Beyond 2030 - **Electricity Transmission Update**

June 2026

NESO
National Energy System Operator

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Executive Summary

Executive Summary

Great Britain's electricity system underpins everyday life and drives economic growth. It powers homes, supports businesses and keeps industries competitive. The National Energy System Operator (NESO) operates today's electricity system and designs tomorrow's energy system. Our role is to ensure the electricity transmission network can move power safely, efficiently and at the lowest cost to consumers.

We have a strong track record of operating a secure and resilient electricity network. However, energy needs are changing with rising demand for electricity and with power increasingly produced in new locations further from where it is needed. The network must adapt to keep pace, ensuring delivery of a resilient, clean and cost-effective electricity system.

These recommendations focus on the higher voltage transmission network, the "motorways" that move power around the country. Upgrades and new networks are being deployed to deliver the UK Government's Clean Power 2030 Action Plan[1], enable the connection of new clean generation and meet rising demand, including from data centres.

This report sets out the ongoing needs for electricity transmission infrastructure out to the mid-2030s. It reconfirms that the **overall need for investment in the transmission network set out in Beyond 2030 (2024) remains broadly unchanged.**

Timely strengthening of the network is needed to minimise the constraint costs which are incurred when the transmission capacity meets a bottleneck. To prevent the system from being overloaded, NESO needs to pay those generators to stop producing often in areas of high renewables and pay generators outside the bottleneck to produce more to meet high usage elsewhere. If transmission infrastructure is not delivered when needed, constraint costs rise, and the available clean power is wasted, requiring gas generation to be turned up in its place, leaving bill payers facing additional cost.

Without reinforcement the constraint costs from balancing the system could increase by three times between 2031 and 2035. At the same time, limited capacity would delay new connections for homes, businesses and clean generation, holding back economic growth.

This reinforces the need to accelerate delivery through full implementation of the Transmission Acceleration Action Plan and coordinated action across industry and government, particularly on planning and consenting. Delays increase costs and reduce system benefits.

This update reflects:

- NESO's updated Future Energy Scenarios
- The UK Government's Clean Power 2030 Action Plan
- Connections reform outcomes
- New evidence and project delivery schedules from Transmission Owners

1 Clean Power 2030 Action Plan

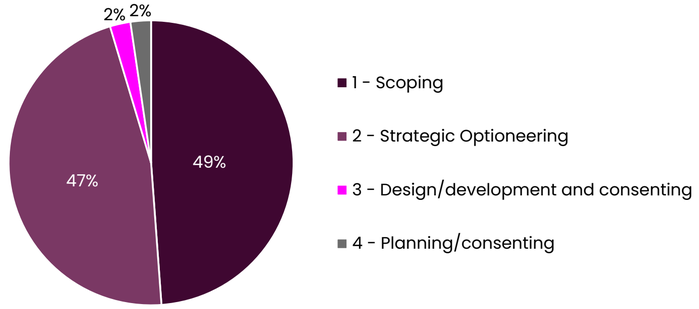
This update provides advice ahead of full strategic energy planning with the Strategic Spatial Energy Plan (SSEP) due next year and Centralised Strategic Network Plan (CSNP) 2028. These will take a whole-system view across electricity, gas and hydrogen setting longer-term energy needs.

In this update we have considered two broad categories of projects:

- **Near-to-medium term recommendations**
  These are the sufficiently mature options typically projects up to the mid-2030s. They address clear system needs, are deliverable in the near-to-medium term. These options offer strong value for money by reducing constraints and enabling efficient use of clean power. NESO recommends early investment in these to enable timely delivery.
- **Longer-term options**
  These options are likely to be needed but require further development and will be reassessed through the Centralised Strategic Network Plan. NESO recommends continued development to keep these options viable, mitigate potential delays, while avoiding unnecessary spend ahead of final decisions. NESO will continue to work with Ofgem and provide updated advice as new evidence emerges.

In most cases this update reaffirms the recommendation set out previously in 2024. In some areas, the case for individual projects has evolved. This reflects updated system design and the growing maturity of network reinforcement schemes. Any changes to previous recommendations have been set out within the paper.

Figure 1: **Project maturity stages for those recommended in this report**



In total NESO recommends that **43 network projects** be developed for delivery in the 2030s. Over half of these are needed by the mid-2030s and are sufficiently mature (i.e. Stage 2 – Strategic Optioneering and higher - read more about the project maturity stages on Figure 13) and will inform near term transmission decisions for Ofgem.

As in *Beyond 2030*, options have been assessed using a consistent evidence-based approach. This considers cost and deliverability, alongside environmental and community impacts. Each is given balanced consideration, recognising that minimising impacts matters, even where difficult trade offs are required to keep the system secure and cost-effective.

Options recommended include significant reinforcements of the existing infrastructure – allowing more power to flow on existing routes. These upgrades are often lower cost and have fewer environment and community impacts than building new assets. New infrastructure is recommended only where it is needed to meet system requirements. NESO is also recommending three-times more new undersea offshore cabling than new onshore.

What this update is (and is not)

This update provides independent, evidence based advice on near term electricity transmission needs.

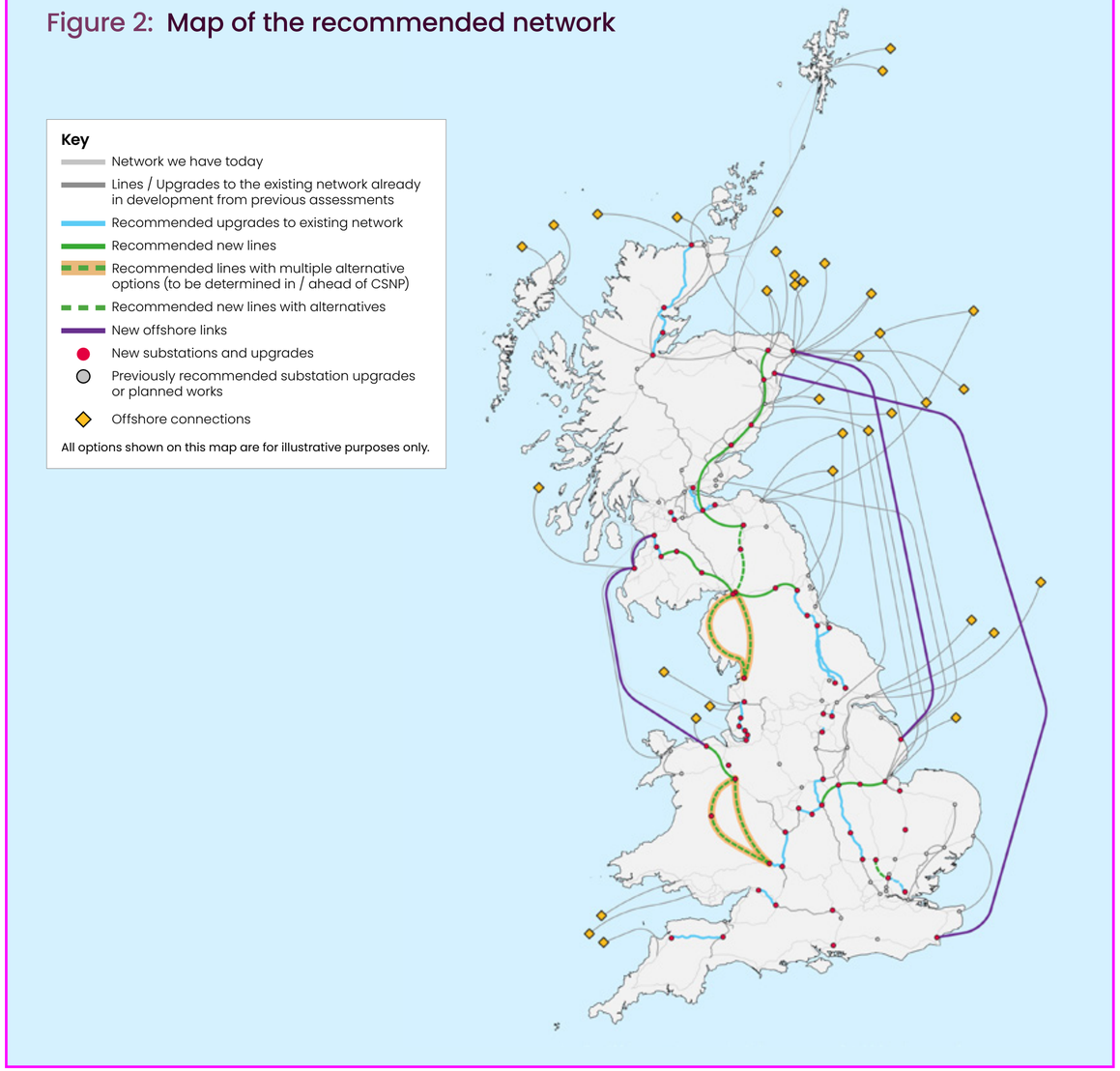
It:

- Updates the 2024 view about the transmission investment needed in the near-to-medium term, based on the latest evidence.
- Reconfirms and identifies the most mature options for Ofgem to consider for early investment.
- Sets out which options need further development through the Centralised Strategic Network Plan.

It does not:

- Replace the Centralised Strategic Network Plan.
- Decide detailed routes, local siting or planning outcomes.
- Make final funding decisions.
- Change the needs case or funding for any projects already in development by Transmission Owners and funded by Ofgem.

Figure 2: Map of the recommended network

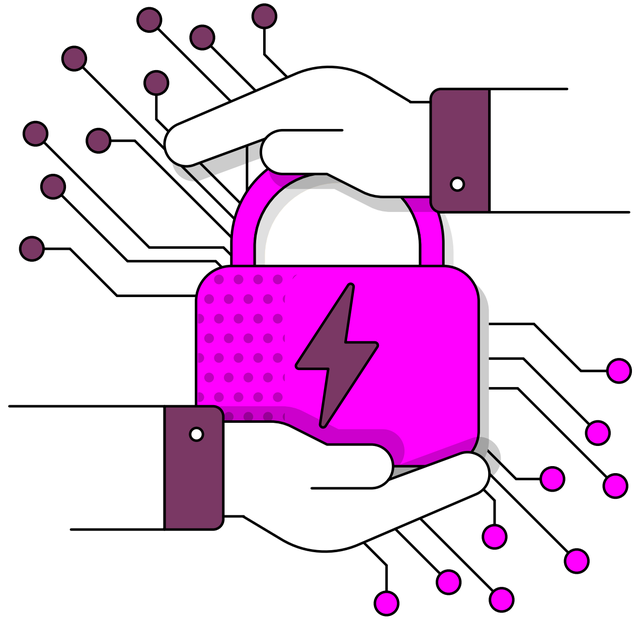


What this update delivers

Overall, the *Beyond 2030 Update*:

- Largely reaffirms the need and recommendations set out previously in 2024.
- Provides clarity on what is ready to progress now and what needs further development, to ensure the continued delivery of needed investment in the transmission network beyond 2030.
- Supports Ofgem's near-term decision-making on funding transmission investments with updated data.
- Provides industry with greater certainty on future direction and sequencing.

Above all, it supports delivery of a reliable, clean and cost-effective energy system for the future.



Key messages Beyond 2030 - Update

1.

The electricity transmission network need reconfirmed in this report is critical to enabling a reliable, clean and affordable electricity system into the 2030s.

NESO maintains a strong track record in operating a reliable and secure electricity system 99.99% of the time.

2.

Timely delivery of network is essential to meet the needs of consumers, keep costs down for bill payers and support economic growth. Delays increase costs and make the electricity system harder to operate efficiently.

Without reinforcement the costs of balancing the system could see around a three-times increase between 2031 and 2035.

3.

By increasing the capacity to integrate more home-grown, clean energy, we can meet rising energy demand in Great Britain while reducing reliance on volatile international markets.

More than 30% forecast growth in electricity demand between now and 2035.

4.

This plan will continue to support economic growth across the wider Great Britain economy.

By 2035, the Beyond 2030 Update and associated projects could support an average of 20,000 jobs per year.

5.

The plan recommends a greater share of offshore cabling and prioritises onshore upgrades where possible, rather than building new lines. This approach best meets future energy needs while reducing the impact on communities.

Three times more new undersea cabling is recommended than new onshore.

02

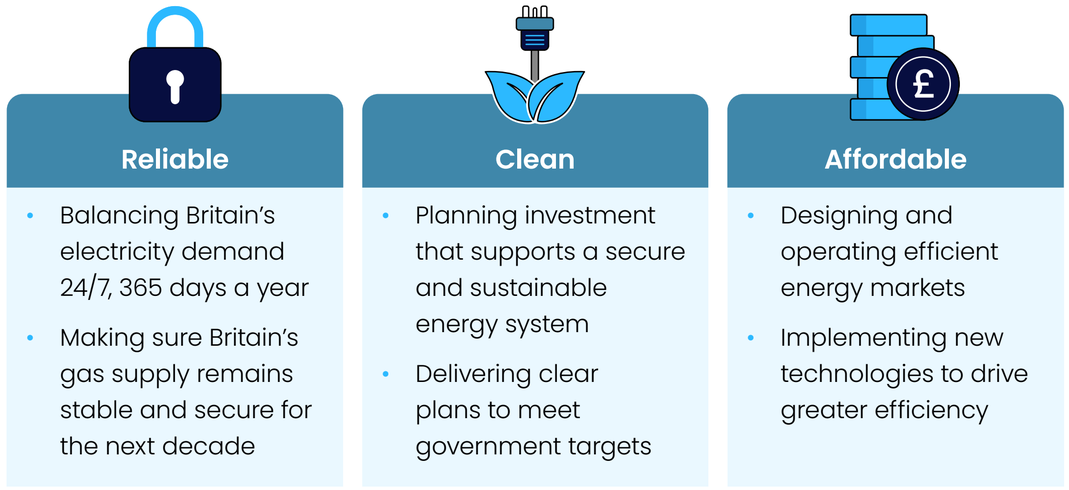
Introduction

Introduction

The National Energy System Operator (NESO) is the independent public corporation at the centre of Great Britain's energy system. We operate today's electricity system and design tomorrow's energy system.

Our role is to help ensure Great Britain has the energy it needs every second of every day, while planning ahead for a system that is reliable, clean and affordable. As an expert and impartial body, we provide independent analysis and advice to support decisions across the electricity and gas systems.

Figure 3: **NESO role in the energy system**



As Great Britain's energy system changes, strategic planning has become more important.

More electricity is being generated from renewable sources across Great Britain, and the energy system is becoming more complex to operate. At the same time, demand for power is expected to grow, supporting economic growth. This means the network must evolve in a way that is coordinated, evidence based and focus on both the near-term and long-term interests of consumers.

The purpose of this report

This report provides an update to the *Beyond 2030 Recommendations* published in 2024. It reflects new evidence, further development of network options, and changes in the wider energy system. Its purpose is to:

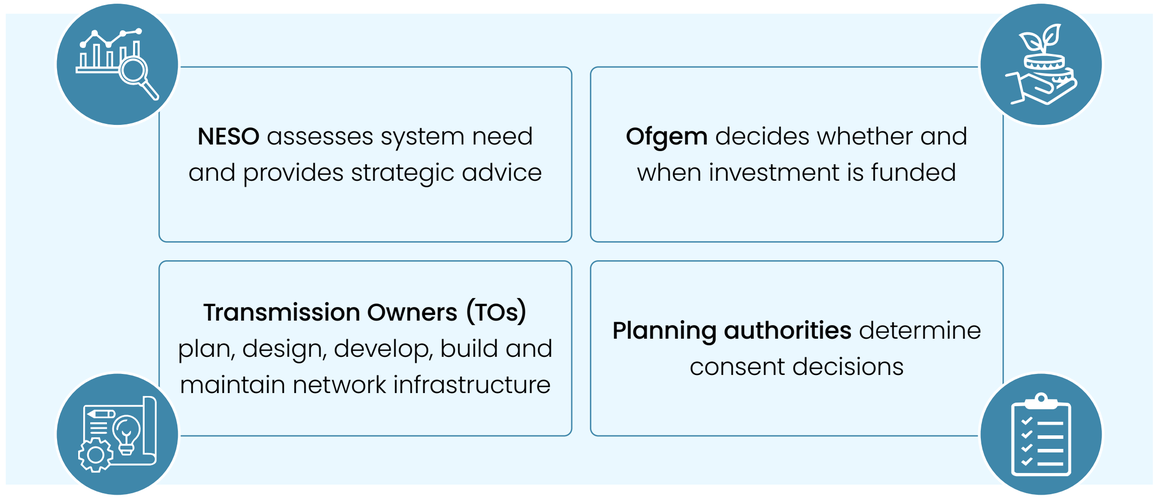
- Clarify where network investment is most clearly justified in the near term.
- Identify which options are sufficiently mature to progress.
- Highlight where further work is needed ahead of longer-term decisions.
- It is intended to support regulatory and delivery decisions, ensuring that network development remains coordinated, timely and grounded in the latest available evidence.

This report is high level summary of the electricity network being recommended written in a simple and accessible manner. For a more detailed understanding of the options assessment, the resulting investment recommendations, and the rationale for each option – refer to the Technical Annex.

Our role in decision making

Our role is to provide independent advice on system need and network development. We do not make final investment or planning consenting decisions. Roles are clearly defined across the system:

Figure 4: **Roles in network development**



This ensures that advice, regulation and delivery remain transparent and accountable.

