

December 2024

Transitional Centralised Strategic Network Plan 2 Refresh Methodology

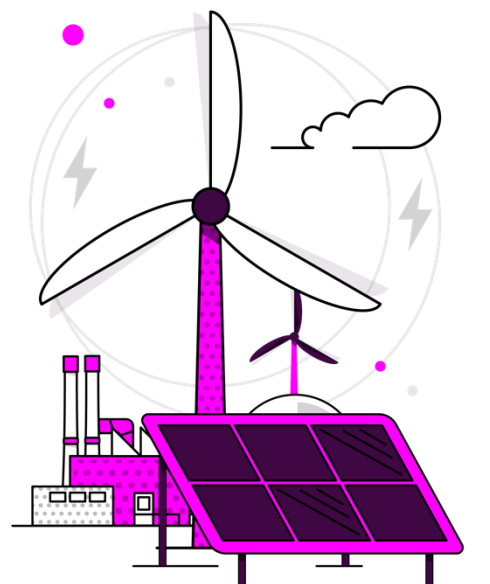
Draft for consultation

NESO
National Energy
System Operator



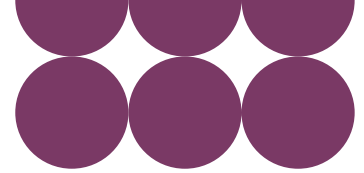
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1. Introduction





Introduction

Ofgem initiated the Electricity Transmission Network Planning Review (ETNPR) programme in 2021 that is leading to the Centralised Strategic Network Plan (CSNP). Until the first CSNP is published, we've been enhancing our approach through a series of transitional CSNPs covering development of the GB electricity transmission network.

In July 2022, NESO published the first transitional CSNP (tCSNP1) which recommended a set of offshore and onshore network upgrades to facilitate the connection of up to 50GW of offshore generation by 2030.

A further network plan was developed by NESO which recommended network reinforcements needed beyond 2030 and was published in the second transitional CSNP (tCSNP2, Beyond 2030 report) in March 2024. Most tCSNP2 recommended reinforcement projects were at an early development stage. This means there is a need to explore, develop, and agree the appropriate technical solution, design, costs, and delivery timelines.

Ofgem have proposed that the Transmission Owners (TOs) develop their options further and submit them to NESO for re-assessment before confirming their needs case and providing material funding. These options, as well as other proposed options, are to be reassessed in a refresh of the tCSNP2, which we refer to as the tCSNP2 Refresh.

This methodology

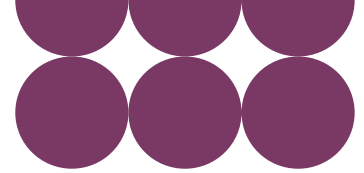
The purpose of the process outlined in this methodology is to provide visibility of the next phase of development in the work recommended in tCSNP2. The methodology describes the end-to-end process, from the analysis to the publication of the tCSNP2 Refresh and which contains the NOA outputs. We touch on changes later in this introduction section. Details including the roles and responsibilities of NESO, onshore TOs, and any non-TO developers that may participate in this are covered by annexes.

Our process for assessing interconnector capacity meets our licence condition C13 obligation. It builds on the existing NOA for interconnectors process and our new cap and floor process. While it depends on the tCSNP2 Refresh assessment outputs, it is outside the main Refresh assessment process and covered in detail in Annex 9.

Interaction with other areas of network planning

1: Holistic Network Design (HND), Holistic Network Design Follow Up Exercise (HND FUE) and impact assessments

The HND and Beyond 2030 reports propose an offshore and onshore network design to support the GB government's targets for offshore wind.



The HNDFUE design, which considered additional offshore windfarms in Scotland and the Celtic Sea, provides network recommendations for in scope projects which were not fully considered in the HND.

During the detailed network design (DND) phase of the HND, developers and TOs identified design changes to network options that required an assessment of their impact compared to the HND baseline.

The HND, HNDFUE, and impact assessment process will contribute to the planning efforts of the NOA and CSNP, as their outputs would form part of the background for analysis.

2: Clean Power 2030 Output

In August 2024, the UK government wrote to NESO, requesting independent advice on the pathway towards the government's ambition to achieve clean power by 2030, specifically on the type of new investment and infrastructure needed to deliver it.

The Refresh assessment will be based on the latest FES while accounting for as much of the outputs of Clean Power 2030 as practicable. Future energy system planning, including the Strategic Spatial Energy Plan (SSEP) (which will be an input for CSNP) will address infrastructure development beyond this decade, aiming to optimise energy infrastructure up to 2050.

Key Changes for 2024

1: The methodology's new format

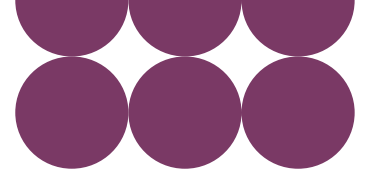
To enhance readability and understanding of the methodology, we have introduced a new format for this year's documentation. This includes a main document that provides a concise and high-level explanation of the tCSNP2 Refresh process, with annexes and appendices that contain detailed descriptions of each process within the tCSNP2 Refresh, organised into specific blocks. This new structure allows for easier navigation and access to information, ensuring a more comprehensive understanding of the methodology.

2: Concept of minimum design criteria

The tCSNP2 Refresh would assess options further developed following tCSNP2 that meet certain design requirements, into a delivery pipeline ahead of CSNP. Projects within the delivery pipeline would be eligible to receive the necessary pre-construction funding from Ofgem. This is further discussed within the [options section](#).

