

An aerial night view of a city, likely London, showing a dense residential area with many lit-up windows and buildings. The city lights create a warm, golden glow against the dark night sky. In the top left corner, there is a white triangle graphic pointing towards the right.

Electricity  
Transmission

# South East: Future Network Blueprint

nationalgrid

# Contents

## Executive summary



- 03 Purpose
- 04 Our future network blueprint strategy
- 05 Key regional highlights

## Information gathering



- 07 Regional context
- 08 Current network view
- 09 Design the right network

## Insights and analysis



- 12 Our approach
- 13 Stakeholder engagement
- 14 Safe and reliable network
- 15 Connections
- 17 Strategic infrastructure

## Develop options



- 20 Our strategy
- 21 Strategy map

# Executive summary



# Executive summary

## Purpose

### Our whole system vision

To collaborate with our stakeholders to optimally plan, develop, and operate the transmission network, protect vulnerable customers, and deliver whole system benefits while ensuring the delivery of the energy transition by 2050.

In alignment with our national Business Plan, these Future Network Blueprints (FNB) serve to deliver a strategy centred on our whole system vision\*, while addressing the unique needs and opportunities within each area. By focusing on national and regional differences and leveraging local opportunities, whilst minimising local impact, we aim to succeed in delivering the grid that is needed by all in the future.

The circumstances in which we build and operate our network are changing rapidly, driven by:

- greater reliance on electricity across various sectors to achieve a decarbonised society and economy
- rising numbers and diversity of customers requiring connections at specific locations
- need for expansive network development to address the requirements of multiple sites and circuits within a region, rather than isolated solutions
- increasing complexity of the network with more variable power flows.

We recognise our FNB ‘regions’ do not fully reflect the geographic or administrative borders that one might expect to see. This is because in defining these regions we have also had to consider electrical factors such as power transfers and access for planned outages. However we have aligned to Distribution Network Operator (DNO) and local authority boundaries where feasible to do so.

**‘Whole system’ – A collaborative and integrated approach with networks and other stakeholders.**



More information can be found in our [short video](#).

\* <https://www.nationalgrid.com/electricity-transmission/our-future-network/our-whole-system-approach>

These changes require a new approach to network development, which is where our Future Network Blueprints play a crucial role. The strategy outlined in these documents detail our process and projected outcomes, ensuring readiness for future requirements.



**“Our Future Network Blueprints embed a forward-thinking approach, offering a pathway to enhance efficiency, boost collaboration, and improve visibility for whole system working at the local level.”**

Ben Haggerty  
Head of Whole Systems,  
National Grid Electricity Transmission

# Executive summary

## Our future network blueprint strategy

In developing our Future Network Blueprints, we used the following process:

### Step 1

Information gathering



#### Regional context

Review the region as a whole, understanding broader interactions beyond the network to ensure alignment and identify interdependencies.

#### Current network view

Collect key data on the current NGET network in each region to understand the baseline for future development.

#### Design the right network

We place stakeholders at the heart of our network planning process. This approach helps us navigate uncertainties and ensures we have a comprehensive regional understanding of network needs.

### Step 2

Insights and analysis



#### Stakeholder engagement

Enhance our understanding along the way through ongoing engagement and partnerships, enabling us to better foresee forecasts, identify risks and explore opportunities.

#### Connections

Provide perspective on customer demand and generation trends, helping us forecast future service requirements and growth areas.

#### Safe and reliable network

Provide critical asset health, maintenance, and operational performance data to ensure the blueprint delivers a dependable network throughout the journey to Net Zero.

#### Strategic infrastructure

Align with government initiatives and the National Energy System Operator (NESO) to provide input on large-scale projects, shaping long-term infrastructure investments.

### Step 3

Develop strategic options



#### 2050 backwards

Step back assessment to ensure we are being ambitious enough to meet our 2050 commitments.

#### Network design principles

Check we are applying the three NGET Design Principles: are we enabling investments; do it once, do it right; and whole system network planning.

#### Network compliance

Ensure all projects meet with network security and quality of supply standards [National Electricity Transmission System (NETS) Security and Quality of Supply Standard (SQSS)] to maintain secure and reliable supplies.