Electricity transmission network

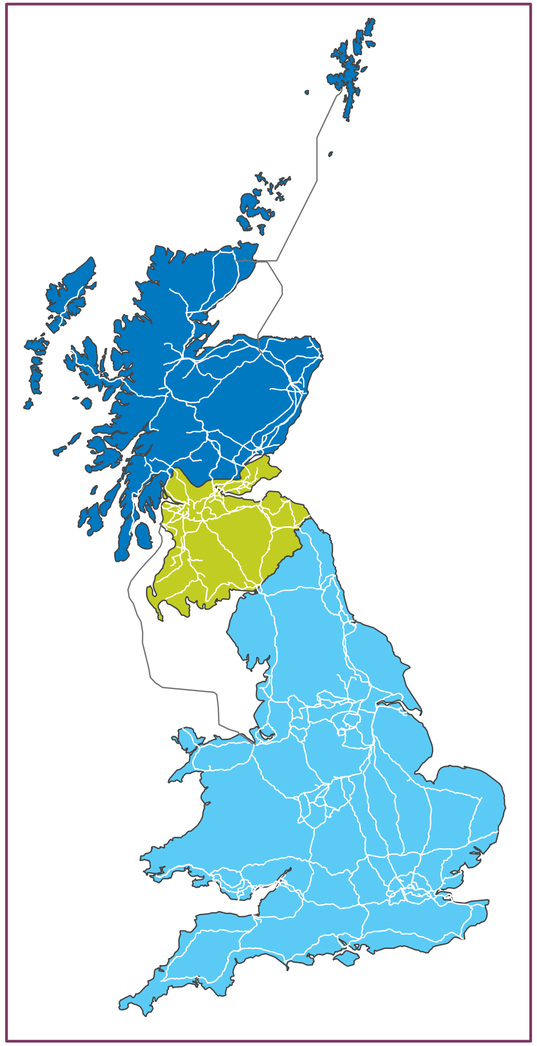
The electricity transmission network moves high-voltage power safely across Great Britain, linking where electricity is generated to where it is needed. It connects power stations, interconnectors and major centres of demand to the local distribution networks that supply homes and businesses.

It is one, fully interconnected system made up of overhead lines, underground and subsea cables, and substations. How we plan and develop this network determines how efficiently electricity flows across the country and how securely the system can be operated.

A well-planned network underpins everyday life. When capacity does not keep pace with demand, electricity cannot move freely. This creates constraints that must be managed in real time to keep the system secure, adding complexity and increasing costs for consumers.

In Great Britain, three onshore Transmission Owners (TOs) own, maintain and develop the transmission network: National Grid Electricity Transmission (NGET), SP Transmission (SPT) and Scottish and Southern Electricity Networks Transmission (SSEN-T). Their network boundaries are shown on the map in Figure 5. Offshore transmission assets are owned by separate developers, who connect offshore wind farms to the transmission or distribution network.

Figure 5:
Great Britain Transmission Owners and system Operator



We have set out a complete guide which explains who is accountable for which aspects of network development, what assets make up the transmission network and what trade-offs need are considered in delivering network.

Read it now EN explainer

How do we plan the Great Britain's electricity network?

Careful, holistic planning is essential so the transmission network can adapt and move electricity to where it is needed in the most cost-effective way possible, while also considering impacts on communities and the environment.

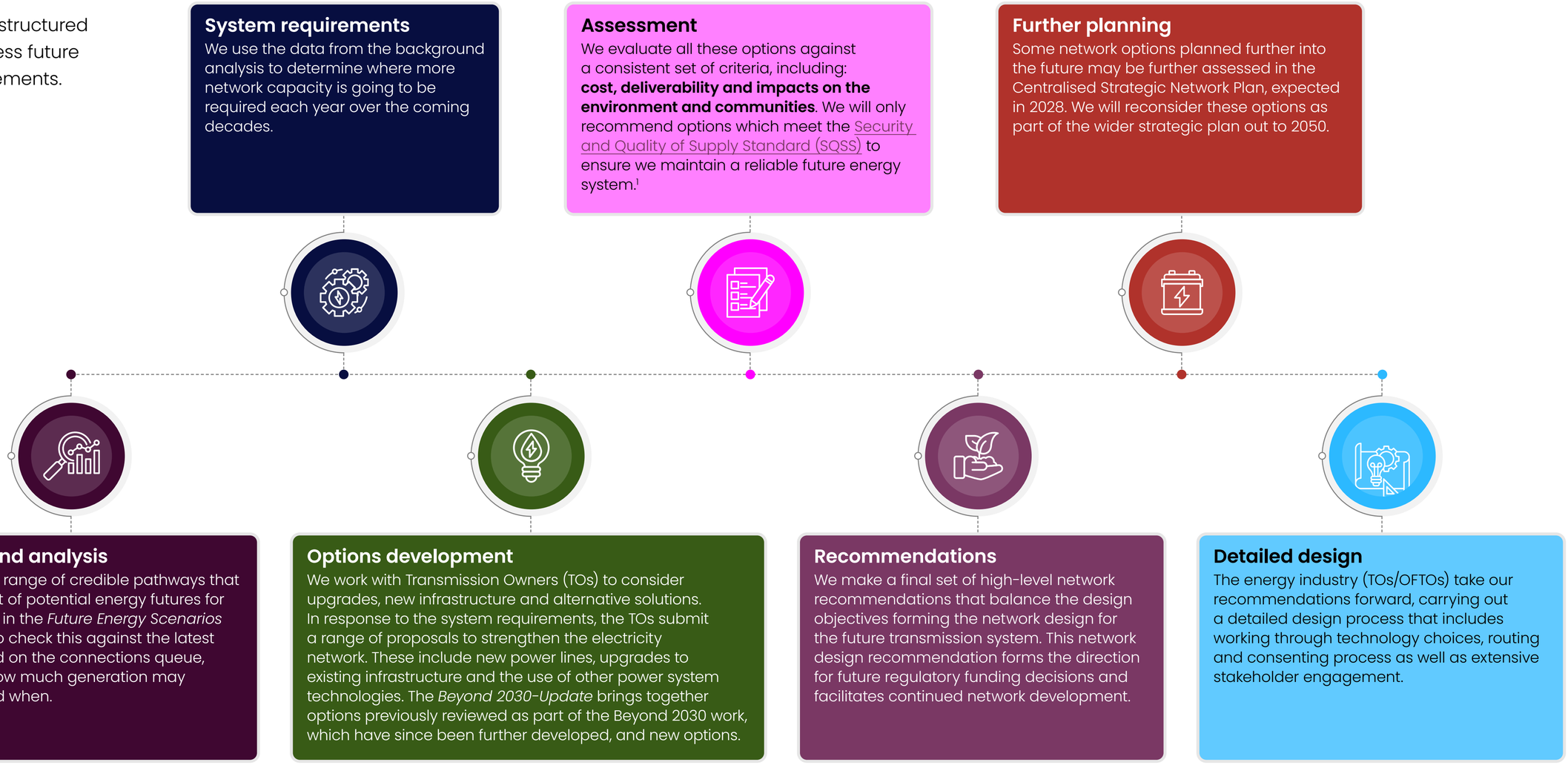
Strategic energy planning helps us match future energy needs across every part of Great Britain. It supports a nationally coordinated system while recognising the different ambitions and priorities of nations and regions. This approach is essential to delivering a reliable, clean and affordable energy system for the future.

We undertake and coordinate both strategic offshore and onshore network planning to support this transition. While these processes are driven by different factors and produce different outputs, together they help ensure the energy system can meet future demand reliably, support cleaner power and keep costs down for consumers.

The network planning process described in this publication forms part of a broader planning framework. While it captures a significant element of the network needs, other elements fall outside the scope of this assessment but will continue to be identified and progressed through other established processes.

Figure 6: How we assess network needs

NESO follows a structured process to assess future network requirements. This includes:



1 While the future CSNP is expected to comply with SQSS requirements, the Beyond 2030 Update does not fully meet this standard. As such, additional onshore reinforcements may be required in certain cases to ensure full compliance.

What has changed since the *Beyond 2030 Report* was published?

This update builds on the *Beyond 2030 Report* that was published in 2024. The overall need for network remains largely unchanged. Instead, it reflects how the supporting evidence, network design and wider system context have developed since then.

The main changes are:

Offshore network design[2] has continued to evolve. In some cases, this has led to reconfigurations of projects and connection points to reduce complexity and improve overall deliverability. These assessments have been an ongoing process since the publication of *Beyond 2030*.

Further development of onshore options. Transmission Owners (TOs) have continued to develop onshore network options. This has improved the maturity of some options in *Beyond 2030* and provided greater clarity on how they could be delivered.

An updated system pathways framework to reflect the latest Future Energy Scenarios (FES)[3] published in 2025 and include alignment with the *UK Government's Clean Power 2030 Action Plan*. This provides a more realistic view of which projects are likely to progress and what that means for network requirements.

Connections reform and queue updates[4] which have resulted in change - including updated assumptions from the Gate 2 to the Whole Queue process. This provides a more realistic project delivery pipeline focused only on those projects likely to progress and what that means for network requirements.

What does it mean for the recommendations from this report?

The recommendations in this report are made against the latest evidence base since 2024.

Projects are split into two categories:

Near-term investment recommendations. These options represent clear system needs based on the FES scenarios, with well-developed solutions that deliver consumer value through delivery by the mid 2030s. They build on the network already recommended and in delivery through the 2030 Great Britain wide network design and the *Clean Power 2030 Action Plan*.

Longer-term options. These relate to the investments needed after the mid-2030s (*Beyond 2030 Great Britain-wide network design*), where further development is still needed. These will be considered through future strategic planning processes, including the Centralised Strategic Network Plan (CSNP).

Later this year, the Secretary of State is expected to choose the pathway for the Spatial Strategic Energy Plan (SSEP).

The SSEP will 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.

We will revalidate the outcomes of this report against the electricity transmission network needs arising from the chosen SSEP pathway in a light touch assessment ahead of the CSNP. There could be significant alignment between the report recommendations and SSEP pathways and this check will affirm the system need for each proposed option supporting the timely development of network options. This is to allow projects (where appropriate) with clear needs case is still clear to progress.

2 Offshore Coordination | National Energy System Operator
3 Future Energy Scenarios (FES) | National Energy System Operator
4 Connections Reform | National Energy System Operator

What this assessment can and cannot do

This update provides independent advice on electricity transmission needs. It is designed to support decision-making, but it does not determine outcomes.

What this update can do:

- **Identify where investment is most clearly required –** The recommended network plan from this report will give industry clarity on where on the network and which projects provide the opportunity for new connections and growth in the country.
- **Highlight options that may be ready to progress –** Assess the maturity of the current pipeline of projects and signal which projects would be best for the industry to focus on to deliver.
- **Support regulatory, funding and delivery decisions –** Provide clarity to the regulator on which projects are to be funded and where action should be brought forward to meet network need on time.

It does not:

- **Set regulatory or technical compliance requirements** such as the Security and Quality of Supply Standard (SQSS).[5] Additional onshore reinforcements may be required separately to meet these requirements.
- **Decide which projects connect to the network** or decisions on individual customer connections. Its focus is on wider system reinforcement needs.
- **Determine final infrastructure outcomes on funding, detailed design and planning consent,** which are made by Ofgem, TOs and planning authorities respectively.

5 Security and Quality of Supply Standard (SQSS) | National Energy System Operator

Stakeholder Engagement

Our role as NESO in developing this report is to independently assess the evidence and provide strategic network advice. Stakeholder engagement supports this process by strengthening the evidence base and ensuring that recommendations are informed by a wide range of perspectives, while remaining objective in our approach. We work closely with Transmission Owners (TOs) who provide data, technical input and insight throughout the process. This forms a core part of the analysis that underpins our assessment. We also engage with the Office of Gas and Electricity Markets (Ofgem) to ensure that our analysis is robust and aligned with the regulatory framework that will inform future funding decisions. Offshore developers have played an important role in the evolution of offshore network design. Ongoing engagement between 2023 and 2026 has contributed to the development of revised design options, which are assessed in the update using a consistent methodology.

At a strategic level, we have maintained structured engagement with the UK Government, the Scottish Government, the Welsh Government, Ofgem and TOs.

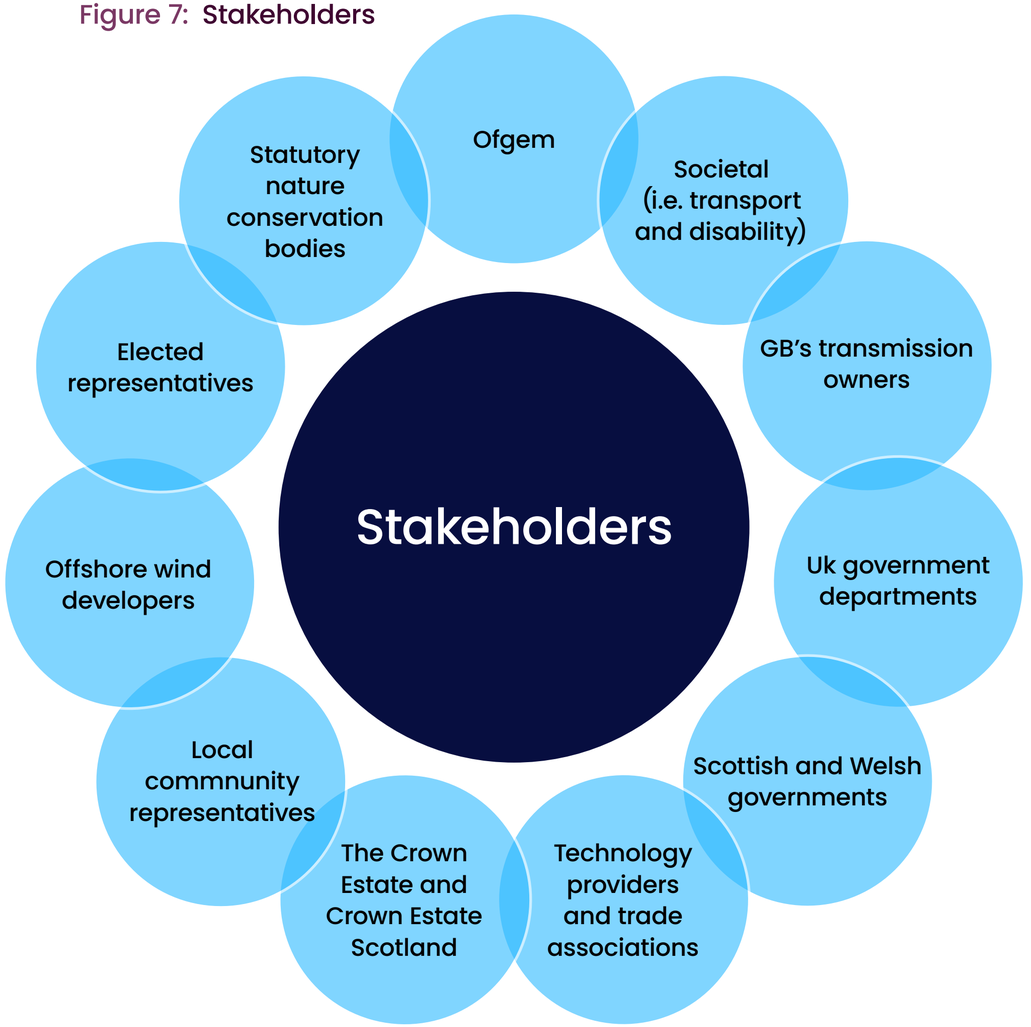
This reflects the wider implications of network planning across Great Britain and supports transparency and alignment on process and guidance. As our strategic planning role has developed, we have expanded both the range of stakeholders we engage with and the ways in which we engage. This includes broader environmental expertise, industry forums and targeted engagement on emerging technologies and system planning issues.

There has been opportunity for stakeholders to submit network options into our analysis who are not TOs. Although we didn't receive options for consideration for these recommendations, we intend to further develop this process in the Centralised Strategic Network Plan.

A number of these key stakeholders are also involved in the governance processes as outlined in the methodology approved by Ofgem to ensure the outcomes are scrutinised appropriately.

These inputs help ensure a wider range of views is considered in our assessment.

Figure 7: Stakeholders



Navigating the suite of documents

For more details, please see our wider suite of documents that explore our processes and recommendations in greater detail.

1. The Electricity Network Explainer - A plain-English guide to what Electricity Networks (EN) is, what it covers, and how to use it. It sets out the "why it matters" for the system — supporting a reliable, clean and affordable transition.

2. Our Electricity Transmission Design Principles – gives a view of what the transmission network needs to deliver future demand and generation securely. It summarises the key network requirements and options so decisions can be made.

3. The Electricity Ten Year Statement sets out the potential future flows that Great Britain's transmission system is likely going to see. It also maps the capability of the system as network is built over the next 10 years.

4. Our Beyond 2030 - Electricity Transmission Update -Technical Report and Data workbook sets out our holistic design considerations for both our onshore and offshore network recommendations in greater detail. It outlines how we made our final recommendations. It also discusses the alternative onshore and offshore wider network reinforcements we have considered.

5. Our Stakeholder Approach, Engagement and Feedback Report outlines how we have embedded stakeholder engagement into our process and considered the feedback we have received in shaping our recommendations.

The report is laid out in four sections:

System Needs gives an overview of why Great Britain's electricity grid looks like it does today, and the societal and technological needs that are driving the grid's future development.

Great Britain-Wide Network Design provides a snapshot of what we are recommending a holistic and modern grid should look like to meet these evolving needs. It sets out clearly where we are recommending new infrastructure and flexible demand after 2030, and in what timeframes.

Nations and regions network design goes into detail on how energy is linked to our lives in every nation and region of Great Britain, and what benefits communities across the country could see from the energy transition.

Next Steps out the transformation that will be seen in the industry following this plan and why this matters to all of us – including how we are working to build a whole-system plan for the future, with a broader reach than just electricity.

