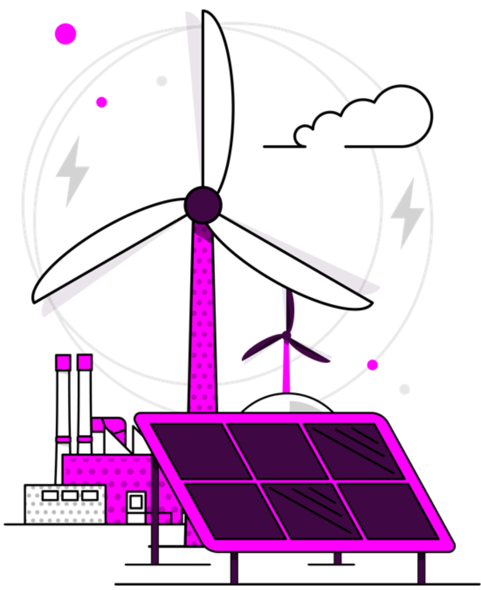
May 2025

Strategic Spatial Energy Plan

Methodology

Contents



1. Introduction

1.1 Executive summary

The *Energy Act 2023* set the legislative framework for an independent system planner and operator to help accelerate Great Britain's energy transition, leading to the establishment of the National Energy System Operator (NESO).

NESO, an independent public corporation at the centre of the energy system, takes a whole system view to create a world where everyone has access to reliable, clean and affordable energy. Our work will be the catalyst for change across the global community, forging the path to a sustainable future for everyone.

Tackling climate change is truly the challenge of our generation; addressing energy security, sustainability, and affordability for everyone is at the forefront of the global agenda. It is NESO's job to steer the transformation of the energy system to meet these challenges and transition to a low-carbon future, embracing new technologies and cleaner generation sources, always with the cost to the consumer in mind.

Our primary duty is to promote three objectives:

- **Net zero** - enabling the government to deliver on its legally binding emissions targets.
- **Efficiency and economy** - promoting efficient, coordinated and economic electricity and gas networks.
- **Security of supply** - ensuring security of supply for current and future consumers of electricity and gas.

NESO's Strategic Spatial Energy Plan

The concept of a Strategic Spatial Energy Plan (SSEP) for Great Britain (GB) was introduced in August 2023, with the publication of a government-commissioned report on how GB can accelerate the deployment of its electricity transmission infrastructure[1]. The report, produced by the UK's Electricity Network Commissioner, recommended the creation of an SSEP for GB.

The commissioner's report was followed in November 2023 by the UK Government's *Transmission Acceleration Action Plan*[2], which set out a holistic approach to delivering the recommendations. In October 2024, the UK, Scottish and Welsh governments officially

[1] Nick Winser, *Accelerating Electricity Transmission Network Deployment* (August 2023) - gov.uk/government/publications/accelerating-electricity-transmission-network-deployment-electricity-network-commissioners-recommendations

[2] Department for Energy Security and Net Zero, *Transmission Acceleration Action Plan* (November 2023) - gov.uk/government/publications/electricity-networks-transmission-acceleration-action-plan

commissioned NESO to produce the SSEP[3]. This will be referred to as 'the commission' hereafter.

The first of its kind in GB, the SSEP is a critical step in supporting the ambitious changes required for GB to achieve net zero by 2050 and to establish a secure energy system. This methodology describes how we will deliver the SSEP, which will build on the UK Government's *Clean Power Action Plan 2030 (CP2030)*.

The UK and devolved governments' policies, targets and ambitions will shape the SSEP and, in turn, use its outputs to inform future policy decisions. The first SSEP will be a GB-wide plan, mapping potential zonal locations, quantities and types of electricity and hydrogen generation and storage. This will help accelerate and optimise the transition to clean, affordable and secure energy across GB. In taking a zonal approach to locations, the SSEP will not identify or recommend specific projects to be delivered. Future versions of the SSEP may also have a broader scope to incorporate other vectors, like natural gas.

This first SSEP will achieve the following goals:

- To provide a pathway for electricity and hydrogen generation and storage types, locations, capacities, and timings. This will be optimised for cost across demand and high-level network needs, as well as environmental, societal, and other spatial interests, to support the energy transition efficiently and securely.
- To provide the UK, Scottish and Welsh governments, and the Office of Gas and Electricity Markets (Ofgem), with a plan they can endorse. This will:
    - provide a consistent strategic approach to spatial planning across GB that becomes part of the framework of planning systems across England, Scotland, and Wales
    - sit alongside government policy and respond to future policy decisions and market-led interventions through further iterations of the SSEP
    - enable specific network solutions to be developed and agreed through the Centralised Strategic Network Plan (CSNP)
- To firmly set the context for the nation's energy requirements. This will increase certainty and confidence for industry and investors by having a plan that considers societal and community voices and interdependencies earlier in the infrastructure development process than before.

The SSEP is a spatial plan, so there are many references to a 'zonal approach' in this publication. This is not to be confused with the concept of 'zonal pricing', which is part of the UK Government's Review of Electricity Market Arrangements (REMA) policy. REMA, in which NESO is a strategic partner, aims to reform the electricity market to ensure it is fit for

[3] Department for Energy Security and Net Zero, *Strategic Spatial Energy Plan*: *commission to NESO* (October 2024) - gov.uk/government/publications/strategic-spatial-energy-plan-commission-to-neso

a decarbonised, cost-effective, and secure electricity system, whereas the SSEP is focused on spatial planning for the locations of electricity and hydrogen generation and storage.

Our statutory duties

NESO has developed the SSEP methodology in line with our statutory duties set out in the *Energy Act 2023*. These drive the mindset of our organisation and ensure we act consistently with our purpose of forging the path to a sustainable future for everyone.

We must balance our three objectives set out above, as well as being consumer-focused and considering other critical factors including innovation, competition and our impact on the whole energy system.

In Chapter 2 – Foundations, we set out an approach informed by these duties, which balances our objectives throughout the SSEP methodology. The holistic approach we describe in this chapter includes a focus on economic value, best practice stakeholder and societal engagement, collaboration with the wider energy industry, identifying and addressing environmental risks and opportunities, and reflecting the objectives of the Public Sector Equality Duty (PSED).

All the above are reinforced by robust, transparent and inclusive governance processes, also summarised in Chapter 2 – Foundations.

An overview of this methodology

In this publication, we outline the principles and methods for delivering the SSEP. To produce this methodology, NESO has collaborated with a diverse range of stakeholders to design an iterative process. This process models and assesses options for meeting future demand projections, integrating economic modelling, spatial evaluation, and statutory environmental assessments. NESO will work closely with the Scottish and Welsh governments to consider existing project pipelines and planning frameworks and ensure that devolved planning responsibilities, statutory and non-statutory, are accounted for.

The methodology considers how we assess and combine a range of factors, including security of supply, decarbonisation targets and the needs and operability of the GB energy system. In addition, we consider the needs and views of communities and society, environmental protection, other important uses of the land and sea, national priorities and strategies, practical delivery, and economic costs.

All of this is reflected in this methodology, together with how we will engage the public, communities, industry representatives and environmental organisations, allowing us to incorporate their feedback and improve the first and future versions of the SSEP.

The methodology is structured through six main chapters (see Figure 1), which are preceded by an initial chapter that outlines the foundations underpinning the SSEP.

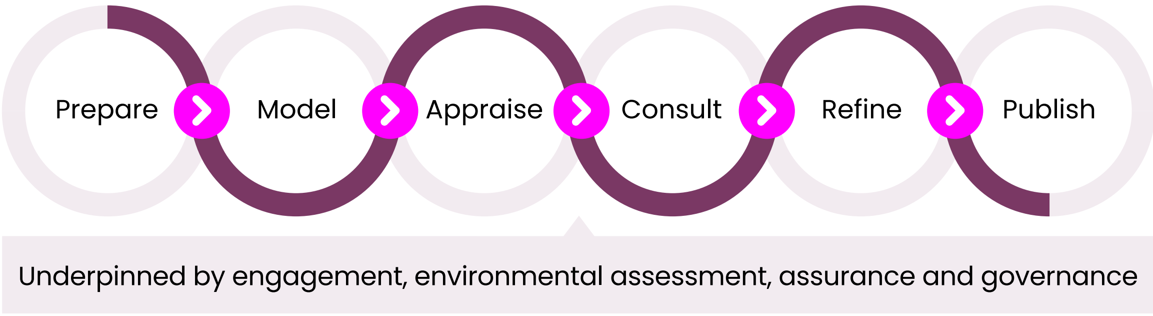


Figure 1: SSEP process

A summary of each chapter is outlined below:

Foundations

Our SSEP process is underpinned by engagement, environmental assessment, governance, and assurance. We set out SSEP pillars that encompass economic, societal, environmental, other spatial uses and technical engineering design requirements. These are supported by a governance structure that includes a committee, advisory groups and working groups. Transparent engagement with stakeholders and societal groups is a foundation for the SSEP's development and will be factored into the development of pathway options. We also describe how the SSEP interacts with other strategic plans and policies, enabling coordination, consistency, and collaboration in the development of an integrated, sustainable energy system.

Prepare

This chapter outlines two important assumptions that 'start' the modelling process: the SSEP baseline which covers projects we consider as the starting point for the SSEP, and the time period covered by our modelling. We then describe which technologies are in scope for SSEP, the modelling tooling and processes we will utilise, as well as the decisions we have made before the modelling begins. To proactively address environmental concerns and facilitate transparent decision-making, the SSEP will include a Strategic Environmental Assessment (SEA), a Habitats Regulations Assessment (HRA) and a Marine Conservation Zone (MCZ) assessment, which includes Marine Protected Areas (MPAs) in Scotland. These assessments will be carried out in line with legislation across the three GB nations.

Model

The next phase is a combination of economic modelling and spatial evaluation. Economic modelling plays a crucial role in simulating and analysing the functioning and evolution of the energy system under various inputs and scenarios. By incorporating inputs mentioned in Chapter 3 – Prepare with the outputs of the spatial evaluation, we will run simulations to inform the development of pathway options for the SSEP.

The spatial evaluation assesses the environmental, societal, other uses of the land and sea, as well as technical engineering design requirements pillars. Through this process, we will assess potentially suitable geographic areas for each in-scope technology. Although we will not recommend project-specific locations, we will understand the potential for the development of energy infrastructure in different areas of GB. It will be important to ensure that this modelling approach is sensibly aligned with established planning methodologies already operating in different parts of GB, such as Scotland.

Appraise

Through this modelling, we will provide a comprehensive appraisal of multiple possible pathways. In this context, 'appraisal' refers to the assessment of pathways guided by principles such as minimising costs and spatial impact, maximising spatial opportunity and achieving future policy ambitions. For a full explanation of 'appraisal', see Sections 5.2 and 5.3. As part of this, we will create between four and six pathway options, including one 'low regrets' pathway, defined as having a higher level of consistency in the pathway elements across the plausible futures considered. All pathways will be designed to achieve net zero by 2050 and establish a secure energy system in GB.

Once all the information on the pathway options is evaluated, they will be shared with Welsh and Scottish energy ministers for their views. The Secretary of State for Energy Security and Net Zero (hereafter referred to as the UK Energy Secretary) will choose a pathway to be used for the draft SSEP consultation. For further information about the evaluation methodology, see Chapter 5 - Appraise.

Consult

Using structures and forums established during the SSEP's development, we will engage a broad range of political, societal, energy industry and community stakeholders to gather valuable perspectives. Our consultation process is designed to be flexible, open, inclusive, and responsive to stakeholders. This will be supported by opinion surveys, targeted focus groups, outreach to prominent interest and campaign groups and sector-specific briefing packs.

Refine

In this chapter, we explain how we will address potential issues, gather valuable input, and adjust our processes in line with feedback and best practice. We will strike a balance between incorporating stakeholder perspectives and maintaining the overall robustness, coherence, and consistency of the SSEP.

Publish

The final chapter (Chapter 8 – Publish) in the methodology explains how we will publish the SSEP and provides an overview of its content and format.

1.2 About this methodology

This SSEP methodology, formally approved by the UK Energy Secretary and Ofgem, is an updated version of the SSEP draft methodology published for consultation in December 2024.

Following publication of the draft methodology, there was a five-week consultation period, during which we invited stakeholders to share their views and questions. Simultaneously, we consulted on our CSNP and the transitional Centralised Strategic Network Plan 2 refresh (tCSNP2 refresh). These documents are available under projects and publications on our Strategic Planning page: neso.energy/what-we-do/strategic-planning.

The consultation generated 137 responses from organisations and individuals. Participants included national and local governments, transmission owners, distribution networks, energy industry experts, interest groups, advisory bodies, community groups, and members of the public. We would like to extend our sincere thanks to everyone who took the time to respond to the consultation. The responses provided a breadth of valuable feedback and insight about our methodology.

Since the consultation closed on 20 January, we have assessed all comments. Where appropriate, we have made changes and clarifications in the methodology that account for this feedback, plus provided additional information.

The main themes to arise from the consultation feedback included:

- **The scope of the SSEP**, its primary focus and areas for future iterations. To clarify this, we have included Section 1.3 in this chapter as a summary.
- **Interaction with other plans and policies**. Further clarification was requested on the interactions between the SSEP and regional, local, and GB-wide energy planning. We have updated Section 2.8.1 in the methodology accordingly, which also covers how the SSEP interacts with other relevant NESO strategic energy plans.
- **Marine Conservation Zones**, which focus on areas that protect a range of nationally important, rare, or threatened habitats and species. In response to the many consultation respondents requesting we undertake a MCZ assessment, we have included this in the methodology and updated the publication accordingly.
- **Stakeholder engagement**. More information on the extent of this engagement has been added throughout. A full list of working groups members is available in Appendix 2.1.
- **The opportunity to consult on pathway options** before the UK Energy Secretary chooses a pathway to be used for the draft SSEP consultation. We have considered this feedback carefully, and against the commission. We have clarified our stakeholder engagement will feed into the development of pathway options. Information on the outputs of the modelling will be shared with expert working groups, societal and community stakeholders, whose feedback will influence the

pathway options presented to the UK Energy Secretary. Details on this process can be found in Chapter 5 - Appraise. The SEA Reasonable Alternatives Assessment (to be included in the SEA Environmental Report) will assess the pathway options presented to the UK Energy Secretary. This will provide some level of detail on the pathway options and transparency on their environmental impacts.

- For **data centres**, after seeking feedback on several options within the consultation, we will spatially optimise a small volume of data centres in different demand backgrounds. More information on this is available in Section 3.3.7.
- An additional section has been created in Section 3.3.4 to describe the SSEP approach to **co-located sites**, following consultation feedback requesting clarification on the SSEP's scope.
- **The SSEP baseline** has been expanded to align to a greater extent with our approach to connections and include projects which have regulatory funding. An updated definition can be found in Section 3.3.1.
- The description of the **economic zones** has been updated, with more detail on how they were derived in Section 3.3.10.
- For **Offshore Hybrid Assets (OHAs)**, we have reviewed how they will be considered in light of consultation feedback. While they are out of scope for the core modelling, we will consider OHAs within the SSEP through sensitivity analysis, something discussed in Section 3.3.12.
- Section 3.3.13 on modelling **external markets** has been updated following additional modelling tests and a review of consultation feedback. We will explicitly model the plant list of neighbouring markets and utilise predetermined capacity expansion pathways for all external markets.
- In Section 4.2.4, more detail is provided on **sensitivity testing** during the economic modelling process.
- **Our modified Multi-Criteria Analysis (MCA) approach** to spatial evaluation has been enhanced to include an analytical approach that assesses the deliverability of pathways against spatial and economic factors. This will improve transparency and robustness, with a focus on stakeholder involvement. An updated detailed description of the assessment of pathway deliverability is in Section 4.2.4 and Appendix 7.1.

Since the consultation closed, we have developed the SSEP methodology in other areas too. A summary of all the consultation feedback, and what NESO has done or will do in response, is available in Appendix 11. Additional changes and clarifications can be found in Appendix 12.

The UK Energy Secretary and Ofgem have formally approved this document. Therefore, any changes that may be required in future are subject to review and approval by the SSEP Committee, as required by the commission. The SSEP Committee is chaired by NESO with representatives from NESO, the Department for Energy Security and Net Zero (DESNZ), Ofgem, the Scottish Government and the Welsh Government. More information about the SSEP Committee is in Section 2.3.1.

If you have any questions about the consultation process, please contact us at: box.sep-portfolio@nationalenergyso.com.

1.3 Scope of the SSEP

Many respondents to the consultation asked for greater clarity on the SSEP's scope, so we have summarised what the plan covers and what it does not.

The first SSEP will assess on a zonal basis, potentially suitable geographic areas across GB for each of the in-scope electricity and hydrogen generation and storage technologies. The assessment will include the optimal locations, quantities and types of energy infrastructure required, across a range of plausible futures and based on known constraints and assumptions.

As a strategic plan, the SSEP will not recommend project-specific locations. However, it will consider existing project pipelines and planning frameworks. The SSEP will **not** include:

- local plans and policies
- heat networks[4] and district heating
- specific distribution network solutions to meet additional network requirements
- the future onshore and offshore electricity transmission network[5]
- natural gas infrastructure beyond gas-fired power plants
- the economic impact of new energy infrastructure on existing uses of land or sea. Instead, these impacts will be considered in our geospatial analysis

The SSEP will be an iterative process and updated every three years, so we can respond to evolving stakeholder requirements, advances in technology and environmental knowledge and future policy decisions. Future versions of the SSEP will be informed by NESO's wider strategic plans, such as the CSNP and Regional Energy Strategic Plans (RESPs). Other factors influencing the SSEP's development will be external changes in planning, technology, and regulation, plus feedback we receive on the SSEP itself.

Together, this forms part of NESO's wider approach to strategic energy planning, which also encompasses Gas and Whole Energy Network Development (GWEND), Offshore Co-

[4] Heat networks are modelled as part of their contribution to electricity demand but will not be optimised in expansion.

[5] The SSEP will model high-level electricity and hydrogen transmission network requirements but not specific projects or routing, which will be addressed by the CSNP.

ordination (OC) and Zero Carbon Operations (ZCO). A summary of strategic energy planning interactions is in Figure 7 of Section 2.8.1.

1.4 SSEP milestones

Some of the consultation feedback asked for more information on the SSEP's high-level milestones. The expanded timeline is as follows:

- SSEP modelling – Q2 2025
- Pathway development – Q3 2025
- The UK Energy Secretary selects the pathway to be used for the draft SSEP consultation - Q4 2025
- SEA, HRA and MCZ Pathway Options Reports presented to the UK Energy Secretary to support pathway selection – Q4 2025
- Draft SSEP, draft SEA Environmental Report, Report to Inform HRA and MCZ Assessment Report published for consultation – Q2 2026
- SSEP published – Q4 2026

2. Foundations

2.1 Foundations: chapter overview

This chapter summarises the principles and cross-functional fundamentals which underpin the whole SSEP methodology. It describes overall SSEP pillars and governance, how the SSEP will align with other strategic plans and policies and our approach to environmental, societal and stakeholder considerations.

Throughout this chapter, you will see how we have taken a holistic approach to the SSEP, characterised by best practice modelling, early engagement with key stakeholders and close collaboration with energy industry and technical experts. These processes are designed to build trust, confidence, and credibility in the SSEP and are reinforced by robust, transparent, and inclusive processes.

Main messages

- We have set out SSEP pillars, which are key to delivery of the SSEP. These pillars encompass economic, societal, environmental, other spatial uses and technical engineering design requirements.
- To govern the development of the SSEP, a structure has been established, including a committee, advisory groups and working groups.
- The SSEP places a strong emphasis on protecting and enhancing the environment while working towards net zero targets. Environmental principles of prevention, precautionary and integration guide our approach.
- Transparent engagement with stakeholders and societal groups is crucial to the development and refinement of the SSEP.
- For English, Welsh and Scottish modelling in the marine space, we will be collaborating with The Crown Estate, Crown Estate Scotland and the Scottish Government at a strategic planning level.
- The SSEP also interacts with other strategic plans and policies, fostering coordination, consistency and collaboration in the development of an integrated, sustainable energy system.

The SSEP uses the following modelling terms:

- **SSEP policy framework** – A series of parameters that provides a structure for the modelling, ensuring it achieves the desired outputs.
- **SSEP baseline** – The starting point for the SSEP. It will consist of network and generation included in the UK Government's *Clean Power 2030 Action Plan*, plus

connection projects that have various forms of regulatory funding. A more detailed description of the SSEP baseline is in Section 3.3.1.

- **Modelling scenario** – A series of inputs to the SSEP energy market simulation tool[6] informed by the SSEP policy framework. Some of these modelling inputs will be determined by policy decisions.
- **Sensitivity** – A change (or number of changes) made to the initial input data of a modelling scenario, which is then re-optimised to test if it provides a different outcome.

2.2 SSEP pillars

The SSEP aims to provide a more strategic, coordinated, and accelerated approach to the energy transition, based on a spatially optimised energy system.

The SSEP will consider different pathways that all achieve the goals of security of energy supply and net zero which are core to NESO's mandate. We will holistically assess these pathways against a set of five SSEP pillars, each of which will have specific inputs into our analysis. These are economic, societal, environmental, technical engineering design requirements and other spatial uses.

The SSEP pillars will enable us to account for practical considerations that influence the delivery of energy infrastructure and provide greater confidence that the final SSEP pathway is deliverable. Later in this methodology, we also refer to spatial evaluation pillars. These are all the SSEP pillars listed in Figure 2, apart from the economic pillar.

[6] The energy market simulation tool used for economic modelling in the first iteration of the SSEP will be PLEXOS. When 'the economic modelling tool' is mentioned in this publication, it is with reference to the use of PLEXOS.

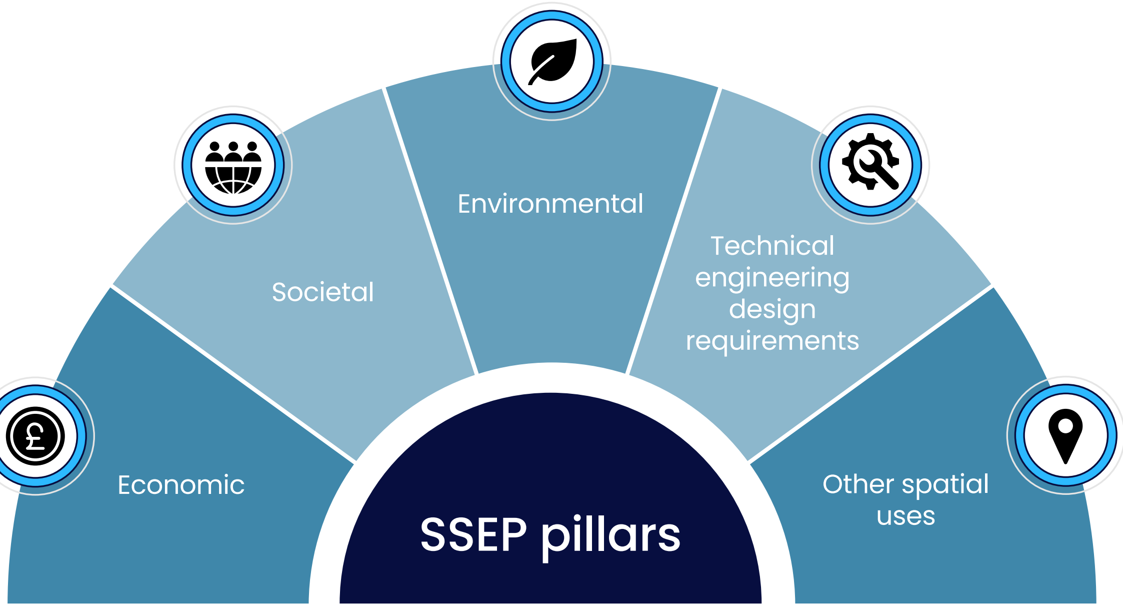


Figure 2: SSEP pillars

Economic

For the SSEP, we will focus on the most relevant economic factors relating to the costs of building and operating the energy system. The aim is to ensure the infrastructure built and the operation of the system are efficient, secure, and meet carbon emissions targets, all with the aim of minimising costs to the consumer.

Economic modelling will be fundamental to our analysis and will create views of optimum future energy systems under different modelling scenarios and sensitivities.

The other pillars will help the economic modelling reflect real-world practicalities on build capacities and rates in each economic zone, while also focusing on minimising total system costs, such as transport costs between different economic zones.

Societal

Many parts of society will have views on future energy infrastructure relevant to the SSEP. Our modelling will take these views into account through a range of societal indicators, including those relating to recreation and tourism, employment, health and wellbeing, community, and visual amenity. We will consider how the views of society could affect the deployment of specific types of technology and what that means for net zero.

Feedback and data will be used to influence the creation of the SSEP pathways, ensuring we address the needs of various sections of society while setting out a plan for a secure and affordable energy system. This will enable societal views to shape the decision-making process and the pathway chosen by the UK Energy Secretary for the draft SSEP consultation.

Environmental

The SSEP will be developed in a way that seeks to protect and enhance the environment.

We will assess the potential environmental interactions and impacts associated with delivering the energy infrastructure in scope of the SSEP. The assessment will look to understand how environmental factors may prevent, limit, or support specific technologies. The assessment will encompass various aspects, including biodiversity, historic environment, and the preservation of sensitive habitats.

Generally, the higher the environmental impact, the more challenging it will be to achieve consent and deliver. We will undertake an SEA, a HRA and an MCZ assessment to evaluate environmental impacts early in the process, as well as to inform decision-making as the plan develops.

An SEA framework will be developed to assess the SSEP options against the current environmental baseline[7]. This will determine if significant environmental effects are likely to arise and provide appropriate mitigation. Presented in the form of the SEA Pathway Options Report, it will accompany the Pathway Options Report to the UK Energy Secretary.

Technical engineering design requirements

This pillar considers how different types of energy technologies have different technical and locational requirements. This involves evaluating factors such as terrain, footprint and seabed conditions, access to relevant resources (such as wind speed, solar irradiation and water availability), resilience to hazard (for example, land stability and flood risk), access to transport (including ports and roads) and network proximity (the distance from generation to network).

This will be reflected in our approach to considering the technical engineering design requirements of in-scope energy generation and storage. By identifying and addressing these issues in the earliest stages of plan development, we can account for potential risks and opportunities, increasing the deliverability of the SSEP.

Other spatial uses

Land and sea areas are finite resources facing increasing demands from different sectors. These demands can be complementary or competing and may change over time to meet evolving government ambitions and co-location opportunities. For example, the utilisation of land and marine areas needs to be assigned appropriately to provide housing for a growing population, protect and enhance the environment and achieve net zero. We will consider factors such as urban development, agricultural land, fisheries and protected areas (for example, defence infrastructure and areas used by utilities and services).