How to read this document

This document provides a summary of the network options assessment process. We encourage you to go to the annexes and appendices on our [SEP Publications, Consultations and Updates webpage](#) for more details regarding a particular process for an in-depth understanding of said process.



Have your say

This methodology will be used for the tCSNP2 Refresh report, scheduled for publication in January 2026. The report will follow the outlined methodology to provide valuable insights and recommendations based on the tCSNP2 Refresh process.

We welcome your views on our methodology, and we encourage you to get in contact with us. The consultation will commence from Monday 9 December and conclude on 20 January.

2. Refresh Process Overview

Methodology structure and key points

Inputs

System requirements

Options

Assessment

Stakeholder engagement and governance

Publish report





Methodology structure and key points

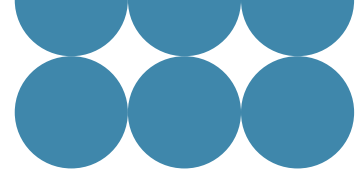
The chart shows the key stages of the tCSNP2 analysis process. The six key stages are covered in more detail over the few pages. You can find further detail in the annexes on our [SEP Publications, Consultations and Updates webpage](#).

Inputs	<p>Our main inputs are the reinforcement options, network background which includes the demand and generation assumptions as informed by energy pathways.</p> <p>Whereas previous NOAs had taken the built network with certain agreed reinforcements, we have also included in the background Accelerated Strategic Transmission Investments (ASTI) and other offshore-related works.</p>
System requirements	<p>We consider the spatial distribution of generation and demand from the FES pathways. This gives us the system flows which we compare against the network's limits to give the boundary transfer requirements. These capture any bottlenecks in the network that need assessment for reinforcing. We pass this data to the TOs.</p> <p>Our study timescales are from 2030 onwards.</p>
Options	<p>The TOs provide options to reinforce the network to meet the system requirements. We receive information about the options for us to assess each option and combinations based on the assessment criteria used in the Beyond 2030 report analysis. The options developed will consist of both asset and NESO commercial solutions which meet the system requirements. For options to go into the delivery pipeline and be granted funding, they must meet design requirements outlined in Ofgem's consultation in August 2024.</p>
Assessment	<p>Both individual and combinations of options are assessed against a balanced multi-assessment criteria, consisting of:</p> <ul style="list-style-type: none"> • Economic case • Environment impact • Community impact • Deliverability and operability <p>The assessment will also consider which options meet the early competition eligibility criteria.</p>



<p>Stakeholder engagement and governance</p>	<p>We interact with a wide range of stakeholders, including various expert group panels at different points throughout the process. The Refresh Committee will consider which options should be recommended and endorse the outcomes of the assessment.</p> <p>The Committee members are made up of senior managers across NESO, representing different aspects of network planning. Key stakeholders which are directly or indirectly impacted by the decisions, such as the TOs, Ofgem and DESNZ are invited to attend.</p>
<p>Publish report</p>	<p>At the end of the process the outcomes of our assessment and recommendations are published on our website. Our ambition is to make sure that we provide stakeholders with an accessible document while also explaining the reasons behind our recommendations.</p>

Figure 1: the key stages of the tCSNP2 Refresh analysis process



Inputs

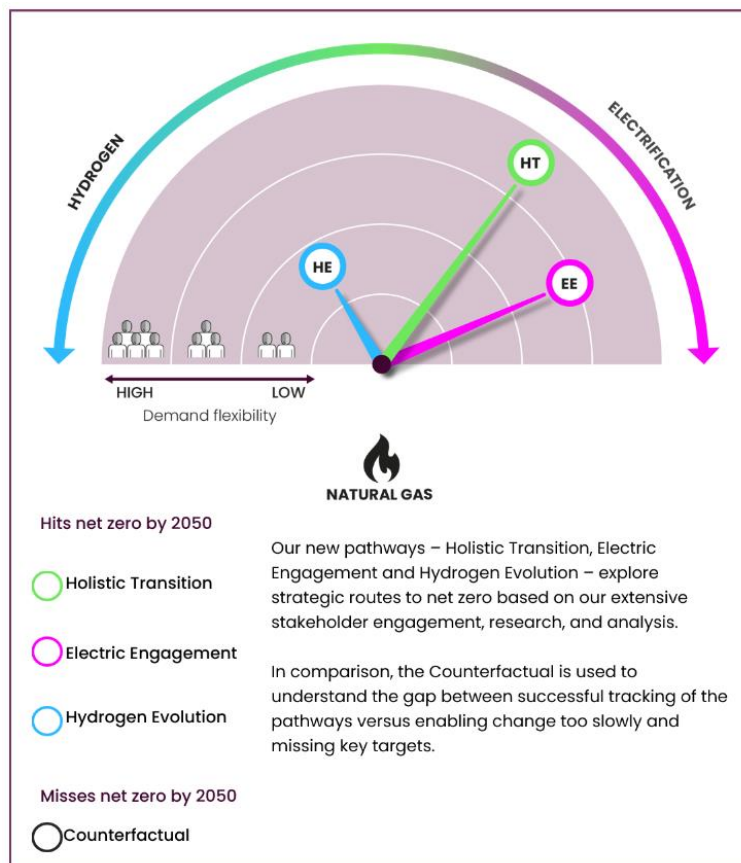
The first stage of the tCSNP2 Refresh process involves defining the necessary supply and demand background and network for the analysis.

We use the latest and updated [Future Energy Scenarios](#) pathways. These provide a credible range of pathways that meet net zero in 2050, and show how energy will be produced and consumed up to 2050.