03

System Needs

Great Britain's changing electricity needs

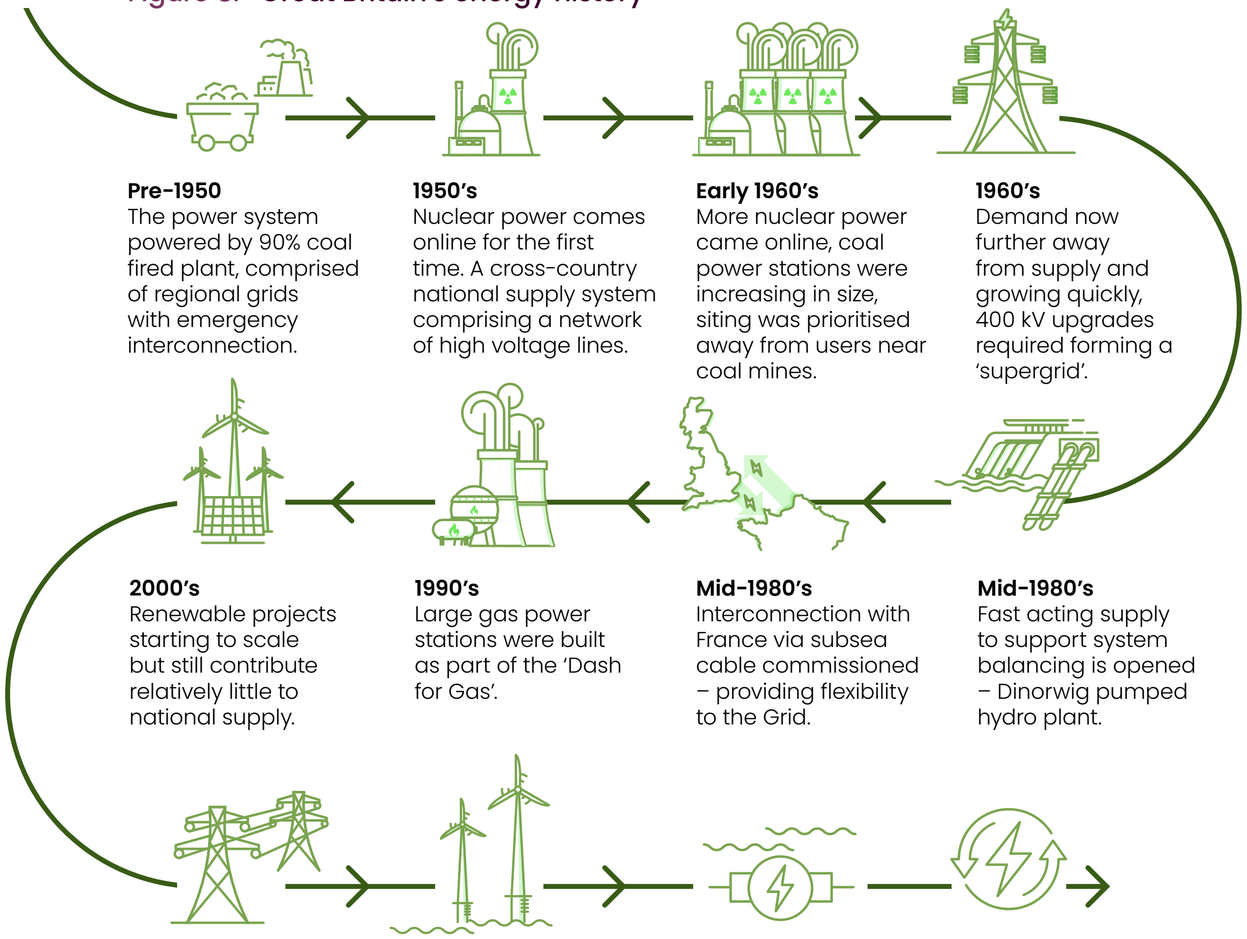
Since the 'super grid' was created in the 1950s, the electricity system is changing, with generation and demand patterns shifting in ways that require significantly greater and more flexible transfer capability across the network.

The transmission system must evolve to meet Great Britain's future energy needs, delivering a system that is reliable, clean and affordable. The existing transmission network was designed for a different generation mix and power flow pattern. As generation and demand change, this design is no longer sufficient to meet future needs. Network "rings" were developed around these areas to support energy-intensive industries. As a result, more rural and coastal parts of Great Britain typically have less transmission capacity.

Over the past 20 years, GB has become a global leader in onshore and offshore wind. At the same time, to support economic growth, electricity demand is increasing and becoming more dynamic as transport, heating, and industrial and commercial activity increasingly electrify. Demand is driven by new patterns such as electric vehicle charging and the early impacts of electric heating.

While Great Britain is moving away from fossil fuels for electricity generation, gas still plays an important role in meeting demand today. Reducing this reliance will cut exposure to global energy shocks and strengthen energy independence. As we design the future transmission system energy resilience and affordability will remain just as important as decarbonisation.

Figure 8: Great Britain's energy history



Heating and transport are now Great Britain's largest sources of emissions, so electrification means replacing fossil fuels with zero-carbon power.

To meet the *Sixth Carbon Budget*, the UK Government aims to operate a zero carbon electricity system by 2035, with fossil fuels used only in limited circumstances. This shift is already underway, driven by the electrification of transport and heating, and could increase electricity demand by up to 65 per cent by 2035.

Our future transmission system will support economic growth and rising demand across Great Britain. It will power new industries, including data centres, strengthen manufacturing, and create skilled jobs. Independent analysis suggests this could deliver around £15 billion in economic benefits and support more than 20,000 jobs on average each year through to 2050.

Meeting this demand requires a significant increase in clean electricity generation. A strong pipeline of renewable projects is emerging, led by offshore wind and supported by onshore wind, solar and storage. Offshore leasing rounds and national ambitions, including Scotland's target of 20 GW of onshore wind by 2030, are driving this expansion. Carbon capture and early hydrogen deployment will also play a role in maintaining security of supply.

By 2035, electricity production could be around twice today's levels. Managing a system increasingly reliant on weather dependent generation will require a diverse mix of technologies, stronger networks and new operational tools.

While we will continue to make the best use of existing infrastructure, upgrades alone will not be sufficient. Much new generation is being developed in coastal and remote locations where network capacity is limited. A stronger, more connected transmission network enables electricity to flow across Great Britain, reducing constraints and supporting a reliable, clean and affordable power system.

The system must be able to move greater volumes of electricity over longer distances, while maintaining secure and efficient operation under more variable conditions. Delivering this requires both reinforcement of existing infrastructure and the development of new network capability, alongside complementary measures such as flexibility and improved system control. While flexibility can reduce and better manage system pressures, it does not remove the need for transmission reinforcement.

The timing of these reinforcements is critical. Delays increase system costs, reduce efficiency and risk constraining the delivery of clean power.

Options available to reinforce the transmission network

The process for determining how to get electricity from where it is generated to where it is used is complex. Each part of the electricity transmission network has a finite capacity at which it can transfer electricity from A to B. As the network was built, rural network capabilities were often less than that of urban or industrial areas because these areas had lower requirements to either connect generation to the system or supply power to local networks. Despite network upgrades throughout the decades, some parts of the network still have limited capability and cannot carry enough electricity during times of high supply and demand. As the volume of generation increases, we will need additional capacity, and new routes on the network to allow electricity to flow from where it is generated to the people and businesses that need it.

When the level of electricity being carried exceeds the capability of the network, we must take operational actions to protect it from damage and ensure that the power supply is secure. These events are known as system constraints and can be thought of in the same way as congestion on our roads which cause bottlenecks. Without proper management of the network, electricity system congestion could result in damage or failure of physical assets on the network.

To manage these constraints, we will typically need to pay generators to stop generating electricity in constrained areas, while paying other generators to produce electricity in areas that are free of constraints. This is known as a balancing action and forms part of the everyday running of the electricity system to help us reduce the strain on the network at certain times.

However, when these balancing actions become significant or prolonged, the cost impact of managing constraints must be weighed up against the investment required to increase the capability of our network. Without action to reinforce the network costs for bill payers will rise.

Overall, we make recommendations for the Transmission Owners (TOs) to upgrade their networks when this is more cost effective for consumers than having to pay for the ongoing cost of balancing actions.

Constraints and system management

When electricity flows exceed the physical limits of the network, it creates conditions that put infrastructure at risk, which then affects system reliability and security of supply. This situation where power flow exceeds those limits is known as a system constraint.

These situations are known as system constraints and can be thought of as similar to congestion on a road network, where limited capacity creates slow traffic and bottlenecks.

In these circumstances, system operators must intervene to manage flows. This typically involves reducing generation in constrained areas while increasing generation elsewhere. These balancing actions are a routine part of operating the system safely. However, when they occur frequently over sustained periods, they increase system costs.

This creates a clear trade-off. In some cases, it may be more cost effective to continue managing constraints through operational actions. In others, investing in additional network capacity provides better long-term value for consumers. Network reinforcement is therefore considered where it reduces overall system costs and improves efficiency. It is also essential for enabling the connections needed for new generation and demand, helping to unlock economic growth.

The electricity industry considers a wide range of options when looking to expand the capability of the network, especially in places where there are transmission bottlenecks (i.e. constraints).

Reconfigure existing network

Upgrading existing circuits

Install smart power management devices

Develop new offshore and onshore circuits

Alongside this report, we have produced an Electricity Network Explainer[1] which provides more information on the different options that can be considered. The Electricity Transmission Design Principles[2] are also available to provide guidance on network design considerations.

1 The Electricity Network Explainer
2 The Electricity Transmission Design Principles

Challenges in delivering network

All new infrastructure solutions have unique challenges depending on the local environment and context. Each element is weighed up and carefully assessed before a recommendation is made. As further detailed design work takes place additional challenges and opportunities may be identified which may refine how this infrastructure is delivered.

The pace at which reinforcement can be brought forward is also shaped by long development and delivery timescales, as well as by practical factors such as supply chains, specialist equipment and workforce availability. This reinforces the importance of a strategic and coordinated approach to network development so that projects aligned with system need can be progressed in the right sequence and at the right time. As a result, diverse solutions that will help us in the near-term, and longer term are needed and are all recommended in this report.

This is why the transmission network matters. It is not simply an engineering requirement. It is the infrastructure that allows Great Britain to make full use of its growing clean power resources, support rising demand to unlock economic growth and maintain system reliability as needs change. The electricity grid must undergo a once-in-a-generation expansion to ensure it can power Great Britain's future industries, and that progress must be swift and coordinated.

Benefits network buildout can unlock for Great Britain

A stronger transmission network reduces constraint costs, enables greater use of clean generation, and supports growing demand at lower whole-system cost. Delaying reinforcement does not remove system need; it decreases operational efficiency and shifts more cost onto consumers. This is why this report focuses on where network investment is most clearly needed now, and where further development is required before longer-term decisions are made.

If Great Britain were to retain the existing transmission network into 2030, constraint costs in that year could reach around £12.7 billion. By building new network capacity, those costs onshore would be reduced by around 75 per cent, with projected 2030 constraint costs of £3.6 billion in one pathway and £2.8 billion in another.[3] This is a clear illustration of **the cost of delay: if network development falls behind, the system becomes more constrained and more expensive for bill payers**. These changes show why timely investment in the transmission network is necessary.

The system must be able to move greater volumes of electricity across longer distances, while operating securely and efficiently under more variable conditions. Addressing this need requires both reinforcement of existing infrastructure and the development of new network capability. Importantly, the timing of these reinforcements is critical – delays increase system costs and risk constraining the delivery of clean power.

These system needs translate directly into the reinforcements required across the transmission network. Chapter 4 sets out how they are addressed through a coordinated Great Britain-wide network design, including both near-term priorities to support Clean Power 2030 and longer-term developments beyond 2030.

3 P36 neso.energy/document/346651/download

04

Great Britain-Wide Network Design

Introduction

To deliver a future-ready grid, we have taken a coordinated approach, bringing together onshore and offshore infrastructure with innovative solutions to create a single, modern electricity network.

This chapter sets out our updated view of the transmission network Great Britain needs through to 2030 and beyond, based on the latest evidence and further option development since *Beyond 2030* was published in 2024. It provides a coordinated, high-level picture of the network required to support changing patterns of generation and demand, while also giving clearer signals on which reinforcements should progress in the near term and which require further development through future strategic planning.

To support changing future energy needs, this chapter provide clear investment signals for industry. Our recommendations are intentionally high level: routes and technologies are not fixed and will be refined through the Detailed Network Design phase by Transmission Owners (TOs) and offshore developers. This allows the network to be developed as the right solution, in the right place, at the right time to meet future system needs.

Looking beyond 2030, particularly into the mid-2030s, the range of potential solutions expands significantly as Great Britain's energy demand continues to grow. We want to encourage early discussion and welcome innovative proposals from industry and consumers. These options will require further refinement as policy and system needs evolve, but maintaining momentum now will be essential. The implications of these wider system changes are set out in Chapter 3.

This section focuses on the resulting network requirements and explains how the recommended transmission design enables efficient, secure system operation. It also distinguishes clearly between the options that should move forward now and those that require further development.

- **Near-term reinforcements** These options represent clear system needs, with well-developed solutions that deliver consumer value through delivery by the mid 2030s. They build on the network already recommended and in delivery through the 2030 Great Britain wide network design and the *Clean Power 2030 Action Plan*.
- **Longer-term options** relate to the investments needed after the middle of 2030s (*Beyond 2030* Great Britain-wide network design), where further development is still needed. These will be considered through future strategic planning processes, including the CSNP.

Together, this chapter provides a coordinated network design and, critically, a clearer signal on what should progress now and what should be developed further.

Assessment criteria for designing network

We consider a wide range of innovative ideas, for both the onshore and offshore network, to increase capacity and flexibility in the future.

We recommended which options work best using a multi-criteria approach. We assess each option against four criteria in order to take a balanced approach when comparing different options, and avoid focusing just on the just the economic costs or benefits.

This means we assess every option against the same set of criteria, based on future system needs. By doing so, we can balance cost and deliverability with impacts on communities and the environment. These options must also be consistent with safety standards set through the Security and Quality of Supply Standard (SQSS)[1] to ensure we maintain the most resilient future energy system.

All our design criteria are considered on equal footing. This helps us make clear, well rounded decisions and take a joined up view of the system.

Deliverable and operable

We applied a deliverability and operability assessment framework that considered 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. Similarly we look at the technical complexity of proposed solution and how easy it will be to integrate with the rest of the system.

Finally, the results are presented to the governance as outlined in the methodology. When there are two solutions that perform similarly across the assessment criteria, the best way forward is recommended to the governance for a final decision for endorsement.

This balanced approach puts us in a strong position to deliver the reliable, clean and affordable energy system Great Britain needs, while carefully considering the wider network impacts of our decisions.

Figure 9: Multi-criteria design approach

The criteria we use to assess these solutions are:

Objective	Our approach
Economic and efficient	We used **economic assessment tools** to determine the optimal economic design from a wide range of proposed options, ensuring the best value for consumers.
Deliverable and operable	We applied a **deliverability assessment framework** that considered 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.
Considers impact on environment	We conducted **assessments of environmental constraints** using a range of geospatial data sources to determine the location and sensitivity of environmental constraints. We did this in consultation with Statutory Nature Conservation Bodies (SNCBs) ensuring our design minimises the impact, where possible, on the natural environment.
Considers impact on communities	We conducted **assessments of community constraints** using a range of geospatial data sources to determine the location and the sensitivity of community constraints, ensuring our designs minimise the impact, where possible, on local communities that host this infrastructure.

1 While the future CSNP is expected to comply with SQSS requirements, the Beyond 2030 Update does not fully meet this standard. As such, additional onshore reinforcements may be required in certain cases to ensure full compliance.

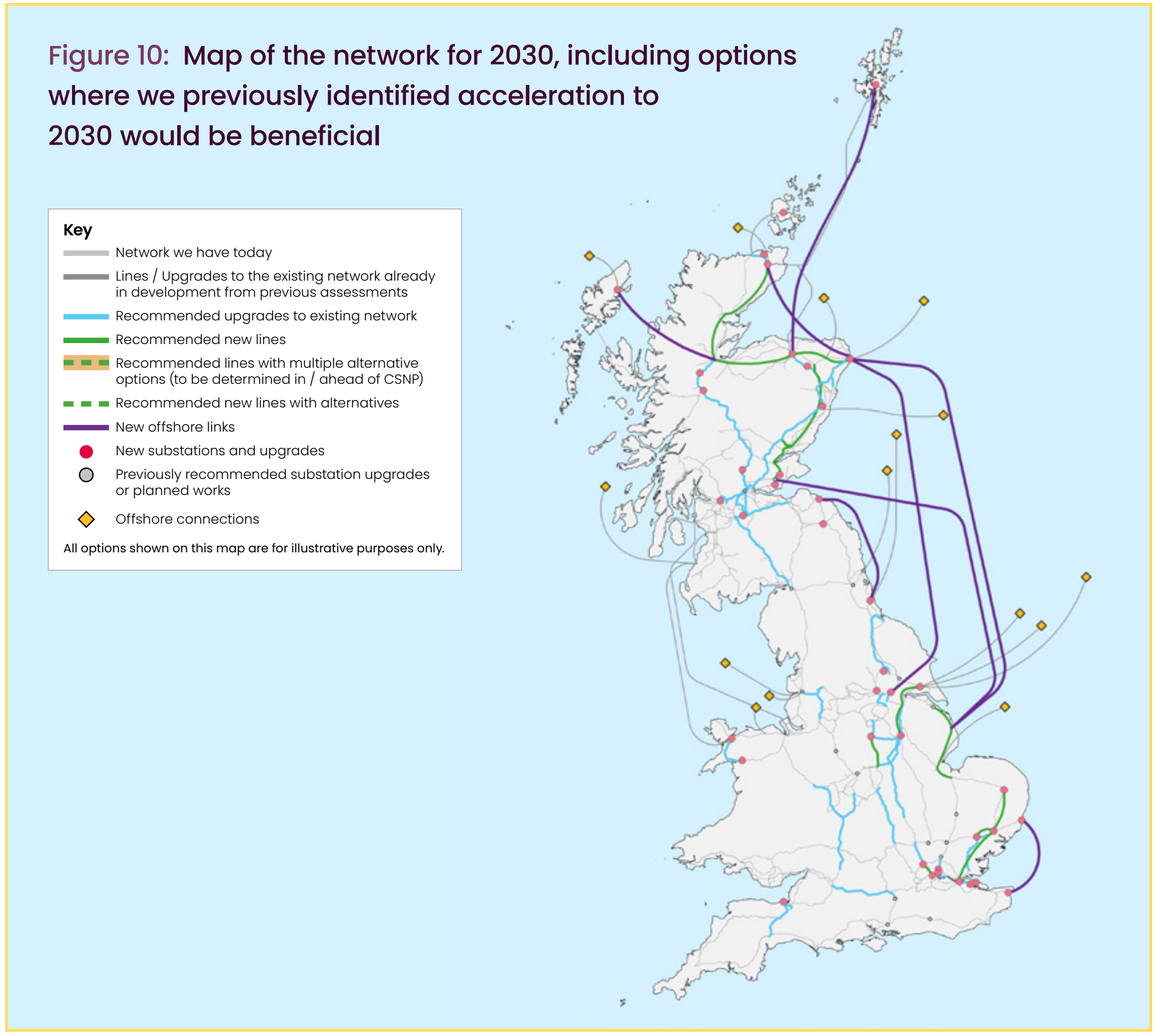
2030 Great Britain's electricity network design

The Pathway to 2030 Holistic Network Design set out a single, integrated network design to unlock Clean Power 2030—enabling the large-scale delivery of offshore wind and moving clean electricity efficiently to where it is needed across Great Britain.