We will identify land and sea spatial use demands, considering them alongside societal and environmental factors. This enables us to have a comprehensive view of all land and sea sectors that may compete or complement the potential development of in-scope energy infrastructure.

[7] The environmental baseline provides the evidence base on which the key issues to be addressed via the SEA are identified, as well as against which impacts of the plan can be assessed.

The SSEP will reflect UK and devolved government policies for agriculture that prioritise and protect the best and most versatile agricultural land. In England, it will reflect the National Planning Policy Framework; in Scotland, National Planning Framework 4; and in Wales, Planning Policy Wales. Similarly, it will reflect marine planning mechanisms already operating and in development in different parts of GB, such as Scotland's existing National Marine Plan and its development of a National Marine Plan 2, as well as the process to review and update the Scottish Sectoral Marine Plan for offshore wind. The SSEP will also consider the National Policy Statements (NPS). The suite of twelve designated NPS set out the national need for certain types of major infrastructure for different sectors as well as the main criteria for judging the acceptability of projects.

England does not currently have a national level marine plan, unlike Scotland and Wales. However, the English regional marine plans largely contain the same policies, anchored to the strategic framework of the UK Marine Policy Statement. The only variations relate to a small number of policies which are regionally specific due to regional variations in the marine environment or assets.

For marine plans at national level, we will use the UK Marine Policy Statement as the appropriate strategic framework. This is supplemented with the Scottish and Welsh Marine Plans as appropriate. We will also consider, as part of our evaluation, where the policies of the regional marine plans for England add additional detail relevant at the strategic scale of the SSEP.

Our recommendations for the zonal locations of energy infrastructure will not take precedence over other land uses. Instead, we will take a more strategic approach that allows for more location and project-specific decisions during subsequent processes. As noted above, this work will consider existing planning frameworks (including devolved governments) across GB as an input, as well as the spatial policy and requirements already set out.

2.3 SSEP governance

Given the SSEP's scale and potential impact, the commission outlined the minimum governance structure and membership required to support its development.

This governance will ensure that throughout the process we have engagement with, and input from, the UK, Scottish and Welsh governments and Ofgem. The governance meetings will provide advice and guidance to NESO, ensure oversight and accountability from government, and facilitate key stakeholder feedback.

To ensure the SSEP aligns with the clear purpose outlined by the commission, we have established a governance structure, illustrated in Figure 3.

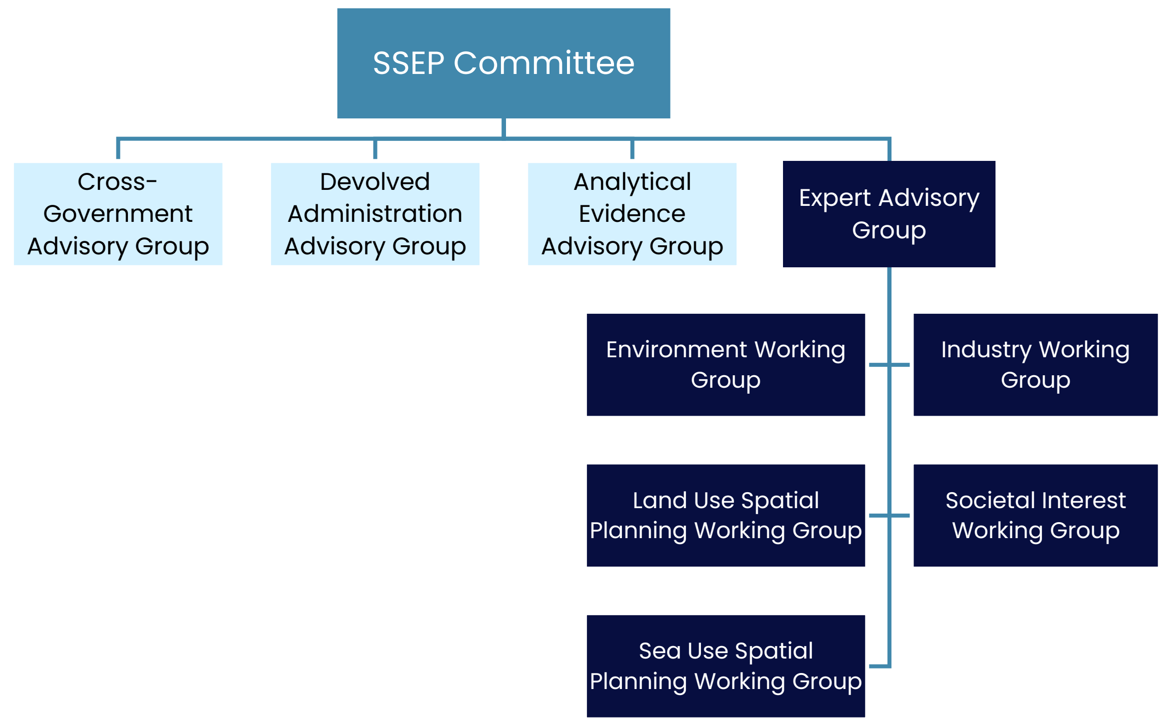


Figure 3: External governance structure

2.3.1 Governance groups

SSEP Committee

A committee chaired by NESO with representatives from NESO, DESNZ, Ofgem, the Scottish Government and the Welsh Government. This group is responsible for providing strategic direction and advice on the development and production of the SSEP. We also have an SSEP Committee Working Group to support the committee which seeks to manage risks and actions for the SSEP Committee, ensuring it interacts effectively with the other governance groups.

Cross-Government Advisory Group (CGAG)

An advisory group chaired by DESNZ with representation from UK Government departments. This group provides strategic direction and advice from representatives on wider sectoral demands on land and sea.

Devolved Administration Advisory Group (DAAG)

An advisory group chaired by NESO with representation from NESO, DESNZ, the Scottish Government and the Welsh Government, ensuring strategic direction and advice relevant to devolved issues.

Analytical Evidence Advisory Group (AEAG)

An advisory group chaired by NESO with representation from NESO, DESNZ, Ofgem, the Scottish Government and the Welsh Government. This group delivers oversight and assurance on the modelling process and analytical issues. We have also established an Analytical Working Group (AWG) to support the AEAG. The AWG feeds into the AEAG and discusses the detailed modelling topics underpinning the SSEP methodology.

Expert Advisory Group (EAG)

An advisory group that focuses on our external stakeholders to provide strategic direction and advice which will feed into the wider governance structure. A collaborative forum, this group shares technical insight and considers different perspectives from external stakeholders across all categories of expertise as we develop the SSEP. It also tests our approach to stakeholder engagement has been robust, inclusive and effective. With representation from the environmental, land, marine, energy industry and societal groups, we aim to enrich the debate and introduce wider perspectives by adding membership from cross-cutting industry professionals. DESNZ, Ofgem, the Scottish Government and the Welsh Government attend as observers. The members of each of the governance groups are listed in Appendix 2.1.

Topics for the governance groups

As we develop the SSEP, we will ensure that crucial outputs and discussion points are taken to the relevant external governance forums as part of our plan. These include:

- **Methodology** – The content of this document and the associated approaches to modelling the SSEP were developed in consultation with the governance groups.
- **Completion of initial modelling** – We will prepare supporting advice on pathway options informed by an SEA alternatives assessment, including environmental, community and technical appraisals, as set out in the commission. This will be submitted to the SSEP advisory groups and SSEP Committee for review and feedback.
- **Pathway options** - We will share the pathway options and supporting advice with Ofgem and the Scottish and Welsh Energy Ministers, prior to submission to the UK Energy Secretary.
- **Submission of pathway options** – We will submit the pathway options, together with supporting advice and stakeholder feedback, to the UK Energy Secretary. Separately, Ofgem may provide independent advice to the UK Energy Secretary regarding the impact of the pathways on consumer interests. The SSEP is co-commissioned by the UK, Scottish and Welsh governments and is being developed on a partnership basis between those governments. In keeping with this approach, the views of the Scottish and Welsh energy ministers and Ofgem will be sought and provided to the UK Energy Secretary ahead of the decision on the chosen pathway that will be used for the draft SSEP consultation. We will aim for agreement between the parties in advance of submission to the UK Energy Secretary. Where this is not possible, we will highlight the different perspectives and the reasons behind them in our advice.

- **Pathway selection** – The UK Energy Secretary will choose and confirm to us which pathway will be used for the draft SSEP consultation and for the SEA, HRA and MCZ assessments.
- **Final SSEP publication** – On completion of the SEA, HRA, MCZ assessment and public consultation, the final SSEP shall be reviewed by the SSEP Committee prior to publication. The UK, Scottish and Welsh governments and Ofgem will be invited to provide their endorsement alongside its publication.

2.3.2 Stakeholder working groups

Under the EAG referred to in the preceding section, there are several stakeholder workings groups described as follows.

Environmental Working Group

This group brings together statutory and non-statutory environmental stakeholders representing GB's land and marine environment to:

- determine the approach and methodology for appraising and assessing the environment for the SSEP
- gather environmental data and feedback from the group to support the environmental appraisals (SEA, HRA and MCZ assessment) for the SSEP
- demonstrate the SSEP minimises and mitigates environmental impact
- assist in meeting the statutory consultation requirements for the SEA, HRA and MCZ assessment

Land and Marine Use Spatial Planning Working Groups

These groups bring together government stakeholders with planning expertise and land or marine use data to:

- gather data and feedback from the group to support the development of the land and marine use framework, plus the technical engineering design requirements for the technologies we are spatially optimising
- support the approach and methodology for appraising and assessing land and marine use
- challenge and review the pathways to prioritise land and marine uses and recommend pathway trade-offs
- provide spatial data modelling expertise.

Industry Working Group

Energy industry stakeholders such as transmission owners (TOs), distribution network operators (DNOs), energy infrastructure developer representatives, original equipment manufacturers (OEMs) and academics sit on this group to provide an industry steer and expertise in both electricity and hydrogen. The group will:

- be a central communications channel to ensure the energy industry understands the aims and objectives of NESO's strategic energy planning projects and how they work together
- test understanding and gather data, insights and feedback, showcasing the work of and gathering support for strategic plans

Societal Interest Working Group

The primary way we will engage with societal interests will be through societal forums, each focused on a societal sector. The purpose of the forums is to provide insight on the development of the SSEP while listening to and acting upon feedback to influence and contribute to its evolution. For more information on societal forums, see Appendix 2.

Representatives from societal forums will sit on the Societal Interest Working Group. They will:

- collate views from across societal forums, ensuring that members' views and unique perspectives on the energy trilemma are reflected
- listen and feed back on any questions or concerns from societal stakeholders
- suggest ways to enhance the success of our engagement activity
- advise on any changes to the structure of our engagement with societal groups that may be necessary

The members of each of the stakeholder working groups are listed in Appendix 2.1.

2.4 Stakeholder approach

Our open, transparent approach will allow stakeholders to understand, shape and feed into the SSEP and see how they have contributed. We will deliver meaningful engagement that instils confidence in the SSEP and considers all stakeholder input, creating a more robust plan and encouraging advocacy.

Through SSEP stakeholder groups, we will seek advice from experts and key stakeholders to gather data and opinions. This will be supported by a clear engagement plan which provides feedback opportunities and explains how we have considered and acted on feedback.

Who are our stakeholders?

The SSEP is GB-wide, so we will engage across England, Scotland, and Wales. Where appropriate, we will engage at a regional level through the structures created by the RESPs.

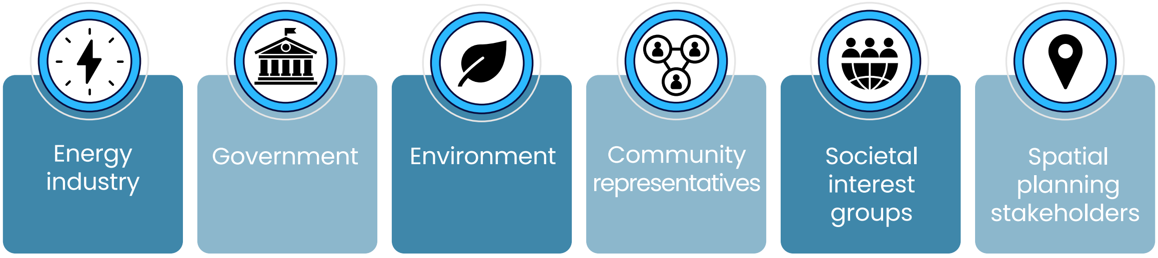


Figure 4: Stakeholder groups we will engage with throughout the SSEP

2.4.1 Engagement principles

The following will define our stakeholder engagement:

- **Timely and transparent** - We will engage early, with a transparent process and stakeholder approach. We will make it clear to stakeholders how we will consider their feedback and how they can shape the plan, while respecting the confidentiality of the work.
- **Proactive engagement** - We will work with a wide range of stakeholders with interest or expertise in energy planning and with the representatives of communities that may experience development of energy infrastructure in the future. Their engagement will help us develop and evolve the plan and make sure it considers a broad range of views of society. We will proactively update our stakeholders on new and changing information via our range of regular stakeholder groups and forums, alongside public communications.
- **Action feedback and inform stakeholders** - We will consider all feedback from our stakeholders during the engagement process. Once all feedback has been digested, we will group it under themes and share how we have considered and addressed these themes. An example of this is in Appendix 11, where the Consultation Feedback Response covers the responses to the draft methodology. We will manage stakeholders' expectations and explain that we will not be able to take on board all views. This could be for a variety of reasons, including that some views will be conflicting or not aligned with the aims of the plan. Finely balanced trade-offs will need to be made by policy and supporting information where possible, to inform decisions made where there are conflicting views.
- **Coordinated engagement** - Where we can, we will align stakeholder engagement activity across NESO's strategic energy planning activities and with other relevant organisations such as The Crown Estate, aiming to be as efficient as possible with stakeholders' time. We will build on relationships formed during other strategic planning activities and explain to stakeholders how the SEP projects all fit together.
- **Tailored engagement** - We will ensure our engagement is accessible and at the right level for our diverse range of stakeholders, who all have different experiences of the energy sector and spatial planning. We will regularly seek feedback to

understand how well the engagement is working for stakeholders so we can enhance our approach.

In planning and delivering our engagement and consultation activity, we will also be guided by the Gunning Principles which are designed to make consultation fair, accessible and worthwhile. The Gunning Principles are that:

- consultation must take place when the proposal is still at a formative stage
- sufficient reasons must be put forward for the proposal to allow for intelligent consideration and response
- adequate time must be given for consideration and response
- the product of consultation must be conscientiously taken into account

2.4.2 Timely engagement

Continuous engagement with the working groups throughout the development of the SSEP will help shape, challenge, and review its outputs. Alongside this, we will undertake regular bilateral engagement with interested and influential stakeholders and representatives of a wide range of societal and community groups. Feedback already gathered through the SSEP methodology consultation and via ongoing engagement with the working groups will influence the development of the pathway options.

There will be ongoing and regular engagement with industry and other interested and relevant stakeholders. Alongside our SSEP-specific working groups and forums, we will take advantage of existing NESO forums and existing industry networks. Additionally, we will provide transparency via regular communication and engagement with key industry representatives, supported by webinars which will be open to all interested stakeholders. Figure 5 shows our high-level engagement process.

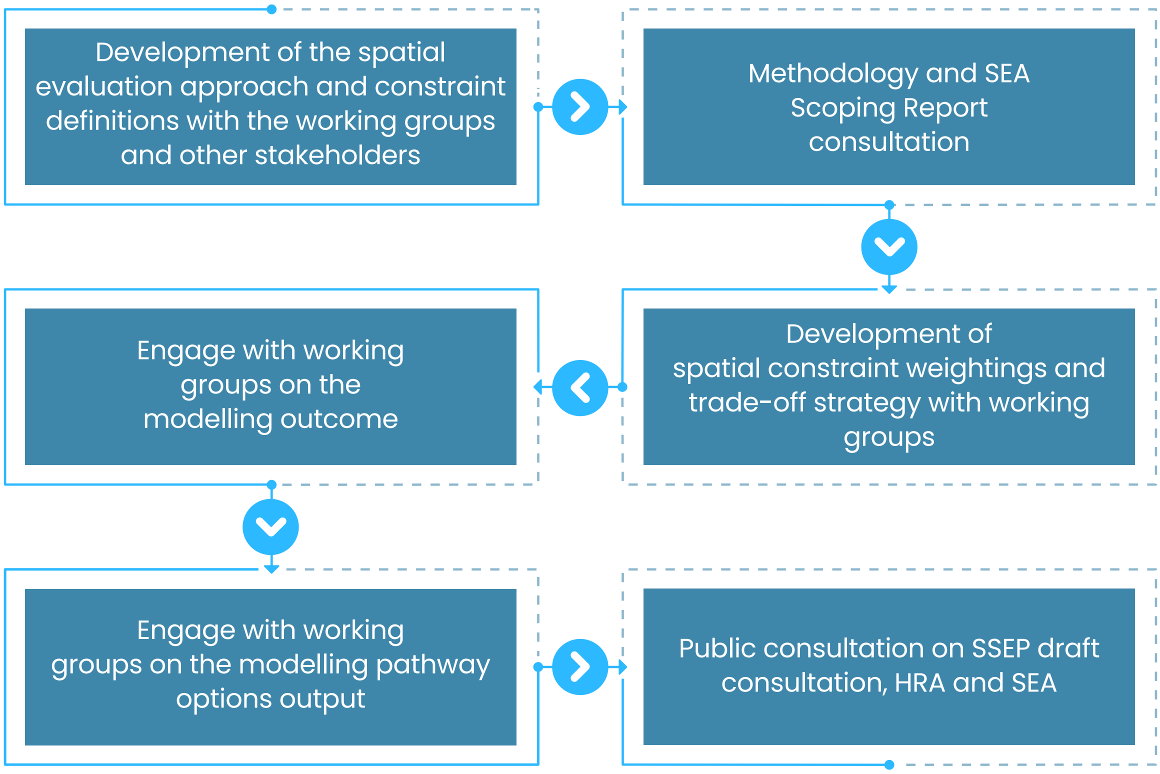


Figure 5: Process flow of high-level engagement activity

For further information on our engagement activities, see Appendix 1.

2.5 Societal approach

The SSEP is one of the largest strategic energy planning projects ever undertaken in GB, so it is important to listen to the views of the public and interested parties as the plan is developed. Considering these views is key to seeking societal acceptability of the SSEP and GB's transition to clean, secure, and affordable energy.

Engaging with a diverse array of stakeholders will ensure the SSEP comprehensively reflects the needs, values, and ambitions of society in relation to the energy transition. This inclusive approach will align the SSEP with societal expectations and contribute to a more equitable and just transition.

Additionally, through this engagement, society can learn about and discuss the options for achieving GB's energy transition, including its potential impacts on, and benefits to, local communities.

Our engagement will use primary research to take feedback and opinions on the transition to net zero and provide engagement channels for a wide range of stakeholders as the SSEP progresses. Participating in these and seeing how inputs from different sectors of society are considered will help build public trust in the process and the final plan.

We expect different people and groups to have diverse views on energy infrastructure and its impact on communities and the environment. By analysing their feedback, we will understand what society values and use this evidence to shape our decision-making process. Societal views will be used to develop analysis and metrics that will inform our spatial evaluation and give us a deeper understanding of societal opinion on in-scope infrastructure that will in turn influence plan development. It may also highlight opportunities for infrastructure development with high levels of societal support in certain areas of GB.

Alongside gathering in-depth primary data, we will use high-quality secondary data shared with us by the government, energy industry and broader stakeholders, such as the *DESNZ Public Attitudes Tracker*[8]. In assessing the suitability of secondary data, we will consider its:

- accuracy and any relevant data checks
- completeness and any gaps in the dataset
- coverage, with it ideally covering the whole of GB
- age, particularly for public opinion data
- robustness, considering the scale and relevance of its sample

2.5.1 Why we are engaging societal stakeholders

Society will benefit from the development of new infrastructure. However, they will also be impacted, not only through the financial costs and savings associated with it, but also by its potential effects on local communities and any environmental impact. In this context, it is crucial to develop and retain societal acceptability of the SSEP.

Experience in the development and delivery of large-scale energy projects has shown that policy makers, developers and campaigners use many different data points and narratives to rationalise the trade-offs between benefits and impacts to the public. These can be difficult to understand, so by openly collecting and analysing primary and secondary data, NESO aims to be a trusted provider of information, helping the public focus on the facts and key trade-offs that need to be made.

2.5.2 Our approach

The societal component of the spatial evaluation is one part of our approach. The framework will help assess zonal locations suitable for energy infrastructure so that the societal spatial constraints (alongside environmental and other spatial constraints or

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[8] Department for Energy Security and Net Zero, *DESNZ Public Attitudes Tracker* - gov.uk/government/collections/public-attitudes-tracking-survey

exclusions) can be effectively considered alongside the energy and economic modelling being undertaken for the SSEP.

However, our engagement with society will be broader, encompassing a wider range of considerations in the development of the SSEP. We will conduct societal opinion research and engage a representative cross-section of societal interest groups and political representatives to contribute to an SSEP that considers the views of society.

How and with whom we engage will be based on stakeholders' interests and how they relate to the SSEP, focusing on the energy trilemma of sustainability, security, and affordability. This will enable effective conversations with different stakeholder groups, keeping the discussions relevant to their experience and interest in the plan.

We will consider a wide range of societal opinions, although the SSEP will not be able to reflect the views of every person or group. However, the SSEP will explain how decisions have been made, considering what we have heard in feedback and what we must do as part of our obligation to government and society.

Four broad categories of societal stakeholders will be engaged:

- **The general public** – Societal research will collect opinions from various demographics and segments of society across GB. A societal opinion survey, with a large sample size of over 9,000 respondents, will reflect the views of society both at a GB level, and a national level across Wales, Scotland and England. It will allow us to use multi-level regression (MRP) and post stratification methods to further understand local views and the views of different parts of society. The survey will be supported by a series of focus groups, split both regionally and demographically, so we can further analyse and understand findings from the opinion survey. The survey will inform an assessment of societal views on potential pathways.

- **Interest groups** - Some societal groups are interested in the energy trilemma because it impacts or contributes to their purposes or goals. These groups – including energy or infrastructure campaign groups – represent a broad spectrum of society and will bring unique perspectives to the conversation. The primary way we will engage with interest groups will be through societal forums, each focused on a societal sector. The purpose of the forums is to provide insight on the development of the SSEP, while listening and acting upon feedback to influence and contribute to the SSEP's evolution.

- **Political representatives** - Political representatives and groups are important to aid society's understanding of energy infrastructure development. While the UK, Scottish and Welsh governments have a formal role in the SSEP, we will also engage with politicians who represent society at regional, constituency or local government levels.

- **Host areas** - The SSEP will consider all parts of GB. It is likely some areas will see clusters of projects, a high number of projects or host energy infrastructure projects for the first time. The development of the SSEP will provide an early opportunity for communities to have their say on strategic planning that may affect them. We will also help these communities understand the process and signpost them to how they can engage and influence the developments in their areas.

Balancing the views of experts, key stakeholders and society will require a thoughtful consideration of a range of perspectives. In this process, it is crucial to weigh carefully the different opinions, using our experience, expertise and professional judgement as the independent system operator to determine how views should be balanced and incorporated into decision-making. In doing so, we will take into account the different expertise and unique insights different stakeholders have.

For further detail on how we will engage and capture feedback, see Appendix 2.

2.5.3 The Public Sector Equality Duty

Throughout the course of developing and delivering the SSEP, we will work with stakeholders to ensure we consider how our activities in this area affect people with different protected characteristics. We will have due regard to the objectives of the Public Sector Equality Duty, ensuring we reflect on its objectives at key stages.

2.6 Environmental approach

The UK, Scottish and Welsh governments are committed to the protection and enhancement of the environment and the preservation of the unique natural, cultural and heritage assets it offers. Achieving this and meeting net zero targets go hand in hand. Our development of the SSEP will reflect this by identifying and addressing environmental risks and opportunities in the earliest stages of plan development.

2.6.1 Guiding principles

Our approach is underpinned by the environmental principles outlined in recent UK, Scottish and Welsh governments' policy statements. As required by the *Environment Act 2021*[9], the *Environmental Principles Policy Statement 2023*[10] includes five core principles for England's environmental protection: integration, prevention, rectification at source,

[9] *Environment Act* (2021) - legislation.gov.uk/ukpga/2021/30/contents

[10] Department for Environment, Food and Rural Affairs, *Environmental principles policy statement* (2023) - gov.uk/government/publications/environmental-principles-policy-statement/environmental-principles-policy-statement

polluter pays and the precautionary principle. Similar principles have been set out or proposed in Scotland[11] and Wales[12].

There is no prescribed approach for applying the environmental principles. For the SSEP, the most relevant are prevention, precautionary and integration.

- **Prevention** promotes policy design options that prevent environmental harm. This is most effective when considered early before any harm occurs.
- **Precautionary** manages the risk of serious or irreversible environmental harm. It promotes reasonable assessments of likelihood and severity of harm even where there is a lack of scientific certainty.
- **Integration** guides policymakers to look for opportunities to embed environmental protection and enhancement across all fields of policy, not just those directly related to the environment.

These principles provide a foundation, alongside relevant planning and environmental policy, to embed environmental protection and nature recovery in the development of the SSEP. The mitigation hierarchy, as set out in UK planning guidance, will be key to determining how environmental factors are considered. This is discussed further in Appendix 7.4.

We have been commissioned to give due consideration to UK, Scottish and Welsh governments environmental commitments, statutory duties and targets. Across all three governments, a key environmental commitment is to ensure habitats for wildlife are left in a measurably better state than they were before. The Scottish Government has set out a national planning policy to protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks in the terrestrial domain. The Scottish Government's National Planning Framework 4 also extends to the marine environment when considering renewable energy developments offshore. The Welsh Government is promoting the adoption of Net Benefits for Biodiversity (NBB) and in England, it has been made mandatory for developments to achieve Biodiversity Net Gain (BNG).

We will work with stakeholders to understand the potential ways in which the SSEP may help support biodiversity policy across the three governments. We are also aware of developments in Marine Net Gain (MNG) and will similarly work with stakeholders to understand the implications as it develops further.

[11] Scottish Government, *Environment - guiding principles: statutory guidance* (August 2023) - gov.scot/publications/scotlands-guiding-principles-environment-statutory-guidance/
[12] Welsh Government, *Environmental principles, governance and biodiversity targets: White Paper* (April 2024) - gov.wales/environmental-principles-governance-and-biodiversity-targets-white-paper

Proposed approach

The SSEP's development will integrate environmental considerations throughout, from conceptualisation to completion. This is based on four distinct but complementary processes, described in Table 1.