# Executive summary

## Key regional highlights



substation investments;  
5 new and 6 major  
interventions

<p>£</p> <p><b>£2.7bn</b> investment</p> <p>of investment to maintain, upgrade and develop our network in T3</p>	<p>Icon of three people</p> <p><b>5 GW</b> demand</p> <p>contracted to connect* <b>1.6 GVA</b> of additional capacity expected to be installed in T3</p>	<p>Icon of lightning bolt</p> <p><b>54 GW</b> generation</p> <p>contracted to connect* <b>1.7 GW</b> estimated to connect in T3</p>	<p>Icon of power line tower</p> <p><b>319 km</b> of overhead line</p> <p>reconductoring planned within T3, equating to 17% of the region</p>
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Icon of a hand holding a plug and the number 3

strategic infrastructure projects within the region



\*Including T3 and beyond

# Information gathering



## In this section

**07** Regional context

**08** Current network view

**09** Design the right network

# South East Regional context

**The South East, which includes counties such as Buckinghamshire, Kent, Sussex, parts of Surrey, Hampshire and Oxfordshire, is a diverse region with urban centres, rural landscapes and coastal areas.**

The region hosts several electricity interconnectors to mainland Europe as well as an expanding number of onshore renewable projects such as battery storage. Interconnectors are high voltage cables that are used to connect the electricity systems of neighbouring countries. They allow excess power to be traded between different countries providing valuable export capability for excess renewables. The region is playing an increasingly important part in meeting the UK's energy net zero target as well as supporting energy security ambitions.

Major urban areas such as Brighton, Portsmouth, Reading and Oxford are significant hubs for residential, commercial and industrial activity. The M4 corridor west of London has seen a significant growth of data centres that support the UK's growing digital economy. Maintaining a secure and reliable supply within this whole region is essential.

The South East region have set ambitious net-zero plans to reduce carbon emissions and transition to more sustainable energy systems such as rooftop solar and energy efficient buildings, demonstrating a strong commitment to addressing climate change.

Despite these ambitious plans, challenges remain, such as upgrading energy infrastructure and ensuring economic and social equity in the energy transition. Collaboration among local authorities, businesses, and communities is essential for achieving net-zero targets, fostering innovation in clean energy technologies, and creating a sustainable, low-carbon future for all.



## Net-zero plans

the South East aims to reduce carbon emissions through sustainable energy systems like energy-efficient buildings.





# South East

## Current network view

### Network overview

The current network consists of a 400 kV coastal network starting in the Thames Estuary, then tracing the South East coast through Sussex to the Solent, connecting into an arterial route that spans Hampshire, Buckinghamshire and Oxfordshire.

As the energy system transitions towards more connected renewable sources like wind and solar, managing excess electricity becomes crucial, especially during times of lower demand. The natural route for this surplus energy is often towards the South East, From here it can be exported through interconnectors to Europe.

Although interconnectors play an important role for the network they can also create dynamic network challenges as the region can act as both an importer and exporter of electricity.

New interconnectors are expected to connect in the South East. This means we need transmission infrastructure that can manage larger power flows in both directions. Projects such as Grain to Tilbury uprating will reinforce the network in the region to help move this clean power and maintain a secure and reliable network.



# Design the right network

## Stakeholders

### Context

As we embark on our RIIO T3 journey, we recognise that the landscape has evolved significantly since our last price control period. The UK Government's ambitious targets for a decarbonised power system, coupled with the devolved Government powers now enabling regional energy decarbonisation planning, necessitate a fresh, collaborative, and holistic approach.

We made a commitment to place stakeholders at the centre of our network planning and listened to over 12,000 stakeholders representing all regions and stakeholder types.

This helped us in getting a balance of needs and priorities across all our stakeholder groups – from those impacted by the upgrade, those dependent on it (across each region) and those funding it (all consumers).

This insight formed our overarching ambition and created stakeholder design principles to initially assess the approach we took to each network blueprint, ensuring we had a fair and consistent approach to planning from the start.

This is our starting position, but we have also been forming partnerships with those representing the region to help inform and shape what we design and build locally.

This includes the new Regional Energy Strategic Planner (RESP) role set up by the NESO in which we have already started aligning and working with.

Local priorities and needs are crucial to our planning process, which is ongoing and continuously evolving.