In 2025, low carbon sources supplied over 60 per cent of Great Britain's electricity across the year, with renewables and nuclear regularly meeting the majority of demand. At times, the system has operated with very high levels of clean power, showing what is already achievable today. These periods, however, still depend on weather conditions and available system capacity.

NESOs *Clean Power 2030*[2] Report sets out how this becomes routine rather than exceptional. By 2030, it will be normal for the electricity system to operate on 100 per cent renewable electricity for extended periods, while maintaining security of supply. This is essential to delivering the UK Governments ambition for a year round electricity mix that is at least 95 per cent low carbon. Achieving this will require coordinated investment and change across generation, networks and system operation.

Figure 10: Map of the network for 2030, including options where we previously identified acceleration to 2030 would be beneficial



2 Clean Power 2030 | National Energy System Operator

The transition goes beyond electricity generation alone. Under the most ambitious Clean Power 2030 pathways, demand for fossil fuels continues to fall through the second half of the decade as homes, transport and industry increasingly electrify. This shift supports the growth of new clean industries and enables consumers and businesses to benefit from reliable, clean and affordable electricity. Hydrogen may also play a role in parts of the system where electrification is less straightforward.

Offshore wind is central to delivering Clean Power 2030. It remains one of the lowest cost sources of electricity and can be deployed at the scale needed to replace fossil fuelled generation. Great Britain is already a global leader, but meeting 2030 ambitions depends on a more coordinated approach to how offshore wind connects to the onshore network. This can reduce costs, minimise impacts on communities and the environment, and ensure power is delivered efficiently to where it is needed.

The scale and pace of change required led the UK Government to establish the Offshore Transmission Network Review (OTNR). Through this work, we were asked to develop a holistic network design to support the coordinated connection of offshore wind, aligned with the ambition to deliver Clean Power 2030. This reflects our role: operating today's electricity system securely, while designing a reliable, clean and affordable energy system for the future.

What are we planning for

In 2022, we set out a first of its kind, coordinated plan to connect 23 GW of offshore wind to the electricity network. This marked a step change in how Great Britain plans and delivers offshore transmission and laid important foundations for Clean Power 2030.

By taking an integrated approach, the design increases the system's ability to make full use of Great Britain's offshore wind resource, providing greater flexibility and capacity. Over the 2030s, the additional clean electricity enabled by this design is equivalent to powering around 10 million homes for a year. Connecting more offshore wind also reduces reliance on imported gas and could cut emissions by up to two million tonnes of CO_2 between 2030 and 2032—an impact comparable to grounding all UK domestic flights for a year.

As set out in the System Needs chapter, the electricity network is approaching the limits of what it can deliver today. Meeting the ambition of Clean Power 2030 and supporting economic growth requires a scale of investment not seen since the development of the super grid in the 1950s. By 2030, we recommend almost **£64 billion** of investment across onshore and offshore transmission infrastructure. This investment supports the connection of new offshore wind and other renewable generation, while ensuring the system operates at best value for consumers.

This investment comprises two main elements: the offshore network design and the reinforcements to the onshore transmission system. These include upgrades that maximise the use of existing infrastructure, alongside new circuits and innovative, market led low or no build solutions. Together, they provide the capacity and resilience needed to operate a reliable, clean and affordable power system by 2030.

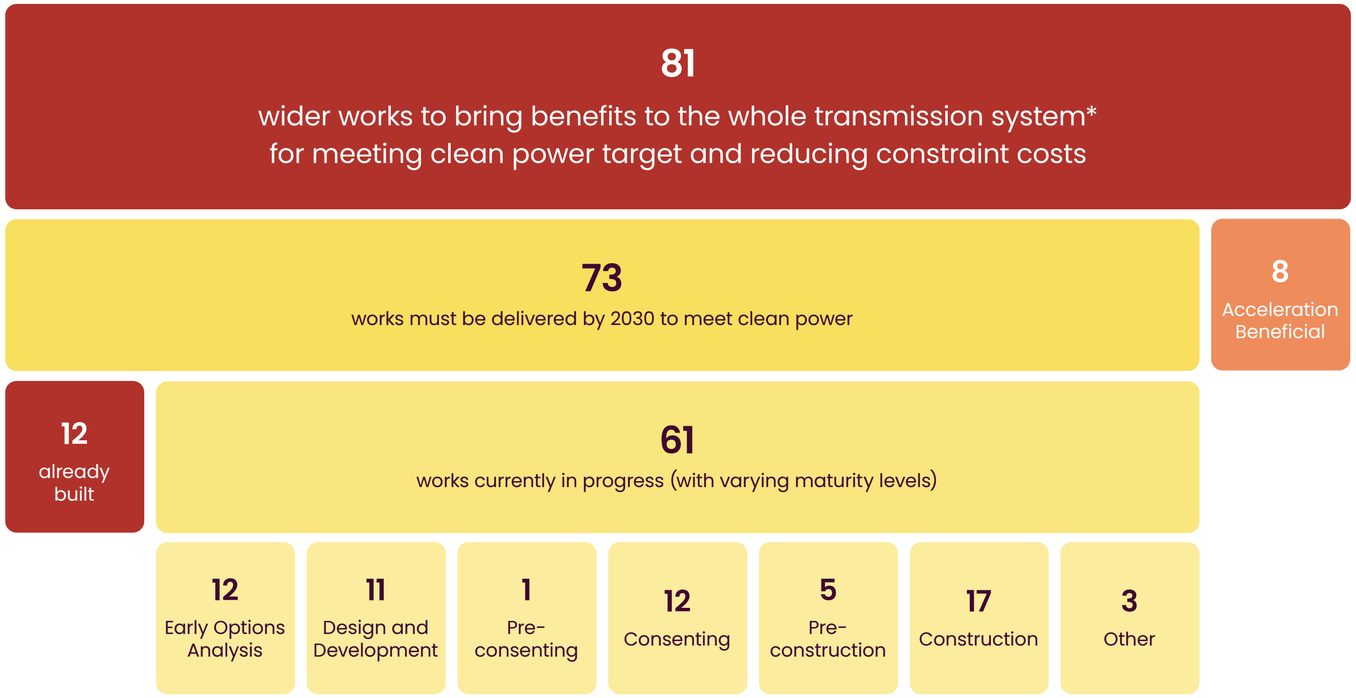
Given the scale of infrastructure required, our aim was to deliver a coordinated and optimised network design that balances impacts on communities and the environment with system security and consumer value. This includes coordinated trenching, offshore cabling that bypasses congestion on the onshore network, and offshore wind farms sharing transmission assets.

By using the seabed more efficiently, the Holistic Network Design is expected to reduce the offshore cabling footprint by around a third and limit the need for additional onshore infrastructure. Compared with a traditional unoptimised radial, point to point approach, shared offshore infrastructure.

To support Clean Power 2030, we also worked with Ofgem to accelerate strategic elements of the network that would otherwise have delivered later in the decade. In late 2022, Ofgem agreed to the regulatory acceleration of 26 projects,[3] delivering a net benefit to consumers of up to £2.1 billion by avoiding network constraint costs.

The delivery programme for the 2030 network is already underway through established planning and regulatory frameworks. Building on the Pathway to 2030 report published in 2022, a refined portfolio of schemes has been identified through our Clean Power 2030 advice as critical to achieving UK Government targets.

Figure 11: **Breakdown of the wider required transmission works**



*Only includes works for wider transmission benefit and does not include works such as connection enabling works, assets needed for operability

*These are wider transmission network reinforcements – they may not include all works for example – works driven by connection enabling works, operability, etc.

(Updated as of March 2026)

3 Acceleration of Strategic Transmission Infrastructure

Delivering this programme is fundamental to enabling the timely connection and efficient utilisation of large-scale renewable generation. It also strengthens system resilience and energy security, reduces whole-system costs for consumers, supports rising electricity demand, and facilitates long-term economic growth. Most importantly, it establishes a scalable network platform that can support continued expansion into the 2030s and beyond.

Great Britian's 2030 electricity network design provides more than a long-term picture of the network needed to support Clean Power 2030. It also provides a practical basis for near-term investment decisions, identifying the reinforcements that are most critical to progress now to maintain momentum, reduce future system costs and support delivery against UK Government ambition.

These reinforcements therefore represent the core set of **near-term priorities**, where timely progression is required to avoid increased costs and delivery risk. In this way, the 2030 network design acts both as a strategic plan and as a clearer signal to Ofgem and industry on where timely action is needed.

Beyond 2030 Great Britian's electricity network design

Beyond 2030, published in 2024, set out a recommended transmission network design to support the UK, Scottish and Welsh Governments' decarbonisation and energy security ambitions. At its core, was the need to connect and integrate a further 21 GW of offshore wind from waters around Scotland, in addition to the 23 GW already considered in the Pathway to 2030 plan. Together, this represented a step change in offshore renewable generation beyond the near-term horizon and required a more coordinated, long-term approach to network development.

Since 2024, the offshore network design has been reviewed and refined. This reflects a stronger focus on deliverability, system efficiency and coordination, informed by the UK Government's *Clean Power Action Plan*, the latest *Future Energy Scenarios* and Connections Reform. The updated approach recognises the need to balance ambition with practicality, ensuring that infrastructure can be delivered at pace and in line with policy timelines.

Earlier designs, which relied on more complex configurations and extensive coordination, have been simplified to improve feasibility and reduce delivery risk. The refined design prioritises more direct and modular offshore connections that can be built more readily, while still providing flexibility for future expansion. Connection points have also been adjusted to better reflect evolving offshore generation patterns and the capability of the onshore network. These changes support a more pragmatic balance between optimising system outcomes and ensuring infrastructure can be delivered when it is needed.

This evolution also reflects wider considerations around construction constraints, consenting processes and supply chain capacity. By simplifying offshore connections where appropriate and making greater use of existing assets, the design reduces unnecessary complexity while helping to minimise costs and impacts on communities and the environment. Alongside this, greater emphasis has been placed on the onshore transmission network.

Transmission Owners (TOs) have continued to develop and mature key reinforcements and connection infrastructure, improving alignment between strategic planning and what can be delivered on the ground. This reflects closer collaboration between system planning and asset development, allowing more detailed consideration of network constraints, buildability and regional needs.

As a result, the recommended designs are better informed by engineering feasibility, environmental considerations and stakeholder engagement.

Our recommendations

Our assessment provides renewed confidence in the *Beyond 2030* recommendations. Most previously identified options continue to demonstrate enduring system need, while updated evidence and further optioneering by Transmission Owners (TOs) have helped identify a number of improved reinforcements. Together, these strengthen the overall network design, ensuring it remains resilient to evolving system conditions and aligned with future electricity system needs.

Across Great Britain, we recommend a total of £89 billion of network investment beyond 2030 delivering a coordinated offshore and onshore network design, supported by targeted upgrades to local networks and power flow control. High capacity offshore high voltage direct current (HVDC) links off the eastern and western coasts form the backbone of the system, enabling large volumes of renewable generation to move from North Eastern Scotland into Northern England, the English Midlands and further south to major demand centres. These are complemented by strategic onshore reinforcements across northern England, North Wales, the Midlands and Southern England, creating a more interconnected and flexible transmission system.

In Northern England, particularly North East England, reconductoring and targeted network upgrades strengthen key circuits between major substations. These works increase thermal capability and enable higher power transfers under both normal and outage conditions, supporting the movement of generation from Scotland into the wider network and maintaining resilience across northern transmission corridors where flows are expected to rise.

Across North Wales, North West England and into the English Midlands, new transmission routes and substations establish a strengthened west coast pathway. This links coastal generation and offshore inflows into the central transmission system, relieving pressure on existing corridors and enabling greater use of both offshore and onshore generation. Targeted upgrades within the English Midlands further enhance north–south and east–west transfer capability, ensuring local constraints do not limit the effectiveness of the wider network.

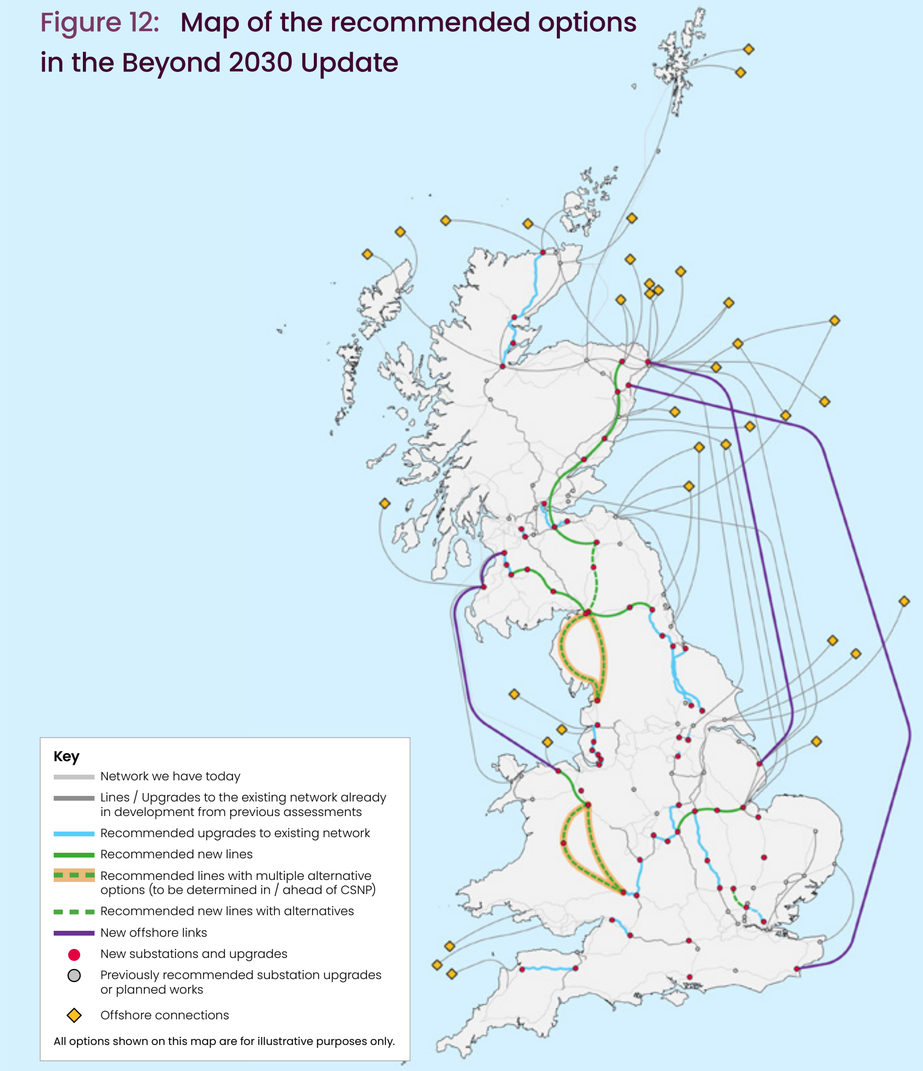
These capacity driven reinforcements are complemented by measures to improve power flow control on key corridors, particularly in Eastern England and the English Midlands. The installation and upgrading of phase shifting and other flow control devices allows power to be managed more effectively, reducing local congestion and improving the utilisation of existing and new infrastructure.

Further south, reinforcements across Southern England and into Greater London ensure the network can accommodate increasing power flows as electricity moves towards major demand centres. Targeted cable upgrades and reconductoring remove local bottlenecks and increase export capability from generation rich areas such as the south coast and South West England. New and upgraded routes into Greater London strengthen the ability of the network to support both imports and exports, reinforcing security of supply in one of the most demand intensive parts of Great Britain.

We have recommended a number of offshore network options. We recognise that these are more expensive than onshore options; however, based on the options provided by the Transmission Owners, and the overall system need to move power from north to south, they remain cost-effective solutions. We also recognise that some of these projects are at an early stage of maturity, so note that appropriate investment should happen to continue developing them, they will be reassessed alongside other options as part of CSNP.

Taken together, these interventions illustrate a coordinated and layered approach to network development. Large scale offshore and onshore reinforcements increase the physical capacity of the system, while regional upgrades and flow control solutions ensure that this capacity can be used efficiently. By strengthening key corridors across Northern England, North Wales, the English Midlands, Southern England and Greater London, the recommended network provides a resilient and flexible platform capable of supporting evolving power flows well into the future.