The offshore generation connections from the HND and the Beyond 2030 publication will be reflected through the pathways used in the analysis. We will also consider the recent pathways from [Clean Power 2030](#), and any offshore connection design changes such as from the [impact assessment process](#), [INTOG](#), and [Celtic Sea](#) recommendations.

In addition, we will receive power system network models from the TOs, covering their operational area for each year that will be analysed. The FES generation and demand data will then be input to these models to produce complete power system models of the GB electricity transmission network for selected study years. The study methodology applied to these models is discussed further on the following page.

Finally, we use a market modelling tool to forecast the constraint costs for different network states and scenarios. The primary output from the tool would serve as an input for the cost-benefit analysis process.





System requirements

The next step is to determine the capability needs of the system across the FES pathways, identifying where future bottlenecks might occur.

To identify the future transmission requirements of the GB National Electricity Transmission System (NETS), there are several inputs that are fed into the planning process and at various stages, as shown below in figure 3. Our system requirements are communicated in the Electricity Ten Year Statement (ETYS).

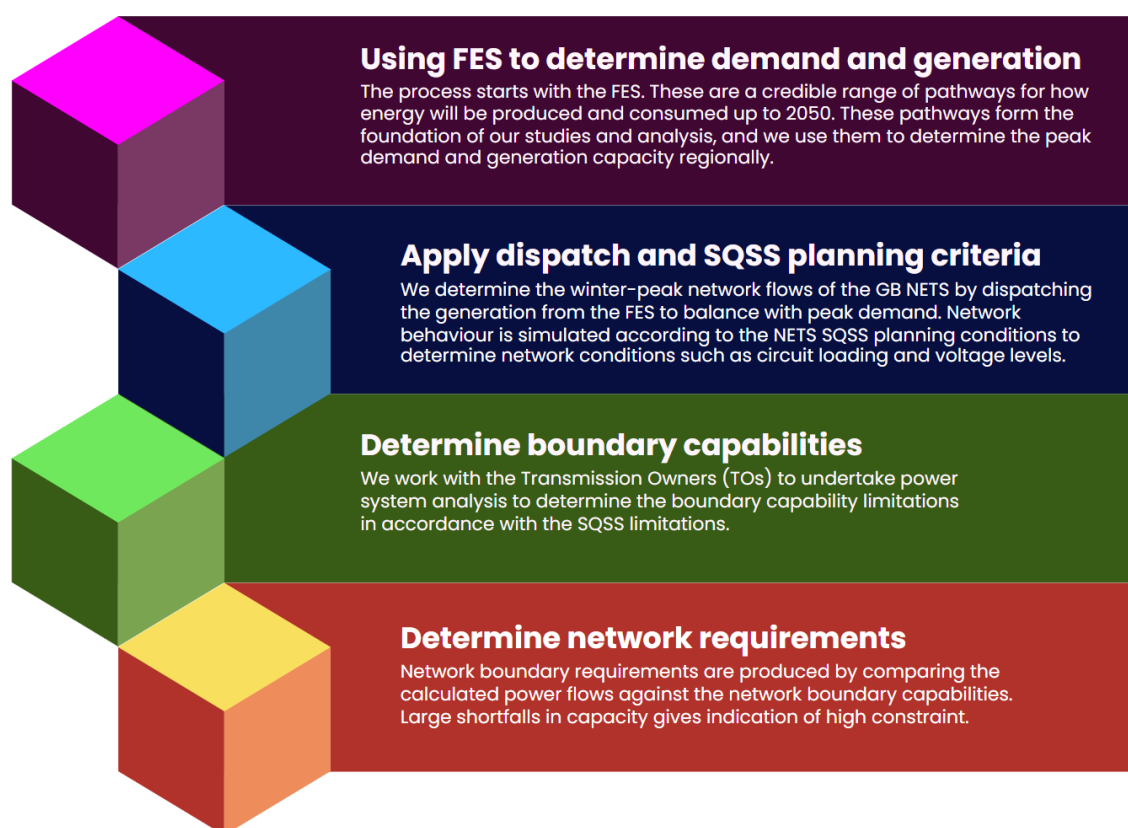
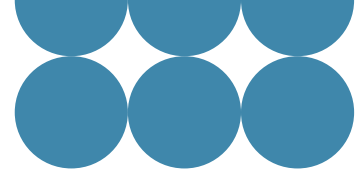


Figure 3: the steps we take to determine the system requirements



Options

Major national electricity system reinforcements

The NOA process and reporting requirements in licence condition C13 refers to major national electricity system reinforcements which we refer to as “options”. We define options as “a project or projects in development to deliver additional boundary capacity or alternative system benefits to relieve electricity network need identified in the Electricity Ten Year Statement or equivalent document.”

The tCSNP2 Refresh will analyse the network through from the current year to a minimum of 12 years ahead (to 2037). This supports the CSNP delivery pipeline, in which projects will receive regulatory funding. The aim is to confirm the need of the projects and avoid the need for future reassessment, unless any substantial changes are identified. While many options have been “baselined” during our Pathway to 2030, some options might need to be reassessed because of further development or scope changes.

Developing the options

This stage involves mapping out and exploring all options that may resolve the future network needs. The TOs develop multiple high-level options that conceptually meet boundary requirements. In addition, NESO can initiate proposals with the TOs as well as develop commercial solutions such as system to generation tripping schemes or demand-side schemes. NESO can include options suggested by other non-TO developers if they are sufficiently advanced.

These options are modelled by TOs and NESO and are studied in our power system models in selected future years, to analyse the projected boundary capability uplift of delivering an option or path of options.