Table 1: Proposed approach

Process	Objective
Spatial evaluation	The environmental component of the spatial evaluation will help assess spatial locations suitable for energy infrastructure. This enables environmental spatial constraints or exclusions (as well as societal, other spatial uses and technical engineering design requirements considerations) to be effectively considered alongside the energy and economic modelling being undertaken for the SSEP. This is discussed further in Section 3.4 and Appendix 7.4.
SEA	To meet the requirements relating to the SEA in England, Scotland and Wales, the SEA process will inform and influence the SSEP's development, evaluating the likely significant environmental effects of the plan and reasonable alternatives. The SEA approach is discussed in Section 2.6.2 and detailed further throughout the methodology.
HRA	The HRA's objective is to determine whether SSEP implementation could adversely affect the integrity of internationally important wildlife sites. Where significant effects are identified, an 'appropriate assessment' will be undertaken to identify the internationally important wildlife sites that could be impacted, what the impacts could be and how they could be mitigated. The HRA approach is discussed in Section 2.6.3 and detailed further throughout the methodology.
MCZ assessment	The purpose of the MCZ assessment is to determine whether the SSEP could hinder the conservation objectives of Marine Conservation Areas (MCAs) and MPAs and the processes on which they rely.

Throughout each of these processes, we will assess the potential environmental interactions and impacts of the strategic energy infrastructure options. The SEA, HRA and

MCZ assessments will be informed by outputs produced during the various stages of the SSEP's development, plus work already underway or completed on relevant 'plan-level' assessments. These plan-level assessments will be regional or national and identified during the SEA scoping and HRA evidence gathering stages. We will engage with the plan-level assessment owners during the relevant stages of the SSEP to make sure our approaches are coordinated and consistent.

2.6.2 SEA overview

The SEA is a systematic process to evaluate the likely significant environmental effects of a draft SSEP and reasonable alternatives in terms of environmental issues. Its purpose is to ensure the plan is sound and reflects sustainable development ambitions. The SEA is a tool to identify the potential environmental impacts of the decisions being made during plan development.

The SEA for the SSEP will meet SEA requirements in England, Scotland, and Wales. These comprise:

- England - *Environmental Assessment of Plans and Programmes Regulations 2004*[13]
- Wales - *Environmental Assessment of Plans and Programmes (Wales) Regulations 2004*[14]
- Scotland - *Environmental Assessment (Scotland) Act 2005*[15]

In addition to complying with the relevant legislative requirements, the SEA process is an important opportunity to help SSEP decision makers understand the potential impacts of different spatial approaches. The SEA process also provides the opportunity to explore the relative sustainability merits and trade-offs required for different SSEP options, as shown in the process flow in Figure 6.

2.6.3 HRA overview

In February 2021, the UK Government published HRA[16] guidance. HRA is the term used for the process set out in the *Conservation of Habitats and Species Regulations 2017*[17], the *Conservation of Offshore Marine Habitats and Species Regulations 2017*[18] for England and Wales, and the *Conservation (Natural Habitats, &c.) Regulations 1994*[19] as amended for

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[13] *Environmental Assessment of Plans and Programmes Regulations* (2004) - legislation.gov.uk/uksi/2004/1633/contents
[14] *Environmental Assessment of Plans and Programmes (Wales) Regulations* (2004) - legislation.gov.uk/wsi/2004/1656/contents/made
[15] *Environmental Assessment (Scotland) Act* (2005) - legislation.gov.uk/asp/2005/15/pdfs/asp_20050015_en.pdf
[16] Department for Environment, Food and Rural Affairs, Natural England, Welsh Government and Natural Resources Wales, *Habitats regulations assessments: protecting a European site* (February 2021) - gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site
[17] *Conservation of Habitats and Species Regulations* (2017) - legislation.gov.uk/uksi/2017/1012/contents
[18] *Conservation of Offshore Marine Habitats and Species Regulations* (2017) - legislation.gov.uk/uksi/2017/1013/contents/made
[19] *Conservation (Natural Habitats, &c.) Regulations* (1994) - legislation.gov.uk/uksi/1994/2716/contents

Scotland, collectively referred to as Habitats Regulations. HRA in Scotland follows the same approach to the rest of the UK, and guidance is available from NatureScot[20].

The HRA is a plan compliance assessment that determines whether adverse effects on the integrity of internationally important wildlife sites can be dismissed for the SSEP, either alone or in combination with other plans or projects while taking a precautionary approach. These sites include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and, as a matter of government policy, listed or proposed Ramsar sites (wetlands of international importance), potential SPAs, possible SACs and any site required as compensatory measures for adverse effects on sites listed under the Habitats Regulations.

If an adverse effect on integrity cannot be dismissed, the SSEP must either be amended or it must pass a series of further tests, known as derogations, to establish that:

- there are no feasible alternatives to the harmful proposal that would cause less harm
- there are Imperative Reasons of Overriding Public Interest (IROPI) why the harmful proposal should nonetheless proceed
- all necessary compensatory measures are secured to address the harm to the network of internationally important wildlife sites

For the SSEP to adopt a proposal likely to have an adverse effect on the integrity of an internationally important wildlife site, all three tests must be passed.

There is value in the HRA process commencing prior to the completion of a draft SSEP, when options will be fixed. Depending on the level of detail available regarding the options, commencing the HRA early will help shape the SSEP by identifying options that pose a risk to internationally important wildlife sites and prove difficult to avoid or mitigate. This will inform the degree to which those options can be amended (thus avoiding or mitigating adverse effects on integrity) and the extent to which the SSEP may need to rely on derogations from the regulations. As such, the HRA for SSEP will commence during plan drafting and will support the development of options.

2.6.4 SEA and HRA Integration with the SSEP process

The SEA and HRA have been mapped out in their relevant sections above, plus there is a high-level description of each phase in Figure 6. We are currently developing the detailed MCZ assessment process and considering how it fits into the wider SSEP programme, so it is not included in Figure 6. Nevertheless, the MCZ assessment closely follows the HRA process, so this can be used as a high-level reference. An outline of the whole MCZ assessment process is in Section 5.4.5.

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[20] NatureScot, *Habitat Regulations Appraisal (HRA)* - nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra

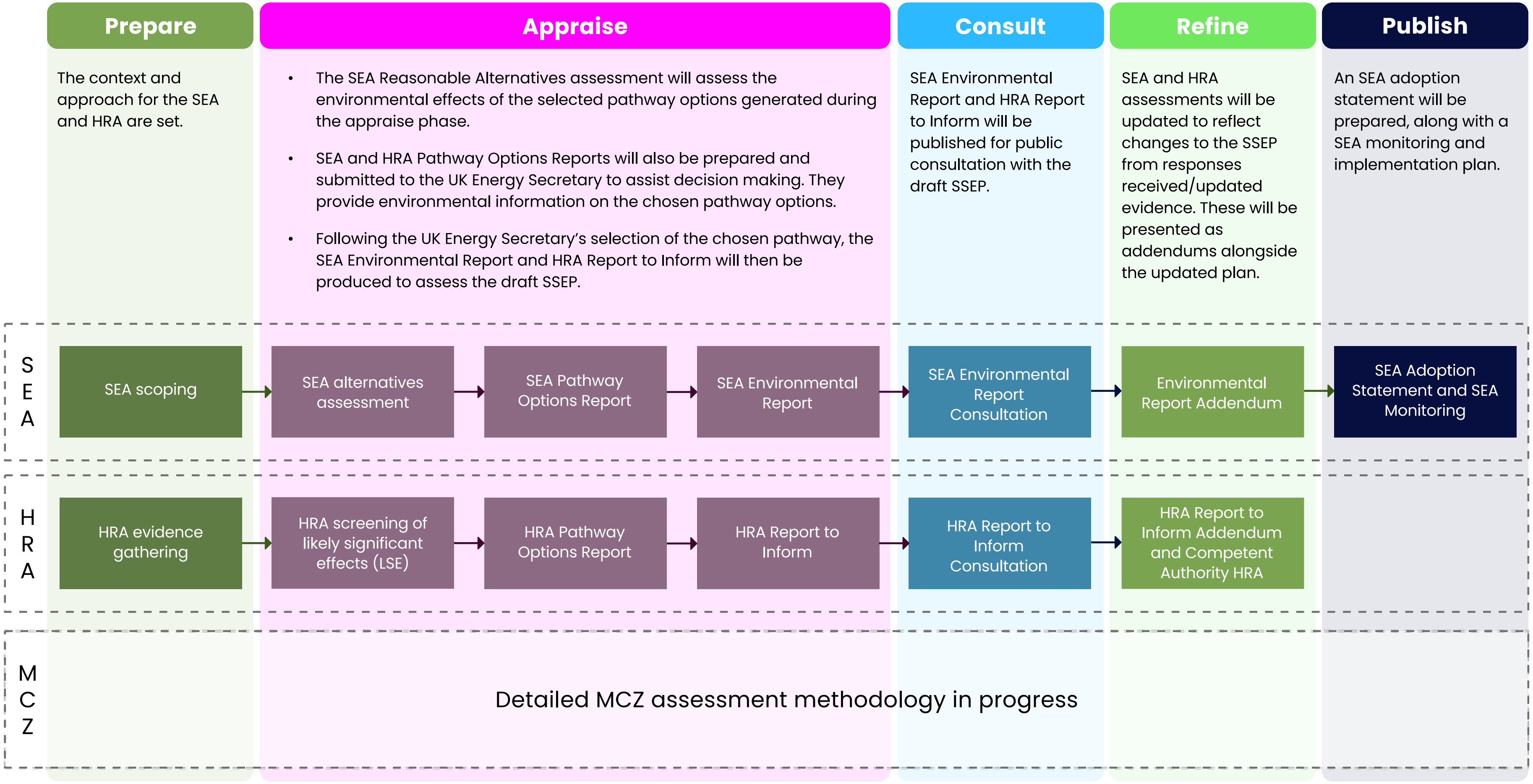

Figure 6: SEA and HRA integration with SSEP

2.6.5 Marine Conservation Zones overview

The purpose of the MCZ assessment is to determine whether the SSEP could hinder the conservation objectives of MCZs and MPAs and the processes on which they rely. It is common for an MCZ assessment to be conducted as a separate but parallel process to a HRA where practicable. There can often be similarities in the methodological approach taken, allowing for the differences in legislation, guidance, and process and subject matter. It is also expected that, where possible, the methods employed for the SSEP MCZ assessment will complement those used for the *Holistic Network Design Follow-Up Exercise*[21] (HNDFUE), adapting the approach to suit the differences in context and plan for the SSEP. The final MCZ assessment methodology for the SSEP is currently being developed and will be shared for review by the Environmental Working Group (EWG).

MCZs in English, Welsh and Northern Irish territorial and offshore waters are designated under the *Marine and Coastal Access Act 2009* (*MCAA*); they provide protection for a range of important marine habitats, species, and geological formations. In conjunction with other existing international and national designations, these sites contribute to an ecologically coherent network of MPAs in the north-east Atlantic and North Sea. MPAs in Scottish territorial waters are designated under Section 1 of the *Marine (Scotland) Act 2010* and under the *MCAA 2009*. Highly Protected Marine Areas (HPMAs) have also been designated under the *Marine and Coastal Access Act 2009*[22]. These sites provide ecosystem-wide protection and recovery of all species, habitats, and processes within their boundaries. In particular, these sites intend to prevent all activities considered damaging, depositional or extractive.

2.6.6 Statutory consultation requirements for environmental assessments

As part of developing the SEA, HRA and MCZ assessment, we will engage with the statutory environmental consultees. The outputs of the assessments will also accompany the draft SSEP for public consultation.

SEA requirements

In line with the relevant SEA requirements in England, Scotland and Wales, the SEA Scoping Report will be sent to the SEA statutory environmental bodies for comment over a period of five weeks. These include:

- England - Environment Agency, Historic England, and Natural England

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[21] National Energy System Operator, *Holistic Network Design Follow-Up Exercise* - neso.energy/document/270851/download

[22] Department for Environment, Food and Rural Affairs, *Marine and Coastal Access Act* (2009) (HM Government, 2023) - gov.uk/government/publications/highly-protected-marine-areas/highly-protected-marine-areas-hpmas#:~:text=Highly%20Protected%20Marine%20Areas%20(%20HPMAs%20)%20are%20areas%20of%20the%20sea,allowing%20the%20ecosystem%20to%20thrive

- Scotland - Historic Environment Scotland, NatureScot, and Scottish Environment Protection Agency
- Wales - Cadw and Natural Resources Wales

We will look to utilise the EWG to undertake the SEA Scoping Report consultation. The members of this group include the SEA statutory environmental bodies and other relevant environmental organisations. We will also look to consult with other relevant organisations, such as the Local Government Association (LGA), the Welsh Local Government Association (WLGA) and the Convention of Scottish Local Authorities (COSLA) as necessary.

Given potential effects outside of GB, it is anticipated statutory consultees for SEA in Northern Ireland and the Republic of Ireland will also be consulted. These include:

- Northern Ireland - Department of Agriculture, Environment and Rural Affairs (DAERA)
- The Republic of Ireland - Environmental Protection Agency (EPA)

Consultation is not likely to be required with the other nations bordering GB waters given the more limited likelihood of impacts across these maritime boundaries. The appropriateness of engagement with these stakeholders will be reviewed as the SSEP and SEA progress.

In addition, the SEA legislation in England, Scotland and Wales has statutory public consultation requirements for the SEA Environmental Report. This will be undertaken on the pathway chosen by the UK Energy Secretary to be used in the draft SSEP consultation.

HRA requirements

The HRA's first stage will be to produce the HRA Evidence Gathering Report. This report will be shared with the EWG and the relevant Statutory Nature Conservation Bodies (SNCBs), including:

- Natural England
- Natural Resources Wales
- NatureScot
- Joint Nature Conservation Committee (JNCC)

As with the SEA, this could also include stakeholders in Northern Ireland, the Republic of Ireland and other European countries bordering GB's waters.

There is no strict requirement on when consultation must occur in the HRA process provided that the SNCBs are consulted on the appropriate assessment and on any derogations case. Beyond these legal minimums, we consider it essential to involve and consult with the SNCBs throughout the process, starting from the HRA Evidence Gathering stage. This will enable the early identification and testing of options that pose a risk to internationally important wildlife sites, so measures can be taken to reduce the need for derogations under the HRA regulations.

MCZ requirements

The MCZ assessment consultation process will seek to mirror the HRA consultation and engagement process.

We will be consulting throughout the MCZ assessment process starting at the screening phase. Consultation will be with the relevant SNCBs: Natural England, JNCC, Natural Resources Wales, NatureScot and the Scottish Marine Directorate - Licensing Operating Team (MD-LOT). The Marine Management Organisation (MMO) will also be consulted. We will also consider effects outside of GB and will consult with the relevant stakeholders in Northern Ireland (DAERA) and the Republic of Ireland.

More information on the stages of the MCZ assessment can be found in Section 5.4.5.

2.6.7 Climate change impacts on availability and suitability of land

Land is a finite resource facing increasing demand and challenges, one of which is climate change. Climate change could result in changes to water availability, leading to drought and flooding forecasts, which affect certain generation technologies like electrolysers that have a dependency on water. As a result, changes in water levels in certain areas could impact the viability of locations for these technologies. If a location is more prone to flooding in the future, this may also mean it is less or no longer suitable as a location for energy infrastructure.

Our assessment of climate change's impact will be considered through available data sources. The datasets utilised in the spatial evaluation framework consider impacts of climate change on water availability, flooding and land stability in the medium and long term. We will use this information to consider the suitability of locating assets at a zonal level over the lifetime of generation assets. As far as possible, this will mitigate against assets being located in more vulnerable areas. The SSEP considers best available data in its modelling process. Future iterations of the SSEP will integrate any new and updated datasets to capture further impacts of climate change as they emerge.

2.7 Collaborative marine modelling

We will work in close partnership with The Crown Estate, Crown Estate Scotland, and the Scottish Government on the offshore component of the SSEP. In addition to collaborating with The Crown Estate in relation to England and Wales, its marine modelling will cover Scotland through collaboration with Crown Estate Scotland and the Scottish Government.

To ensure the independence of NESO in carrying out the SSEP modelling, we will set the modelling and decision parameters for The Crown Estate to use in its SSEP analysis. This will also provide transparency of outcomes and consistency between onshore and offshore analysis.

Spatial offshore analysis for the SSEP will be supported by The Crown Estate's Whole of Seabed modelling capability. This will help ensure strategic coherence between SSEP and offshore leasing activities, as well as other initiatives where this capability has been used, for example The Crown Estate's Marine Delivery Routemap and Defra's Marine Spatial Prioritisation Programme (MSPri).

The Whole of Seabed modelling will cover Scottish waters as well as English and Welsh waters. Joint work is underway between The Crown Estate, Crown Estate Scotland and the Scottish Government to ensure the Whole of Seabed modelling reflects the marine spatial planning approaches and modelling that already exist in Scotland. Under the partnership, and using its two decades of marine spatial planning experience and insights from its Marine Delivery Routemap, The Crown Estate will work in partnership with NESO to support the development of:

- the treatment of spatial constraints
- opportunities for co-location of offshore renewables with other users, interests, and sensitivities within the marine environment
- marine stakeholder perspectives and issues
- interpretation of spatial modelling outputs and insights

It is critical the SSEP and marine leasing and development in English, Scottish and Welsh waters are appropriately aligned. This way, we can maximise the impact that strategic spatial planning will deliver. Respective processes and outputs will be aligned to achieve this. We are exploring with The Crown Estate the most appropriate way to align the SSEP HRA and The Crown Estate's HRA on their prospective leasing plans.

When it comes to utilising the Whole of Seabed evidence base, our collaboration with The Crown Estate, Crown Estate Scotland and Scottish Government will be underpinned by key principles and clear roles and responsibilities. We will draw on our experience in the Virtual Energy System project[23] to adopt a collaborative approach to SSEP data sharing. This will enable us to integrate and interoperate with The Crown Estate and the relevant marine leasing and planning authorities in Scotland on their leasing models, strategies, and datasets.

Using this approach requires our organisations to consolidate data and insights in a consistent manner. Both NESO and The Crown Estate will use agreed data standards, classification, and categorisation to nurture effective data sharing in support of interoperability, while protecting underlying intellectual property and securing sensitive underlying data. We are also investigating the scope for establishing a similar marine

[23] NESO data sharing infrastructure to enable an ecosystem of interconnected digital twins of the entire energy landscape, working in parallel to the physical system.

spatial data sharing approach with Crown Estate Scotland and the Scottish Government, where seen as beneficial by all parties.

2.7.1 Principles

The four principles of our collaborative marine modelling are:

- **Alignment** - Developing and working towards a shared strategic vision and direction of travel
- **Collaboration** - Working together to integrate models and datasets
- **Ensuring independence** - Creating a governance framework for collaborative marine modelling, formalising roles and responsibilities for realisation of consumer benefits, and maintaining independence throughout the approach
- **Transparency** - Clearly communicating to stakeholders their roles and responsibilities, ensuring visibility

2.7.2 Process

During our collaborative marine modelling:

- We will use agreed data standards, classifications, and categorisation.
- We will engage with stakeholders to develop the spatial evaluation for the marine area. Throughout this process, there will be close engagement with The Crown Estate, the Scottish Government and Crown Estate Scotland to ensure it is informed by their input.
- We will share our spatial evaluation model and the economic modelling outputs for the marine area with The Crown Estate, Crown Estate Scotland and the Scottish Government.
- The Crown Estate will use its Whole of Seabed model to run geospatial analysis on marine output in accordance with NESO's methodology for spatial evaluation.
- The Crown Estate will provide NESO with the resulting geospatial outputs and input layers. These layers will contain the applied exclusions and spatial constraints and give insight on the deliverability of marine generation volumes within the defined zones.
- This information will be used to inform modelling runs during the modelling iteration process across both economic and geospatial modelling.

2.8 Interactions with other strategic plans

2.8.1 Other NESO strategic energy plans

At a strategic energy planning level, NESO is responsible for three plans – the SSEP, the CSNP and the RESPs.

As Figure 7 demonstrates, the relationship between the SSEP, CSNP and RESPs will be an iterative one, with each plan interacting with the other and updated through regular cycles. This process will involve the respective teams sharing insights, data, research findings and modelling results, enabling them to compare assumptions, assess infrastructure requirements, create opportunities for co-ordination and to identify synergies or trade-offs between the different plans.

The SSEP's objective is to provide greater certainty on the location of electricity and hydrogen generation and storage infrastructure, which will feed into the CSNP. The CSNP will then set out the specific network solutions to meet the additional network requirements. With more granular detail, the CSNP will be a collection of plans focused on network assets. It will assume fixed volumes and locations for generation, production and consumption provided by the SSEP. Like the SSEP, the CSNP will also be updated every three years.

Additional information on the CSNP is available in its high-level principles document[24], published in December 2024 alongside the SSEP draft methodology. Further detail and clarity on the CSNP framework and processes will also be available in the upcoming CSNP draft methodology, published for consultation in summer 2025.

RESPs will see NESO work at regional levels in England and national levels in Scotland and Wales, with a wide range of stakeholders, including local councils, energy providers, networks and communities to develop 'bottom-up' plans to inform future energy needs, including where strategic investment is likely to arise. The plans will factor in existing decarbonisation targets for industry, homes and transport and will ensure alignment with the 'top-down' strategic plans.

As a strategic plan, the SSEP will focus on energy technology capacities on a zonal basis. It will not determine the specific size and type of projects, nor preclude local or community projects coming forward. The RESPs will develop bottom-up plans of generally smaller energy infrastructure and will be better placed to provide support to local and community projects.

[24] *Centralised Strategic Network Plan High Level Methodology Principles* (December 2024) - neso.energy/document/349136/download

Further information on RESPs will be available in its upcoming draft methodology, due to be published for consultation in late 2025. As our thinking develops, we will work to develop mechanisms for how the SSEP and RESPs will inform each other and interact.

Feedback from all three plans will also inform future iterations of the others. For example, RESPs insights will inform the development of the SSEP, which will in turn provide feedback for follow-on iterations of the CSNP and RESPs, respectively. Together, this will foster coordination, consistency, and collaboration in support of an integrated, sustainable energy system.

More specific examples of interaction include:

- The output of the SSEP on electricity transmission boundary capabilities will inform the required additional network capacity that should be developed into specific network solutions for assessment in the CSNP. More detail on this can be found in Section 3.3.10.
- As part of the SSEP analysis, we have worked with the CSNP team to source the best, most up-to-date network information to feed into SSEP modelling. Any electricity transmission network costs identified during the CSNP's first iteration which are different to the initial SSEP analysis will be factored into the second iteration of the SSEP.
- The SSEP will optimise point-to-point interconnectors in terms of the connecting zone in GB, the connecting overseas market, the capacity of the interconnector and the timing of the commissioning of each interconnector. Using the SSEP's outputs, the CSNP will consider the full network impact of interconnectors to assess whether the recommended design should be point-to-point or an OHAs. More information on our approach to interconnectors can be found in Sections 3.3.12 and 3.3.13.

The processes and interactions between all three plans will be continually refined as they evolve. From a broader perspective, the CSNP, SSEP and RESPs will interact with wider policies, regulations, and planning frameworks such as the Land Use Framework, considering plans, policy objectives and targets set at national, regional and local levels. These include the *Connections Action Plan (CAP)*[25] published in November 2023, REMA, and planning and consenting systems across UK, Scottish and Welsh governments. More information can be found in Sections 2.8.2 and 2.8.3.

For the SSEP's economic modelling, our main source of data inputs will be from DESNZ. Where appropriate, we will use other NESO data sources such as the Future Energy Scenarios (FES) 2024 (see Figure 7). FES 2025, published in July 2025, will also inform our modelling of external markets, more details of which is in Section 3.3.13.

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[25] Department for Energy Security and Net Zero and Ofgem, *Connections Action Plan* (November 2023) - assets.publishing.service.gov.uk/media/6581730523b70a000d234bb0/connections-action-plan-desnz-ofgem.pdf

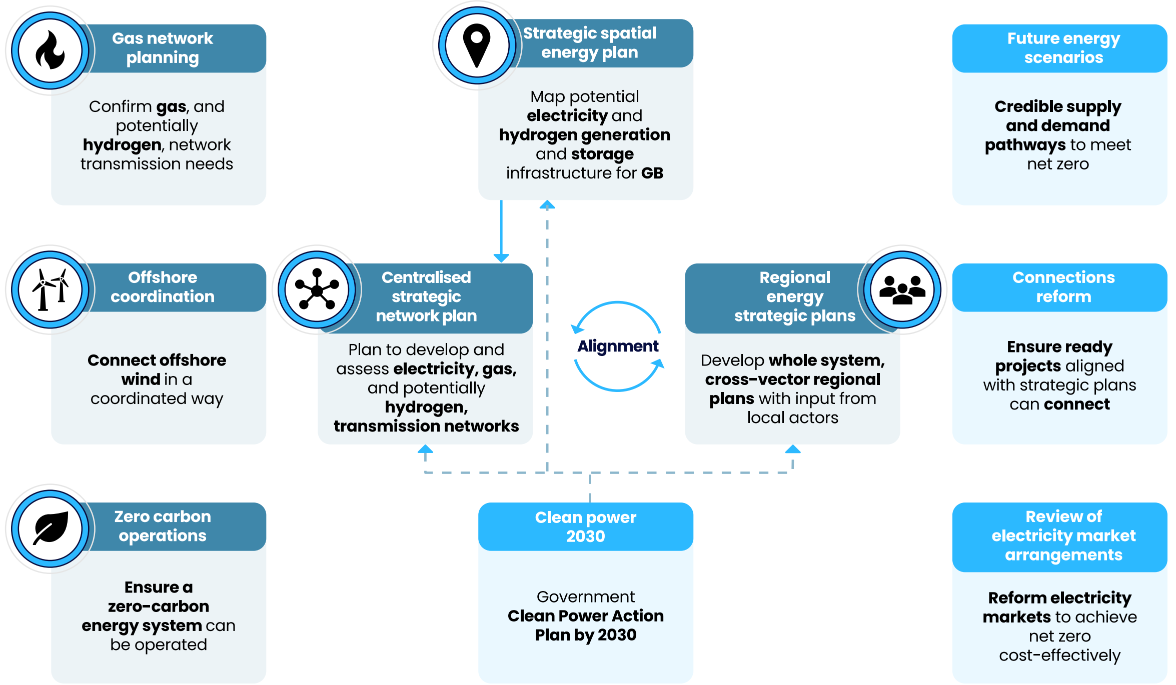

Figure 7: Summary of strategic energy planning interactions

2.8.2 Connections reform and interactions with SSEP

It will be important to consider how the SSEP interacts with the current reforms to the electricity connections process. The overall objective for a reformed connections process in GB is to ensure quicker connection to, and use of the electricity transmission system, in a more coordinated and efficient way to help meet net zero ambitions[26].