Figure 12: **Map of the recommended options in the Beyond 2030 Update**



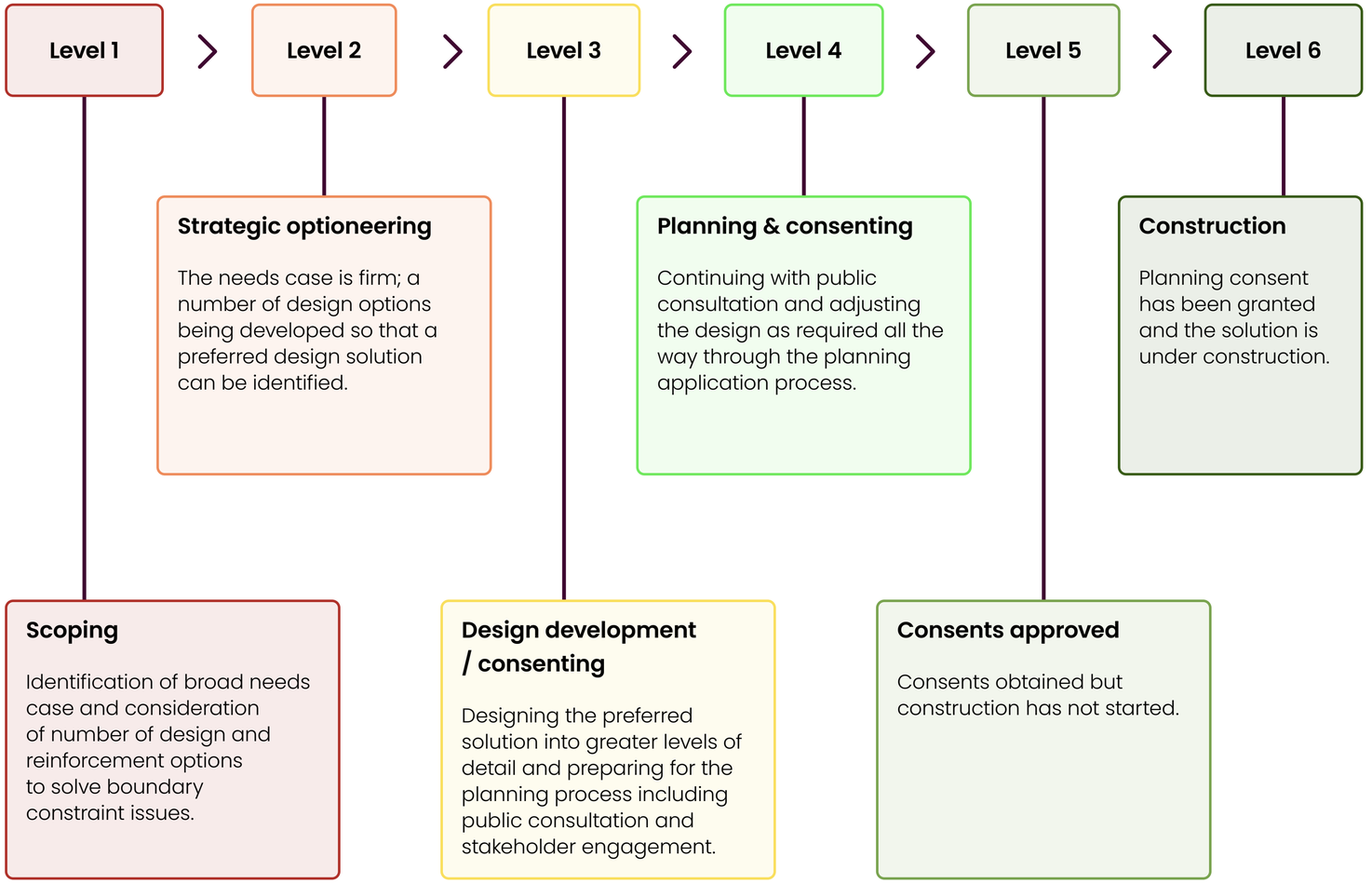
What happens next?

The recommendations set out in this report are strategic and high level. They identify where transmission reinforcement is needed and indicate the current maturity of different options, but they do not determine final project outcomes. Our role is to provide independent advice on system need and the strategic case for investment. The Office of Gas and Electricity Markets (Ofgem) will consider this advice in funding decisions, while Transmission Owners (TOs) and offshore developers will take forward detailed design, routeing, environmental assessment, consultation and delivery in accordance with statutory and regulatory processes.

For many options, further detailed design will explore potential routeing, technology choices and how onshore and offshore assets could be configured, building on the high-level recommendations set out in this report.

Detailed design, consenting and delivery will be led by the organisations responsible for developing each asset. As part of this process, they will carry out the necessary assessments and engagement activities, including detailed environmental assessments and consultation, in line with statutory requirements and established processes. This engagement will help inform how projects are taken forward as they move through development.

Figure 13: Project maturity level



05

Nations and Regions Network Design

Introduction

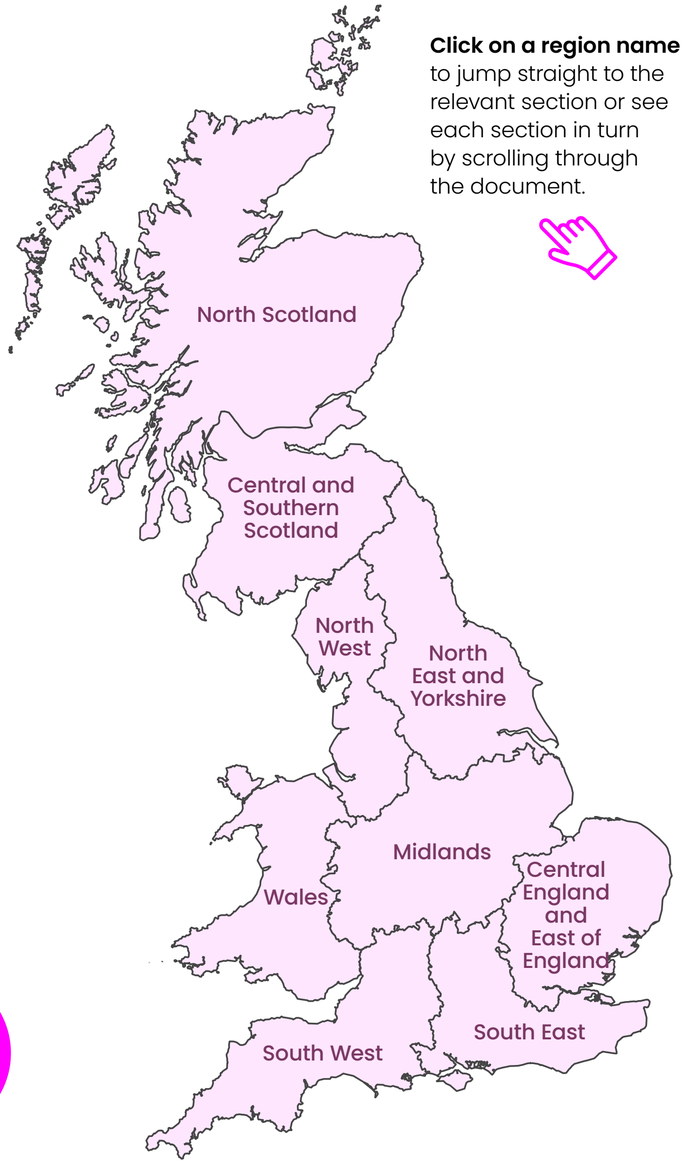
This chapter translates the recommended Great Britain-wide network design into individual nations and regions, showing how local reinforcements contribute to one coordinated transmission system across Great Britain. It explains how evolving generation, demand and power flow patterns create different network needs in different places, while also making clear where earlier recommendations continue to be supported, where options have been refined, and where new reinforcements are now recommended. In this way, the chapter provides a more local view of the same strategic choices set out in the Executive Summary: what should move forward now, and what requires further development.

As a broad picture, the output of our assessment shows that much of the network recommended in our original Beyond 2030 network design continues to provide a strong foundation for the future energy system. In most areas, these earlier recommendations remain similar to Beyond 2030 and are expected to play a central role in supporting a reliable and efficient network as demand grows and generation patterns change.

By building on established plans, the design provides continuity while supporting the delivery of clean power and maintaining security of supply.

Alongside the existing *Beyond 2030 Recommendations*, we have identified a need for **16** network options which differ from those previously recommended. Some of these new options are variations or updated versions of previously recommended options. Together, they strengthen the network's ability to move electricity efficiently across Great Britain and reduce the risk of congestion as more generation connects to the network. These recommendations increase the emphasis on upgrading existing network infrastructure where possible, helping to minimise costs and impacts.

Overall, this emerging network design is expected to deliver a substantial reduction in system constraints and keep electricity flowing reliably. The reinforcements in each area come together to form one holistic national design, helping to secure Great Britain's energy future.



Click on a region name to jump straight to the relevant section or see each section in turn by scrolling through the document.

North Scotland

The North of Scotland has a long history in energy, evolving from its oil and gas industry to both onshore and offshore wind generation.

As the hub of the United Kingdom's oil and gas industry, the North of Scotland has been a key hub of energy production for the rest of Great Britain.

The North of Scotland has evolved from an area of historically low demand, into a major producer of clean electricity, driven by rapid growth in onshore and offshore wind generation. While local electricity demand has remained relatively modest due to low population density and limited industrial load, generation capacity has expanded, with the electricity network needing to handle power flows south to major demand centres. This surplus increasingly drives high power flows across the overhead lines linking the north of Scotland to central Scotland and then to the rest of Great Britain.

The network in this region was not originally designed to accommodate sustained, high-volume north to south transfers. As the amount of electricity generation in the region has increased, bottlenecks on existing overhead lines between the north of Scotland and the rest of Great Britain have become worse, resulting in increased costs from switching off generation due to these bottlenecks.

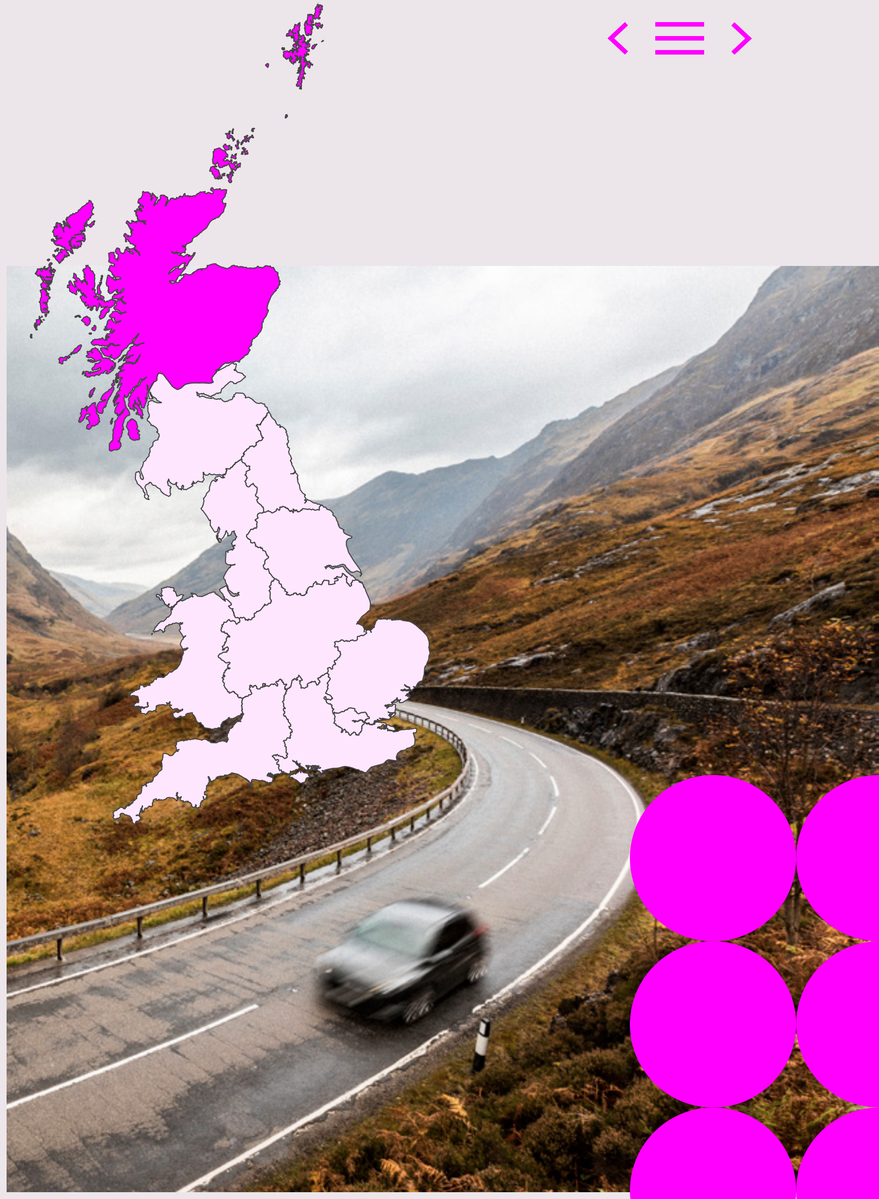
Our recommendations in this update aim to address these challenges, maximise consumer benefit, reduce constraint costs on bills, and support long-term decarbonisation objectives.

In *Beyond 2030*, we recommended several options to increase the capability of the network in North Scotland, facilitating future offshore wind generation in the region.

Our analysis continues to confirm the need for these options, including the critical onshore spine, transferring power from the North of Scotland further south. We also continue to recommend multiple offshore links developed from the coordinated offshore design, moving power from Aberdeenshire to other parts of the network and reducing the need for onshore reinforcement.

We have refined two offshore links, previously identified in the offshore network design that move significant amounts of power from the North of Scotland to the South of England. This combination of the onshore and offshore network together provides a better balance between the economic and the environmental and community considerations.

Additionally, we have identified new network upgrades in the Scottish Highlands, increasing the capability of the existing network even further.



North Scotland

New infrastructure

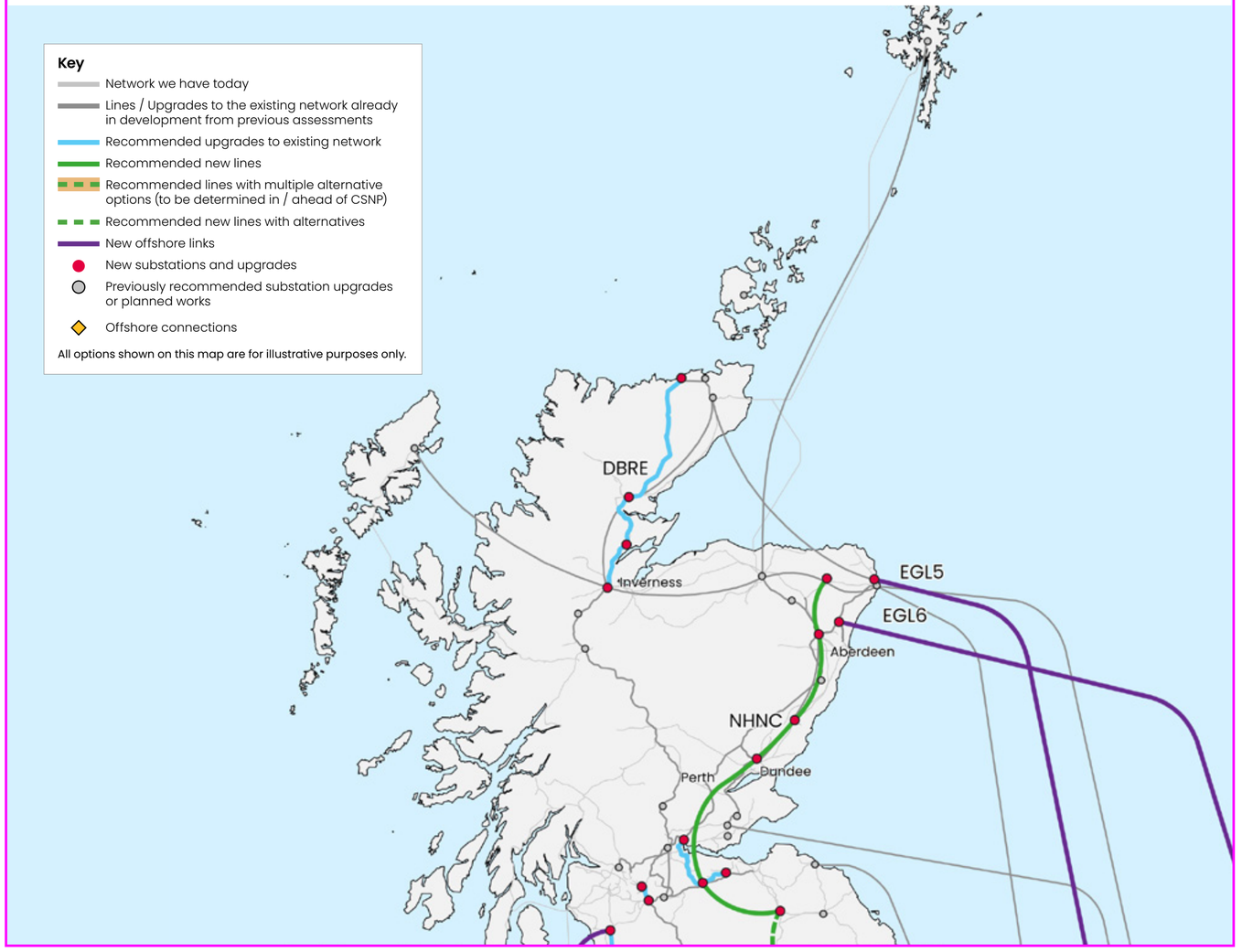
Code	Description	Previously recommended
EGL5	New offshore HVDC link between North East Scotland and Lincolnshire	Yes
EGL6	New offshore HVDC link between North East Scotland and the South East of England	Yes
NHNC	Combination of new and replacement 400 kV double circuit from North East Scotland to central belt Scotland	Yes

Network upgrades

Code	Description	Previously recommended
DBRE	Reconductor existing circuits between Dounreay, Loch Buidhe and Beauly	No

Click **code** for further information

Figure 14: Map of the recommended network for North Scotland



Central and Southern Scotland

Central and Southern Scotland is a geographically diverse region, including the urban areas of Edinburgh and Glasgow as well as the rural Southern Uplands.

Since the publication of *Beyond 2030*, the recommended network for Central and Southern Scotland has continued to evolve in response to updated generation trajectories, accelerated delivery frameworks, and emerging system operability evidence.

Beyond 2030's Recommendations built on the earlier Holistic Network Design by identifying additional onshore and offshore reinforcements through the 2030s, recognising that earlier recommended upgrades alone would be insufficient to accommodate forecasted changes on the electricity network.

Subsequent work has reinforced this conclusion, with this coming from updated constraint analysis and operational experience. This highlights network bottlenecks in the region becoming more congested earlier than expected. As a result, many of the options considered for our network have shifted from incremental reinforcement towards coordinated, high-capacity upgrades.

These include increased use of high voltage direct current (HVDC) links, uprating of existing corridors, and accelerated delivery of key upgrades. These changes reflect a clearer recognition of the role that Central and Southern Scotland play on the national electricity network.

To move the power generated in North Scotland, as well as facilitate future renewables in the region, towards the south, we recommended several network upgrades and new infrastructure in Beyond 2030.

Our analysis continues to confirm the need for these options, including the critical onshore spine, transferring power from the generation sites in Scotland to areas further south.