Options data

The core data for the options comprises the earliest in-service date (EISD), the boundary transfer capability that the reinforcement option provides, and its cost profile. The cost profile shows the capital spend in each of the years taken to construct and deliver the reinforcement. Other key data is environmental impact information, outages requirements, and technical data. You can find more detail in Appendix C: System Requirements Form on our [SEP Publications, Consultations and Updates webpage](#).



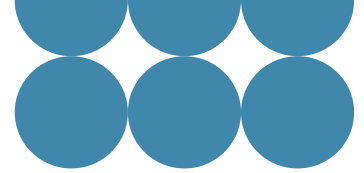
Design requirements

This Refresh analysis is to identify the delivery pipeline projects prior to the first CSNP so that they can receive the necessary pre-construction funding for their continued development. A key element of this is the maturity level of the project reflected in the design requirements. These will set out the data quality needed for a project to progress into the delivery pipeline and to support Ofgem in making funding decisions on those projects which [Ofgem consulted on](#). The delivery pipeline is part of the proposed CSNP framework to give the necessary certainty for electricity transmission reinforcement work following robust assessment. This gives the pace of delivery needed for work to meet net zero.

Please see our [Network Planning Review webpage](#) for more information.

Baseline

A fundamental part of the analysis is to establish the “baseline” network. This includes the built network and some specific reinforcements such as strategic wider works and large onshore transmission investments, which due to their scale, have undergone more detailed studies to support the needs case. Similarly, accelerated strategic transmission investment (ASTI) projects are included in the baseline network as part of achieving the necessary works to support net zero. Ofgem [published their decision on ASTI](#) in December 2022.



Assessment

High-level overview of the process

We run this assessment to identify which reinforcements are needed for the national electricity transmission system.

The options will be evaluated using a multi-criteria assessment approach, similar to what was used in the Beyond 2030 analysis, which considered:

- Economic case
- Environmental impact
- Community impact
- Deliverability and operability

To make them work together, we work the criteria through iterative stages, which figure 4 below shows. The economic stage comes first as without a justification for the reinforcement for national benefit, there's no further analysis needed. By analysing each reinforcement, we build a "path" of reinforcements that provide benefit together. This is done for each of the energy pathways and in isolation from each other.

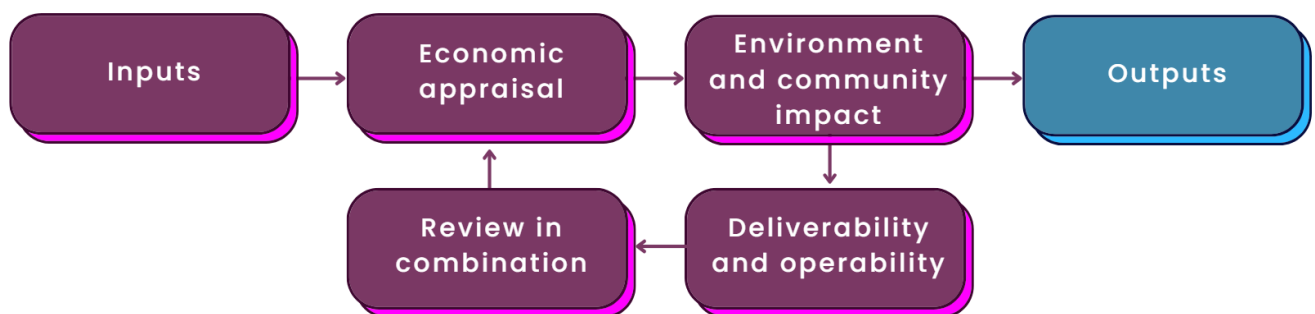


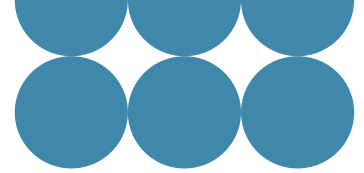
Figure 4: high level view of the options assessment process

We consider appraisals of the environment and community impacts as well as deliverability and operability of reinforcement option proposals; we describe how we conduct these appraisals later in this methodology chapter and in more detail in the Options Assessment Annex.

Our process revisits the economic case for a reinforcement path to check its benefit once all assessment criteria are considered. We balance the assessment criteria by reaching the optimum of costs and benefits of all criteria.

The outputs of the process go into the next stages including competition assessments and governance.

The assessment process is broadly unchanged since we conducted our tCSNP2 analysis. However, we have made incremental changes and have also added in additional checks such as of the earliest in-service dates.



The constraint costs arise from there being less capacity on the network than the natural generation mix needs and so NESO must to take action to operate within the limits, such as thermal loadings, of the system

Economic appraisal

This appraisal uses a cost-benefit analysis process that compares forecast capital costs against the reduction in transmission constraint costs over a reinforcement option's lifetime to form an investment recommendation. In other words, is it worth the country reinforcing the electricity transmission system to alleviate bottlenecks or paying generators to switch off? This appraisal comprises several stages as shown below in figure 5.

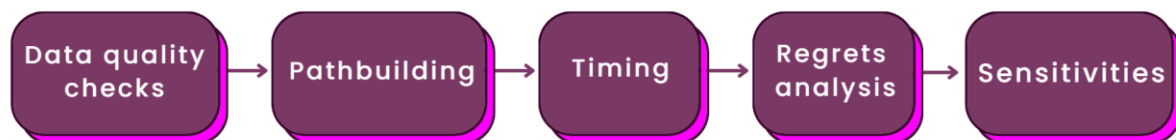


Figure 5: high level view of the economic analysis process

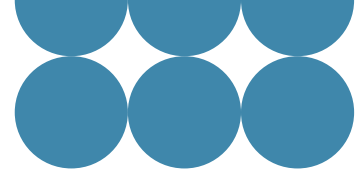
Data quality checks

The process needs the cost of options and when they'll be delivered as well as their benefit. The benefit is how much it improves boundary transfer capability. We often refer to the delivery date as the earliest in-service date, or EISD. We perform data quality checks such as comparing the costs against benchmarked values to ensure costs fall within a reasonable range.

