that secured all environmental permits for operation of the first new nuclear power station in the UK for two decades.
- Responsible for driving a constructive, open relationship with the Environment Agency across all parts of the nuclear power station's developer / operator.
- Secured favourable Euratom Opinions and Point of View for the new nuclear power station from the European Commission.

G.G. BSc CEng MIET MSP

Competence:

- Information acquisition and knowledge management
- Regulator engagement and complex stakeholder management
- Requirements definition and management
- Project and programme management

Previous experience:

- Project Controls Manager on the Ministry of Defence Submarine Dismantling Programme.
- Single point of contact with ONR assessors, on behalf of a Licensee, co-ordinating cross-functional reviews of the plant safety cases, emergency arrangements and organisation as part of Level 4 engagements, and compiling position statements for review by the nuclear safety committee, station directors, and the board of the licensee.
- Leading a team to ensure the learning from the events at Fukushima was appropriately dealt with and the output from the resultant programme of work was well understood and communicated, including responding to WANO on the relevant SOER reports and leading a team to close out recommendations and findings from a number of bodies including the ONR.
- Inspection Leader, Automated Non-Destructive Testing (NDT), during multiple nuclear power station outages, leading multiple teams on multi-disciplinary inspections, ensuring the appropriate permitry and procedures are in place and site rules being followed. This included the full project lifecycle from outage planning and preparation, resource management, commissioning of equipment and procedures, training, inspection management and post-inspection close-out.

J.E. BA CEng FIMechE FNucI

Competence:

- New nuclear power programme development
- Nuclear safety and licensing management strategy
- Corporate structure and organisational capability development
- Nuclear technology and operations

Previous experience:

- General Manager with 50 years' experience related to the electricity supply industry and almost 40 years related to nuclear progressed from technical work through project and extensive programme management to general management issues related to personnel, finance, business planning, change management and strategy development.
- Extensive knowledge of the UK nuclear licence arrangements and the operation of nuclear safety committees, including as a member of the pre-licence nuclear safety committee for companies developing new nuclear power stations in the UK.
- Depth and breadth of knowledge spanning the whole nuclear industry, having held roles as Director and Board Member of the Nuclear Industry Association, being involved in key industry development aspects such as an independent member of the Nuclear Technology Education Consortium, and with an extensive background of Nuclear Power Generation Operations experience.
- Generation Manager in the Corporate Operations Division of a UK nuclear operator (reporting to a Board Director) with responsibility for; Operations Services - Emergency Arrangements, Operating Experience, Strategic Spares, and Operations Development.
- Engineering Manager at a UK nuclear power station, leading a department which had responsibility for establishing and maintaining engineering standards to ensure adherence to the nuclear safety case, personally holding delegated responsibility for a number of the nuclear site licence conditions, routinely involved with the Nuclear Installations Inspectorate, and frequently represented the station at the nuclear safety committee.

J.H. MBA BEng MIET MIC

Competence:

- Investment analysis and project financing
- Economics and financial analysis
- Global energy markets and technologies
- Energy policy

Previous experience:

- Comprehensive knowledge of, and significant experience operating with senior stakeholders within the Clean Energy generation and energy policy fields, across UK, Europe and Japan.
- Engaged as a senior consultant in the SMR Feasibility Study commissioned jointly by DECC and BIS, working under the oversight of Gordon Waddington (ex-Rolls-Royce MD for Energy) within a multipartite team comprising consultants from AMEC, Atkins, Rolls-Royce, National Nuclear Laboratories, Lloyds Register and KPMG, to provide a structured market and economic assessment of the global potential for the UK to participate in the development of Small Modular Nuclear Reactor Technology.
- Active participant in the World Economic Forum's Emerging Technologies taskforce, which seeks to identify key technologies at early stages of technology readiness that could have significant positive impact in addressing the global energy challenge, and to lay out roadmaps to bring them to cost-effective commercialisation.
- Strategy Consultant to the Global Strategic Programmes team of a major engineering and consultancy organisation; structuring and executing international strategic planning, development and market entry initiatives in highly regulated power markets across the globe.
- Consultant for a £7bn nuclear asset ownership bid, advising on transition, post-merger integration and cultural change.

J.L. MEng MPhil CEng MIMechE

Competence:

- Systems engineering
- Engineering design and product development
- Optioneering and concept development
- Design and development of plant systems

Previous experience:

- Chartered engineer and technical project manager with a background in engineering design, product development and systems design, and a history of delivering complex engineering projects spanning the energy and manufacturing sectors.
- Managed major research projects in the manufacturing industry leading to the delivery of disruptive product solutions and associated manufacturing processes.
- Managed the operation, design and development of process systems within the renewable energy sector.
- Leading the concept development and implementation process of several safety critical plant systems for the UK's leading civil nuclear operator.
- Responsibility for running the UK's first and largest commercial scale biogas plant.