Central and Southern Scotland

New infrastructure

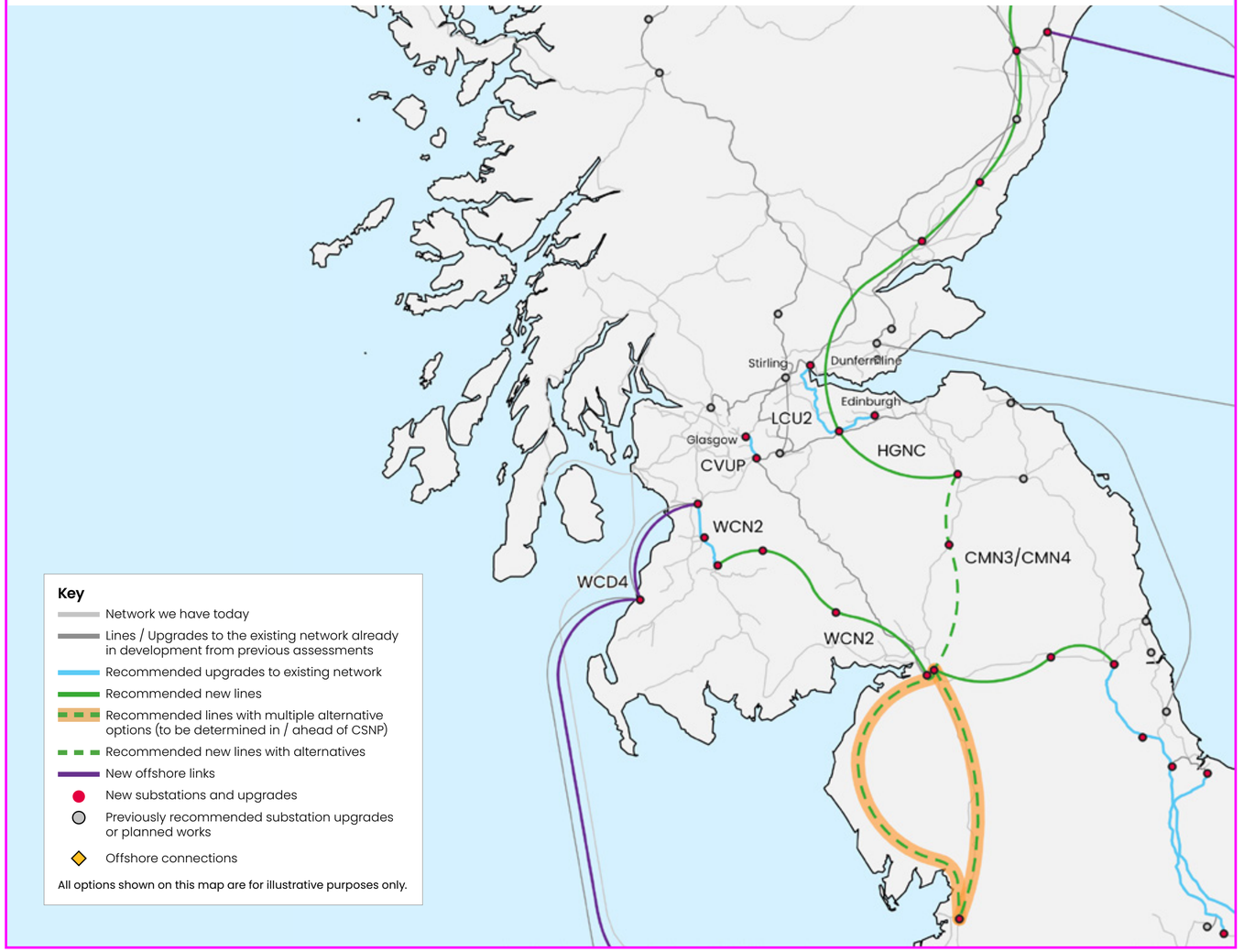
Code	Description	Previously recommended
CMN3/ CMN4	Gala North to Teviot to North West England circuit via new Carlisle 400 kV substation south / north of Carlisle	Yes
HGNC	Harburn to Gala North 400 kV Reinforcement	Yes
WCD4	New 2 GW offshore HVDC link between Ayrshire and North Wales	Yes
WCN2	New 400 kV onshore circuit from Ayrshire to the north west of England	Yes

Network upgrades

Code	Description	Previously recommended
CVUP	Clyde's Mill to Strathaven 400 kV Reinforcement	Yes
LCU2	Kincardine North - Harburn - Currie 400 kV Reinforcement	Yes

Click **code** for further information

Figure 15: Map of the recommended network for Central and Southern Scotland



North West

The North West of England has long been a cornerstone of Britain's electricity system, shaped by a strong industrial heritage, major urban centres, and a well established transmission network.

Historically, the North West has been characterised by relatively high and stable electricity demand, driven by population centres including Greater Manchester and Merseyside, alongside energy intensive industries and strategically important economic infrastructure. Because of this, the North West has previously seen reasonably high energy needs, relying on a combination of local generation and imported electricity from other parts of Great Britain.

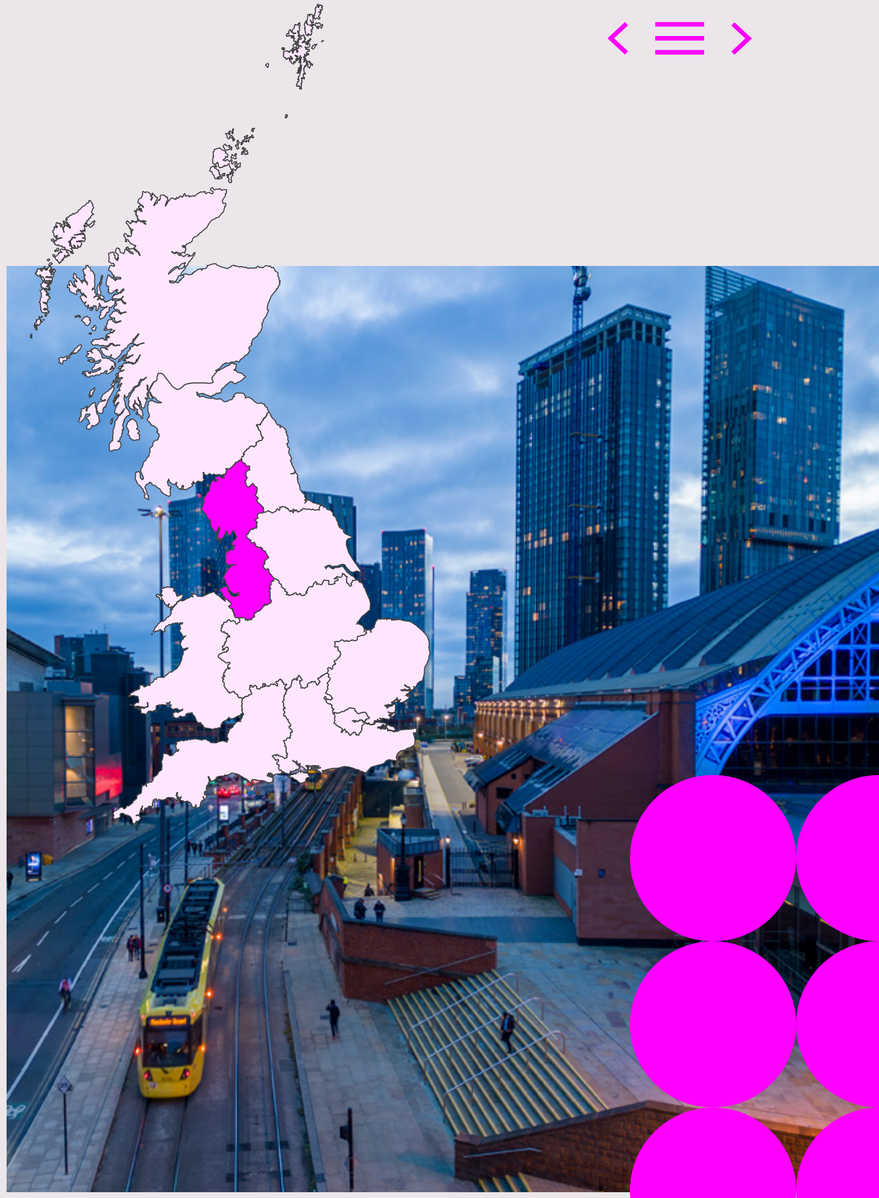
However, in recent years, the role of the region within the national electricity system has begun to evolve. Growth in renewable generation, particularly offshore wind in the Irish Sea, complemented by onshore wind and solar, has increased both the volume and variability of electricity generated within and adjacent to the region. This transition is changing power flow patterns across the transmission system, including in the North West.

While electricity demand in the North West remains significant, it is also expected to grow further as transport, heat and industrial processes increasingly electrify to support decarbonisation.

As a result of both these shifts, the North West is becoming not only a major centre of electricity consumption, but also an increasingly important transit and balancing region for power flows between Scotland, Wales, offshore generation zones, and demand centres further south.

This evolving role places growing pressure on the transmission network. Existing infrastructure was largely designed to accommodate conventional generation and to large, predictable demand locations, rather than larger and more variable power flows which are forecasted.

As such, upgrades are required to efficiently support growing demand, connect new generation, reduce congestion costs, and ensure the region can play its role in the energy of Great Britain as a whole.



North West

New infrastructure

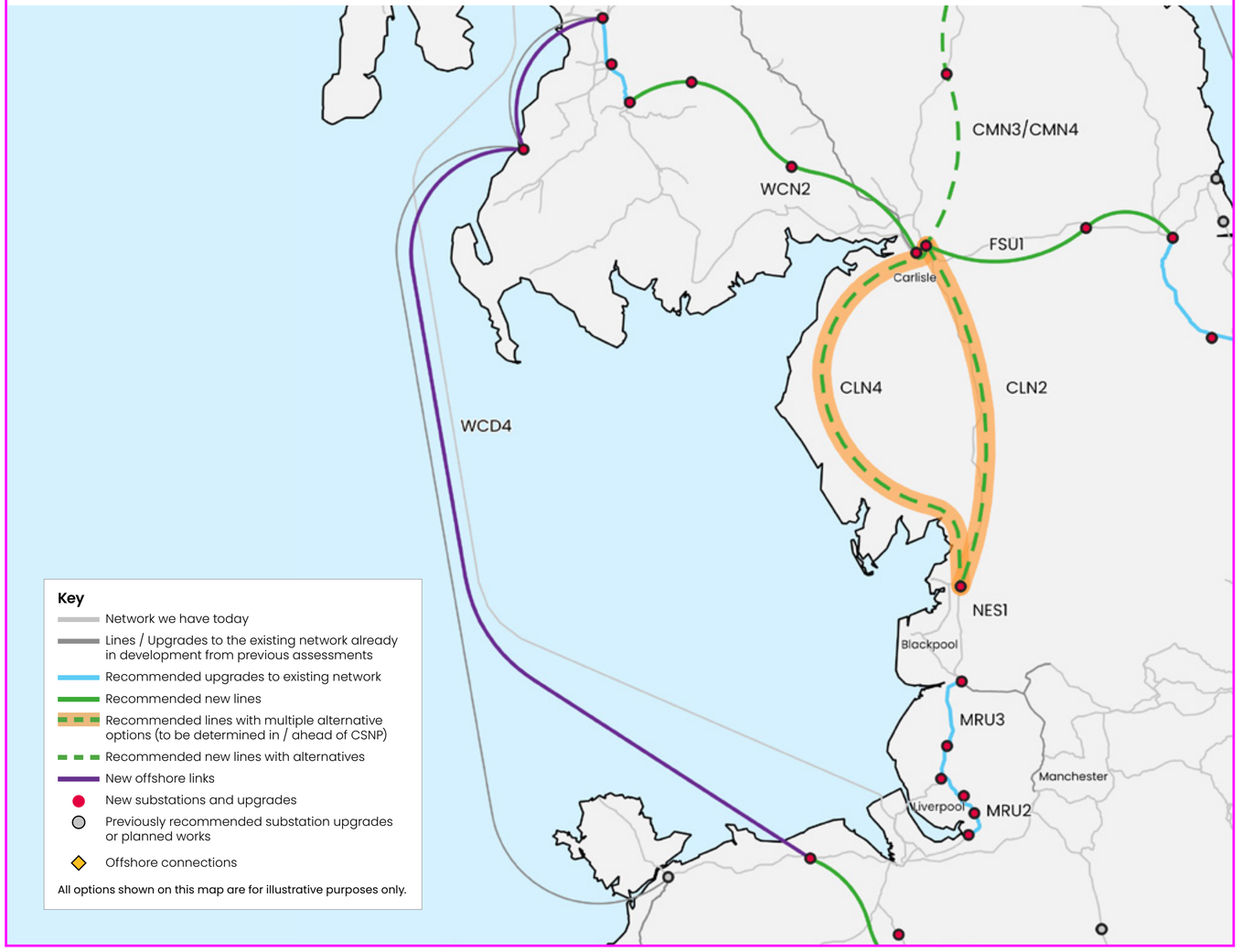
Code	Description	Previously recommended
CLN2/ CLN4	New 400 kV double circuit from North West England to Lancashire directly / following the coast	Yes
CMN3/ CMN4	Gala North to Teviot to North West England circuit via new Carlisle 400 kV substation south / north of Carlisle	Yes
FSU1	Harker to Stella West upgrade from 275 kV to 400 kV	Yes
WCN2	New 400 kV onshore circuit from Ayrshire to North West of England	Yes

Network upgrades

Code	Description	Previously recommended
MRU2	Mersey Ring Upgrade Stage 2: 275 kV to 400 kV upgrade retaining existing tower	Yes
MRU3	Mersey Ring Upgrade Stage 1: 275 kV to 400 kV upgrade retaining existing tower	Yes
NES1	Series compensation strategy 1 across the North of England transmission network	Yes

Click **code** for further information

Figure 16: Map of the recommended network for North West



North East and Yorkshire

The North East of England and Yorkshire both have a long and influential history in Britain's energy system, with roots in heavy industry, manufacturing, and coastal infrastructure that have shaped both regional demand and national supply.

While traditionally associated with industrial electricity consumption and local generation, both the North East and Yorkshire's role within the electricity system have evolved significantly in recent years.

The North East and Yorkshire are both emerging as strategically important hubs for offshore wind generation, supported by extensive coastal and port infrastructure and proximity to major offshore development zones in the North Sea. The Crown Estate has identified the seabed in the region as the next area in England to be leased for more offshore wind development within Leasing Round 6.

Substantial growth in offshore wind capacity, alongside onshore renewables and other low carbon technologies, is transforming the region from a primarily demand led area into a growing exporter of electricity to the wider system.

Local electricity demand in the area remains relatively modest compared to major urban and industrial centres elsewhere in England. While demand is expected to increase over time due to electrification of transport, heat and industry, the pace of growth in renewable generation is outstripping local consumption.

As a result, an increasing proportion of electricity generated in the region must be exported to demand centres elsewhere on the network, and this shift is placing new demands on the bottlenecks on the system. The existing infrastructure was largely designed to serve traditional industrial demand and radial generation connections, rather than sustained, high volume exports from offshore and coastal generation.

As such, our recommended network supports this transition and helps enable the offshore wind opportunities which will bring economic benefit and more home-grown energy to the region.

North East and Yorkshire

New infrastructure

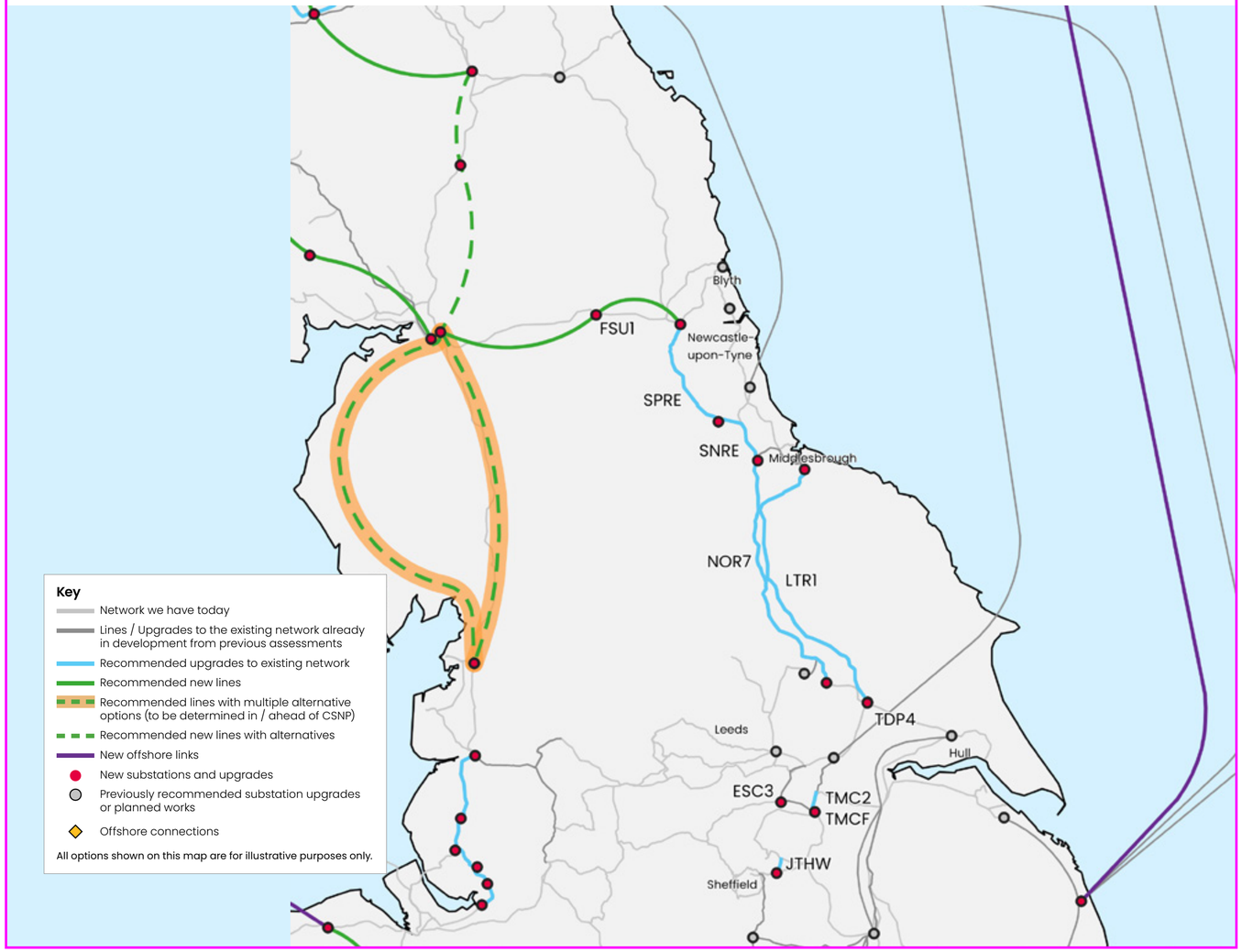
Code	Description	Previously recommended
ESC3	New 400 kV substation and power flow control devices within the West Yorkshire region	Yes
FSU1	Harker to Stella Wes via Fourstones upgrade from 275 kV to 400 kV	Yes

Network upgrades

Code	Description	Previously recommended
JTHW	Hotwire route between Thurcroft and West Melton	Yes
LTR1	Reconductor Lackenby to Thornton 400 kV double circuit route	Yes
NOR7	Reconductor Norton to Osbaldwick 400 kV double circuit route	Yes
SNRE	Reconductor Spennymoor to Norton 400 kV double circuit	Yes
SPRE	Reconductor Spennymoor to Stella West 400 kV double circuit	Yes
TDP4	Installation of power flow control devices along Drax to Thornton 400 kV double circuit	Yes
TMCF	Thorpe Marsh substation reconfiguration	Yes
TMC2	Reconductor Thorpe Marsh leg of Drax to Keadby to Thorpe Marsh 400 kV circuit and Keadby 400 kV substation running arrangement update	Yes

Click **code** for further information

Figure 17: Map of the recommended network for North East and Yorkshire



Wales

The electricity system in Wales has undergone a period of structural change where all coal fired and nuclear power stations in Wales have now closed, removing historic sources of firm generation from the Welsh transmission network.