Pathbuilding

The pathbuilding stage of the process is to decide which reinforcement options have an economic benefit. It's an iterative approach where we add a single reinforcement at a time and then analyse the effect of this change on the transmission constraint cost forecast. We analyse this for each option being completed on its EISD. Where more than one option can be next in the path, we call this a branching point, and evaluate the diverging paths for the best economic performance. This also gives us alternatives for the other assessment criteria.

For each new option in the path, we compare the constraint cost forecast against the capital costs of the reinforcements. Because the costs and benefits are spread over the lifetime of the reinforcement, we discount to today's values according to the Spackman



methodology which uses the HM Treasury's social time preferential rate and the TOs' own weighted average cost of capital (WACC).

We undertake this iterative process for each of the energy scenarios and produce a set of results of the total forecast cost of managing network constraints for each path. This takes account of the constraint costs and the cost of building reinforcements or in some cases the commercial services costs. We represent this as the net present value (NPV) for each path, and we can track the NPV through each path as it is built. In this way we can see how options perform along the path, but we also note that some options are interactive and so might need one another to provide a benefit.

Timing

The process just described helps us to identify which reinforcements provide benefit. Our next step is to work out the best time for a reinforcement to be delivered as this might not be on its EISD. A further factor is that some reinforcements need outages or system access that aren't compatible with outages needed for other works. Our process can consider outages and we use this to prioritise one reinforcement over another. The output of the timing stage is a path comprising a list of reinforcements with their optimal delivery years. Those needed on their EISD will receive a **"Proceed – critical"** recommendation.

Some reinforcements are not needed in any scenario, and these will receive a **"Do not start"** recommendation. Some of these reinforcements may have already begun work but are no longer deemed optimal given the new data – these will receive a **"Stop"** recommendation. The options analysis outputs are summarised later in this chapter.

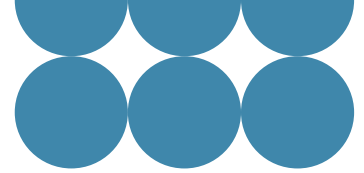
Regrets analysis

We use least-worst regret analysis to identify the best course of action for reinforcements that are critical in some but not all energy pathways. We describe such reinforcement options as "marginal".

The rationale behind this part of the process is to run all the combinations of the marginal reinforcements. This gives us a view of how the combinations of reinforcements perform against each other. For each combination, there is a cost output reflecting the constraint costs and capital costs. We would adopt the least costly combination. The Options Assessment Annex provides a fuller explanation along with a worked example.

Sensitivities

In addition to the standard process, we can consider sensitivities as required to deepen the analysis for local parts of the network. This is usually to test variations in the generation mix in a region or to check the effect of interconnector flows. This facility exists to give additional insight that NESO can use in agreement with the TOs.



Environment and community

We seek to understand the risk of environmental and community impact of reinforcement options. This enables us to form an overall view when determining to recommendations for developing the electricity transmission system. In short, it allows us to make a more holistic view.

As part of this high-level environment and community assessment, we will be considering a range of aspects some of which are ecology (typically special areas of conservation, special protection areas, Ramsar sites, ancient woodlands), geology, and soils; landscape and historic significance, air quality, and socio-economics.

We use a combination of data supplied by the TOs with their reinforcement options along with specialist public datasets to appraise options. However, this is not a substitute for the TOs' work carried out during their statutory consultation process with communities about proposed works.

Cumulative effects

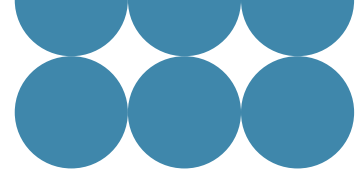
The appraisals mentioned for environment and community are undertaken on an individual basis. This means the reinforcement projects are appraised in isolation although some interacting factors such as existing or proposed infrastructure might be noted.

The next stage is to consider the appraisals in the "path" of reinforcements so that we can consider the cumulative impact of multiple reinforcements. This might be for instance because reinforcements are close together. Connecting to a new substation might cause such an instance.