The UK Government and Ofgem published their *CAP*[27] in November 2023. Action 3.6 of the CAP said we should introduce a connections process that aligns with strategic planning reforms and REMA.

We published our connections reform consultation[28] on 5 November 2024. In that consultation, we recommended that the new connections queue, determined under the revised connections reform arrangements (currently planned to be implemented from Q3 2025), should be aligned to the government's *CP2030*.

[26] NESO, *Great Britain's Connections Reform: Overview Document* (November 2024) - neso.energy/document/346816/download

[27] Department for Energy Security and Net Zero and Ofgem, *Connections Action Plan* (November 2023) - assets.publishing.service.gov.uk/media/6581730523b70a000d234bb0/connections-action-plan-desnz-ofgem.pdf

[28] NESO, *Connections Reform, Phase 3: Consultation documents* - neso.energy/industry-information/connections/connections-reform

On 14 February 2025, Ofgem published a suite of consultation documents on connections reform, known as the NESO Target Model Option 4 (TMO4+) reform package[29], taking into consideration the need to achieve Clean Power by 2030. The TMO4+ reform package aims to prioritise projects that are ready and needed under the *CP2030 Action Plan* to help with more efficient network planning and increase investor confidence. The Ofgem decision on TMO4+ was published on 15 April 2025, alongside key decisions across the regulatory framework, in order to enact the TMO4+ reforms. This includes licence changes, industry code modifications and approval of the Connections Methodologies.

In addition, to enable investors of projects seeking to connect to or use the transmission system in the interim period before the SSEP, we recommended to the government that its *CP2030 Action Plan* should also include a pathway from 2031 to 2035. The *CP2030 Action Plan*, alongside the approved connection reform proposals, will be used as the basis for issuing connection offers for projects in the period from 2031 to 2035.

Once the first SSEP is in place, it is expected to be used as the basis for offering connection agreements going forward. Where the SSEP pathway sets out a higher capacity than has confirmed connection agreements for the 2031 to 2035 period, additional contracts will be offered. Where the SSEP pathway sets out a lower capacity in a particular technology, the connection agreements in place will remain; no connection contracts will be taken away from developers in light of the SSEP.

2.8.3 Interactions between markets and the SSEP

The delivery of an efficient, secure, and decarbonised power system requires an approach that draws upon the strengths of both market mechanisms and strategic plans.

Strategic energy planning and markets each have their own strengths and limitations in sending efficient investment signals to different assets. We are carefully considering the interactions between markets and SSEP to provide greater clarity on the shape of our future energy system.

The UK Government is currently considering the market reforms proposed in *REMA*[30]. The SSEP will sit alongside and grow with future government policy and market-led interventions by providing a more strategic approach to spatial planning.

Any potential market reforms should enable price signals to reveal where generation build is most valuable and encourage efficient dispatch of the existing assets. If the government decides to progress with zonal wholesale market pricing, we encourage alignment between the market zones and the economic zones used to model the SSEP to ensure complementary locational signals.

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[29] Ofgem, *Consultation on connection reform (TM04+) enablers, including a statutory consultation on modifications to licence conditions* (February 2025) - ofgem.gov.uk/consultation/consultation-connection-reform-tm04-enablers-including-statutory-consultation-modifications-licence-conditions

[30] Department for Energy Security and Net Zero, *Review of electricity market arrangements* (July 2022) - gov.uk/government/collections/review-of-electricity-market-arrangements-rema

2.8.4 The planning and consenting system

Planning and consenting plays an important role in the timely, safe, cost-effective, efficient and reliable provision and operation of energy infrastructure, as well as how it interacts with other planned infrastructure. When considering the location of generation and demand, it is essential to understand how this interacts with other strategic plans and policies across UK, Scottish and Welsh governments.

As included in the commission, it is intended the SSEP will become part of the framework of planning systems across GB. The SSEP will evaluate the zonal locations and volumes for in-scope technologies and therefore will not identify or recommend specific projects to be delivered, so is neither a duplicate or substitute for existing spatial plans that form part of existing planning and consenting systems.

The UK, Scottish and Welsh governments will lead on consideration of how the SSEP may be used in planning frameworks across the three GB nations' respective planning regimes, how it can support planning policy, and whether it is appropriate to amend the existing planning frameworks to incorporate the SSEP or its spatial outputs. All this will be subject to relevant statutory impact assessment requirements and procedures. For an overview of the approach used to determine which plans, policies and programmes are considered within the SSEP, see Appendix 3.

2.9 Assurance

Throughout the development of the SSEP, we will monitor and evaluate our work, carefully controlling risks and continuously learning from experience.

We are developing a monitoring and evaluation process with UK, Scottish and Welsh governments and Ofgem for the SSEP, described in further detail in Appendix 4. We will also have a monitoring and implementation plan for the SEA which is described in Appendix 10. Technical assurance and programme delivery assurance are delivered by a 'three lines of defence model', described in Appendix 5. These will show the boundaries between different roles and responsibilities in the delivery of assurance and risk management. For more information on programme assurance, see Appendix 5.

3. Prepare

3.1 Prepare: chapter overview

The purpose of this chapter is to summarise how we will ensure a robust and effective framework is in place prior to starting the SSEP modelling. These activities involve the development of our process, stakeholder engagement, data collection, setting up the economic model, the development of our approach to assessing spatial factors and preparing for environmental assessments.

Main messages

- Policy considerations will be crucial to SSEP analysis and can include government ambitions or specific parameters, such as net zero targets and security of supply.
- Two important assumptions 'start' the modelling process: (1) the SSEP baseline (for example, what projects we consider 'fixed' as a starting point for the SSEP analysis) and (2) the SSEP timeframe.
- This chapter describes which technologies are in-scope for SSEP spatial optimisation and those that will not be included in this part of the analysis.
- The next stage involves gathering the requisite inputs and data for the SSEP economic modelling. We also identify appropriate modelling tooling and processes and, where necessary, develop and test to ensure their appropriateness for the purpose.
- Before we start modelling, several crucial decisions are needed on how the modelling will consider the energy system, its constituent parts and the potential variables and expansions. These include the zonal economic approach, the use of electrical boundary capabilities to model the transfer of electricity, and how network and generation connection data is treated in the economic modelling.
- We also discuss our approach to spatial evaluation, our selected method for evaluating spatial factors (a modified multi-criteria analysis) and pathway deliverability, and our spatial evaluation tool selection (GIS software).
- To prepare for the SEA and HRA, we will conduct SEA scoping and HRA evidence gathering at an early stage. This means the SSEP can proactively address environmental concerns, facilitate transparent decision-making, and reduce the risk of delays during later stages of the plan.

This chapter uses the following economic modelling terms:

- **SSEP policy framework** – A series of parameters that provides a structure for the modelling, ensuring it achieves the desired outputs.
- **SSEP baseline** – The starting point for the SSEP. It will consist of network and generation included in the UK Government's *Clean Power 2030 Action Plan*, plus connection projects that have various forms of regulatory funding. A more detailed description of the SSEP baseline can be found in Section 3.3.1.
- **Modelling scenario** – A series of inputs to the SSEP energy market simulation tool (for example, an electricity demand forecast) informed by the SSEP policy framework, that form a starting point for our modelling.
- **Sensitivity** – A change or number of changes made to the initial input data of a modelling scenario, which is then re-optimised to test if it provides a different outcome.

3.2 SSEP policy framework and interactions

3.2.1 Policy interactions

As the SSEP is a strategic plan, it will sit alongside and grow with future government policy and market-led interventions. It is intended to be complementary to these, providing a more strategic approach to spatial planning and becoming part of the framework of planning systems across England, Scotland, and Wales.

This means it will be shaped by UK and devolved governments' policies, targets and ambitions and will consider other strategic plans and policies, networks plans and markets, all of which will shape the location of future transmission and generation infrastructure. This is important to achieve alignment and coherence, ensure coordinated messaging for future NESO publications and to provide consistent investment signals for the energy market. It will also provide the best opportunity for governments across GB to oversee implementation of the planning framework set out in the SSEP.

Government decarbonisation targets, economic efficiency, security of supply, operability and deliverability will be incorporated into the modelling process to ensure they are reflected in the recommended SSEP pathways.

3.2.2 SSEP policy framework

Defining the SSEP's parameters will provide a structure that ensures our modelling achieves the desired outputs. The SSEP policy framework (previously described as 'policy scenarios' in our draft methodology) will be created to enable an efficient approach to testing uncertainty and developing evidence relating to decisions on energy policy. For example, how the role of interconnectors is considered for security of supply purposes, linking into the broader context of how self-sufficient GB should be in meeting energy demand.

As the modelling progresses, the policy questions may be reviewed to ensure the evidence created through the SSEP reflects the key questions the commissioning governments may want to consider.

Testing economic input sensitivities[31] will be important to refining the modelling scenarios. The final modelling outputs will be generated through investigating modelling sensitivities to understand their relative impacts.

3.2.3 Government decarbonisation targets

As the modelling progresses, the policy focus areas may be reviewed to ensure the evidence created through the SSEP reflects the key questions the governments may want to consider.

All input uncertainties will be considered, prioritising those we expect to have the most significant impact on the outputs from the economic modelling. They will be considered from both a locational impact perspective and a total system cost perspective. To develop the economic modelling for the SSEP, we will set certain parameters to ensure recommendations are inclusive of net zero targets and the *Sixth Carbon Budget* (CB6). This budget covers the period 2033 to 2037, detailing the path to a net zero UK economy by 2050 and providing a blueprint for a decarbonised UK energy system. It focuses on a reduction in UK greenhouse gas emissions (including international aviation and shipping) of 77% relative to 1990 and accounts for the Scottish Government target date for net zero emissions of all greenhouse gases by 2045.

In February 2025, the Climate Change Committee published advice to the government on the *Seventh Carbon Budget (CB7)*[32], which covers the period 2037 to 2042. The UK Government will consider this advice before publishing CB7, confirming the target for emission reductions and providing the sector specific (for example, energy) targets for this period. At the time of economic modelling, the SSEP will utilise the latest available published data on sector-specific targets from the UK and devolved governments.

Net zero will be considered within our modelling tool by setting the long-term emissions target to zero across the whole economy; all pathway options will therefore meet the legally binding 2050 target. A negative target within the co-optimised power and hydrogen system would require the energy sector to offset residual emissions from the economy via deployment of carbon capture and storage (CCS) attached to bioenergy with carbon capture and storage (BECCS).

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[31] Change(s) made to the input data to test the robustness of the answer.
[32] Climate Change Committee, *Seventh Carbon Budget* (February 2025) - theccc.org.uk/publication/the-seventh-carbon-budget/

3.2.4 Technology ambitions

Ambitions for hydrogen production can be explored in the economic modelling. Technology-specific ambitions for electricity can also be included within the model, such as those related to offshore wind, restrictions on the building of new unabated fossil fuel generation capacity from a certain year, or capping the annual output of unabated plant. See Appendix 6 for more information on technologies that the SSEP will spatially optimise.

3.2.5 Operability

The day-to-day, hour-to-hour, second-to-second ability to run the electricity system safely and deliver the power to where it is needed is a fundamental obligation of NESO. This is what is known as 'operability'. The SSEP will optimise the transition to net zero while protecting system security, reliability, and resilience. To consider the operability of the SSEP modelled outputs, we will work closely with relevant expert NESO teams to allow high-level appraisal of these from an operability perspective. This will allow us to identify operability opportunities and risks, then integrate these into our modelling iterations and the narrative on SSEP pathways.

3.2.6 Deliverability

Deliverability assessments, in the context of the SSEP, will analyse the practical ability of developers to deliver the pathways and technology volumes recommended by the SSEP to meet net zero targets. These assessments consider the potential barriers and risks that may impact the ability of a pathway to be feasibly delivered. This includes the ability to design, plan and construct the recommended volumes of electricity and hydrogen generation and storage technologies in the high-level zonal locations within the timeframes required to meet net zero.

Community views, environmental considerations and cross-sectoral demands on land and sea sit at the heart of the SSEP, which are both key elements of deliverability and essential when considering planning and consenting regimes. The SSEP pillars (economic, environment, society and other spatial users) will form a key criterion for evaluating the deliverability of pathways, as detailed in Section 4.2.4.

We are also considering access to key technical requirements and resources for in-scope technologies such as logistics, transport and associated infrastructure, as well as access to network and connections as a part of the technical engineering design requirements.

Additionally, other elements of deliverability, including practical aspects like supply chains, will be considered. These include:

- technology readiness of generation and storage technologies, including innovative technologies
- challenges in supply chains

These aspects will be reflected in economic modelling both quantitatively though realistic build rates as well as qualitatively in the wider modelling process.

Through our process, we will consider existing deliverability assessments executed by other NESO strategic energy plans, including the CSNP and the Offshore Coordination Holistic Network Design (HND) exercises, as well as any deliverability considerations in our *CP2030* report. We are engaging with our stakeholder groups on these topics and will consider feedback to help shape the SSEP's deliverability assessment.

3.3 Economic modelling assumptions

This section of the methodology will outline the inputs and activities taken in the economic modelling portion of the SSEP analysis. It includes the choice of simulation tool, key data inputs, a discussion on SSEP assumptions for specific technologies (such as hydrogen and interconnectors), and how we address areas such as security of supply.

3.3.1 SSEP baseline

To develop the economic modelling, a starting point is required for the network, generation, storage, and demand. This is referred to as the SSEP baseline. Energy projects in the baseline will be fixed in the model. Projects in addition to those in the baseline will be considered against the SSEP pillars (economic, environment, other spatial uses, society and technical engineering design requirements) and take into consideration a number of other factors, including existing seabed leases, lease options and seabed exclusivity agreements.

The SSEP baseline will comprise the network and generation included in the UK Government' s *CP2030 Action Plan* and projects which have regulatory funding. This will give certainty to investors and bring closer alignment with connections reform. Projects with regulatory funding include projects which hold a Contract for Difference, capacity market contracts, those with interconnector cap and floor arrangements, designation to receive funding through the nuclear Regulated Asset Base (RAB) model or merchant interconnector approval (via the relevant exceptions process with Ofgem).

3.3.2 SSEP timeframe

The SSEP will assess the requirements for the period between 2030 to 2050. This aligns with the *CP2030 Action Plan*, giving the SSEP a natural starting point. The end timeframe of 2050 aligns with the government's net zero target, providing the CSNP a sufficiently long-term outlook, as well as confidence for network planning in the anticipated levels of electricity and hydrogen supply and storage. Such a timeframe will also help provide longer-term investment signals to the market while recognising the greater uncertainty in the later years. The SSEP will be an iterative process with an updated version published every three years.

3.3.3 Technologies considered

The first SSEP will include infrastructure for the generation and storage of electricity and hydrogen. Future iterations could cover other energy vectors, like natural gas. To model accurately the economically optimal future pathways for GB's electricity system, we will model the whole electricity and hydrogen systems in our economic modelling, including all expected generation and demand. This allows us to explore how best to match optimal generation and high-level network needs to demand projections under different modelling scenarios.

Not all technologies included in the economic model will be spatially optimised. Technologies that are spatially optimised have been selected after assessing them against four key principles, listed below. Technologies not spatially optimised for the pathway will still be modelled in our economic modelling to ensure a holistic energy system is represented in the SSEP modelling.

Technical engineering design requirements will be developed for each of the spatially optimised technology types as part of the spatial evaluation. They will then be included for spatial optimisation as technology-specific indicators, spatial constraints, and opportunities.

Principles

The following key principles have guided the approach to selecting the final list of technologies to be included in SSEP assessments and geospatial optimisation.

- **Consideration of policy ambitions** - The commission requires the UK, Scottish and Welsh governments' ambitions for the level of generation of certain technologies to be considered in the SSEP modelling.
- **Data availability** - The SSEP modelling is based on credible data sources and assumptions that are quality assured. Including technology types in our modelling requires access to reliable data (considering both data availability and data quality) on aspects such as cost and operational properties of the infrastructure type, as well as an understanding of the spatial requirements.
- **Strategic planning** - The SSEP is a strategic plan that will be published on a zonal basis. From a strategic planning perspective, the SSEP will add value by geospatially assessing energy infrastructure to provide confidence and greater certainty at a zonal level. Certain smaller-scale infrastructure would be more challenging to assess in detail geospatially but will be included where it can be aggregated to a zonal level.
- **Provide certainty** - The SSEP aims to provide certainty to stakeholders about the future strategic shape of the energy system, carefully considering any risks associated with technologies in the modelling and recommendations.

Process

The technologies to be spatially optimised in the first iteration of the SSEP were agreed together with the UK Government and Ofgem through our external governance groups.

Table 2: Technologies in scope for spatial optimisation

Technology	Additional detail
Bioenergy with carbon capture and storage (BECCS)	New build and possible consideration of retrofit BECCS
Data centres	Spatially optimise a small volume of flexible data centre demand (1-2 GW)
Hydrogen	Hydrogen production (including electrolysers and hydrogen carbon capture utilisation), hydrogen to power, transport and storage included
Interconnectors	Spatially optimise the GB zone to which interconnectors connect
Long and short-duration storage	Network-connected storage to be included - pumped hydro power, compressed air energy storage, liquified air energy storage and long and short-duration batteries
Nuclear	Both conventional large (GW) capacity nuclear and small modular reactors (SMRs) included
Offshore wind	Both fixed and floating offshore wind included
Onshore wind	No additional detail
Power carbon capture utilisation and storage	New build and possible consideration of retrofit gas generation
Solar	Network-connected solar (ground mount)
Unabated gas	Gas power plants in-scope for security of supply

Table 3: Technologies NOT in scope for spatial optimisation

Technology	Additional detail
Energy from waste	Modelled using forecasts of their expected growth and zonal location
Large-scale demand	Most large-scale demand will not be spatially optimised. The SSEP will consider this in demand sensitivity analysis. Exceptions are specified in Table 2
New flexible demand – EV storage	Modelled using forecasts of their expected growth, price-responsive flexibility and zonal location
Nuclear – AMR	AMRs will not be included in this SSEP as they are currently considered novel and innovative technologies. However, they may feature in future iterations of the SSEP
Solar - rooftop	Modelled using forecasts of their expected growth and zonal location
Tidal stream	Modelled using forecasts of their expected growth and zonal location
Tidal wave	Modelled using forecasts of their expected growth and zonal location

For more detail on the in-scope technologies and those not considered for spatial optimisation, see Appendix 6.

3.3.4 Co-location

Definition of co-location

The existing available land and sea is recognised in government policy across GB, with multi-sectoral strategic plans supporting co-location where possible. Being a spatial plan, the SSEP may add value by recognising policy developments and practical opportunities. For the purposes of the SSEP evaluation framework, co-location can be defined as 'a situation where multiple energy developments, activities or users co-exist in the same place by sharing the same footprint or area'. The footprint can include both the physical location of a development or activity, for example, a built structure, and a wider area associated with the development or activity, such as a surrounding safety zone. These developments may not necessarily share the same grid connection point.

We recognise that co-location is a project-specific consideration, with an increasing number of developers considering co-location options when designing their project. To identify strategic opportunities for the co-location of energy technologies, we are developing a matrix to consider the most likely pairings of technologies that can co-locate, as per the above definition. To do this, we use geospatial modelling to assess potential suitable areas for each energy infrastructure type. Where potential suitable areas overlap, we will identify opportunities for co-location. For example, the spatial overlaps may identify areas of opportunity for the co-location of battery energy storage systems (BESS) and onshore wind.

Strategic interactions with other spatial users

It is important to distinguish between strategic spatial interactions between sectors (for example, between the energy sector, agriculture, and fishing) and co-location within energy generation (that is, the co-location of technologies such as battery storage with solar panels or hydrogen electrolysers with wind turbines). The SSEP is not a cross-sectoral plan and will not be making decisions on trade-offs with other sectors, as cross-governmental programmes like Marine Spatial Prioritisation are better placed to consider these trade-offs. In the SSEP, these cross-sectoral interactions will be considered through a spatial evaluation framework. Being an energy sector plan, the SSEP will only consider opportunities for co-location within the energy sector.

3.3.5 Innovation

We will need to be responsive to new information as we develop the SSEP. If, for example, new generation technology types emerge in addition to those listed, we will consider how these can be included, alongside other innovations, industry, or policy developments. This will be done through our agreed governance processes. Furthermore, the SSEP will be delivered on a three-year cycle, so future iterations can account for new advancements and lessons learnt. We also sought feedback from stakeholders through our methodology consultation on other factors or innovation to be considered.

3.3.6 Demand representation and demand flexibility

The electricity and hydrogen demand projections for SSEP modelling are broken down into various segments. The electricity demand segments cover the residential, industrial and commercial sectors as well as various heating loads – such as heat pumps and heat networks, and transport loads – for example, residential electric vehicles (EVs), depots and rapid public charging stations. The hydrogen demand segments include heat, industry, services, and transport loads. Each demand segment has an associated load shape profile, which illustrates the pattern of usage across a specific timeframe. This is hourly for electricity and daily for hydrogen and it may be weather-dependent.

A proportion of demand in certain segments is assumed to be flexible in the time it is consumed and therefore capable of providing demand side response (DSR). The key demand segments that could provide DSR include smart and other appliances and equipment in the residential, industrial, and commercial sectors (such as heat pumps), as well as residential EVs with off-street parking.

The utilisation of the available DSR is optimised within the economic model. Each DSR component is modelled with parameters representing the potential volume, duration, and timing of demand flexibility. DSR is mostly modelled as load shifting, moving demand away from peak times to other times of day when wholesale energy prices are lower.

3.3.7 Data centres in SSEP

We gathered feedback and evidence from stakeholders during the SSEP draft methodology consultation to understand how data centres should be considered in the SSEP. It was concluded we will spatially optimise a small volume of data centre demand and also use different demand projections to incorporate a range of views regarding data centre growth. These will reflect the uncertainties associated with the future growth of data centres beyond 2030 and consider the adaptability of the system from an evolving policy landscape. Spatially optimising 1-2 GW of data centre demand will provide the government and industry with evidence and indicate where opportunities for energy system benefits exist. This can support future development of government policy on the spatial location of data centre demand.

We will be engaging with stakeholders to refine our economic and spatial assumptions around data centre growth, including suitability of zones, future growth up to 2050, flexibility and technical inputs, and resource requirements. For further information on the options considered for data centres see Appendix 6.

3.3.8 Establishment of the SSEP dataset

As set out in the commission, the main source of data inputs into the SSEP economic modelling will be from DESNZ, with other NESO data sources such as FES 2024 used where appropriate.

DESNZ will primarily provide cost data for the parameters, while NESO will contribute technical data and fill in any missing information for specific modelling inputs not modelled by DESNZ. Where DESNZ does not provide input data, we will follow their guidance to source and utilise NESO data, which will be subject to DESNZ's agreement prior to use in the modelling. This ensures that the model utilises the most up-to-date data from either NESO or DESNZ.

Where there are discrepancies in the data inputs, these will be reviewed and a decision taken on corrective action. This will include, but not be limited to, the correction of inputs and re-running models to validate the data.

We will collate all the data into a single source that serves as the definitive view for all economic inputs. To facilitate transparency of the SSEP process, the economic data inputs (or a list of datasets used in the SSEP) will be published alongside the draft and final SSEP documents, where possible.

Table 4: SSEP data input groups

SSEP data input group	Data provider
Batteries	DESNZ
Commodities	DESNZ
Demand side response (DSR)	DESNZ
Electricity demand	DESNZ
Economic (for example, derating factor)	DESNZ
Electricity plants	DESNZ/NESO
Hydrogen production	DESNZ
Hydrogen pipelines	DESNZ
Emissions	DESNZ
Energy security (minimum capacity reserve margins, capacity shortage price and firm capacity increase)	NESO
Geospatial	NESO
Hydrogen demand	DESNZ
Hydrogen storage	DESNZ
Interconnectors	DESNZ
Modelling zones	NESO
Networks	NESO

3.3.9 Economic modelling tools and optimisation

To carry out the SSEP economic modelling, we require a simulation tool that has the capability to optimise the technology, capacity and timing of commissioning and retirement of assets, such as electricity generation and transmission network assets. We also want to consider different timeframes, address long-term planning requirements and solve the fundamental problem of ensuring that dispatched generation can meet GB demand.

To perform our economic modelling we use an energy market simulation tool that is designed to optimise aspects of the energy market. These aspects include trading strategies, operational management, policy, and forecasting. This is an established tool within NESO and has been used to deliver analysis with similar use cases as our SSEP modelling requirements. The tool can also model interactive components of the energy system, such as electricity and hydrogen, which are key features of our modelling.

The economic modelling tool is designed to minimise the overall system cost for the simulation that it is given, while respecting any economic modelling constraints. These can range from overarching constraints, such as the requirement for energy generation to equal demand or more user-defined economic modelling constraints, such as limits on the build rates for a given technology or limits on how much energy can flow from one point to another.

It optimises the cost of building all assets, building supply where renewable resources are greatest, taking into account the cost of transmission assets against the cost of building supply closer to the demand. This may result in more supply capacity being required, but fewer transmission assets. It also includes evaluating what balance of electricity and hydrogen assets is optimal.

The economic modelling can be run in several timeframes, ranging from the very short term (almost real time) to the very long term (multi-decade). In addition, our modelling tool allows for flexibility in the resolution of the simulated markets to be varied. For example, the GB energy market could be modelled in greater detail than other European markets. This means we can explore a range of approaches to the both the timeframes considered when optimising the economic outcomes and also when modelling European markets, particularly for interconnectors.

While optimising various aspects (such as capacity and technology), the SSEP economic modelling tool solves the problem of how to dispatch generation to meet demand. This process is referred to as capacity expansion modelling.

Capacity expansion modelling finds the minimum cost solution, given the modelling constraints placed upon it and the input costs provided. The types of input costs are as follows (sources for these are discussed in Section 3.3.8):

- The capital cost of new assets, with the economic life and weighted average cost of capital (WACC) included, to allow calculation of the cost to finance construction of the asset. These assets include:
    - Electricity generation
    - Electricity storage
    - Electricity transmission
    - Hydrogen production
    - Hydrogen storage

    - Hydrogen transmission
    - Interconnectors
- A fixed operation and maintenance cost for each asset, applied each year per unit of capacity.
- The production cost of an electricity generator, which includes:
    - Commodity prices for fuel, such as a natural gas price forecast
    - Carbon price for fossil fuel generators
    - Variable operation and maintenance costs
    - Technical parameters, such as the thermal efficiency of a generator type and the carbon intensity of the fuel used
- The cost of unserved energy that is the value of lost load (VOLL).

We can also run the capacity expansion with multiple sets of inputs, for example using multiple historical weather datasets to find the single optimal solution across all the weather datasets. Once we have a solution for capacity expansion, we will conduct further analysis on this outcome using a more detailed simulation of how the market would dispatch the generation mix. This will be the lowest cost solution, given the inputs and modelling constraints that the modelling tool is given. It will then allow us to simulate market behaviour with significantly more accuracy than is possible in the capacity expansion process due to the size of the problem being optimised.