K.A. FIMechE CEng BSc

Competence:

- New nuclear power programme development
- Regulatory permitting and consents
- Generic design assessment
- Nuclear safety and licensing

Previous experience:

- 35 years' experience with both the Nuclear Licensee and Regulator.
- Office for Nuclear Regulation (ONR) Director for Nuclear New Build and Generic Design Assessment.
- Led and focused the 70 strong GDA team, providing direction and personal leadership in consulting and explaining to stakeholders the need for improved project management, transparency and metrics for monitoring performance, the production and publication of progress reports, and re-establishing HSE's good reputation for delivering value for money and timely/quality outputs/outcomes.
- Significant experience in Regulation and Inspection, Programme Management and Leadership, and Stakeholder Engagement, including roles as an ONR Deputy Chief Inspector and the ONR Director for a major organisational change programme.
- Division Head of HSE's Nuclear and Hazardous Installations Policy Division within HSE's Safety Policy Directorate, managing a team of 31 staff developing policy advice and legislative reform on nuclear, major onshore hazard sites, and for flammable substances.
- Head of Nuclear Policy Division, HSE London, responsible for leading and managing staff working on nuclear safety policy.

K.M. MEng MAPM

Competence:

- Project management
- Risk and opportunity management
- Resource and activity co-ordination and management
- Integration strategy and implementation

Previous experience:

- Long-term international assignment to support the establishment and development of a new foreign entity of a major engineering and consultancy organisation. Delivered diverse parallel roles, including leading the development of the local systems, processes and procedures for Project Management (Project Delivery), Project Reporting, and Quality Assurance, ensuring global executive buy-in and that the new business achieved ISO 9001 Certification.
- Deputy Lead for the Back-Up Equipment Workstream within a UK nuclear operators Fukushima response programme. The workstream was a portfolio of 40 integrated projects worth approximately £80 million, being delivered through a team of Project Managers, Contract Managers and Project Engineers.
- Deputy Lead for the Safety Review Team within a UK nuclear operators Fukushima response programme. The diverse team was responsible for conducting a comprehensive safety review of all EDF Energy's nuclear power stations to provide detailed technical reports to the Office for Nuclear Regulation (ONR) to meet the stringent EU Stress Test requirements set by the European Nuclear Safety Regulators Group (ENSREG).
- Project Manager responsible through the full procurement and delivery lifecycle for 7 key contracts amounting to more than £10m of capital investment by a UK nuclear operator, encompassing some of the key components of off-site emergency response capability.

S.D. BEng PhD

Competence:

- Systematic major programme definition and strategy
- Programme management and project leadership
- Programme risk management
- Corporate strategy and organisational leadership

Previous experience:

- 30 years' experience in delivering risk management, procurement, programme support and engineering services to major programmes for clients world-wide across the nuclear, oil & gas, renewables, transport and defence industries.
- Programme risk maturity assessments, set-up and operation of programme risk management and other programme support activities on behalf of prime contractor and government programmes of up to £2bn in value.
- Managing Director and Lead Consultant of 110 person consultancy providing programme support services (risk management, requirements management, planning, earned value management), programme management office teams, through life cost modelling, investment/business cases and strategic options appraisal.
- Delivery of organisation risk and safety management system and governance reviews, safety engineering, human factors and assurance services to government and commercial clients in safety critical industries.
- Leadership of procurements and tenders ranging in value up to £100M, including a complex competitive dialogue bid on behalf of an alliance and large scale managed service procurement on behalf of a nuclear licensed site operator.

S.W. BSc PGDip MIET MSP

Competence:

- Information systems and knowledge management
- Programme management and programme support
- Systems engineering
- Requirements management and configuration control

Previous experience:

- Delivering analytical and effective intelligence, identifying key issues and effectively deconstructing technically complex subjects, including early identification and management of strategic and operational risk.
- Managed international procurement process for highly specialised capabilities on behalf of MoD, requiring full stakeholder management to facilitate accurate requirements capture, identification of potential suppliers and full project management of the development and delivery of the solution including long term support and training.
- Developing robust change strategies for complex global business transformation programmes, while ensuring at a practical level change activities are firmly embedded into programme plans.
- Strategic senior consultancy for the Defence Information Infrastructure Programme operating at both strategic policy and guidance level and tactical hands-on level.
- Provided front-line engineering support, expert advice and ensured ships' systems were fully compliant with rigorous quality standards.