Notwithstanding these changes, Wales continues to play an important role within the Great Britain electricity system due to its strategic geographic position as "gateway" for offshore wind and energy projects, flexible system assets and future low carbon generation potential.

Wales is also home to the affectionately named "Electric Mountain" (officially known as Dinorwig Power Station), which provides critical system flexibility. The facility enables storage of energy during periods of low demand and rapid release during periods of peak demand, playing a crucial role in the operation of the electricity network.

The existing transmission network in Wales is predominantly oriented on an east–west axis, with circuits broadly aligned along the north and south coasts. While this configuration historically supported power flows to and from neighbouring regions, it provides limited capability for direct north–to-south transfers within Wales. As generation patterns evolve and power flows change across the system, this constraint becomes increasingly relevant.

Beyond 2030 and Pathway to 2030 recommended a North–South Wales reinforcement (PSNC) to address a key system limitation. At the time, it was early stage, with several distinct options. This report has not identified the need for additional infrastructure beyond this earlier recommendation. As it continues to reinforce the requirement for enhanced north-to–south transfer capability, to support future generation in North Wales, maintain efficient power transfer across Wales, and facilitate onward transmission to wider demand centres. This need is proposed to be met through modifications to the circuit previously recommended in *Pathway to 2030*.

The North–South Wales reinforcement (PSNC) first set out in Pathway to 2030 has been further developed in the Refresh. It has been refined into two coordinated projects: UWNC in North Wales and MWNC/MWN1 in Central Wales.

These changes support:

- new generation in North Wales
- growing generation and demand in Mid Wales
- improved transfer capability across Wales

Together, these refinements ensure that the evolving system role of Wales is addressed in a manner that remains consistent with the strategic intent and holistic network design established through Beyond 2030.

Wales

New infrastructure

Code	Description	Previously recommended
MWNC/ MWN1	New 400 kV circuit between West Midlands and South West England via a new substation in Wales /directly	No[1]
UWNC	New double circuit from North Wales to Shropshire	No[1]

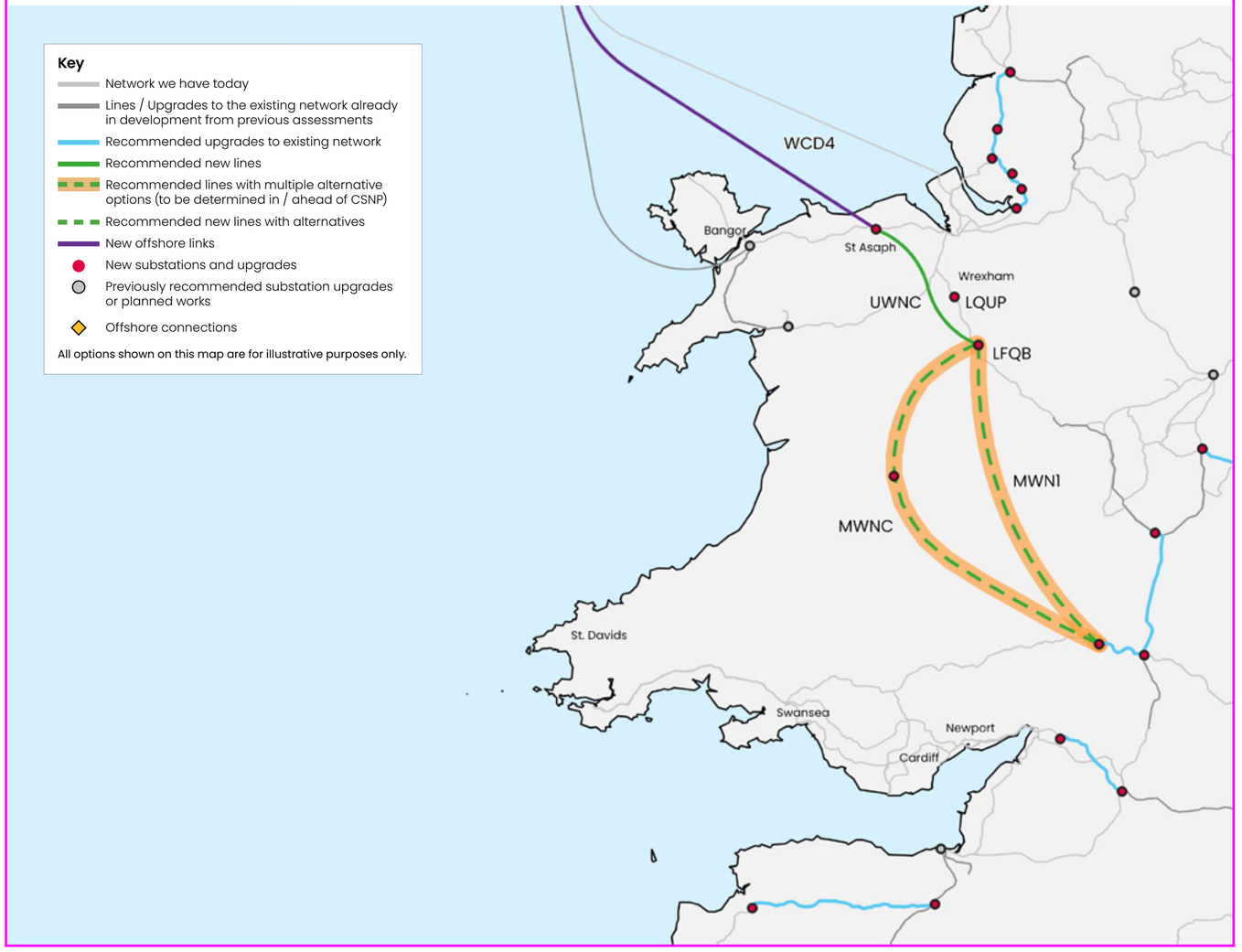
Network upgrades

Code	Description	Previously recommended
LFQB	New power flow control device in West Midlands	No
LQUP	Upgrade of the existing Quad Boosters to higher ratings at Legacy 400 kV substation	No

Click **code** for further information

1 In the 2024 Beyond 2030 report, NESO recommended the need for a new circuit between North and South. Following the publication, this circuit has undergone further development resulting in this new option(s).

Figure 18: Map of the recommended network for Wales



Midlands

The Midlands has long played a central role in Great Britain's electricity system, acting both as a major source of generation and a key route for power flows across the country.

Historically, the region was home to many large thermal power stations, particularly in the East Midlands, helping supply electricity locally and nationally. Over time, many of these stations have closed as they reached the end of their operational lives. Coal generation has been replaced in part by gas and, more recently, by lower-cost renewable generation located both within the region and across Great Britain. A key milestone was the closure of Ratcliffe-on-Soar in September 2024, Great Britain's last coal-fired power station. This has significantly changed regional power flows.

Today, the Midlands combines high and enduring electricity demand—especially in the West Midlands, with its large urban and industrial centres—with an evolving generation background. As a result, power flows across the region are increasing, particularly from North Wales and the West into the East Midlands, and onward to major demand centres in the South of England. These changing patterns place growing pressure on existing transmission infrastructure.

To maintain a reliable electricity system, targeted network reinforcements and new infrastructure are needed to increase transfer capability across the Midlands, particularly supporting stronger eastward and southward flows. This includes the continued development of the North to South Wales reinforcement, now refined into two coordinated projects: UWNC in North Wales and MWNC/1 in Central Wales. These upgrades will support the efficient connection and export of future generation, enable growth in Mid Wales, and strengthen links between Wales, the Midlands and the South of England.

At the same time, as system assumptions have evolved, the need for some previously proposed investments in the East Midlands has reduced. This has allowed plans to be refined, ensuring that investment remains proportionate, targeted and aligned with the region's changing role.

Together, these developments ensure the Midlands continues to support a reliable, clean and affordable electricity system, while adapting to changing generation and demand across Great Britain.

Midlands

New infrastructure

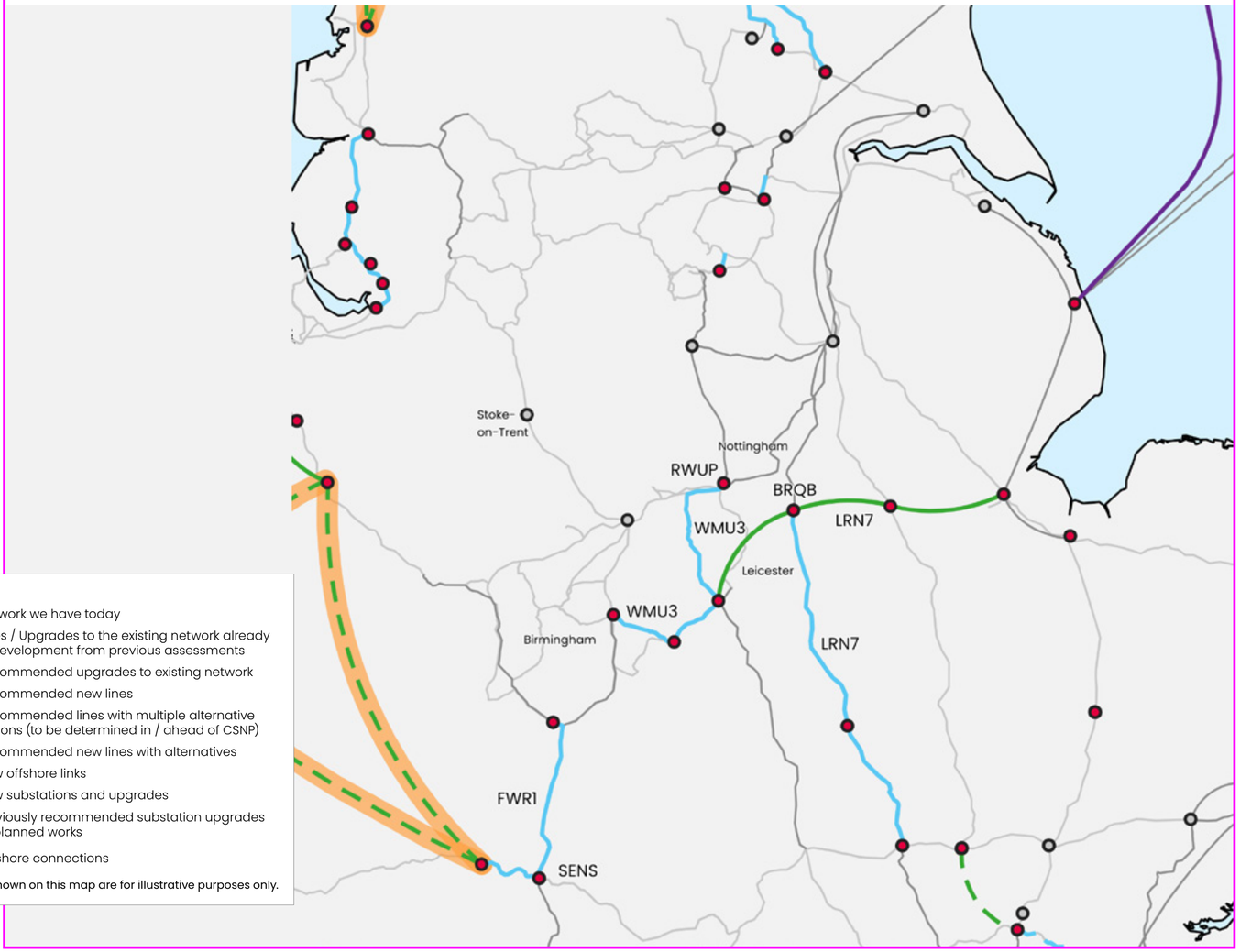
Code	Description	Previously recommended
WMU3	New 400 kV substation within the West Midlands region and associated circuit reconfigurations	No

Network upgrades

Code	Description	Previously recommended
BRQB	Installation of power flow control devices on circuits across East Midlands	No
FWR1	Reconductor Feckenham to Walham 1 400 kV circuit	No
RWUP	Uprate cable section of Ratcliffe-on-Soar to Willington East 2 400 kV circuit	No

Click **code** for further information

Figure 19: Map of the recommended network for the Midlands



Central England and East of England

Home to some of Great Britain's first offshore wind farms and key junctions on the electricity system, the East of England and Central England already play a critical role in the electricity system.

Stretching from the Norfolk and Suffolk coastlines, along the Ox-Cam arc, and reaching Swindon in the West, the combined area of the East of England and Central England is vast and varied.

This area contains some of the most critical junctions on the electricity network, with crossroads between north-to-south and west-to-east circuits, serving local needs and helping move electricity into the capital.

Forecasts show that electricity demand in the region is set to remain relatively stable. Across our Future Energy Scenarios, the main change in the transmission system flows across the area is the expected growth in generation rather than demand. As installed generation capacity is forecast to exceed local consumption, the region is expected to predominantly become a net exporter of electricity, supporting supply to other parts of Great Britain.

In the *Beyond 2030 publication*, a targeted package of network reinforcements was identified for the East of England and Central England to support these changing power flow patterns. These recommendations reflected the strength of the existing network and focused on selective new infrastructure combined with upgrades to existing circuits.

These included a new circuit between Wymondley and Waltham Cross (both in Hertfordshire), voltage uprating of surrounding circuits to increase capacity, and replacing the wires on the existing circuit between Grendon and Sundon with higher-capacity ones.

These previously recommended reinforcements remain part of our current design, and no additional network reinforcement schemes have been identified beyond those set out in Beyond 2030.

Following further development by the relevant Transmission Owner (TO), refinements have been made to the configuration of one previously recommended reinforcement. A circuit initially proposed to run from Lincolnshire through Cambridgeshire to Hertfordshire has been reconfigured to route from Lincolnshire to East Leicestershire, supported by upgrades to adjacent circuits to deliver equivalent system capacity.

Alongside physical network development, we are also exploring non build solutions to manage expected bottlenecks in the region. This approach is intended to reduce constraint costs while reducing the need for further large scale network infrastructure.

Central England and East of England

New infrastructure

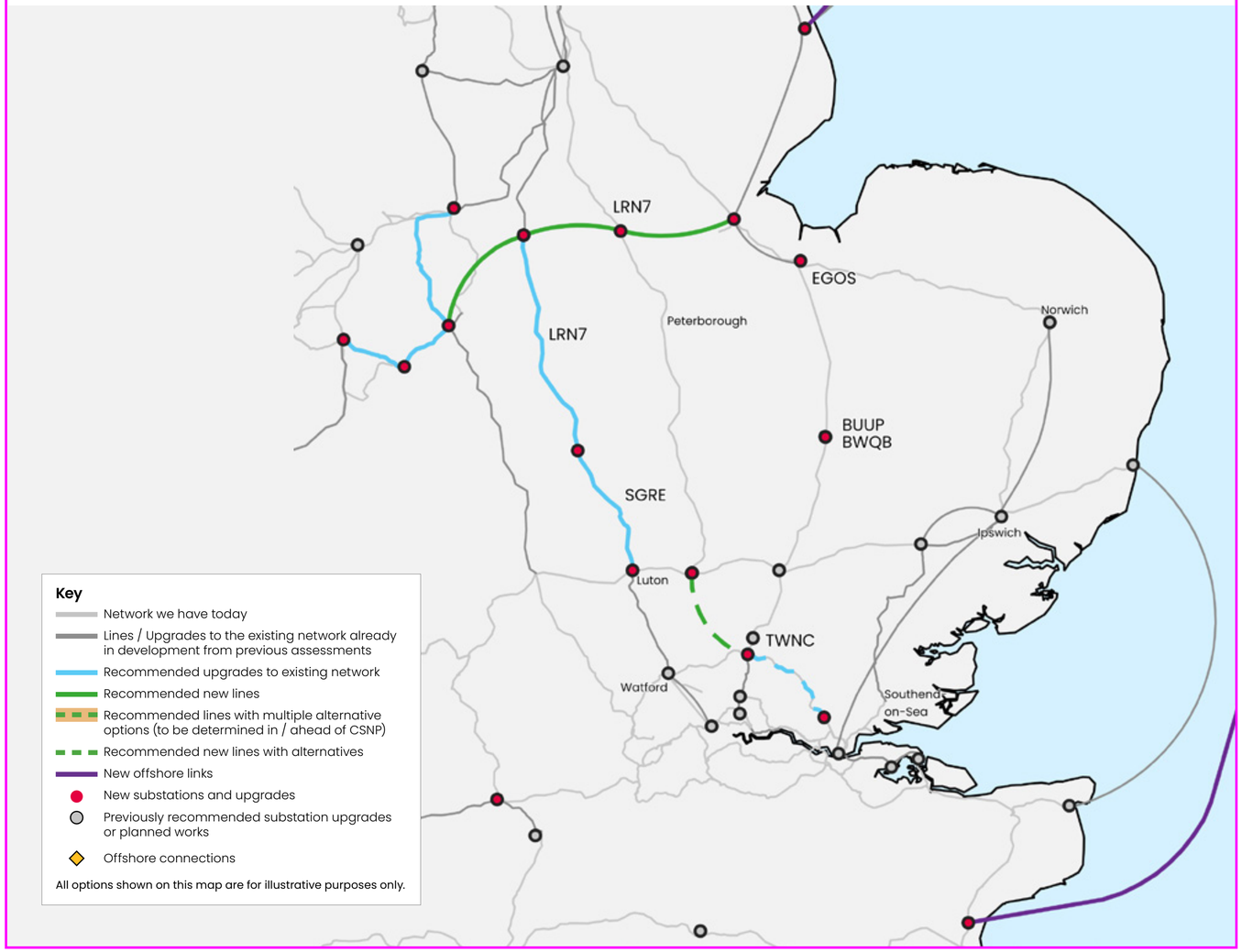
Code	Description	Previously recommended
LRN7	New 400 kV double circuit from South Lincolnshire to East Leicestershire with two new substations. Reconductor one circuit of Cottam to Grendon 400 kV route between new substation in East Leicestershire and Grendon substation	Yes[2]
TWNC / TWN1	New Wymondley to Waltham Cross 400 kV double circuit and Waltham Cross to Warley 275 kV to 400 kV upgrades with a substation extension at Waltham Cross	Yes

Network upgrades

Code	Description	Previously recommended
BUUP	Burwell Main substation upgrade	No
BWQB	Installation of power flow control devices on the Burwell to Walpole 400 kV double circuit	No
EGOS	Operational tripping scheme on the East Coast	No
SGRE	Reconductor Grendon to Sundon 400 kV double circuit	Yes

Click **code** for further information

Figure 20: Map of the recommended network for central England and East of England



2 A similar option was previously recommended in Beyond 2030, as LRN6. Since then, further development has been carried out to refine its scope per LRN7.