The economic modelling process has layers of modelling. In each layer there are trade-offs that must be made between various aspects of the modelling to keep the problem size manageable. If the problem size becomes too large, either the model will not be able to run, or it will take longer to run than is feasible for the number of modelling runs we plan to carry out. The lowest layer is the economic optimisation. Here, the trade-offs primarily concern the level of detail of the individual modelling parameters. For example, additional historical weather years may be used. However, this will increase the problem size for the modelling simulation tool, requiring either a reduction in the complexity of other modelling parameters or a reduction in the number of simulations that can be run.

The capital costs of new assets are annuitised over their economic life, rather than being treated as a lump sum investment. When evaluating investments with lifetimes extending beyond our 2050 modelling horizon, our modelling assumption in the SSEP is that the final year is repeated indefinitely for the remaining life of the asset. This allows investments in longer-life assets to be compared alongside technologies with shorter lifetimes, with all costs considered on a discounted cash flow basis.

The natural gas market is not being modelled as part of the capacity expansion in the SSEP. Price forecasts for natural gas are used to determine the cost of electricity production using a gas-fired generator. We will conduct further analysis on potential capacity issues if natural gas plays a part in the outcome of the SSEP (for example, if CCUS is recommended). This process will be run to test the robustness of the outcome as natural gas assets are phased out in the transition to net zero.

3.3.10 Economic zones

A zone in the context of the SSEP is the geographical representation of an area of land which generation and demand fall within. The SSEP analysis will be conducted on a zonal level to create a high-level overview of the energy system. This will then enable the CSNP to consider network infrastructure in greater detail. Developing a zonal approach also enables strategic analysis of economic, environmental, societal, and other space use factors.

17 economic land zones

The SSEP zones are steered by electricity transmission network constraints. Network constraint boundaries split the electricity system into multiple zones, crossing parts of the network that carry electricity between the areas where flow limitations may be encountered. Depending on which boundaries are considered in a study, the number of zones varies. In previous studies (such as the Network Options Assessment) the system was split into 39 zones.

Our zonal economic approach allows us to consider different analytical and modelling perspectives. The creation of economic zones forms part of the data layers and means our economic modelling tool can interact with our geospatial tool. This enables us to optimise the GB energy system within a single model of GB and neighbouring energy markets.

As the SSEP is considering capacity expansion with many competing factors, the economic modelling is highly complex. We have therefore reduced the number of zones by focusing on critical transmission network boundaries[33], which enables a more efficient process. Initially, this creates 16 zones. However, when considering the potential hydrogen network, we made the decision to split the zone in the north of England into two zones, which resulted in zones 5 and 6. The vertical split between the electrical boundaries, B6 and B7a, reflects existing gas pipelines that run down the east and west coasts that may be relevant to hydrogen in future. This will allow better representation of flows on either side of the coast and any potential flows across them. This results in 17 zones for the SSEP (see Figure 8).

[33] The boundaries considered are B1a, B2, B4, B6, B7a, B8, B9, EC5, LE1, SW1, and B13.

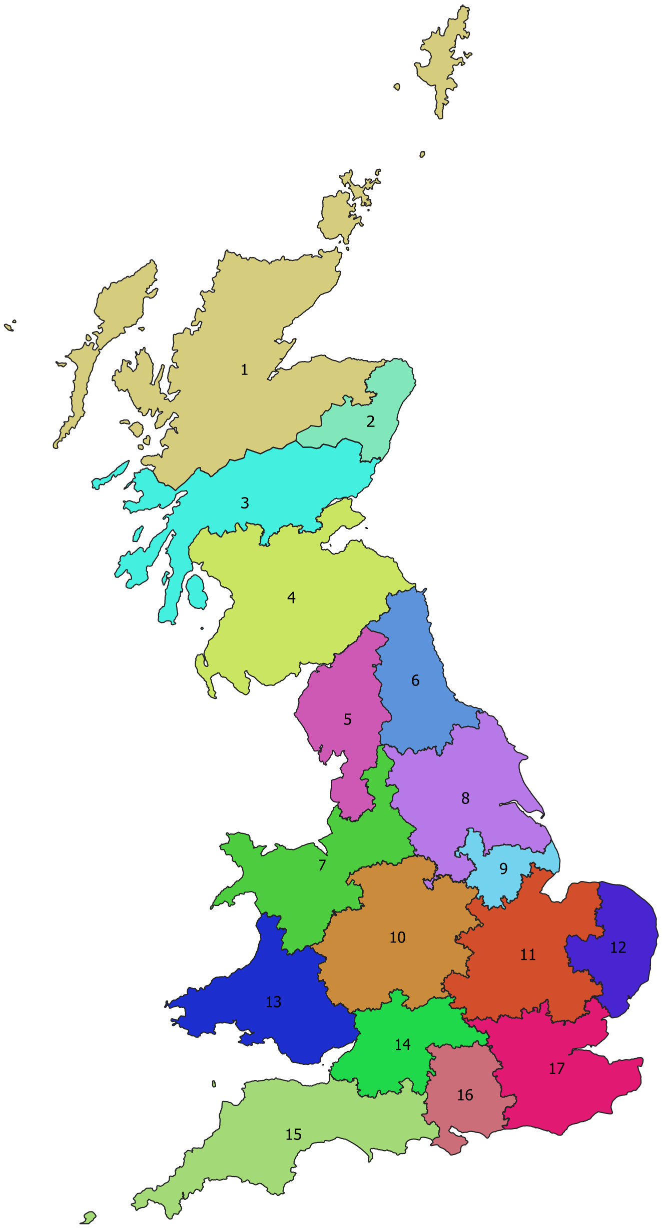

Figure 8: The 17 economic zones

Electricity and hydrogen demand in each economic zone is derived from DESNZ projections for GB-wide energy demand, combined with NESO analysis of local load distributions as applied in the FES 2024 pathway modelling.

The 17 zones will be used in our modelling. However, in presenting the SSEP itself, we will use different zones more aligned to geographical rather than energy system boundaries, which will be configured through our geospatial modelling.

How the borders of the zones are drawn

As the SSEP incorporates spatial optimisation for the first time within NESO, the delineation of zone borders is important. From a spatial perspective, the key aspects to consider when building new generation and storage infrastructure are where it will most likely connect to the network and, therefore, to which SSEP zone it belongs.

Energy networks are complex and there are various approaches to determining where the borders of distinct zones should be. To draw the borders of the SSEP zones, we have started with the initial split into 17 zones using the electrical transmission network boundaries and the location of the Grid Supply Points (GSPs) as guidance. GSPs are points where the transmission network connects to the distribution network and each GSP will be in an SSEP zone. We have then taken the distribution network feeding into each GSP and drawn the border of each SSEP zone around these networks.

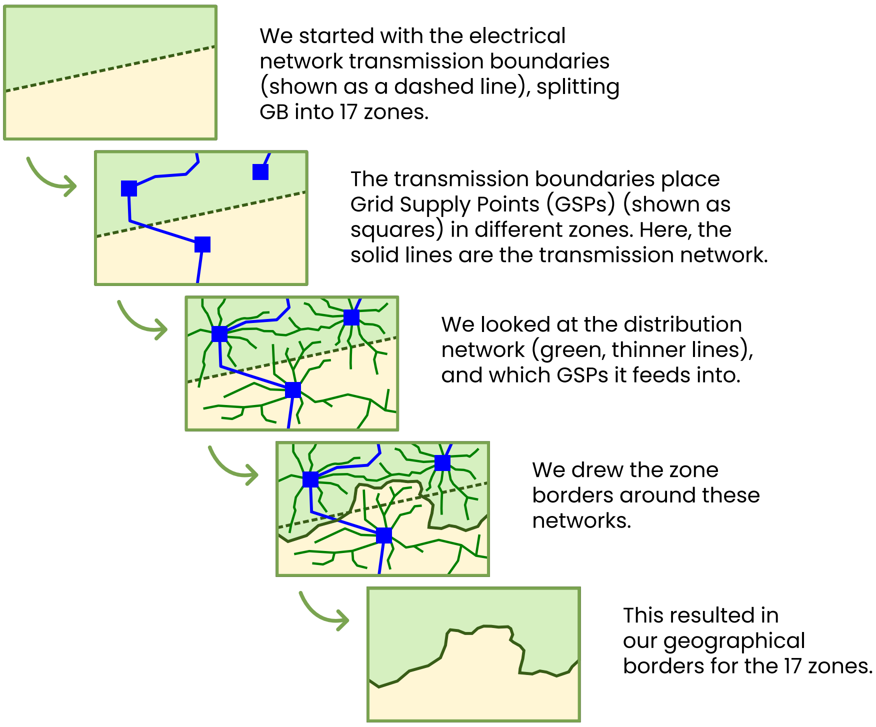

Figure 9: A simplified diagram explaining the steps to drawing zone borders

It is possible that an individual generation or storage asset built in one location may connect to a zone further away. Therefore, we will conduct sensitivity analysis on our build limits per zone and explore sharing capacity between adjacent zones.

Approach to offshore zones

The 17 economic land zones are based on the key energy network constraints of the electricity transmission network and hydrogen systems. In all land zones that include a coast, offshore technologies already in the baseline will be counted as being in the land zone that they connect to. Furthermore, there will be new build capacity connecting into each of these zones.

To achieve this, environmental, societal, other spatial uses and technical engineering design requirement considerations will be analysed across connecting marine areas. This will assess optimal locations of in-scope offshore energy technologies and build limits within each zone. Through iteration between geospatial analysis and economic modelling, this will be refined to determine the required capacity of offshore technologies and in which of the 17 onshore economic zones capacity should land.

Assumptions on market design

As set out above, the SSEP economic model requires a zonal structure to place spatially electricity generation and hydrogen infrastructure and identify network reinforcement requirements. Running the model on a zonal basis will optimise expansion and dispatch simultaneously for all asset types, considering modelled GB network boundary constraints.

The SSEP economic model is intended to be agnostic to market design and trading arrangements. This means that, in running the model on a zonal basis, we are not assuming the implementation of specific market reforms such as the adoption of zonal pricing in the GB electricity market. The outcome of the UK Government's REMA programme was not known at the point of finalising the SSEP methodology.

Under the current GB market design, the zonal modelling approach can be interpreted as reflecting the outcome of Balancing Mechanism 'bids' and 'offers', a process in which generators and interconnectors are moved away from dispatch positions to mitigate network congestion.

The primary objective of the economic model is to minimise total system costs subject to meeting constraints such as carbon emissions and reliability targets. To move beyond the consideration of system costs and evaluate the commercial viability and profitability of infrastructure investments, it would be necessary to start making assumptions about market design.

Electricity network modelling

The transfer of electricity between SSEP zones in the economic model is limited by a set of electrical boundary capabilities[34]. These boundary capabilities or network constraints are represented in the model by a maximum flow, in MW, for each boundary and a seasonal profile that limits the flow further during certain parts of the year. Further scaling of the maximum flows will be applied to represent generic maintenance outages throughout the year. This means the boundaries will have a dynamic capability throughout the study, which can change year on year.

Electricity network expansion

The electricity transmission network capacity will be allowed to expand from the initial boundary capabilities discussed previously. Each boundary will have a cost per MW of capacity increase. These costs will be derived from forecast boundary reinforcement data taken from the *Beyond 2030*[35] report. It will be assumed that all practical upgrades to the existing transmission network will already have been made (for example, reconductoring

[34] The electrical boundary capability is the maximum amount of electricity that can flow through a boundary. As new reinforcements to the network are built, this capability may be increased, allowing more electricity to flow across the boundary.
[35] NESO, *Beyond 2030* - neso.energy/publications/beyond-2030

existing lines to increase the amount of electricity they can transport). Therefore, the cost data that will be used to inform the input costs for the SSEP will be taken from the forecast costs for new transmission circuits.

This data will represent an average derived from various options, including overhead lines, underground cables and offshore subsea cables. The output from the SSEP process will be a list of boundary capability increases, the year(s) in which the increases are required and the assumed capital cost of each increase.

The output of the SSEP will go on to inform what level of boundary reinforcement should be considered in other NESO processes; for example, future iterations of the CSNP. The SSEP will not make any recommendations on the form the new asset will take, such as overhead line, offshore subsea cable or the technology used, such as alternating current (AC) or high-voltage direct current (HVDC) or any indication of routing. This will be the role of the CSNP.

3.3.11 Offshore wind generation

In the SSEP model, we will consider offshore wind as being located in the SSEP land economic zone to which it connects, rather than having its own offshore zone. Each SSEP zone with a coastline will have an offshore wind profile associated with it, distinct from onshore wind profiles.

Expansion

In addition to the baseline, the economic modelling simulation tool for the SSEP will include the possibility of building more offshore wind generation, considering both fixed and floating technologies. DESNZ has provided the capital costs for each of these technologies and, as with other types of plant, capital cost of the plant is independent of the zone.

The economic modelling outcomes of additional offshore wind will be geospatially modelled in collaboration with The Crown Estate and placed in applicable marine zones. These will be mapped back to the 17 economic zones through identifying appropriate landing points. The geospatial analysis will highlight deliverability of offshore wind in these zones, based on the requirement for network connection as well as spatial constraints.

Connection costs

Connecting offshore wind to the onshore transmission network is considerably more complex than connecting onshore. Additionally, in some areas, wind farms are located much further offshore than in others. Without accounting for these factors, our economic modelling tool would have to make decisions based solely on aspects like wind conditions and onshore network considerations, ignoring these crucial cost variations and onshore network considerations.

For offshore wind, we will include a cost that represents the connection from the offshore wind farm to an onshore interface point, with a different cost for each zone. This approach involves using data from the *Beyond 2030* report about future offshore wind locations, cable corridors and connection costs, to give an estimate of the cost of connecting to a specific zone. This data is undergoing updates and further analysis through other NESO offshore planning processes. The cost will reflect an average for the zone, considering that new wind farms might be built with shorter or longer cables and existing wind farms might increase their capacity. Onshore technologies already have this equivalent cost included in the costs provided by DESNZ.

Connection types

Offshore wind farms can be connected to onshore interface points either by a radial connection, where the wind farm connects individually and directly to the interface point, or by a shared connection, whereby a wind farm may connect to another wind farm, a tee-point or even have multiple connections. There are examples of these in the *Pathway to 2030*[36] and *Beyond 2030* reports.

The model's output will indicate the optimal capacity of offshore wind connecting into each zone. However, it will not specify the type(s) of connections or the locations of the wind farms in the sea. This approach is consistent with that used for other technologies. For SSEP we will use radial connections as the starting assumption for connecting new offshore wind. Shared connections can improve economic, environment and community outcomes in certain circumstances, but it is necessary to limit the complexity of the SSEP modelling process by starting with radial connections. Each wind farm will be considered as connecting to the SSEP zone that is logical, based on NESO's previous experience and publications. This may not necessarily be the closest zone to the offshore wind farm due to network considerations. However, the results will be investigated, analysed and tests may be conducted to vary the zones that offshore wind farms connect to.

One of the main benefits of coordinated connections is the reduced environmental impact, as they require fewer landing points compared to radial connections. The output of the model will specify the optimal offshore capacity connecting into each zone; it will not put restraints on what kind of connection can provide this capacity, therefore we will not be specific on the landing usage. However, given that the model is based on radial connections, if a specific zone reaches a limit for capacity arriving onshore (for example, by offshore wind or interconnectors), then we could consider performing a sensitivity using coordinated connections by lowering the landing point usage.

Coordinated connections may also enhance the transmission network by creating links across transmission boundaries. Although this is beyond the scope of SSEP, when we identify the need for transmission network improvements and offshore wind nearby, one possible solution could be to combine the two into a coordinated offshore link. As part of its modelling, the CSNP will investigate this possibility in further detail, exploring to what extent it is achievable.

During the modelling of the SSEP, we will share the results with our Analytical Working Group members and others involved in offshore modelling such as our internal offshore coordination team to review and critique the output. After the SSEP has determined the

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[36] NESO, *Pathway to 2030* - neso.energy/document/262676/download

optimal level and location for future offshore wind, a full offshore design exercise to determine the appropriate level of coordination will be carried out as part of other NESO offshore planning processes.

3.3.12 Interconnector expansion

Interconnectors transfer electricity from one electricity market to another. To achieve a more beneficial outcome, we will optimise generation and interconnector capacity simultaneously, rather than optimising generation first and then interconnectors.

The model will optimise the connecting zone in GB, the connecting overseas market, the capacity of each interconnector and the timing of the commissioning of each interconnector. To reduce the problem size for the model, some limitations will be applied to the GB connection points available. For example, we will not consider an interconnector between Ireland and East Anglia a feasible option, as this would not be practical. From a spatial point of view, we will investigate the potential future landing point capacity of each SSEP zone based on spatial assessments and discussions with relevant stakeholders. This analysis is being conducted as part of a broader investigation into potential future offshore wind locations and connection points.

We will explore the use of caps on the maximum possible capacity of interconnector expansion via discussion with our key stakeholders. The use of caps can take many different forms, representing build rates, earliest delivery, foreign appetite and onshore landing point capacity. The use of caps will be tested, and any application will be justified and supporting evidence made transparent. This approach has been adopted because, while allowing unlimited capacity expansion will lead to the most economical solution, it carries the risk of producing an unfeasible solution. For example, this could be unfeasible due to deliverability constraints or a lack of political appetite.

The output of the modelling will indicate the optimal capacity of interconnection between SSEP zones and external markets. However, it will not specify the exact landing points either side of the interconnector, nor will it specify the number or configuration of the interconnectors required to achieve the optimal capacity. The CSNP will utilise the output of the SSEP to conduct a more detailed analysis of interconnectors, investigating strategic parameters such as cost, capacities, various technologies and configurations, delivery dates and where they connect on the GB side.

Carbon Border Adjustment Mechanism (CBAM)

An important consideration when modelling interconnector expansion is the European Union (EU) CBAM legislation. Under CBAM, from 2026, electricity imports into the EU via interconnectors will be subject to a carbon price equivalent to the EU Emissions Trading System (ETS). The EU should recognise explicit carbon prices paid domestically, but details of how that would work remain unpublished. However, as it has been incorporated into EU law, the economic modelling will reflect the resulting additional cost on exports from GB to the EU.

Offshore Hybrid Assets (OHAs)

OHAs are the coordination of interconnectors with other offshore infrastructure, typically an offshore wind farm. In the SSEP we will initially model interconnectors as point-to-point (P2P) due to the significant increase in modelling complexity required to model OHAs and the large number of permutations involved.

However, we will consider OHAs within the SSEP through sensitivity analysis. In areas where offshore wind generation and interconnectors are found to be in proximity to one another, we will explore the effect of placing an OHA there. We can compare the output with, and without, this OHA and analyse the impact across different aspects.

It is important to note that the CSNP will take the output from SSEP and explicitly explore OHAs within the modelling. OHAs may also be a consideration for optimisation in future iterations of the SSEP.

3.3.13 External markets

Within the SSEP, when we refer to 'external markets', we mean any market outside of GB. We use the term 'markets' instead of 'countries' because some countries have multiple markets, such as Norway and Denmark.

To model interconnector flows between GB and external markets, it is essential to consider relevant factors from other markets to some extent. At a minimum, this involves knowing the electricity price for both markets involved. Our economic modelling tool can simulate markets with varying levels of complexity, from setting a time-varying market price, to explicitly modelling a plant list and deriving the market price for each period. The highest level of complexity would be optimising new plant builds for other markets, as we are doing for GB.

For the SSEP we will group the markets into two categories based on whether GB is directly connected to them via an interconnector or not. The direct connection could either be an existing interconnector or a potential connection considered by the model. The two different market categories will be referred to as the 'neighbouring markets' and 'other markets', respectively. This distinction has been made because the primary reason for modelling external markets in detail is to accurately model interconnector flows between these markets.

In Figure 10, each of the markets are shown with their assigned category. Note that if an investigation is done into connecting to one of the 'other markets' (for example, Spain), then for those runs that market would be classified as a neighbouring market. For further information on the options considered for modelling external markets, see Appendix 8.

Figure 10: Markets considered in the SSEP economic modelling tool

The way we will model external markets can be summarised as follows:

1. For neighbouring markets, we will explicitly model all the plants in the market, as we do for GB.
2. We will use predetermined capacity expansion pathways for all external markets.
3. The predetermined capacity expansion pathways will be the same as those used in FES 25.

3.3.14 Hydrogen assumptions

Scope of hydrogen supply chain

A co-optimised approach will be used due to the material interaction between hydrogen and power systems. Electrolysers, which use power to extract hydrogen from water, and hydrogen generators, which turn hydrogen into power, are the two types of hydrogen assets that directly link with the power sector. To fully capture their interactions with the power sector, these two asset types must be considered in the context of the wider hydrogen system. This context is needed because the deployment of electrolysers and hydrogen generators are in turn dependent on the availability of hydrogen transport, storage, and alternative sources of hydrogen production. The SSEP, therefore, considers the full hydrogen supply chain in its approach, including transport, storage, and the production of hydrogen from electricity, natural gas, and biomass.

Scope of demand

Hydrogen demand for all major end uses is considered in the SSEP, including the use of hydrogen as a feedstock chemical, an energy vector for heat, power and transport and a precursor for hydrogen-derived fuels. Hydrogen that is produced as a by-product of a chemical process, and consumed by another process on-site, is not included in scope as it does not interact with the wider hydrogen system. All hydrogen demand is an external, independent input assumption into the economic model, except for hydrogen to power, which is an outcome of the hydrogen and power system co-optimisation.

Treatment of pipeline infrastructure

Existing natural gas infrastructure is not included in the SSEP's scope. As the natural gas system is not modelled, the date at which existing assets will become available for retrofit to hydrogen is highly uncertain. The cost of retrofitting transmission pipelines relative to new build is also highly uncertain and can vary depending on the context of each pipeline. Due to this uncertainty in the availability and relative cost of retrofits, the retrofit of natural gas infrastructure to hydrogen is also not considered. All pipeline costs used in the SSEP represents new build. The use of a singular cost for transmission capacity aligns with the approach used for the power sector, which does not differentiate overhead, underground, or subsea cables.

Pipelines and ships used for the international trade of hydrogen and its derivatives will not be included as an expansion candidate. There is substantial uncertainty around the future of a global hydrogen market, with the long-term supply and demand balance of major economies, and their resulting role in hydrogen trade, still unclear. This uncertainty in fundamental input assumptions, combined with the significant increase in modelling complexity that developing a global view on hydrogen trade would require, has led to the decision that hydrogen trade will not be modelled in the SSEP at this stage.

Expansion candidates

To manage computational run times, the number of technologies selected as expansion candidates at each stage of the hydrogen supply chain will be limited (see Table 5). The selection of technology alternatives for each supply chain stage will be based on data availability, the technical and economic similarity of alternatives and impact on the modelling problem size. For example, if two technologies have similar cost projections and technical characteristics, then only one alternative may be selected if the inclusion of both does not materially add to the model's insight. The selected technology will then represent both alternatives in the model. For example, autothermal reformers (ATRs) with CCUS will represent all blue hydrogen production including steam methane reformers.

We recognise that many hydrogen technologies are still in the early stages of commercialisation and that some may not progress to a suitable technology readiness level for deployment at scale. Uncertainty about the availability of hydrogen technologies and their future techno-economics will be an underlying consideration during the selection of expansion candidates.

Table 5: Hydrogen production, storage and transport technologies considered for potential selection as an expansion candidate

Hydrogen production	Hydrogen storage	Hydrogen transport
Proton exchange membrane (PEM) electrolysers	Salt caverns	Transmission pipelines
ATRs with CCUS	Depleted gas fields	Trucking
Hydrogen from biomass with CCUS	Lined rock caverns	
Steam methane reformers (SMRs) with CCS	Above ground tanks	

Note some of these are developing technologies and have low levels of technology readiness.

3.3.15 Weather and security of supply

Weather

The assumptions made on weather patterns used in our modelling simulations are an important factor in the solutions the modelling tool creates. The weather assumptions affect both the demand patterns and the available output of weather-dependent renewable generation. Given the increasing capacity of weather-dependent renewables, the weather datasets also have a significant effect on security of supply considerations for the SSEP. This is discussed in more detail in the following section.

There is a large range of weather datasets available to the SSEP that use historical observations to assess what relative demand levels and weather-dependent renewable generation availability would be on a zonal basis. We can select a single or multiple weather datasets as an input to the capacity expansion model. The choice of datasets is particularly important to weather-dependent renewables as it can determine which zones are the most economically suitable to build in.

For this reason, within the SSEP modelling, we will consider multiple weather years within our capacity expansion optimisation. By reviewing historical weather years, we have identified key years to consider within our analysis. These include 'average' years as well as 'extreme' weather years, such as high/low wind output, high/lower solar output, and high/low annual and peak demands.

Similarly to other NESO processes, we have chosen to model generation and demand profiles using historical data rather than projected data. This is due to uncertainty around how climate change may impact these datasets, but we may explore this option in future iterations of the SSEP.

Security of supply

Security of supply standards help us determine if GB's demand can be met in a range of situations, particularly where the system is experiencing stress conditions such as low availability of renewable generation resources coinciding with high demand. By meeting security of supply standards, we can ensure that GB has a resilient transmission network. We will be using several approaches to ensure that our pathways are robust, which include:

- considering multiple weather years within our capacity expansion optimisation
- allowing no unserved energy in the SSEP capacity expansion optimisation
- monitoring unserved energy in the SSEP pathways relative to the loss of load expectation (LOLE) standard when we run a higher resolution market dispatch simulation
- additional adequacy stress tests performed on the SSEP pathways, against a wide range of weather and plant outage conditions
- utilisation of a capacity reserve margin target and largest infeed loss reserve within our economic modelling tool

The security of supply standard set by the UK Government for electricity in GB[37] is three hours of LOLE per year. We will ensure that the SSEP economic expansion model is configured to build sufficient generation, storage, and interconnection to meet a target derated capacity margin and account for the largest infeed loss. This means maintaining a reserve margin of electricity supply (whether from generation, storage, or interconnection) to cover the event of the largest supplier being cut from the system (largest infeed loss). For example, if the largest supplier at a given time was a nuclear power plant with 3 GW output, we ensure we have 3 GW of backup supply in case the nuclear plant suddenly shuts down or a connecting circuit experiences a fault.

The reliability of the resulting capacity expansion pathway is then tested to assess LOLE. Derating factors and other inputs to the reliability assessment are sourced from the NESO *Electricity Capacity Report*[38].