# >12,000

We have received feedback from >12,000 stakeholders as part of the listening phase of our price control engagement programme



# Design the right network

## Our ambitions

### Ambition A

#### Deliver the grid of tomorrow, today

**A1:** Maintain world class levels of network performance and resilience, ensuring that the new network we build is designed to reflect future security and climate challenges

**A2:** Deliver the capacity our customers need now, looking holistically across multiple investment drivers to deliver at the pace and scale required to support the Government's ambition on growth and decarbonisation

#### Deliver with urgency the Transmission Network needed for Great Britain's future growth and decarbonisation

**A3:** Future-proof our network with strategic capacity and flexibility for the longer term, using the network modeling capabilities we developed in RIIO-T2 to surface insights and inform strategic decisions

**A4:** Invest in the next generation of innovative technologies to make sure that we are planning and building a network that is ready for tomorrow

### Ambition B

#### Do the right thing for consumers, communities and the environment

**B1:** Maximise the value we create by controlling our costs as our network grows, seek opportunities to create additional value for consumers

**B2:** Play a leading role in accelerating a net zero, nature positive future, including by reducing our own emissions and environmental impact

#### How we deliver is as important as what we deliver

**B3:** Support vulnerable consumers and have a positive impact in our communities through our operations and construction, leaving a lasting legacy

**B4:** Represent the diverse communities we serve by maintaining our sector-leading record on workforce diversity and inclusion

### Ambition C

#### Transform the way we work

**C1:** Transform our asset management, network development, and network operation capabilities to ensure we can deliver the step-up in work required during this period, and manage a larger, more complex, decarbonised network

**C2:** Grow our workforce capability by positioning National Grid as the best place to work in the electricity sector

#### Transform our capabilities to deliver for consumers

**C3:** Put into practice new supply chain strategies to secure the long-term capacity we need

**C4:** Leverage digital and data capabilities to transform how we work with our stakeholders to maintain and operate our network

# Insight and analysis



## In this section

- 12** Our approach
- 13** Stakeholder engagement
- 14** Safe and reliable network

- 15** Customer connections
- 17** Strategic infrastructure

# Insight and analysis

## Our approach

To develop a comprehensive and informed strategic plan, we engaged in a process of data collection and analysis, leveraging insights from both internal departments and external stakeholders. This involved a combination of analysing technical data as well as incorporating feedback from engagement workshops, which ensured a balanced and holistic approach.

The combination of external feedback and internal insights, allowed us to create a blueprint that is responsive to both operational realities and future national and regional transmission needs.

Stakeholder engagement	Safe and reliable network	Connections	Strategic infrastructure
<p>Local regional stakeholder input from bodies such as the Distribution Network Operators, local authorities, and community representatives gathered understandings on market dynamics and future expectations at a local level.</p>	<p>Provided critical data on asset health, maintenance, and operational performance, ensuring the blueprint aligns with current capabilities and future needs.</p>	<p>Offered insights on customer demand and generation trends, helping us forecast future service requirements and growth areas.</p>	<p>Delivered input on large-scale projects and alignment with government initiatives, plus network compliance which are pivotal in shaping long-term infrastructure investments.</p>





# Safe and reliable network

There are over 500 substations, 7,200 km of overhead line and 1,400 km of high voltage cable on the NGET network.

Our Asset Management Strategy provides direction to the management of these.

For RIIO T3 we are required to submit a portfolio view of our assets with supporting narrative providing justification on the level and type of investment.

Typically, the default position in asset operations is to incrementally upgrade and replace assets as and when required.



In developing our strategic plan, our Asset Operations colleagues conducted a thorough review of the asset health data across the region relating to:

- **Reliability:** Network growth will be at its highest in T3. We will proactively identify, manage, and address asset failure risk ensuring reliability across our network is maintained at the current industry leading level.
- **Risk:** Our plan delivers value to consumers by achieving a significant reduction in risk.
- **Environment:** We will seek to maximise environmental benefits by identifying and replacing assets which contribute to environmental harm.

## Key metrics across South East

We continuously monitor and maintain our assets on a regular basis, undertaking replacements or refurbishments of assets when determined necessary to ensure the reliability of the network.

We have identified three high voltage substations in the region with enhanced asset health requirements. Apart from requiring asset replacements due to condition, these sites also have other site-level structural and equipment issues. These will be addressed via a combination of portfolio asset interventions and major projects.