South East

Home to the control room of Great Britain's electricity grid, the South East hosts the "brains" of the network. Across the region, the grid's infrastructure needs to be able to meet rising demand.

For over 30 years, Wokingham, Berkshire, has been home to the Electricity Network Control Centre. In this control room, engineers have balanced the grid 24 hours a day, 365 days a year, to keep electricity moving from where it is generated to where it is needed.

The region is also home to several of Great Britain's interconnectors to Europe, connecting the South East to France, Belgium, and the Netherlands. These undersea cables connect the Great Britain grid to the continental European grid, allowing Great Britain to export electricity when there is extra electricity on the network, and import electricity when more is needed.

The region is also one of the largest demand centres across the country, alongside London, while also having a relatively low amount of generation capacity for a region of its size. Parts of the region already see periods of large network congestion, such as North Kent, which can cause challenges.

As such, the South East's electricity transmission network needs to meet the requirements placed on it, and it remains a focal point for targeted upgrades to the electricity transmission network so that electricity can get into the South East.

Our recommended network supports the current and forecasted power flows seen on the electricity transmission network, reducing bottlenecks and helping get electricity to where it's needed – both in the South East and across Great Britain.

South East

New infrastructure

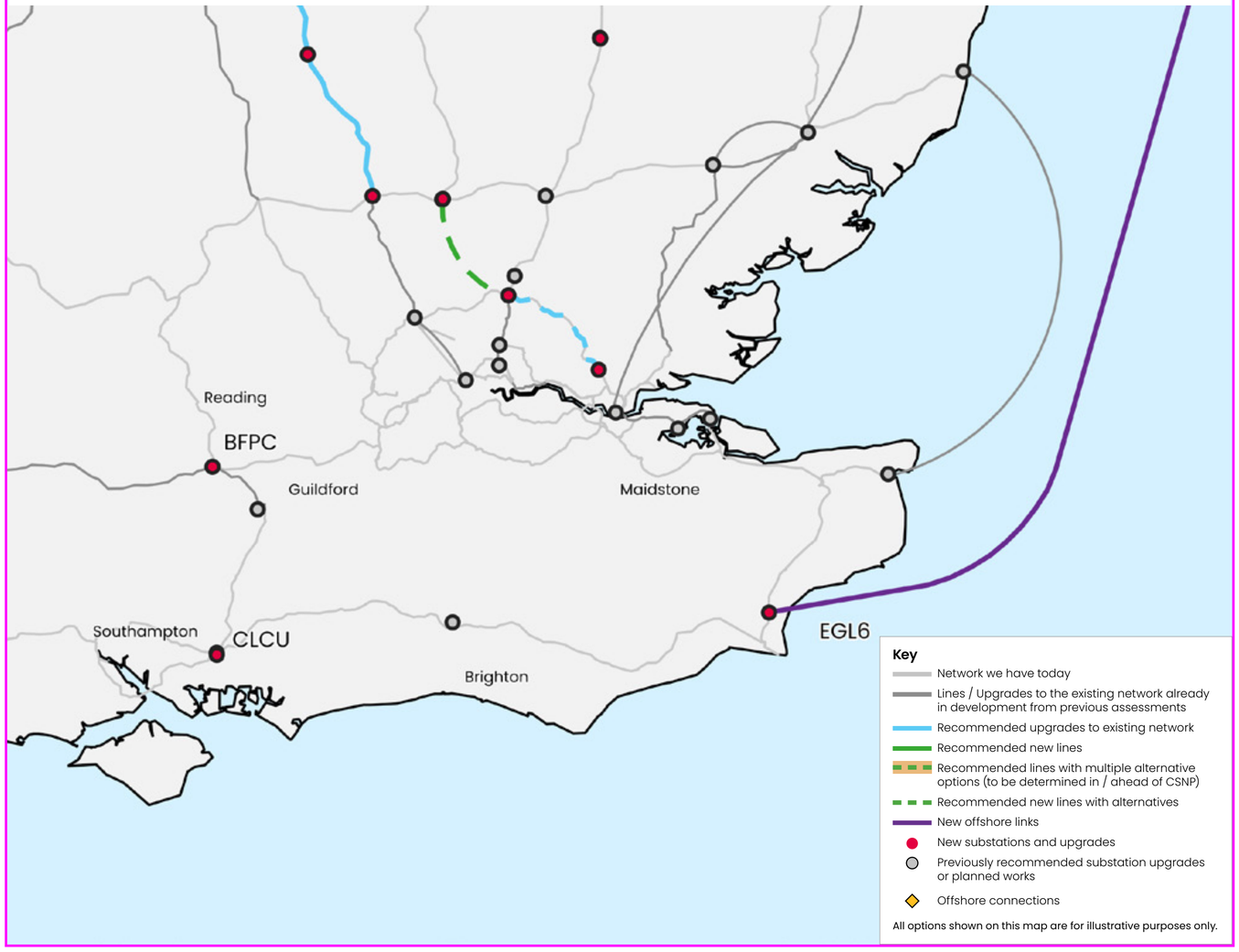
Code	Description	Previously recommended
EGL6	New offshore HVDC link between North East Scotland and the South East of England	Yes

Network upgrades

Code	Description	Previously recommended
BFPC	Installation of power flow control devices on Bramley to Fleet 400 kV double circuit	No
CLCU	Uprate cable section of Chilling to Lovedean 400 kV circuit	No

Click **code** for further information

Figure 21: Map of the recommended network for South East



South West

The South West of England is a hub for innovation in the energy industry. It was the region where the first new pylon design in almost a century was installed, with that overhead line connecting new sources of low carbon and secure energy to the transmission network.

From the tip of Cornwall and up to Wiltshire, the South West of England will play a vital role in meeting Great Britain's energy future. This is due to the presence of large volumes of renewable solar and wind generation, along with a longstanding nuclear energy site at Hinkley Point.

The area around Hinkley Point was home to the first new pylon design for nearly 100 years. These "T-pylons" were used for the first time on the circuit between Bridgwater and Loxton, with the design being around a third of the height of a traditional pylon and having a smaller footprint – reducing the impact of new infrastructure on the landscape.

On top of this historical generation, the Celtic Sea has recently become a key focus for offshore wind development, enabled by The Crown Estate. This included the recent Leasing Round 5, with up to 4.5 GW of offshore wind projects– enough to power around four million homes.

The Crown Estate's future offshore wind development roadmap also includes more offshore wind development and more investment in the South West, continuing to increase the importance of the Celtic Sea and the South West in Great Britain's energy future.

All this combined, places the South West in a key place within Great Britain's electricity system, for which our recommended design looks to maintain and enable into the future.

South West

New infrastructure

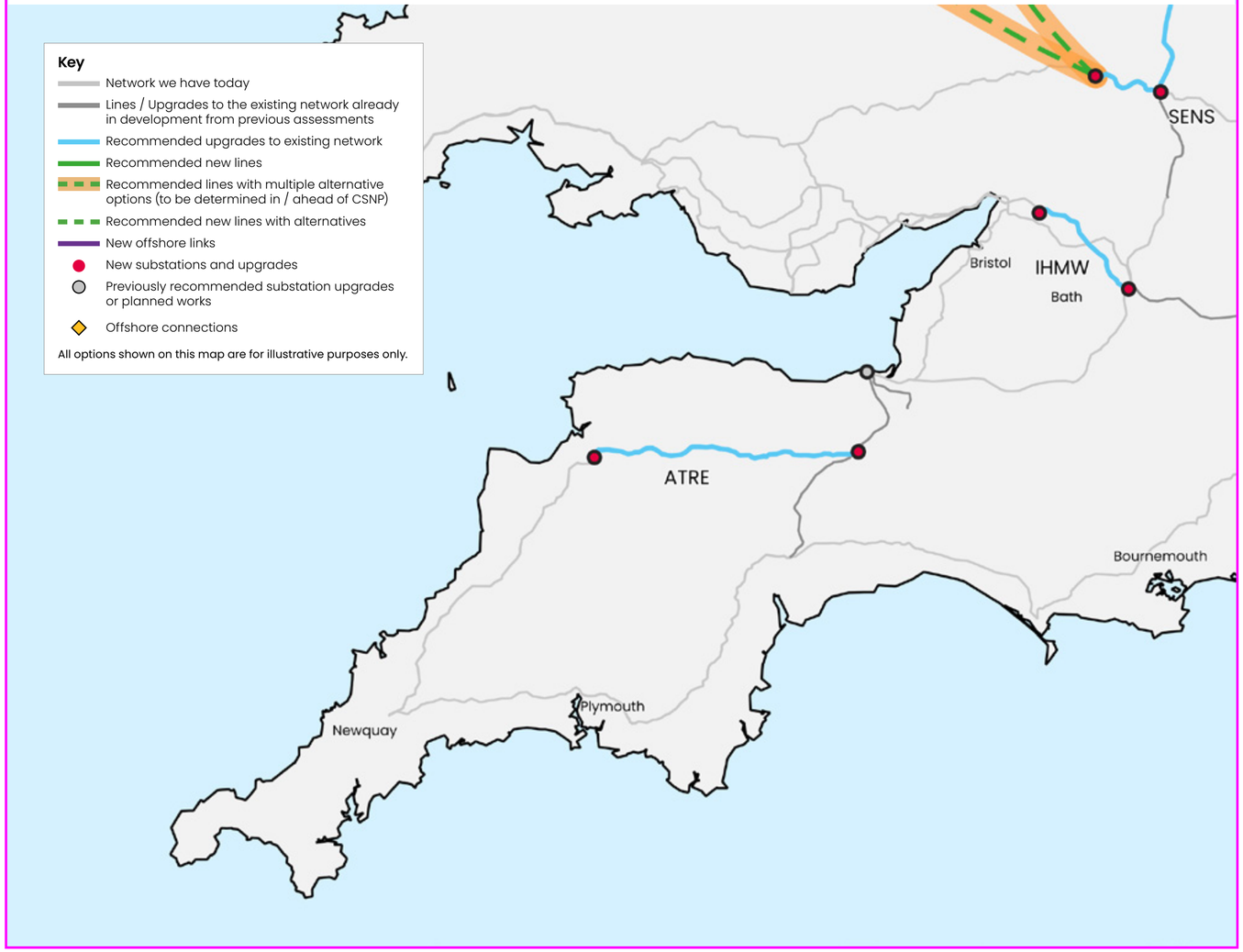
Code	Description	Previously recommended
SENS	New 400 kV substation within the South West region	No

Network upgrades

Code	Description	Previously recommended
ATRE	Reconductor Alverdiscott to Taunton 1 400 kV circuit	No
IMHW	Hotwire and substation cable uprate of Iron Acton to Melksham 275 kV double circuit	No

Click **code** for further information

Figure 22: Map of the recommended network for the South West



06

Next Steps

Next Steps

Great Britain needs a secure, affordable and home-grown electricity system for the decades ahead. As demand grows and the way we generate electricity changes, the transmission network must keep pace. This infrastructure takes many years to design and build, so decisions made now will shape the system for the future.

This *Beyond 2030 - Electricity Transmission Update* builds on the direction set out in *Pathway to 2030 and Beyond 2030* – it does not change course. It provides greater clarity on what is ready to progress now, based on updated evidence and further development of options.

We have reviewed the offshore network design alongside the 102 onshore network options submitted by Transmission Owners (TOs) to identify those which best meet system need. In doing so, we considered deliverability and value for consumers, alongside minimising impacts on communities and the environment.

Together with the coordinated offshore network to connect offshore wind and the onshore network, these recommendations represent around £89 billion of total investment in electricity transmission beyond 2030. Delivering this network will support economic growth across Great Britain – enabling new homes, connecting clean generation and supporting industries of the future – while strengthening a more secure, home-grown energy system.

Timely investment is essential. Where the network cannot move power efficiently, constraints increase, and costs are passed on to bill payers. Delay risks a more constrained and more expensive system. Building the right network at the right time reduces these costs and ensures better value for consumers.

What happens next?

For recommendations of near-term options where system need is clear and offers strong value for money for consumers, we are recommending that Ofgem consider these options for early investment.

Ofgem will now consider the technical case for the onshore recommendations and work with the TOs to develop a pipeline of projects through RIIO-T3 and other potential regulatory mechanisms. TOs will then take forward detailed design, including confirming technology choices, routeing and engagement with communities and stakeholders. It is for TOs to secure planning consent, with decisions made by the relevant planning authorities.

For recommendations of longer-term options where delivery is required after the mid-2030s, further development is still needed.

For these options, we will gather insight from the Strategic Spatial Energy Plan (SSEP) and work with the regulator and the TOs to determine how to progress these options through to delivery. This will include establishing which will benefit from further assessment through the enduring CSNP.

Related publications from the National Energy System Operator (NESO)

Principles for delivering electricity network

Delivering this scale of network is a significant national undertaking, with real impacts for communities across Great Britan. It is important that infrastructure is developed a way that is deliverable, represents value for consumers and takes proper account of environmental and local community considerations.

Alongside this report, we have published the Electricity Transmission Design Principles (ETDP), which set out the factors that should be considered when developing transmission infrastructure. These principles, recommended by the Electricity Networks Commissioner, and referenced in the *UK Government's Transmission Acceleration Action Plan (TAAP)*,[1] are intended to support consistent, transparent decision-making and more effective engagement with communities. They help ensure there is a shared understanding of how technology choices are made, what trade-offs are considered and how impacts are balanced as projects are developed.

The principles will apply to options that are developed following the publication of the ETDP and have not undergone a strategic options assessment. This does not include strategic options set out in this *Beyond 2030 – Electricity Transmission Update Report* or any other previous recommendations.

Explaining network development

We have also published an *Electricity Networks Explainer*[2] alongside the report. This provides clear, accessible guidance on how electricity network decisions are made and who is responsible at each stage. Its purpose is to improve transparency and understanding – helping stakeholders, communities and wider audiences see how system need is assessed, how options are evaluated and how decisions are taken forward by different organisations.

Reformed national pricing package

Network development is one of the key ways to reduce system costs by relieving bottlenecks and improving efficiency. However, it works alongside other interventions across the energy system.

Working alongside the UK Government and Ofgem, we are also progressing market reforms through the *Reformed National Pricing Call for Input*,[3] published in February 2026, which aims to reduce the cost of operating the system in real time and further bring down costs for consumers. This work focuses on three areas:

- Aligning siting and investment decisions with strategic energy planning.
- Improving system operability and efficiency.
- Taking further action to reduce network constraint costs.

These reforms will complement network investment, helping to ensure the electricity system is delivered at the lowest possible cost to bill payers.

The case for action is clear. We know what network Great Britain needs, and we know the cost of delay. Acting now keeps electricity secure and affordable, supports growth and avoids higher costs for bill payers. Delay simply means a more constrained system and a bigger bill in the future.

1 gov.uk/government/publications/electricity-networks-transmission-acceleration-action-plan
2 Electricity network explainer
3 neso.energy/document/376966/download

Future strategic energy planning

This update sits within a wider programme of strategic energy planning. The Strategic Spatial Energy Plan (SSEP), to be published in 2027, will provide a Great Britian-wide zonal view of where different types of generation and storage are likely to be needed, helping align investment decisions across the system. As the SSEP develops, it should provide additional clarity on how future generation, and demand are likely to evolve. This should help us identify where there is a case for network needs to be revisited where necessary, to ensure recommendations remain robust and give the Office of Gas and Electricity Markets (Ofgem) confidence when making funding decisions.

Looking further ahead, the Centralised Strategic Network Plan (CSNP), expected in 2028, will set out a whole-system view of Great Britain's future energy networks. It will look across electricity, gas and hydrogen to identify the network needed over the next 25 years. This integrated approach will become the long-term framework for Great Britain-wide network planning.

Together, these plans align near-term decisions with long-term system needs, providing continuity and a clear pathway for network development. They enable effective strategic planning to meet Great Britain's changing energy needs, unlock opportunities for economic growth, and support the delivery of a system that is reliable, clean and affordable.

07

Glossary

Glossary

Acronym	Description
ASTI	Accelerated Strategic Transmission Investment
CP30	Clean Power 2030
CSNP	Centralised Strategic Network Plan
ETDP	Electricity Transmission Design Principles
ETYS	Electricity Ten Year Statement
FES	Future Energy Scenarios
GB	Great Britain
GW	Gigawatt
HVDC	High Voltage Direct Current
Ofgem	Office of Gas and Electricity Markets
OTNR	Offshore Transmission Network Review
RNP	Reformed National Pricing
SEP	Strategic Energy Plan
SQSS	Security and Quality of Supply Standard
SSEP	Strategic Spatial Energy Plan
TAAP	Transmission Acceleration Action Plan
TO	Transmission Owners

NESO

National Energy
System Operator