[37] Department of Energy and Climate Change, *Annex C: Reliability Standard Methodology* (July 2013) - assets.publishing.service.gov.uk/media/5a7c52eaed915d338141e0ce/emr_consultation_annex_c.pdf
[38] Electricity Market Reform Delivery Body, NESO, *Electricity Capacity Report* - emrdeliverybody.nationalenergyso.com/IG/s/article/Electricity-Capacity-Report-ECR

An equivalent national security standard has yet to be defined for hydrogen. For modelling purposes, we assume a VOLL, which acts as a penalty on shortages in the capacity expansion process.

With regards to energy independence when considering imports, there are no restrictions set for the initial model runs. However, we will investigate cases of extreme interconnector imports and exports.

3.4 Development of the spatial evaluation approach

To determine the optimal zonal locations for the in-scope technologies and develop the SSEP, it is necessary to evaluate the spatial and economic factors that influence these.

The spatial evaluation is a crucial part of the process. It considers environmental, societal, other spatial uses and technical engineering design requirements for each of the in-scope technologies. This analysis helps assess the optimal zonal locations for the different in-scope technologies within the energy system, considering both the spatial constraints (push factors[39]) and potential spatial opportunities (pull factors[40]) of those locations. This process will help to maximise the effectiveness and deliverability of the final SSEP pathway, not only within the energy system but also in the broader context of our society. Our geospatial model will allow us to represent the outputs of the SSEP in other zonal configurations to more closely reflect more commonly recognised boundaries.

Our approach to the spatial evaluation will help to ensure a fair assessment of spatial constraints and opportunities related to in-scope technologies and facilitate stakeholder engagement on these inputs to the SSEP process. Alignment with existing marine and terrestrial planning, including spatial planning policies on the deployment of energy, will similarly support this evaluation. This will allow for the development of an evidence base of spatial constraints and opportunities for each of the technologies, which is validated by stakeholders and existing policy related to the SSEP.

3.4.1 Spatial evaluation pillar

The spatial evaluation is guided by four of our SSEP pillars which are referred to as ‘spatial evaluation pillars’. These are environment, societal, other spatial uses, and technical

[39] Push factors - factors that are considered to negatively impact the feasibility of building energy infrastructure due to spatial constraints/sensitivities in that area.
[40] Pull factors - factors that are considered to positively impact the feasibility of building energy infrastructure due to the provision of more favourable conditions.

engineering design requirements. Greater detail on how the spatial evaluation pillars are considered can be found in Appendix 7.4.

A hierarchical classification of spatial factors that sit within the spatial evaluation pillars is illustrated in Figure 11. This provides a clear framework for implementing the spatial evaluation as it enables the application of assessment processes (for example, scoring) at different levels within the hierarchy (see Section 4.2.3). Its structure was informed by literature, policy reviews and stakeholder input completed when identifying relevant spatial factors for the SSEP. These are described in Appendix 7.3.

1. **Pillars**
   Key elements of the spatial evaluation, namely environment, society, technical engineering design requirements and other spatial uses
2. **Categories in each pillar**
   For example, landscape and ecology and biodiversity within the environment pillar; health and wellbeing and recreation and tourism within the society pillar
3. **Subcategories in each category**
   For example, landscape designations within landscape category, recreational routes within recreation
4. **Indicators in each subcategory**
5. **Datasets representing a spatial factor**
   Datasets scored in relation to each infrastructure type and to each devolved nation where relevant to create metrics and a standardised set of data

Figure 11: Hierarchical classification representing spatial factors

3.4.2 Development and implementation of approach

To deliver the evaluation, the following components need to be developed and implemented:

Prepare

1 Clearly defined objectives

Clearly articulating the objectives and goals of the spatial evaluation provides a clear direction and purpose for the analysis. Appendix 7.1 sets out the aims and objectives of the evaluation in providing a robust and transparent tool for identifying optimal locations for the in-scope technologies.

2 Identification and selection of relevant spatial factors

We are gathering the necessary data for each selected spatial factor. Each of the in-scope technologies is being evaluated for the spatial factors that may exclude, constrain or favour its development. Their categorisation is described in the next section.

3 Develop scoring criteria for spatial factors

We are developing a set of criteria to evaluate spatial suitability by identifying spatial factors that could potentially impede, limit or support placement of energy infrastructure. We are also developing criteria for assessing the significance of these factors and the impact energy infrastructure would have upon them. The criteria used for the suitability assessment is described in Chapter 4 - Model.

Model

4 Perform evaluation

There are three stages of spatial evaluation: spatial exclusion, spatial suitability and supporting contextual overlay information.

5 Aggregation and analysis

This involves aggregating the scores applied to each indicator for each technology type in GB. Resulting aggregated scores will be analysed to identify spatially suitable areas of lower constraint and higher opportunity.

6 Interpretation and visualisation

This entails interpreting the results of the analysis and visualising them to better understand the implications of the aggregated scores on energy infrastructure development.

7 Documentation and communication

The methodology, data sources and results of the spatial evaluation will be documented, followed by communicating the findings effectively to stakeholders and decision makers. This is described in Appendix 7.2.

Figure 12: Development and implementation

Approach to assessing spatial factors

The SSEP's spatial evaluation follows the principles of a modified MCA approach to establishing its evidence base. MCA is used whereby there are multiple criteria (that is, spatial factors) associated with a decision. For the purposes of the SSEP's spatial evaluation, these are constraints and opportunities associated with environmental, societal, other spatial uses and technical engineering design requirements.

This method is particularly useful in situations where there are conflicting objectives or potential trade-offs between criteria, as it provides a structure within which to evaluate criteria, (including spatial factors in the spatial evaluation) and enable systematic and comprehensive decision-making. It is also highly applicable to, and commonly used for the basis of, Geographic Information System (GIS) spatial mapping and analysis tools.

To improve transparency and clarity and address the limitations of MCA identified in His Majesty's Treasury's (HMT) *Green Book*, we are adopting a modified approach for our MCA on the spatial evaluation. This includes documenting the approach thoroughly, defining clear criteria and employing an evidence-based approach to scoring with stakeholder involvement via our stakeholder working groups. A more detailed description of this enhanced approach, as well as the process taken to select it, is described in Appendix 7.1.

Approach to assessing deliverability

We will build on our modified MCA approach (for identifying and scoring spatial factors) and employ an analytical approach to assess the deliverability of pathways against spatial and economic factors at the pillar level. The criteria for selecting this method can be found in Appendix 7.1. This will happen later in the process when we begin shortlisting pathways by comparing and analysing their impact on SSEP pillars, using stakeholder and expert guidance to assess deliverability. A detailed description of this process can be found in Section 4.2.4.

By expanding on our approach to assess deliverability at the pillar level, we are enhancing transparency and robustness by:

- introducing clarity around weighting and how the SSEP pillars are considered against each other and interact
- providing a clear approach for stakeholders and industry experts to analyse and assess the deliverability of pathways
- providing more detail on how trade-offs between pathways and among pillars could be identified employing more of the analytical approach for options appraisal recommended by *The Green Book*

3.4.3 Refining and data collection

To evaluate and map the spatial factors that influence the suitability of certain technologies across GB, it is crucial to have data pertaining to these factors. However, not all inputs initially identified in the assessment of spatial factors are suitable for inclusion when considering the objectives and scope of the SSEP. To create a refined list of inputs represented by suitable datasets the following data selection criteria will be applied:

- Data is available with national coverage
- Data, or equivalent representation, is available for England, Scotland and Wales
- Data is available at a strategic scale
- Data quality is suitable for the purposes of the SSEP
- Data is relevant

The data selection criteria are aligned with the requirements from *INSPIRE (EU Information for Spatial Information in Europe)*[41]. More detail on the criteria to develop a refined list of datasets can be found in Appendix 7.3.

Once the refined list of datasets is developed, a review is conducted to ensure they fit within the appropriate hierarchy of the MCA structure presented in Figure 11.

3.4.4 Spatial evaluation and visualisation

The spatial evaluation process will leverage *GIS*[42] software, The Crown Estate's Resource Identification and Optimisation (RIO) tool, and various input spatial data layers to interpret and visualise the spatial evaluation for each of the in-scope technologies. Geospatial data layers will be combined in GIS to help determine areas where generation and storage infrastructure development may be possible. This input data may take the form of lines, polygons, or gradients to represent the indicators spatially. Scored spatial data, representing indicators, will be aggregated up into a regular hexagonal grid and/or to zonal or administrative boundaries as required throughout the process.

This approach is in line with the widespread use of GIS in land and sea use planning worldwide. By utilising GIS, we will generate a comprehensive series of maps for GB that depict the identified spatial exclusion areas, suitability areas and informative overlays across each of the technologies. Aggregating these assessments in GIS will provide an overview of the available area across GB for the respective technologies. This information can then be converted into potential energy output per unit area for each technology. The economic model can utilise this information to conduct scenario analysis and optimise technology configurations based on the potential energy output provided and the economic assumptions for testing and sensitivity analysis. A further description of this process can be found in Chapter 4 – Model.

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[41] European Commission, *INSPIRE Overview* - knowledgebase.inspire.ec.europa.eu/overview_en#:~:text=The%20INSPIRE%20Directive%20aims%20to,an%20impact%20on%20the%20environment

[42] *Geographic Information Systems (GIS)* consist of integrated computer hardware and software that store, manage, analyse, edit, output and visualise geographic data.

3.5 Preparation for the SEA and HRA

The first step in the SEA and HRA processes will be SEA scoping and HRA evidence gathering. These stages establish the context for the whole SEA and HRA process, considering key parameters such as the range and level of environmental issues to consider, how the assessments will be undertaken and the information needed.

The MCZ assessment is a more recent inclusion and therefore does not precisely complement the HRA and SEA stages. The MCZ assessment process, including MCZ assessment screening, is detailed further in Section 5.4.5.

3.5.1 SEA scoping

SEA scoping will involve:

- reviewing plans, policies, and programmes relevant to the SEA process of SSEP
- identifying the evidence base for the SEA
- identifying the main environmental issues associated with the SSEP and the reasonable alternatives to the SSEP
- creating the SEA framework of objectives and assessment questions against which the SSEP will be assessed
- developing the methodology for the SEA process, in conjunction with the SSEP's wider spatial evaluation

Outcomes will be presented in the SEA Scoping Report, which is targeted, accessible and sent for statutory consultation, as described in Chapter 2 – Foundations, in Section 2.6.6.

Incorporated within the SEA Scoping Report will be an SEA screening opinion. This will explain why the SSEP requires an SEA, in line with the *Transmission Acceleration Action Plan (TAAP)* and the Electricity Network Commissioner's recommendations.

3.5.2 HRA evidence gathering

Unlike for SEA, scoping is not a formal requirement of HRA. However, we see its value because of the atypical nature of the plan (there is no real precedent for the SSEP) and it is therefore referred to as evidence gathering. The relatively high level of information likely to be available for each option will influence the level of detail possible in the HRA. Outcomes will be presented in the HRA Evidence Gathering Report and will cover:

- the methodology for the HRA, including data sources and impact risk zones based on expected impact pathways[43]
- the geographic scope
- the 'in-combination' scope (other projects and plans to be considered)
- how internationally important wildlife sites will be identified for inclusion in the assessment

The HRA Evidence Gathering Report will then be shared for consultation, as described in Chapter 2 – Foundations, in Section 2.6.6.

[43] The sequence of events or steps through which a plan (the SSEP) might impact a sensitive receptor (European sites for an HRA).

4. Model

4.1 Model: chapter overview

This chapter demonstrates how we will use economic modelling and spatial evaluation to assess the optimal zonal locations of in-scope electricity and hydrogen generation and storage technologies.

Economic modelling focuses on simulating energy system scenarios and optimising costs, while spatial evaluation assesses factors that shape the spatial configuration of the future energy system. Throughout the modelling process, spatial and economic assessments are iterated so that we can deliver a plan that balances sustainability, affordability, and security of supply as well as interactions with other uses of the land and sea.

Main messages

- The economic model plays a crucial role in simulating and analysing the operation and evolution of the energy system under various inputs and scenarios. It incorporates the inputs described in the previous chapter and the outputs of the spatial evaluation to run simulations to shape and develop pathway options for the SSEP.
- The spatial evaluation process assesses environmental, societal, other spatial uses and technical engineering design requirements that help to understand potentially suitable areas for the development of each of the in-scope technologies. This takes place via three interlinked exercises: identifying areas of exclusion, identifying areas of suitability and overlaying the data with additional insights for each of the in-scope technologies.
- The flow diagram presented in Figure 13 illustrates the individual workflows, information flow, interactions and iterative processes that constitute the approach to the modelling in the SSEP.

This chapter uses the following economic modelling terms:

- **Modelling scenario** – A series of inputs to the SSEP energy market simulation tool informed by the SSEP policy framework. Some of these modelling inputs will be determined by policy decisions.
- **Sensitivity** – A change, or number of changes, made to the initial input data of a modelling scenario, which is then re-optimised to test if it gives a different outcome.
- **Component** – A capacity for a given technology, on a zonal (or inter-zonal for transmission assets) level. For example, 5 GW of onshore wind capacity in zone 1. Components can be binary or non-binary, with an example of a binary component being a nuclear power station, which is either built or not built. Most components are non-binary.

- **Outcome** – A list of components that should be built for a given modelling scenario or sensitivity.
- **Pathway** – The final, holistic outcome of all of the assessment stages.

4.2 Integration and iteration of modelling streams

Integration of and iteration between the spatial evaluation assessments and economic modelling are critical aspects of the SSEP modelling process. By incorporating both spatial evaluation and economic modelling into the analysis, we capture the complex interplay between spatial exclusions, spatial constraints, spatial opportunities, and economic optimisation.

The economic modelling and spatial evaluation run alongside each other to optimise the energy system based on realistic inputs and assumptions. At various stages, the two processes feed into each other. For example, as the spatial evaluation process progresses, its outputs feed into the economic modelling process, to provide detail on the areas of land and sea potentially suitable for generation or storage.

As part of the economic modelling, the economic modelling simulation tool will look for an optimal solution, alongside the testing of specific sensitivities. If required, we can explore further options by reassessing relevant aspects of the economic modelling and spatial evaluation.

The integration and iteration of the modelling processes is shown in Figure 13. A supporting high-level step-by-step explanation headed 'summary of stages' follows immediately afterwards. These are presented in the order the processes first appear. Due to its iterative nature, the process is not linear, so Figure 13 is therefore illustrative. It is also important to recognise that while it may illustrate a single model run, multiple runs will be conducted throughout the process in an iterative way. Each phase in the process is described in further detail from Section 4.2.1 onwards.

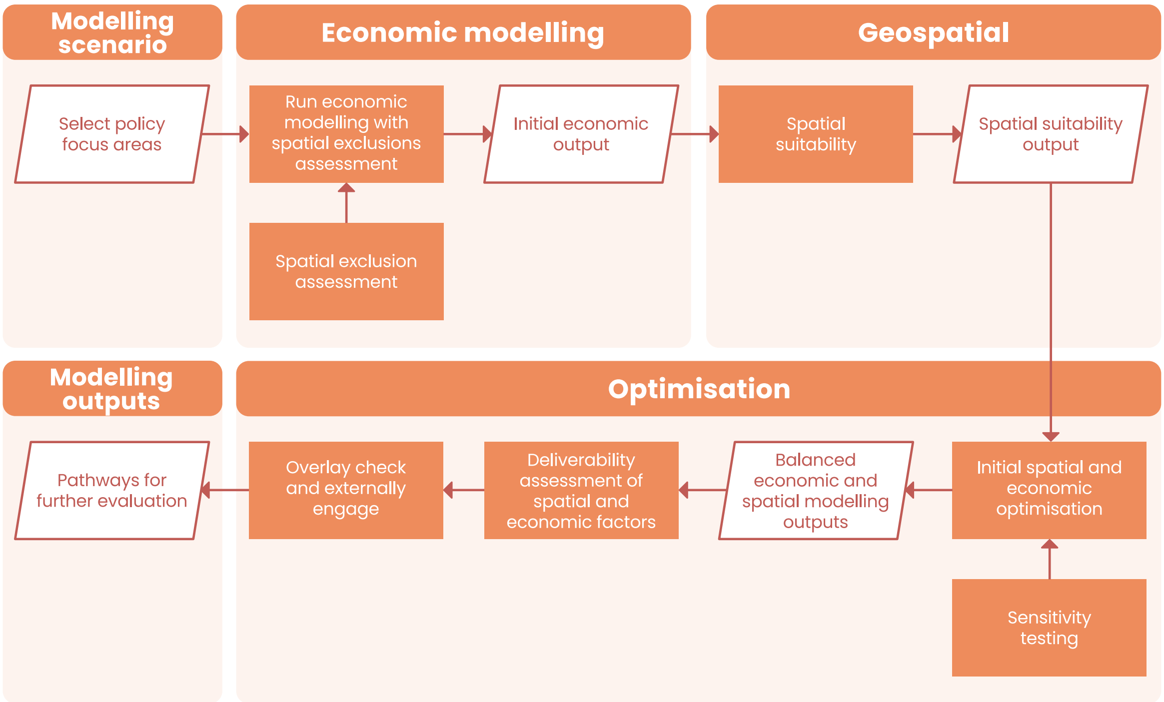

Figure 13: End-to-end modelling process

Summary of stages

Modelling scenario

- A series of inputs into our economic modelling tool, informed by the SSEP policy framework, some of which will be determined by policy decisions.

Economic modelling

Spatial exclusions assessment (geospatial)

- Spatial exclusions are areas that cannot accommodate the in-scope technologies. These are identified and factored into the analysis.
- Further areas may be excluded that do not meet assumed minimum footprint requirements of each technology type.
- Areas remaining are referred to as the potential developable areas. These are then converted into economic modelling inputs.

Initial economic output

- In-scope technologies are modelled on the potential developable areas to create an 'initial economic output' for each modelling scenario.
- This will produce an economically optimal energy output for each technology in each region.

Geospatial

Spatial suitability assessment

- We further refine the potential developable areas by considering two factors:
    - 'Push factors', which limit the siting of in-scope energy infrastructure and are referred to as spatial constraints.
    - 'Pull factors', which support the siting of in-scope energy infrastructure and are referred to as spatial opportunities.
- Spatial constraints and opportunities are then mapped across GB. Through a process of spatial refinement, we disregard highly constrained and low-opportunity areas.

Spatial suitability output

- The remaining potential developable areas resulting from the spatial suitability assessment have corresponding potential energy outputs. These are then fed into the optimisation process.

Optimisation

- Sensitivity testing, where we change the initial input data of a modelling scenario, is then conducted. During this process, economic costs are repeatedly traded off against spatial suitability inputs. The deliverability of the outputs is then assessed against SSEP pillars – economic, environmental, societal, and other spatial uses.
- To examine the various inputs and outputs of the modelling process and provide transparency for stakeholders, we will also apply contextual overlays. These are visual layers depicting national spatial plans and policies for energy infrastructure, existing energy infrastructure or visualised results from SSEP societal surveys.

Pathway for further evaluation

- A comprehensive analysis and review of the above stages will be used to develop the SSEP pathways. This process is then repeated to develop further pathways.

4.2.1 Modelling scenarios in economic modelling

Modelling scenarios are series of inputs to the economic modelling tool that form a starting point for our modelling. Some inputs will be determined by assumed policy decisions that form the basis of a modelling scenario. For example, we may consider two modelling scenarios: the first assumes that domestic heating is predominantly electric, the second assumes significant use of hydrogen for domestic heating. These two modelling scenarios are mutually exclusive; they are different pathways that GB could take. There could also be further modelling scenarios which consider varying combinations of these two approaches.

Each modelling scenario will be considered independently to determine the optimum outcome for that modelling scenario. Comparisons can then be made between the outputs from each modelling scenario. This will give insight into each modelling scenario and the policy decision(s) behind them.

The majority of inputs to a modelling scenario are not linked to any specific policy decision. These will include costs, build limits and commodity prices. It is likely that these inputs will be the same across all modelling scenarios, although they may subsequently be varied using sensitivities, which we explain later in this chapter.

4.2.2 Economic modelling

The initial phase of economic modelling gathers inputs from the modelling assumptions phase (including those derived from the SSEP policy framework) and the outputs of the spatial exclusions assessment (described in the following section). It then puts both into the economic model to produce an 'initial economic output'.

Spatial exclusion assessment

The spatial exclusion assessment involves identifying and excluding areas from analysis. The definition for a spatial exclusion is 'a spatial factor that precludes the potential siting of in-scope energy infrastructure due to relevant physical, legal and land and sea use restrictions'. What classifies as a spatial exclusion may differ from one technology to the next; therefore, the assessment is conducted for each in-scope technology separately. Utilising the GIS tool described in Section 3.4.4, areas where these exclusions are present are omitted from the ongoing assessment.

The areas remaining after the spatial exclusion areas have been removed will undergo further filtering to exclude areas that do not meet assumed minimum footprint requirements of each technology type. Key deliverability factors will also be considered, including the shape of the remaining areas, to ensure they meet the specific requirements of each technology type. Once these areas are excluded from the analysis, an initial study area for each in-scope energy infrastructure technology remains. These are referred to as potential developable areas.

The remaining potential developable areas will then be converted into economic modelling inputs. Since the economic model does not read inputs based on spatial parameters such as area, the areas remaining are converted to potential energy output, expressed in GW. The process diagram in Figure 14 illustrates the steps in producing spatial exclusion outputs that feed into economic modelling.

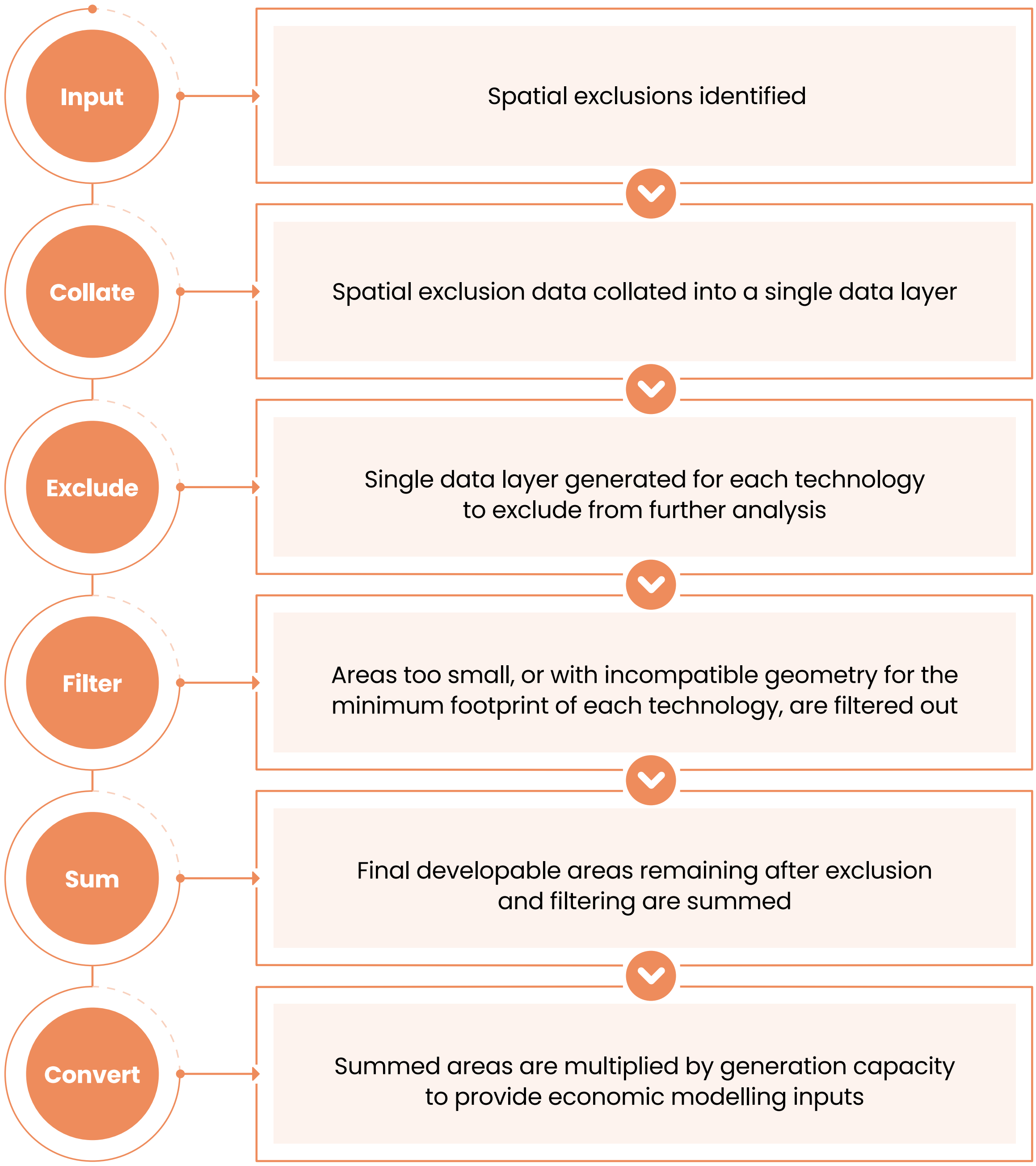

Figure 14: Spatial exclusion flow diagram

A full list of data sources included in the spatial exclusion assessment will be provided as part of a data register in the final SSEP report.

Initial economic output

For the potential developable areas, we then model in-scope technologies to create an 'initial economic output' for each modelling scenario. The initial economic output is the initial economically optimal energy output for each technology in each region based only on spatial exclusions. We then further refine these through a process of spatial suitability, described in the following section.

4.2.3 Geospatial modelling

Spatial suitability

Spatial suitability involves evaluating and scoring the spatial factors present within the potential developable areas and evaluating their relevance to in-scope energy infrastructure. These factors fall into one of two categories:

A **spatial constraint** is a spatial factor that may, to varying degrees, limit the potential siting of in-scope energy infrastructure. The constraints assessment focuses on evaluating factors related to the environmental, societal, and other spatial uses pillars.

A **spatial opportunity** is a spatial factor that may, to varying degrees, support the potential siting of in-scope energy infrastructure. Spatial opportunities are instrumental in highlighting where development is desirable for a given technology, based on its specific requirements. These factors are specifically related to the technical engineering design requirements pillar.

Spatial constraint assessment criteria

To assess spatial constraints, we will score spatial factors based on their evidence-based, individual, substantive importance and their magnitude of effect in relation to the in-scope technology under consideration.

The first criterion aims to consider the significance and distinct characteristics of each spatial factor, including its uniqueness, intactness, and overall value.

The second criterion focuses on the impact that the development of a given type of energy infrastructure could have on the spatial factors. By scoring both the importance and the potential magnitude of the effect, we gain a comprehensive understanding of the significance and relevance of each spatial factor on a given technology. The spatial constraints criteria are negatively scored to reflect these as 'push factors'.

During scoring, the importance of spatial factors is assessed independently. However, there may be instances where it is necessary to adjust scores through a multiplying factor at category, sub-category, or indicator level due to potential bias in the spatial suitability process. Retaining the flexibility to adjust at this stage in the process will help ensure that no single indicator, sub-category, or category is preferentially impacted due to our aggregated process.