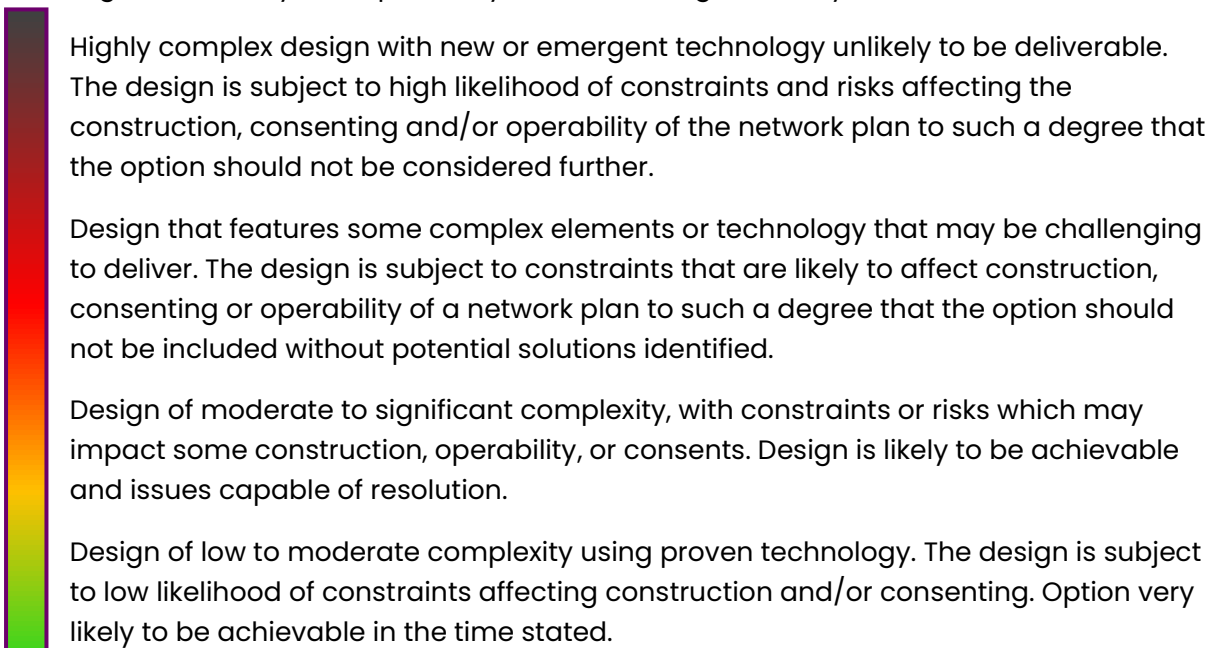
The output of the environment and community appraisals and from the cumulative stage is then considered as part of the overall assessment criteria.

Deliverability and operability

For each option, there is a deliverability assessment framework applied that considers a range of factors including supply chain of technologies, construction timeframes and consenting challenges ensuring our design is delivered in a timely and practical way.



Ranking deliverability and operability with increasing feasibility:



You can find out more about our deliverability and operability appraisal process in the Options Assessment Annex.

Options analysis outputs

To take an overall view of the reinforcement options and produce a suitable set of outputs, we apply the assessment criteria aiming to balance them. As mentioned, while the economic analysis provides the initial driver, we then factor in the environment impacts, community impacts and deliverability and operability. If we change the path and hence the constituent reinforcement options, we then review the economic case. This continues as an iterative process until we reach the optimal outcome.

We've developed a set of recommendation outputs for the tCSNP2 Refresh process. Figure 6 shows the recommendations on the right-hand side along with the analysis steps described the previous pages and which we take to reach the recommendations.

We establish whether an option is optimal from the iterative assessment stages including pathbuilding. We establish when it is needed, in other words if an option is critical in the timing stage. It might be more economical to delay an option than continue to aim for its earliest delivery date: we determine this at the regrets analysis stage.

An option is:

- 'optimal' if our analysis shows that it is needed at some time over the study period.
- 'critical' if the analysis shows that it is needed on its EISD.

This means that 'critical' options are a subset of 'optimal'.

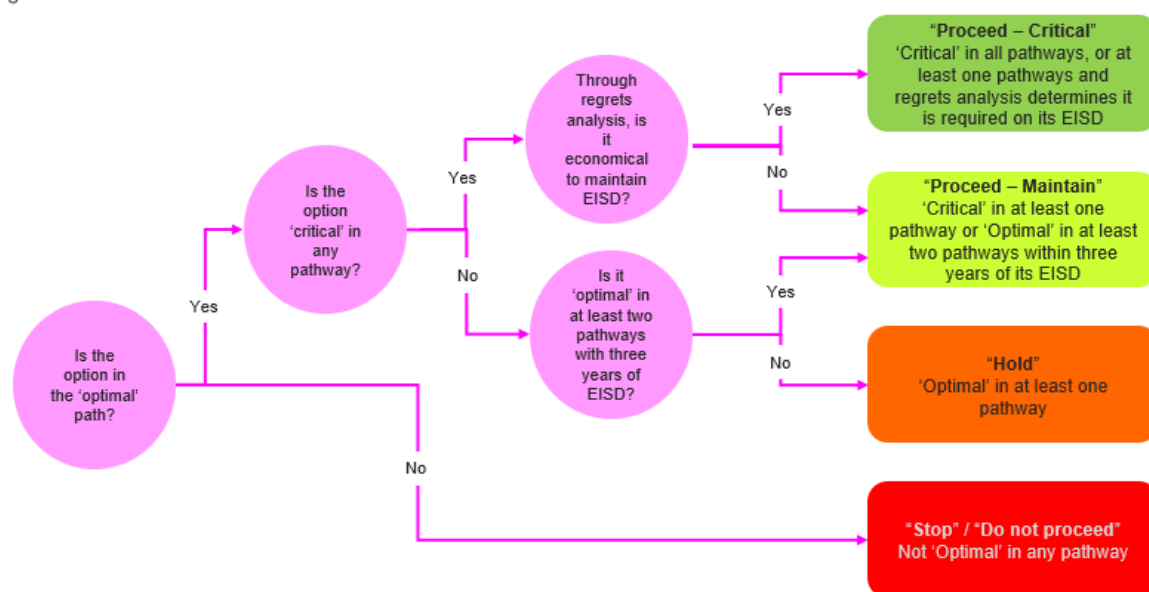


Figure 6: flow diagram of the decision tree for options recommendations

Using the descriptors

The recommendation descriptors reflect whether our analysis shows an option must proceed urgently, should be worked to be able to maintain its EISD, if there's scope for a pause and reviewing the option subsequently, or if it's not needed at all. For a fuller description of the outputs, please see the Options Assessment Annex.