Spatial opportunity assessment criteria

Spatial opportunities relate to technical engineering design requirements for a given energy infrastructure type. This assessment aims to capture the level of opportunity provided by a given technical engineering design requirement by evaluating its effect on potential energy output, capital expenditure (CapEx) and operational expenditure (OpEx). These criteria ensure a robust understanding of the criticality of the technical engineering design requirement for siting energy infrastructure and its importance compared to other key drivers. The criteria for this assessment are positively scored to reflect that they are 'pull factors' that enhance the spatial suitability of a given area. The scoring matrix that brings together the criteria for assessing spatial constraints and spatial opportunities is refined through geospatial testing and stakeholder engagement (Figure 15). Neutral scores may also be considered for both spatial constraints and opportunities.

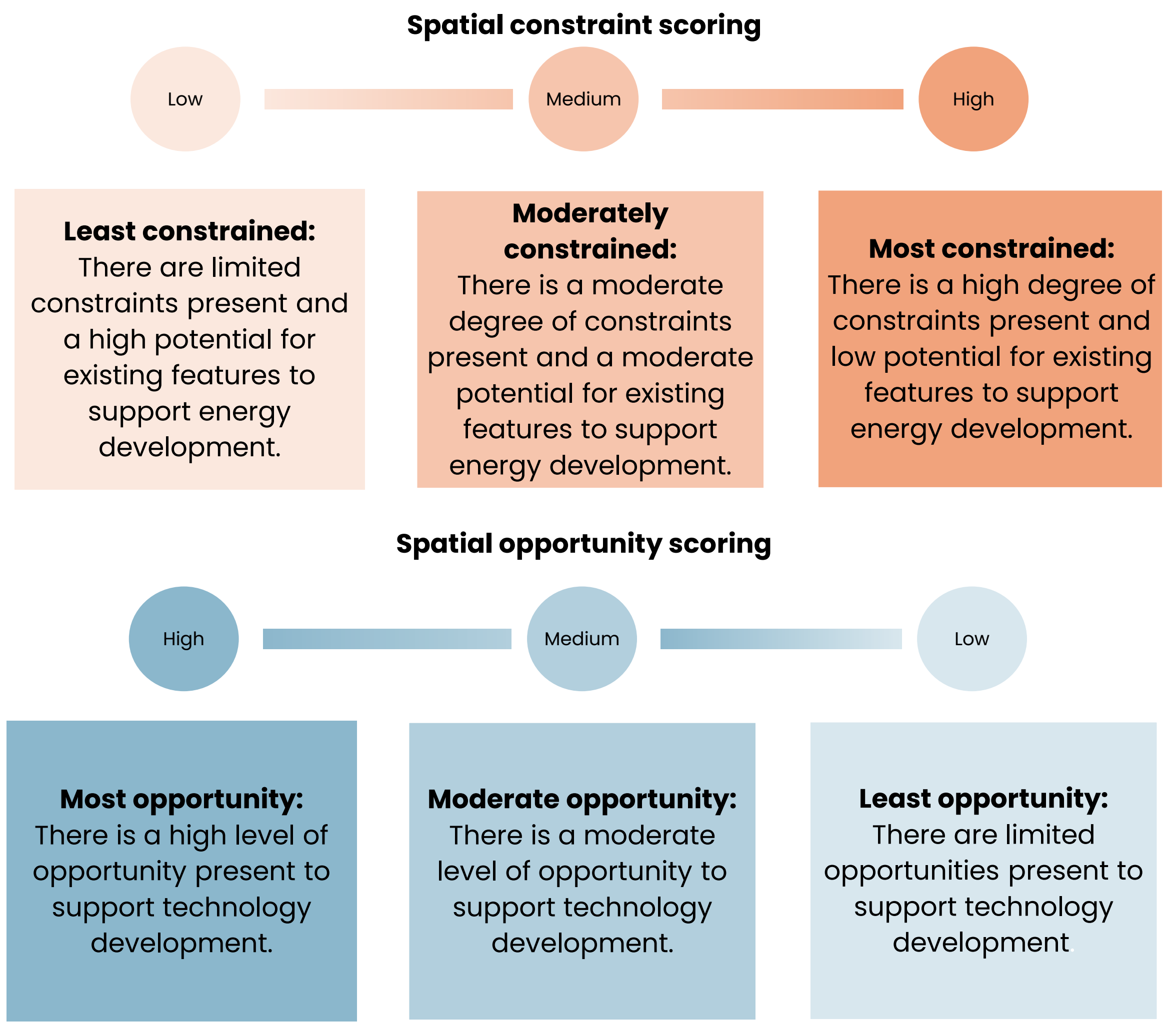

Figure 15: Example of overall scoring approach

Refining spatial suitability

Once the spatial suitability assessment has been conducted, we propose establishing a threshold within the range of scores observed to further prioritise potential developable areas for each technology. Areas that score below this threshold, that is, are less constrained and of highest opportunity, will be considered further, while those scoring higher will be excluded from analysis.

This allows us to focus on areas that are potentially more suitable for development, disregarding areas with more constraints or lower opportunity. The threshold may be determined as a percentile of spatial constraint areas or a cut-off in the overall scores. The threshold will be informed by stakeholder and expert review.

Spatial suitability output

Areas scoring below the spatial suitability threshold will be converted to potential energy outputs. These outputs will be further optimised during sensitivity testing, which is described in the following section.

4.2.4 Optimisation

Initial spatial and economic optimisation

Following the spatial suitability assessment, the initial phase of spatial and economic optimisation occurs. This is where we use the outputs of both the economic and geospatial modelling in an iterative fashion to find an optimal solution. At times, the optimal spatial and economic outcomes could be in conflict. To strike a balance, we will undertake sensitivity testing. This will involve varying the spatial suitability threshold to assess changes in the potential energy output per economic zone, and in turn, the generation in each economic zone. The economic model will then demonstrate the effect on cost of this spatial suitability change. Testing these variables facilitates iteration between the spatial suitability assessments and economic modelling, thereby identifying optimal outcomes that align with the SSEP's objectives.

Sensitivity testing

Types of sensitivities

Within the SSEP, the input data used by our economic modelling too is either a forecast or an assumption, hence, it is not sufficient to optimise the pathway for each modelling scenario with the belief that these inputs are completely accurate. Sensitivity analysis therefore entails a change, or a number of changes, to be made to the initial input data of a modelling scenario, which is then re-optimised to test if it gives a different outcome. All input uncertainties will be considered, prioritising those we expect to have the most significant impact on the outputs from the economic modelling. They will be considered from both a locational impact perspective and a total system cost perspective.

Given the size of the optimisation problem in the SSEP, it is not practical to use commonly used statistical methods such as Monte Carlo analysis[44]. Therefore, we intend to use targeted sensitivity analysis. Our current thinking on sensitivity analysis is included in the following section. However, we will refine the process as appropriate once we begin modelling. We aim to perform two types of sensitivities:

- **Output sensitivities** – Sensitivities that are vital in ensuring the robustness of the modelling outputs. An example could be varying the capital cost of solar farms to understand how sensitive the output (for example, capacity built) is to that cost.

[44] Monte Carlo analysis is a computational method that uses repeated random sampling to model the probability of different outcomes in processes influenced by random variables.

- **Exploratory sensitivities** – Sensitivities that will help rule in or out technologies/theories and answer 'what if' questions. An example could be testing what would happen if interconnection was capped at a specific capacity.

When considering which inputs to vary and by how much, particularly for output sensitivities, we will use our own insight, the output of the economic modelling and stakeholder recommendations. In most cases we will conduct multiple sensitivities on the same input, using a different value each time. This increases our insight into how sensitive an outcome is to variance in the input. Testing a particular sensitivity may affect various components, even those unrelated to the initial input. For instance, higher capital costs for one technology can impact the optimal capacity of another.

Prioritisation of sensitivities

We aim to prioritise those sensitivities with economic and spatial inputs considered to be the most influential for the optimisation of a modelling scenario. This will allow us to gain insight that may be useful to run in the other modelling scenarios, which will save considerable computational effort in the long run.

For output sensitivities, this means that the results of the optimisation will guide the choice of sensitivities that should be run. For example, if the results recommend a large capacity of a particular technology, the dependability of that outcome on technology costs and build rates will likely be tested.

For exploratory sensitivities, those believed to be the most impactful or contain the largest possibility of uncertainty will be prioritised. Sensitivities which are believed to have a very small overall impact will be considered but will have a lower priority. Given the need to ensure robustness of the SSEP, all output sensitivities will have the highest priority. The process by which robustness is measured is described in more detail in Appendix 9.

Once the robustness level has been chosen for all components, they are run through the economic modelling tool for one final optimisation. The outcome of this final optimisation will be a universally optimised outcome where all the components are within a tolerance around their robustness level, which will help inform pathway development. By conducting sensitivity analysis and understanding the variance to the input, we can test the robustness of the modelling outputs to key input data forecasts. Employing robust analysis in sensitivity modelling ensures that the results obtained are reliable and not heavily influenced by minor fluctuations or uncertainties. In the SSEP economic analysis, sensitivity testing enables us to gain a more accurate understanding of the relationships between input parameters and model outputs, allowing for better decision-making and risk assessment.

Deliverability assessment at pillar level

Following the initial spatial and economic optimisation, a balance will be struck between spatial and economic outcomes for pathway options. However, it is expected that modelling outputs will vary in how deliverable they are when assessed against each pillar. Therefore, we will use an analytical approach (the selection criteria for which is described in Appendix 7.1) that involves conducting a detailed analysis of the modelling results to assess their deliverability in a way that is robust, transparent and ensures the perspectives of multiple stakeholders are considered.

The SSEP pillars (economic, environmental, societal and other spatial uses) serve as the primary criteria for evaluating the performance and deliverability of modelling outputs. This approach is based on the observed correlation between impact and deliverability in real-world scenarios. Technical engineering design requirements already reflect deliverability from a technical perspective and do not require any additional assessment, therefore technical engineering design requirements as a pillar is excluded from this assessment. When applying this approach to assessing deliverability, each modelling scenario will have its own set of scales, representing their assessment against each pillar. The extremes of each scale will represent the worst and best-case modelling outputs for the modelling scenario, with other modelling outputs falling between. For economic factors, the range of that scale is determined through the lowest and highest outputs from the economic modelling simulation tool, while for spatial factors it will be between the minimum and maximum observed impact on spatial constraints.

To enable comparison across pillars, the outcomes reflected on each scale will be assigned scores: the most deliverable option (that is, the lowest cost, least spatial impact) being assigned a score of 100 and the least deliverable (that is, the highest cost, most spatial impact) being assigned a score of 0. Other modelling outputs will fall in between these relative extremes. For further detail on how we establish these impact ranges, see Appendix 9.1.

Once all criteria have been relatively scored for each modelling output, the overall impact on spatial constraints can be broken down into the impact on each spatial pillar (environment, society and other spatial uses) as shown in Figure 16. Through engagement and analysis, this approach allows us to establish whether modelling outputs are deliverable based on the impact on spatial and economic factors.

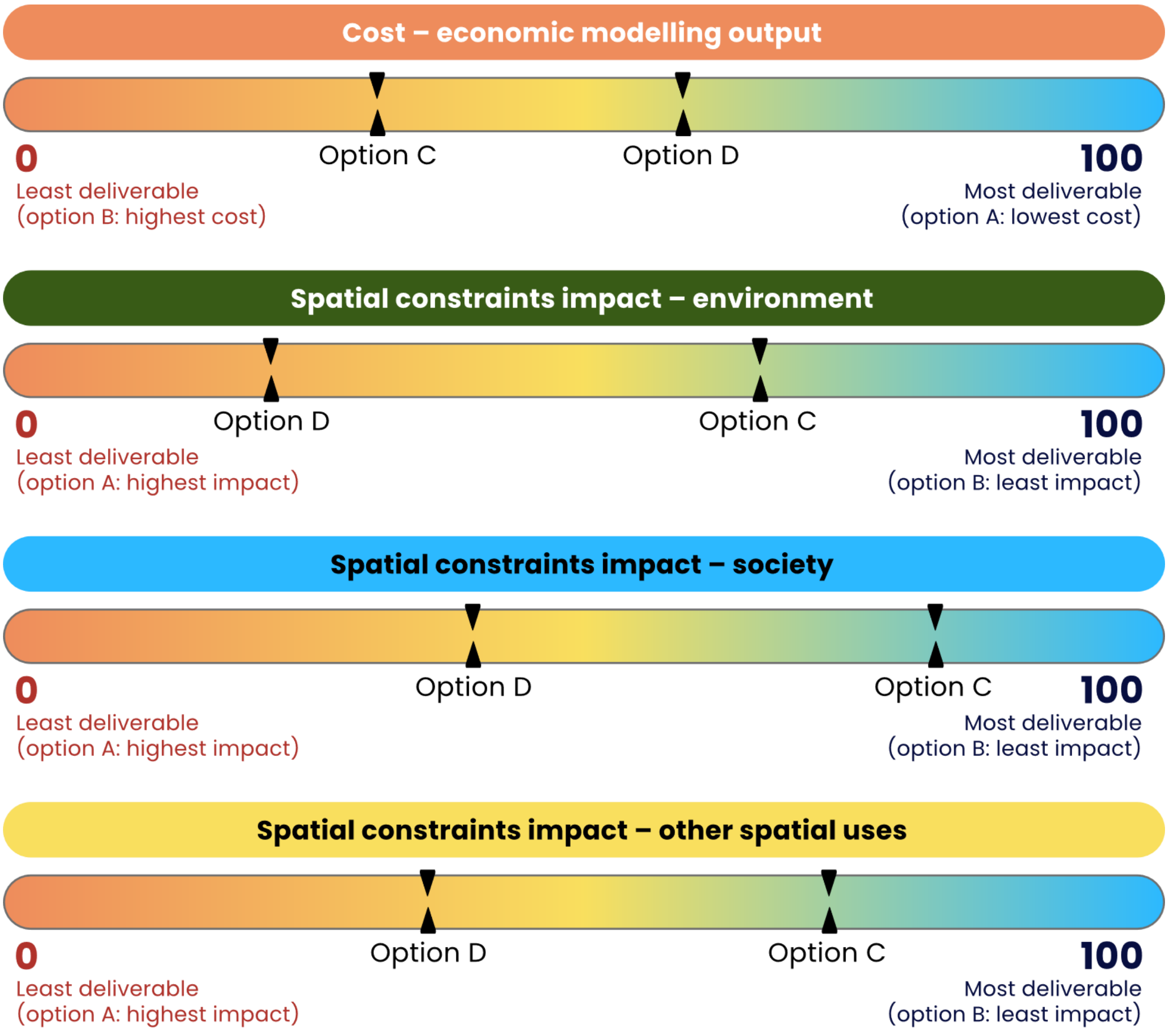

Figure 16: Relative scale of deliverability

If modelling outputs are determined to be deliverable, weighting at pillar level will not need to be applied. Should it be determined that modelling outputs are not deliverable due to the degree of impact on any of the SSEP pillars, we may undertake a process of 'swing' or 'pairwise' weighting to achieve a deliverable outcome. For further detail on the process of swing weighting and assessing deliverability, see Appendix 9.1.

Contextual overlays

The SSEP will use contextual overlays to provide essential background information to the modelling and spatial evaluation. These are visual layers depicting a specific dataset in GIS. For instance, overlaying national spatial plans and policies for energy infrastructure, existing energy infrastructure or visualised results from the SSEP societal survey.

While the core modelling and inputs remain the driving force of the SSEP, we will utilise overlays to examine, help ratify and contextualise the inputs and outputs of the modelling process. Overlays also provide a transparent and visual mechanism for stakeholder engagement, demonstrating how these datasets have been evaluated and utilised. Therefore, the application of information as overlays enables distinct separation and clear communication of the primary criteria driving the outcomes, while also illustrating how additional considerations relate to the optimised outcomes identified throughout our modelling process.

Existing spatial plans

A key set of contextual overlays will be that of existing national spatial energy plans including their spatial assessments. Such plans and assessments will be overlaid onto the outputs emerging from our modelling to:

- enable transparency and stakeholder dialogue
- identify the reasoning behind potential differences between the SSEP outputs and existing spatial plans
- make any necessary adjustments and refinements in our process or inputs
- provide a collaborative tool for engagement

There will be a prescribed process for overlaying existing spatial plans and addressing any changes resulting from the evaluation. This process will include engaging with relevant stakeholders, collaborating on courses of action based on findings and using appropriate escalation routes when SSEP outputs and existing spatial plans differ, if applicable.

An example of using overlays is with the cross-comparison and evaluation of spatial assessments conducted for offshore wind generation in Scotland as part of the current sectoral marine plan. This plan can be integrated with the outputs of the SSEP for enhanced analysis and contextual understanding. We will consider such work in our analysis and update it when new information becomes available.

4.2.5 Modelling outputs for further evaluation

During the modelling process, costs are continuously balanced and traded off against spatial assessments to achieve a balanced outcome that minimises costs and maximises the utilisation of potentially developable areas. After conducting thorough sensitivity and deliverability analysis, optimised modelling outputs are achieved. The modelling outputs are transitioned to the appraise phase for the development of pathway options, set out in Chapter 5 – Appraise.

5. Appraise

5.1 Appraise: chapter overview

This chapter explains how we produce a set of carefully chosen pathway options. These will be presented to the UK Energy Secretary, who then decides on the pathway to be used for the draft SSEP consultation. The chapter also covers how the environmental impacts of the chosen pathway are assessed.

Our appraisal process for developing suitable pathway options is guided by key principles - minimising economic and spatial impact and the ability to meet future policy ambitions. All pathways will be designed to support achieving net zero by 2050 and establish a secure energy system in GB.

This chapter describes the pathway options selection process. It is designed to combine analysis, strategic direction by governance committees and stakeholder input, to arrive at a final subset of options that will be presented to the UK Energy Secretary. It also describes how the environmental impact of these options is considered. The chapter concludes by outlining the environmental assessments undertaken on the UK Energy Secretary's chosen pathway.

Main messages

- Economic and spatial modelling will facilitate the comprehensive assessment of multiple possible pathways, including the identification of trade-offs, guided by our key principles. A 'low regrets' pathway will be created, defined as having a higher level of consistency in the pathway elements across the plausible futures considered.
- Potential pathways will be presented to governance committees, together with a comprehensive explanation of the options, their differences in strategic direction and steers needed on key points.
- Pathway options will be refined to consider feedback from governance committees and stakeholders. This will produce a subset of pathways for submission to the UK Energy Secretary. These options will be accompanied by SEA, HRA and MCZ pathway options reports.
- Once all the information on the pathway options has been evaluated, the UK Energy Secretary will choose a single pathway option for the draft SSEP consultation. It will also be the pathway for the SEA Environmental Report, HRA Report to Inform and the MCZ Assessment Report, which together comprehensively assess the environmental impacts of the selected pathway.

5.2 Summary of the appraisal process

Comprehensive evaluation and refinement will be crucial to identifying the SSEP pathway options. The evaluation and selection of these pathways is guided by their ability to minimise costs and spatial impacts and to meet the impactful themes derived from the SSEP policy framework.

The creation of pathway options happens throughout the model and appraise phases and is driven by observation of key insights. The SSEP policy framework establishes and defines the modelling parameters which initiate this. Sensitivity testing will be undertaken to help determine the economic inputs that have the most significant impacts on economic modelling outputs, and we will assess overall deliverability of pathway options against each of the SSEP pillars. Once these outcomes have been assessed, governance committees will provide strategic direction to refine and evaluate the pathway options selected.

The options will be presented to internal and external governance committees, accompanied by relevant information such as cost, spatial impacts, alignment with government policies, stakeholder views and key differences between pathway options. Feedback and insights from the committees will then be used to evaluate and further refine the pathway options. The environmental impacts of these options will then be assessed and presented as an SEA, HRA and MCZ Pathway Options Report.

The pathway options will be shared with Welsh and Scottish energy ministers and Ofgem for their views. The UK Energy Secretary will select a pathway for the draft SSEP consultation. Analysis required for the SEA Environmental Report, Report to Inform HRA and MCZ Assessment Report will be undertaken on the selected pathway.

5.3 Assessment of pathway options

Pathways will be assessed against their ability to achieve SSEP objectives. The principles guiding the evaluation and selection of pathway options are:

- minimising costs
- minimising spatial impact
- maximising spatial opportunity
- achieving future policy ambitions

These will serve as the foundation for testing and evaluating different outcomes and options within the appraisal process. Using the principles as levers, we will assess the impact of various economic, spatial and policy decisions and determine to what degree each option fulfils the four principles.

5.3.1 Process

To develop pathway options, we will follow these steps:

Assess results

Guided by the principles, we will evaluate the outcomes derived from economic and spatial modelling and, if required, identify the significant trade-offs and pending decision points.

By conducting tests on a wide range of modelling scenarios and performing sensitivity analysis on model inputs and outputs, the modelling process enables a comprehensive assessment of various possibilities. This approach facilitates a thorough evaluation and is expected to identify significant trade-offs and decisions that may need to be considered. Trade-offs may be identified between the SSEP pillars or the guiding principles of pathway appraisal. It is important to note that we will only be identifying potential trade-offs and not recommending solutions to them.

These outputs serve as strategic guides, providing insights into the potential pathways for achieving net zero goals while balancing the economic, societal, other land use and environmental considerations. By analysing the results and testing a wide range of modelling scenarios, a clearer understanding of the potential pathways for decarbonisation will emerge.

A ‘low regrets’ pathway will be created, defined as having a higher level of consistency in the pathway elements across the plausible futures considered. In practice, this means that the energy infrastructure in the ‘low regrets’ pathway is commonly found in most other pathways. However, this does not imply that it would be suitable for all other modelling scenarios individually. Rather, it represents a versatile foundation capable of adapting to various possible futures.

The identification process for a ‘low regrets’ pathway involves examining the results in detail to select pathway options with substantial margins of viability for meeting the minimum requirements across the plausible futures considered. This ensures the chosen options can accommodate potential changes or adjustments, reducing the risk of becoming unfeasible if circumstances were to shift.

Stakeholder assessment

Information on the outputs of the modelling will be shared with expert working groups and societal and community stakeholders, whose feedback will influence the pathway options presented to the UK Energy Secretary. We will evaluate the acceptability of potential pathway options among a diverse set of stakeholder groups.

Additionally, a societal assessment process, informed by research, will provide insight of societal views on potential pathways.

By considering a range of perspectives, and the potential impact of pathways on various regions, communities, and sectors of society, we can gain an understanding of their potential acceptability. This will help to ensure a comprehensive and inclusive societal appraisal of the pathways.

Strategic direction by governance committees

Pathways will be presented to governance committees to obtain direction and facilitate decision-making at key points.

Once the trade-offs and insights have been understood, these options will be presented for internal and external governance. This is a key element of appraisal that recognises certain decisions require strategic judgment in addition to analysis and cannot be resolved through analytical processes alone.

Based on the geospatial and economic modelling outputs, all the shortlisted options will be accompanied by an explanation of when and where infrastructure should be built across GB on a zonal level, how this differs between pathway options and the key factors driving these differences, such as:

- the relative cost of the pathway option
- what spatial impacts each option represents
- how the pathway options align with UK, Scottish and Welsh government policies, plans and targets

Evaluation and refinement

Building on the feedback and insights provided by the governance committees and by stakeholders, this stage evaluates and refines further the available options to ensure they align with desired objectives and priorities.

Pathway options for selection

A set of pathway options will be provided to the UK Energy Secretary for consideration, who will then decide which one is to be used for the draft SSEP consultation. The options will include at least one ‘low regrets’ option among other pathways, each one selected and refined through the described process, using the principles and objectives as guides. Fundamentally, these options will consist of those most likely to succeed across a range of plausible futures while meeting the SSEP objectives and considering the interests of stakeholder groups.

Our modelling approach is the foundation for this phase of the process, offering invaluable insights into the trade-offs and considerations involved in selecting the most suitable pathways for achieving the desired outcomes. The direction taken in this pathway selection process is contingent upon robust governance mechanisms and effective decision-making structures in line with the objectives and principles outlined above.

Through this iterative process between modelling and governance, the SSEP will ensure the selected pathways are well informed, robust, and aligned with the objectives of the energy transition.

5.4 Environmental assessment of options

5.4.1 SEA reasonable alternatives assessment

The SEA legislation applicable to England, Wales and Scotland requires the SEA to identify, describe and evaluate the likely significant environmental effects of the SSEP. The legislation also requires the setting of reasonable alternatives which account for the objectives and geographical scope of the SSEP.

We have undertaken a review of the potential approaches to assessing reasonable alternatives, identifying the most beneficial to the SSEP's development. Through internal and external engagement, it was agreed that using the pathway options presented to the UK Energy Secretary is the most appropriate approach. This assessment will feed into the SEA Pathway Options Report (described in Section 5.4.2) and, because the reasonable alternatives assessment is published in the SEA Environmental Report, provides transparency on the environmental impacts of the pathway options.

Each of the selected alternatives will be assessed against the SEA framework of objectives, the assessment questions developed during scoping and the evidence base developed for the SEA. For each alternative, a commentary of the findings of the assessment will be presented, providing a clear overview of the relative sustainability merits of each alternative considered.

5.4.2 SEA, HRA and MCZ Pathway Options Reports

To appropriately inform pathway decision-making, we will look to use the SEA, HRA and MCZ assessment processes to provide relevant environmental information on the options presented. The SEA, HRA and MCZ Pathway Options Reports will be submitted to support the UK Energy Secretary's selection of the pathway used for the draft SSEP consultation.

SEA Pathway Options Report

Once it has been decided which options will be presented to the UK Energy Secretary, we will produce an SEA Pathway Options Report to provide context on the selected pathways using the information gained during the SEA reasonable alternatives assessment. The SEA Pathway Options Report will present information in a clear, accessible, and concise manner, using visual aids and infographics.

HRA Pathway Options Report

Rather than waiting until the final option has been selected, the HRA process will begin when the pathway options are shortlisted for the UK Energy Secretary.

Each of the shortlisted pathway options will be assessed against the HRA criteria developed at the evidence gathering stage. These assessments will draw on the outputs of the spatial evaluation, plus information on the impact of pathway options, zones of influence, qualifying features, and conservation objectives of internationally important wildlife sites.

Focus will be given to identifying whether any options have less of an effect on internationally important wildlife sites and whether there are any options less likely to require reliance on derogations. For each alternative, a commentary discussing the findings of the assessment will be presented, with a view to providing a clear overview of each option's merits.

MCZ Pathway Options Report

We are in the process of developing a detailed MCZ assessment methodology for the SSEP. However, there will be a level of MCZ assessment on the pathway options presented to the UK Energy Secretary.

5.4.3 SEA Environmental Report

Once the pathway has been chosen for consultation, an SEA Environmental Report will be prepared. This will be the main output of the SEA process and will accompany the draft SSEP for public consultation. It will be presented in a clear and concise manner, using simple and clear language and supported by maps and other illustrations where appropriate.

The SEA Environmental Report will present the information required by the relevant SEA legislation for each GB nation. Its purpose is to present readers with an informed assessment of the draft plan, as well as an assessment of the reasonable alternatives identified.

It will detail the likely significant environmental effects of the draft SSEP, covering topics such as biodiversity, water, community wellbeing and cultural heritage, which were identified during the scoping stage and considered relevant to the SSEP. The effects identified will include cumulative, short-, medium-, long-term, permanent, and temporary and positive and negative effects. To account for potential cumulative effects, the SEA will undertake an in-combination assessment of the interaction between SSEP proposals and other relevant plans or programmes. Following this, the SEA will identify appropriate mitigation at a level consistent with the assessment.

5.4.4 Report to Inform HRA

The Report to Inform HRA will be produced following the decision on the pathway for consultation. The broad stages of the HRA process are outlined in Figure 17.

1 **Evidence gathering**
Collecting information on relevant European sites, their conservation objectives and characteristics and other plans or projects

2 **HRA Task 1: Likely significant effects ('screening')**
Identifying whether a plan is 'likely to have a significant effect' on a European site

3 **HRA Task 2: Ascertaining the on-site integrity**
Assessing the effects of the plan on the conservation objectives of any European sites 'screened in' during HRA Task 1

4 **HRA Task 3: Mitigation measures and alternative solutions**
Where adverse effects are identified at HRA Task 2, the plan should be altered until adverse effects are cancelled out fully

Figure 17: Four-stage approach to HRA

Test of likely significant effects

Following evidence gathering, the first stage of any HRA will be the Likely Significant Effect (LSE) test. This is essentially a risk assessment to decide whether the full subsequent stage known as appropriate assessment is required. Case law has established that, 'likely' really means 'possible' and a 'significant' effect is one where reasonable scientific doubt remains as to whether it would affect the ability of a habitats site to achieve its conservation objectives. Case law has also established that the assessment must be undertaken without reference to any mitigation measures specifically introduced to protect internationally important wildlife sites.

Appropriate assessment

The second stage of HRA will be the appropriate assessment. Case law has established appropriate assessment is not a technical term; it literally means whatever level of assessment is appropriate to form a conclusion regarding effects on the integrity of internationally important wildlife sites.

As such, it has no set methodology. The steps will be essentially identical to those of the LSE stage but will involve more detail. The methodology will be tailored to the specific impacts requiring investigation and the interest features of the relevant internationally important wildlife sites. It is at this stage that mitigation measures specifically introduced to protect such sites will be considered.

In accordance with the Habitats Regulations, at the test of likely significant effects and appropriate assessment stages, the effects of the plan will be considered both individually and in combination with other relevant plans or projects.

Derogations

If during the appropriate assessment stage, it is identified that the adverse effects on the integrity of internationally important wildlife sites cannot be dismissed from the selected pathway (considering qualifying features of a designated site, its sensitivities and conservation objectives), derogation will be required. The legal tests are:

- There are no feasible alternative solutions that would be less damaging or avoid damage.
- There are IROPI.
- The necessary compensation measures can be secured.

The Report to Inform HRA will then be shared with statutory stakeholders, including Natural England, Joint Nature Conservation Committee, Natural Resources Wales, NatureScot and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland.

5.4.5 Marine Conservation Zone assessment

Under Section 126 of the *Marine Coastal Access Act*[45], duties are placed on the MMO in England, Natural Resources Wales (NRW in Wales) and DAERA in Northern Ireland, Marine Licencing Teams to consider MCZs for the purpose of plan authorisation.

Pending a detailed screening process, at this stage the impact pathways[46] associated with the SSEP are not anticipated to overlap with Northern Irish MCZ boundaries. However, as the protected features under consideration in the MCZ assessment can be mobile species, the mitigation measures considered for English and Welsh MCZs and Scottish MPAs may be relevant to some Northern Irish MCZs. In this way, the effects to the protected features of Northern Irish MCZs will be considered in the assessment but will not be subject to the full assessment process, as they are not included in the geographic extent of the SSEP.

In the absence of formal guidance from NRW or DAERA on the assessment of MCZs in Welsh and Northern Irish Waters, the MMO guidance for English MCZ assessments will be applied to MCZs in Welsh and Northern Irish waters, thereby remaining compliant with the *UK Marine and Coastal Access Act 2009*.

MPAs in Scotland are designated under the *Marine (Scotland) Act 2010*[47] and the *UK Marine and Coastal Access Act 2009*. In the absence of formal guidance from the Scottish

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45 *Marine and Coastal Access Act* (2009) - legislation.gov.uk/ukpga/2009/23/contents

46 The sequence of events or steps through which a plan (the SSEP) might impact a sensitive receptor (MCZs and MPAs for the MCZ assessment).

47 *Marine (Scotland) Act* (2010) - legislation.gov.uk/asp/2010/5/contents

MD-LOT on their assessment, the MMO guidance for English MCZ assessments will again be applied. Where we refer to MCZs throughout the document, MPAs are included too.

The MMO guidance describes how MCZ assessments should be undertaken during the process of plan authorisation. These MMO guidelines recommend a staged approach to assessment, involving three sequential stages: screening, stage 1 assessment, and stage 2 assessment. Full details of these stages are provided below.

Screening

The assessment approach applied during the MCZ screening is based on the MMO guidance document ‘Marine conservation zones and marine licensing’ and presented in Figure 18.

Identify all MCZs in and around the SSEP activities

Examine the conservation objectives of each MCZ potentially affected by the SSEP activities

Consider the SSEP activities and the changes that they may cause which may be relevant to MCZs; duration, location and extent, as can be reasonably predicted at this stage

Identify if any elements of the SSEP activities are likely to have a significant effect on any MCZ protected features or processes both directly or indirectly

If SSEP activities are capable of significantly affecting protected features, or ecological or geomorphological processes of the MCZ, then proceed to stage 1

Figure 18: MCZ screening process

Stage 1

The Stage 1 assessment takes place after the screening process and considers the ‘likelihood of an activity causing an effect, the magnitude of the effect should it occur and the potential risk any such effect may cause on either the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant'.

This should be considered in terms of whether they hinder the achievement of conservation objectives or maintenance or achievement of favourable status. If mitigation to reduce identified impacts cannot be secured and there are no other alternative locations, then the plan will proceed to be considered under stage 2 of the assessment process.

Stage 2

The stage 2 assessment considers whether the socio-economic impact and benefit to the public of the proposed plan outweighs the risk of damage to the environment. There are two parts to the stage 2 assessment process:

1. Does the public benefit in proceeding with the plan clearly outweigh the risk of damage to the environment that will be created by proceeding with it?
2. If so, can the applicant satisfy that they can secure, or undertake arrangements to secure, measures of equivalent environmental benefit for the damage the project will have on the MCZ features?

Finally, it will be the responsibility of the MMO to determine if the plan authorisation process is successful.

6. Consult

6.1 Consult: chapter overview

This chapter explains how we will carry out a formal consultation on the SSEP and use subsequent feedback to enhance the plan. It also covers the same process for the statutory environmental reports accompanying the SSEP - the SEA Environmental Report, Report to Inform HRA and MCZ Assessment Report.

Our consultation process is designed to be flexible, open, inclusive, and responsive to community and industry needs. Using structures and forums established during the SSEP's development, we will engage a broad range of political, societal, industry and community stakeholders, gathering valuable perspectives.

This will be analysed using a wide range of tools, including artificial intelligence (AI), to develop robust and accurate findings that in turn create clear actions for improving the SSEP.

Alongside this, consultation will also be completed for the SEA Environmental Report, Report to Inform HRA and the MCZ Assessment Report, with responses duly considered, implications evaluated, and updates published via addendums.

Main messages

- We will engage with the same sectors as we have throughout the SSEP's development, including expert working groups on industry and spatial planning.
- This will be supported by societal engagement through opinion surveys or targeted focus groups, outreach to prominent interest and campaign groups and sector-specific briefing packs.
- A range of communication tools and diverse engagement methods will be deployed, including visual representations of the plan, text descriptions and direct engagement such as webinars and stakeholder meetings.
- AI will also be used to summarise the consultation data to support transforming it into actionable insights.

6.2 Our approach to stakeholder feedback

Stakeholder feedback is essential to the development of the SSEP. Insights, perspectives, and recommendations from stakeholders are built into the development of the plan and will be invaluable as we deliver on the aims of the SSEP. An important element of this will be formal consultations on specific parts of the plan.

To give stakeholders the opportunity to help shape our plan, we sought feedback on our draft methodology (published in December 2024) via consultation. We would like to extend our sincere thanks to everyone who took the time to respond to the consultation. Details of the insights we gathered can be found in the Consultation Feedback Response in Appendix 11, where we explain how we have considered and acted on the main stakeholder feedback themes to inform the development of the SSEP. In addition, we will later seek feedback on the draft SSEP via public consultation.

Alongside our draft SSEP, we will publish the SEA Environmental Report in line with our statutory obligations, and the Report to Inform HRA and MCZ Assessment Report to give the public the opportunity to understand and comment on the environmental impacts of the draft plan.

Our consultations will be wide-reaching and inclusive and guided by the Gunning Principles, ensuring everyone can have a say. They will be run in addition to the ongoing stakeholder engagement, which is outlined in the stakeholder approach section. These methods balance broad and meaningful engagement with stakeholders and experts, creating a robust plan and encouraging advocacy for its direction.

6.2.1 Draft SSEP consultation

The UK Energy Secretary will select a pathway to be used for the draft SSEP consultation, providing the opportunity for society and a wide range of stakeholders to have their say.

We will employ a range of communication tools and diverse engagement methods to explain to the public and stakeholders how the plan has been developed to date and the role that society has played in its creation. Our activities will include visual representations of the plan, text descriptions and direct engagement such as webinars and stakeholder meetings. These efforts aim to provide accessible information and data to various stakeholders interested in the SSEP.

We want to make sure that the SSEP reflects the needs, values, and ambitions of society, while delivering on the commission. By providing an overview of engagement to date, we will highlight the journey to the development of the pathway and the significant role that engagement has played.

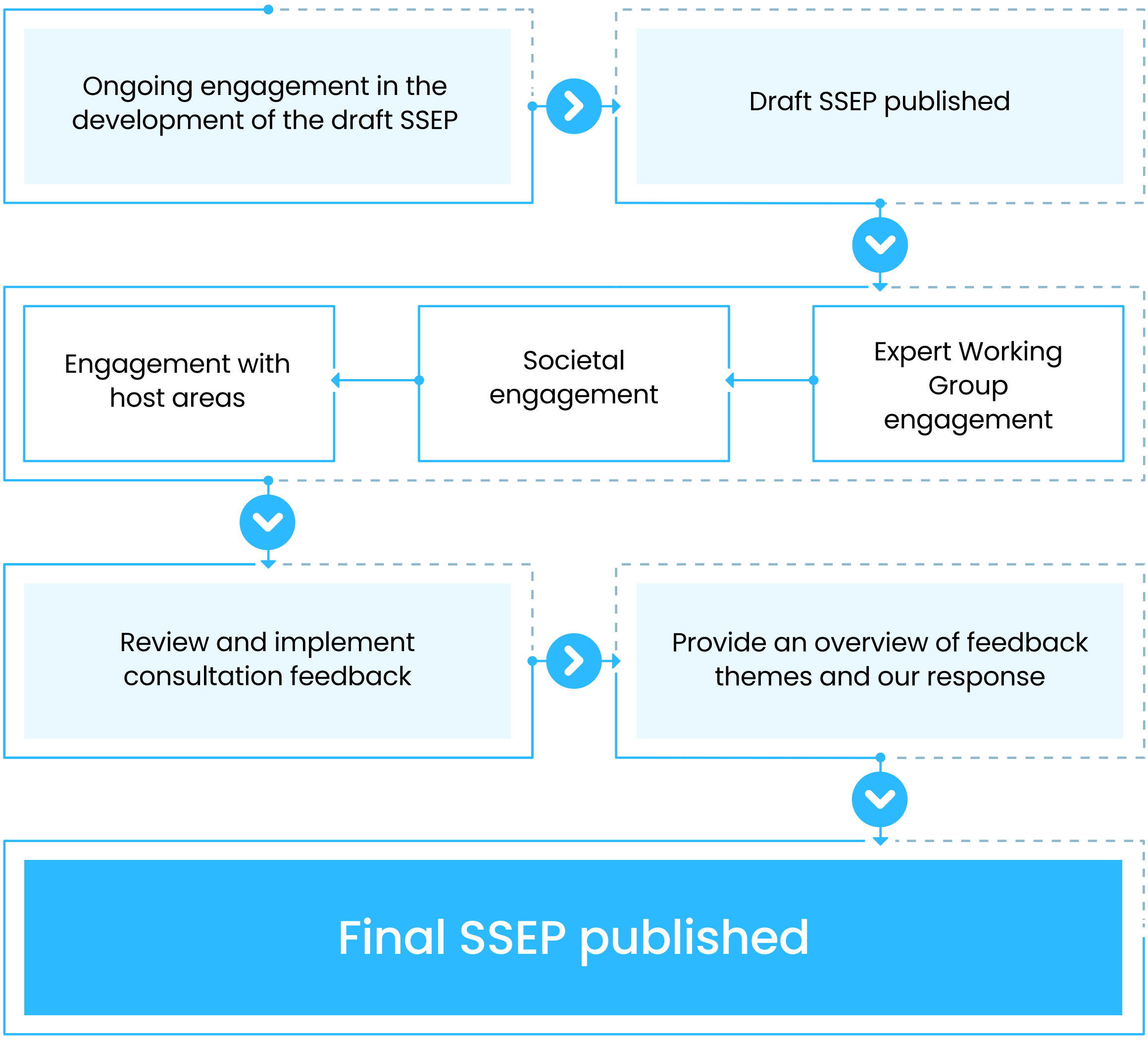

Figure 19: Consultation stakeholder engagement process

We will engage with the same sectors as we have throughout the development of the SSEP (see Sections 2.4 and 2.5 for more information on our engagement with stakeholders and with society), including expert working groups on industry and spatial planning.

This will be supported by broader societal engagement, which will include re-testing societal acceptance of the necessary trade-offs in the draft SSEP. To better understand these aspects, we will employ various methods, which could include opinion surveys, targeted focus groups and outreach to prominent interest and campaign groups. Additionally, sector-specific briefing packs will be used to update these groups on the draft SSEP.

Following publication of the draft SSEP, we will continue to engage with the host areas identified as being best suited for energy infrastructure development. Our experience indicates that communities want to participate in the decision-making process. In addition, they want to understand who the key decision-makers for different types of energy infrastructure are and how they can influence outcomes. We will utilise the structures and forums established during the SSEP development to address these points and facilitate conversations among political, societal, industry and community stakeholders about the draft SSEP content and rationale. We will also remain reactive and responsive to community and industry needs, continually evolving our engagement activities accordingly.

6.2.2 SEA Environmental Report, HRA Report to Inform and MCZ Assessment Report consultation

Public and statutory consultation are legislative requirements for the SEA Environmental Report. This will form the key consultation document in the SEA process, providing an explanation of the environmental effects of the draft plan and reasonable alternatives, along with an opportunity to comment.

For the HRA Report to Inform and MCZ Assessment Report, we are only required to consult statutory bodies. However, to maintain transparency, it will also be published for public consultation.

The statutory and public consultation for the SEA Environmental Report, HRA Report to Inform and MCZ Assessment Report will take place alongside the draft plan consultation. For further information on consultees, refer to Section 2.6.6.

6.2.3 Use of artificial intelligence (AI)

The SSEP will engage a broad range of societal groups to ensure that a diversity of views and opinions are considered during its development. AI will be employed to support summarising of the data and transforming it into actionable insights, facilitating a more efficient and comprehensive understanding of stakeholder perspectives across various sectors of society. All feedback received from stakeholders on the SSEP will be read and reviewed by a human in both its raw and summarised form.

AI's ability to handle diverse data sources and formats enhances our capacity to engage with a wide range of stakeholders. Whether the feedback comes from surveys, meetings, forums, emails or other channels, AI can integrate and analyse this information cohesively. AI can process large volumes of feedback quickly and accurately, ensuring that no valuable insights are overlooked. Additionally, AI can identify patterns and trends within the feedback that might not be immediately apparent to human reviewers alone.

When we make decisions on the SSEP, AI will help ensure that the voices of all stakeholders are heard and considered. AI will not be used to make decisions autonomously, but serve as a tool to enhance, rather than replace, human judgement and support decision-making.

AI will help to highlight important issues and common themes, allowing us to include stakeholder feedback in the SSEP more effectively and proactively. This comprehensive approach ensures that stakeholder input into the SSEP is informed by a broad spectrum of perspectives, allowing us to respond in a timely and appropriate manner.

We will regularly review our use of AI in interpreting stakeholder responses and we will be able to track any stakeholder insight identified by AI to its original source.

We acknowledge the potential for biases in AI platforms. We will incorporate bias mitigation strategies into our AI planning processes. This proactive approach will help us ensure that the actionable insights our AI systems provide are fair, unbiased and reflective of the diverse range of stakeholders' views.

Additionally, we recognise our responsibility to maintain transparency and due diligence in all our AI-related activities. Our AI use will strictly adhere to NESO's relevant policies, including AI, data management, data privacy, data classification and data sharing. These policies ensure that our AI practices are aligned with our commitment to ethical standards and regulatory compliance.

7. Refine

7.1 Refine: chapter overview

The refinement phase is an opportunity to improve the final SSEP through stakeholder feedback and insights, guided by the principles of inclusivity, coherence, continuous learning, transparency, and collaboration.

Main messages

- Through ongoing and proactive stakeholder engagement, we will address potential issues, gather valuable input and adjust our plans and processes in line with feedback and emerging best practice.
- The SSEP's processes are designed to be flexible and adaptable in this sense, ensuring the final SSEP achieves its objectives and delivers the best outcomes possible for stakeholders.
- Our refinement process strikes a balance between incorporating stakeholder perspectives and maintaining the overall robustness, coherence and consistency of the SSEP.

7.2 Principles of refinement

There are several principles that will underpin our approach to the refine process of creating the SSEP.

Inclusivity and engagement – We will continue to prioritise inclusivity and meaningful engagement with stakeholders, valuing the input and perspectives collected in consultation throughout the refinement phase. We will strive to strike a balance between different stakeholder perspectives, considering the weight of feedback based on its representativeness, significance and alignment with project and national planning objectives.

Coherence and consistency – While refining the SSEP, we will strive to maintain overall coherence and consistency. Changes made during the refinement process will be carefully balanced to ensure that the plan remains robust and aligned with its objectives. Changes will be evaluated for their feasibility and practicality, considering technical, economic, environmental, and societal aspects to mitigate adverse effects as a result of changes made.

Continuous learning and improvement – Alongside the process of incorporating stakeholder feedback, we will use this period to reflect on lessons learned and actively seek opportunities to refine the SSEP and processes based on emerging best practices and new information. Lessons learned will be incorporated in the process of refining the

SSEP should this benefit the overall quality and effectiveness outputs. Feedback received from the consultation will also inform future versions of the SSEP.

Transparency – Throughout the refinement process, we maintain transparency on the modifications made. Explanations will be provided for how consultation feedback has been considered and incorporated, ensuring that stakeholders are informed about the outcomes and the reasons behind them.

Collaboration – We will work closely with governance forums, technical experts and relevant stakeholders to evaluate proposed changes and ensure their effective implementation. This collaborative approach allows us to consider various perspectives and expertise in assessing the feasibility, costs and timelines associated with any refinement that is proposed.

7.3 Proactive refinement

Throughout the SSEP's development, we will encourage ongoing stakeholder engagement and refinement via stakeholder engagement channels.

This approach ensures that development and outputs are consistently aligned with stakeholder interests, address concerns and maintain a balanced and informed approach from the outset.

By involving stakeholders early in the SSEP's creation, potential issues can be proactively addressed, input can be gathered, and adjustments can be made along the way. This proactive involvement strives to reduce the need for significant changes during the public consultation phase and allows for the incorporation of key feedback and perspectives from the beginning. Notwithstanding this, the SSEP process is designed with flexibility in mind, allowing for refinement and adjustments as needed. This flexibility enables us to effectively respond to evolving circumstances based on lessons learned from the public consultation phase and refine the SSEP to achieve optimal outcomes.

In summary, the refinement phase of the SSEP process aims to improve the final SSEP by incorporating stakeholder feedback, lessons learned and best practices. This will be in addition to the SSEP incorporating feedback throughout its development via stakeholder groups; however, refinement may incorporate additional considerations if required. As such, this part of the process is designed to ensure the final SSEP aligns with stakeholder interests and achieves the objectives of the SSEP.

7.4 Analysing stakeholder feedback

We greatly value input from our stakeholders as it plays a vital role in shaping and refining the plan.

We are committed to transparency and will clearly communicate which suggestions have been incorporated and the reasons why certain views cannot be implemented. We will explain to stakeholders how we will consider their feedback and how they can inform, influence, and improve the plan, while adhering to the confidential nature of the work where appropriate.

We will analyse the feedback from our consultations alongside views from our stakeholder groups and governance forums. After all feedback is digested, it will be grouped into themes and presented back as part of the final documents. An example of this is in Appendix 11, where we explain how we have considered feedback and what action we have taken in response.

7.5 SEA Environmental Report Addendum

Once the consultation on the draft SSEP and accompanying SEA Environmental Report has been completed, the responses received will be considered and their implications for the SEA process evaluated.

Where appropriate, assessments in the SEA Environmental Report will be updated to reflect significant changes to the SSEP in light of responses received and new or updated evidence.

The updates to the assessments will be presented in the Environmental Report Addendum, which will be made available alongside the updated plan. If no updates are required, this will be highlighted in the subsequent SEA Adoption Statement.

7.6 Report to Inform HRA and MCZ Assessment Report Addendum

After the completion of consultation on the draft SSEP and accompanying Report to Inform HRA and MCZ Assessment Report, responses received will be considered and their implications in relation to the HRA and MCZ assessment processes evaluated.

Where appropriate at this stage, the Report to Inform HRA and MCZ Assessment Report will be updated to reflect any significant changes to the SSEP made because of the responses received and any new or updated evidence.

Prior to endorsement of the SSEP by the UK Government and Ofgem, the Competent Authority will then use the Report to Inform for their own formal HRA, which will be consulted upon with statutory stakeholders including Natural England, Joint Nature Conservation Committee, Natural Resources Wales, NatureScot and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland.

8. Publish

8.1 Publish: chapter overview

This chapter explains what to expect in the final SSEP publication.

Main messages

- We will submit the final SSEP to the UK Energy Secretary, the Scottish and Welsh governments and the energy industry regulator Ofgem for their endorsement. We will also publish it on our website.
- The SSEP will be available in two formats: a digital PDF with interactive navigation and a downloadable print version. Both formats will contain the same content, with the digital version including additional guidance for navigation.
- The SSEP will feature clear, readable design elements and concise, informative content. It will include an executive summary, context on the SSEP's purpose and its alignment with government strategies.
- The SSEP will incorporate graphs, charts, maps and tables, as well as links to supporting documentation. A glossary will be included to make the document more accessible.
- An SEA Adoption Statement will be published alongside the SSEP, which will detail the SEA process, its influence on the SSEP, consultation feedback and monitoring processes.

8.2 The final SSEP output

We will submit the final SSEP to the UK Energy Secretary, the Scottish and Welsh governments, and the energy industry regulator Ofgem for their endorsement.

The SSEP will be published on a dedicated page on the NESO website, the link to which will be shared on all NESO social media channels. This will be supported by wider stakeholder communication in the form of a public webinar and externally through a NESO digital newsletter. In addition, NESO will publish a data workbook, which will enable transparency and clarity for the key inputs into the SSEP modelling process.

NESO is currently developing a Welsh language policy in collaboration with the office of the Welsh Language Commissioner. As this work and policy develops, the final output of the SSEP and its wider engagement will be compliant with the policy.

To ensure the document is accessible for stakeholders, the SSEP will be published in two formats. The first will be a digital e-publication in PDF format with interactive navigation, while the second will be designed for downloading and printing. The content will be the same in both formats, with the digital version housing additional material to guide readers through using the publication's navigation.

Focusing on clarity and readability, the SSEP's design will feature legible fonts at an accessible size, contrasting colours, prominent signposting, appropriate word lengths and content segmentation, to make the document easy to access and understand.

The content itself will follow the same principles, written in a style that is informative and concise, communicating authoritative, strategic advice that is knowledgeable and transparent. All our advice will be supported by clear reasoning and, where necessary, our working assumptions explained and justified.

Throughout the document, we will use graphs, charts, maps, and tables to illustrate and expand upon important data and insights. Among these will be a map showing the zonal locations, capacities and timings of electricity and hydrogen generation and storage.

Elsewhere, the digital version will contain links to the documentation for the SEA and HRA, the previously published SSEP final methodology and in-depth supporting information as required. These will also be referenced in the print version of the SSEP, with guidance on how to access this additional material.

To support understanding of the SSEP, it will close with a glossary explaining technical and industry terminology. Important contact information, together with sources of other contextual information relating to the SSEP, will be signposted throughout.

The content items, and the format itself, may change as the SSEP develops. However, we endeavour to adhere to the principles set out in this document as closely as possible.

8.3 SEA Adoption Statement

To accompany the published SSEP, an SEA Adoption Statement will be prepared, as required under Part 4 of the *English and Welsh SEA Regulations* and Part 3 of the *Environmental Assessment (Scotland) Act 2005*.

Reflecting the requirements of the SEA Regulations and Act, the SEA Adoption Statement will include:

- an overview of the process which has been undertaken for the SEA to date
- how the SEA has informed and influenced the development of the SSEP (including the consideration of reasonable alternatives)
- the consultation that has been undertaken as part of the SEA process and how the feedback has been considered

- a summary of proposed monitoring processes (expanded on through the preparation of a subsequent SEA Monitoring and Implementation Plan, which is described in Appendix 10)

Legal notice

For the purposes of this report, the terms "NESO", "we", "our", "us" etc. are used to refer to National Energy System Operator Limited (company number 11014226).

NESO has prepared this report pursuant to its statutory duties in good faith and has endeavoured to prepare the report in a manner which is, as far as reasonably possible, objective, using information collected and compiled from users of the gas and electricity systems in Great Britain, together with its own forecasts of the future development of those systems.

While NESO has not sought to mislead any person as to the contents of this report and whilst such contents represent its best view as at the time of publication, readers of this document should not place any reliance in law on the contents of this report.

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