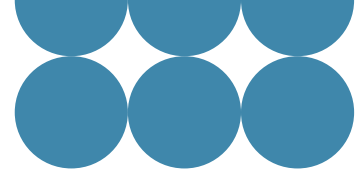
These outputs also form the inputs to the governance process that we describe in the next chapter. They will feed into the NOA for Interconnectors process and connections reform.

Competition

We assess certain transmission reinforcement options against eligibility criteria for early and late competition. This is to optimise value for end consumers. Some reinforcements might have already been exempted by Ofgem and therefore won't form part of our competition eligibility assessment.

The eligibility criteria test for both early and late competition against network need, novelty, and separability conditions. In addition, early competition includes a test against consumer benefit criterion while for late competition, the reinforcement is tested against high value criterion of £100m.

We've included more details of the process in the Competition Annex. You can find more information about competition on our [Early Competition webpage](#).



Stakeholder engagement and governance

Stakeholder engagement

Our approach will be open and transparent so that stakeholders can understand and feed into our process, and know how they have contributed. This methodology and its consultation is part of that process.

Engaging with stakeholders is vital in the delivery of our Refresh of the Beyond 2030 report to support transparency. This engagement provides us with different data, inputs, and perspectives which we will consider as we develop proposals. We engage with stakeholders as part of ensuring we produce the right recommendations for reinforcing the national electricity transmission system.

We have a variety of stakeholders from across the energy industry and expert panels who we'll engage with through meetings or workshops. We will continue to build on our strong relationships in the energy sector including transmission owners who submit reinforcement options. Our work with the TOs is continuous from developing the methodology to running the assessment process and finalising the results.

Governance

Our governance process exists to provide an overall supervision of the tCSNP2 Refresh process that ultimately supports end-consumer value by making the right decisions.

It provides a means for challenging the analysis and ensuring that all appropriate avenues are explored.

Governance comprises earlier internal stages whereby management checks the process' progress and keeps key stakeholders up to date. The formal part of the governance framework is based on the tCSNP2 Refresh Committee. It comprises senior NESO managers with observers from Ofgem, the TOs and DESNZ. It provides a final decision and endorsement of the outputs and key challenges in the tCSNP. We'll update our terms of reference as appropriate for this committee.



Publish report

It is important to us that we ensure information is easily accessible and that our decisions and recommendations are shared with all stakeholders. Our licence C1.4. provides guidance on making sure that we publish a report that is accessible and outlines the necessary developments in the electricity network.

Our Beyond 2030 report incorporated a new approach to communicating our network recommendations. Our goal with Beyond 2030 was ensure the future requirements of the transmission network are available and accessible to all audiences. To do this we produced a main publication explaining at a high level the need to reinforce the network and our recommendations both nationally and regionally. This provided stakeholders with a holistic view of our design for the offshore and onshore network, as well as providing specific insight into how each region of the would evolve as we follow the path to net zero.

To complement the main publication we also produced a more detailed report focusing on the technical elements, design choices and rationale behind our specific recommendations. This document was created for audiences that are more familiar with network planning and have requirements for a greater level of detail that in the main report.

Lastly, we published a series of workbooks that provided the raw data behind our analysis and recommendations.

We understand the significance of our recommendations and it is important to us that all stakeholders understand the scale of unprecedented levels of change that are required for us to meet net zero. We will continue to work with Ofgem, to provide them with the necessary level of information, transparency and confidence that they require to make important funding decisions.

3. What Happens Next





What happens next

What happens next with the report

Once we have published the tCSNP2 Refresh report in January 2026, the TOs use it to support their business cases for funding and Ofgem uses it as part of its funding decision processes where there is a need.

In the case of commercial solutions, NESO takes these forward via the [Network Services Procurement](#) process. Projects that meet the eligibility criteria for competition will be highlighted within the report and considered for competition.

Our new Centralised Strategic Network Plan (CSNP) which arises from a previous [Ofgem Electricity Transmission Network Planning Review consultation](#) will include the concept of a delivery pipeline. It is part of recommending the development of the electricity transmission network up to 2050. The results of our tCSNP2 Refresh will form the initial round of delivery projects in the pipeline subject to them meeting the design requirements and pass funding decisions. A tCSNP2 Refresh option that enters the delivery pipeline could be reopened if there is a material change that meets a trigger point using the proposed change control process being developed in the CSNP. You can find out more about our CSNP high level principles which is also on our [SEP Publications, Consultations and Updates webpage](#).

What happens next with the methodology

We consult on the summary methodology and its annexes as one of several steps as shown in figure 7 below. We'll review your feedback and use it to improve our processes.

Our online portal for feedback includes questions for areas we're particularly interested in, notably how we present the methodology, the tCSNP2 Refresh assessment process and the report content. We are also interested in any feedback outside of the areas the questions focus on.

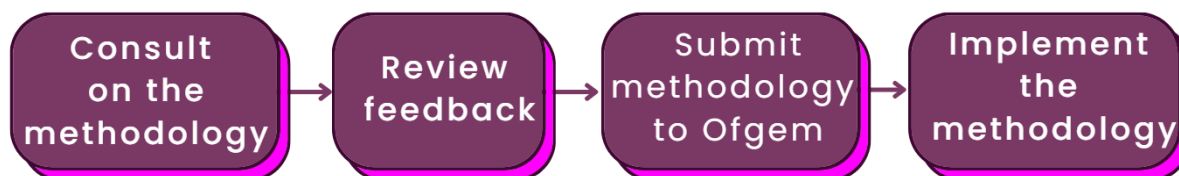


Figure 7: tCSNP2 Refresh methodology consultation steps

We'll summarise feedback and give a short explanation of what we did in response to your feedback in Appendix E of the finalised methodology in spring 2025. Figure 8 shows our consultation timeline.

3. What Happens Next

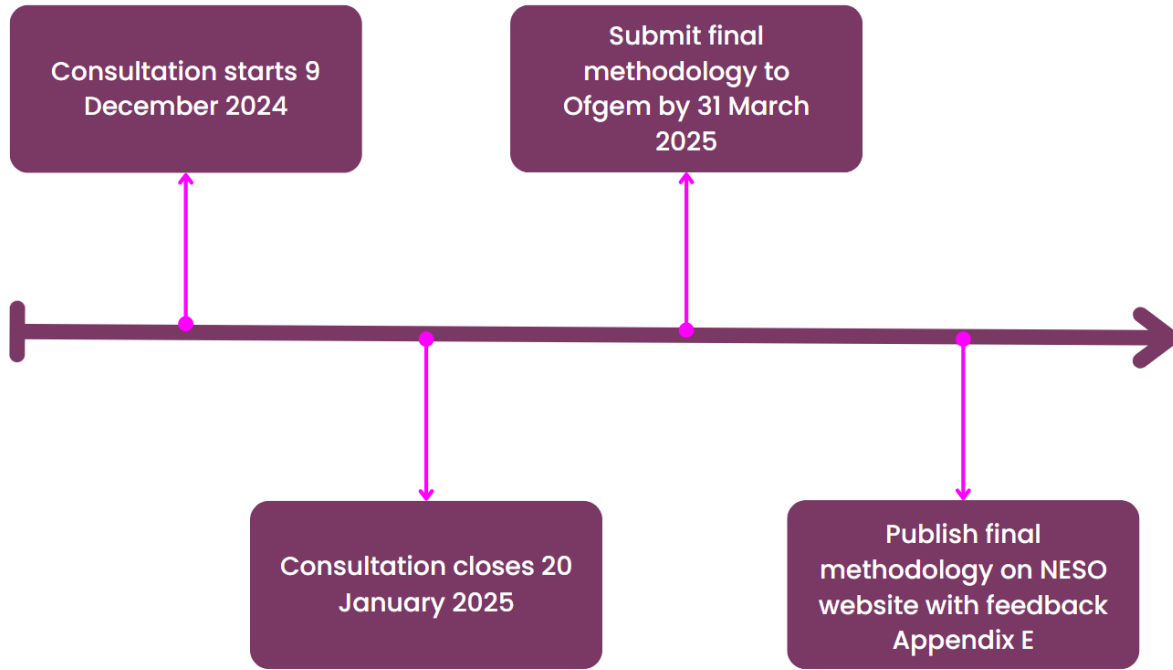
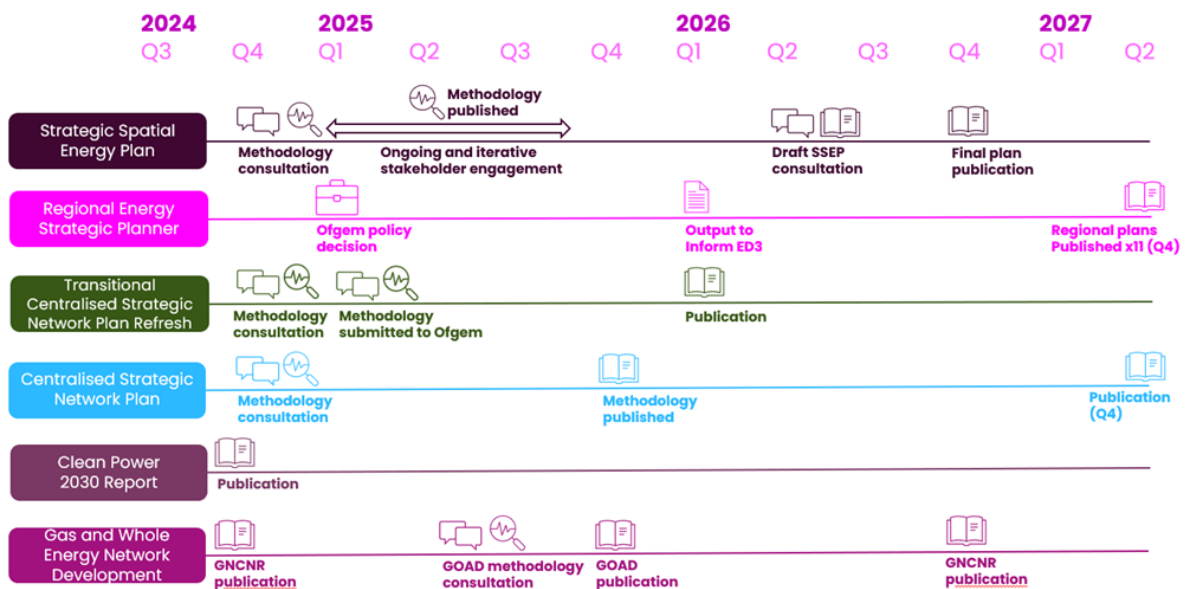


Figure 8: tSNP2 Refresh methodology consultation timeline

Figure 9 shows our tCSNP2 Refresh timeline in the context of other Strategic Energy Planning (SEP) methodology consultations, subsequent analysis and report publications.

SEP consultation/publication dates



*dates subject to change; not all methodologies may be public

Figure 9: SEP consultation/ publication dates. Note that the dates are subject to change and that not all methodologies may be public.



How to get in touch

We're very keen to hear from you to find ways to improve the methodology all as part of ensuring value for end consumers. Please do use the [online portal](#) to provide feedback or email us on box.SEP-Portfolio@nationalenergyso.com.