A total of 411 km of overhead line in South East require replacement in the next 10 years. Some of this will also be updated alongside other work.

### Natural hazard resilience

By the end of 2025, all relevant South East sites will be fully compliant with Energy Networks Association standard 138 on flood protection.

### Physical security resilience

With increasing generation and demand we are investing in enhanced physical security at sites within the region.

 3

High voltage substations identified in the region that require enhanced asset health intervention

 411 km

Overhead line in the region that requires replacement over the next 10 years

### Asset health intervention regional metrics

 77

Circuit breakers

 611

Bay assets

 66

Voltage management assets

# Customer connections

## Regional overview

We leverage the National Energy System Operator (NESO)'s future energy scenarios and market intelligence to chart the pathway that defines the required energy mix and informs our investment plans. Beyond this, we continuously analyse various scenarios and their underlying network drivers to understand how the energy mix might evolve, incorporating these insights into our regional assumptions.

The investments to achieve the energy mix required will drive how we think about these at site and regional level. For example:



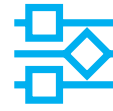
### Standalone connection

Typically there is a specific customer need at a site. The connection usually requires less investment and is relatively straightforward in terms of complexity.



### Site strategy

Where ageing infrastructure, fault level restrictions or physical space is unavailable at an existing site we may not be able to connect customers, therefore a more holistic site strategy is required such as building a new substation.



### Circuit strategy

When we review circuit health, we will assess the long-term growth and capacity needs in a region. This will help us determine whether to maximise the line ratings or consider increasing the voltage and upgrading the associated substations.

### Regional demand and generation

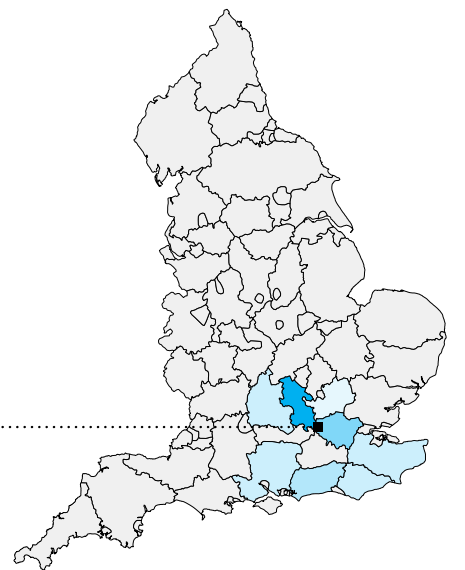
**Demand connections – where power is taken from the grid**

**Generation connections – where power is added to the grid**

Demand:  
**5 GW**

Generation:  
**54 GW**

Shows a heat map for the number of contracted connections within South East region out to 2034.



No. of Customer Contracts

1

14



# Customer connections South East demand and generation breakdown

## New connections in the region: Generation

The South East primarily acts as a net importer, where excess power from the transmission network flows into the region and is directed to interconnectors for export to mainland Europe during periods of high wind and solar generation in the UK.

We have contracts for our customers to deliver into the mid 2030s which would connect up to 54 GW of generation. However, not all of this is expected to connect to the network.

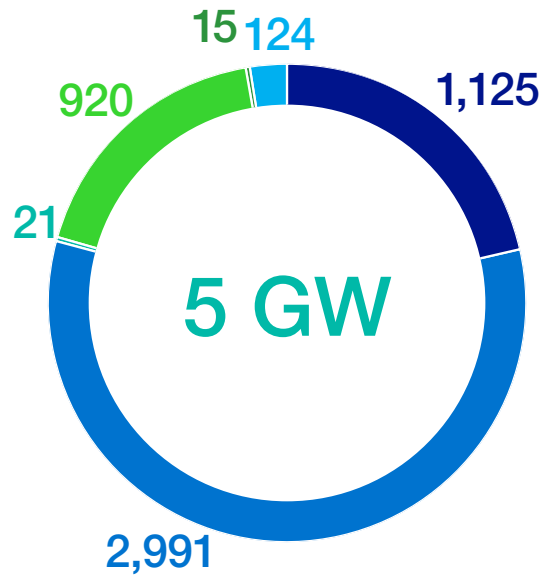
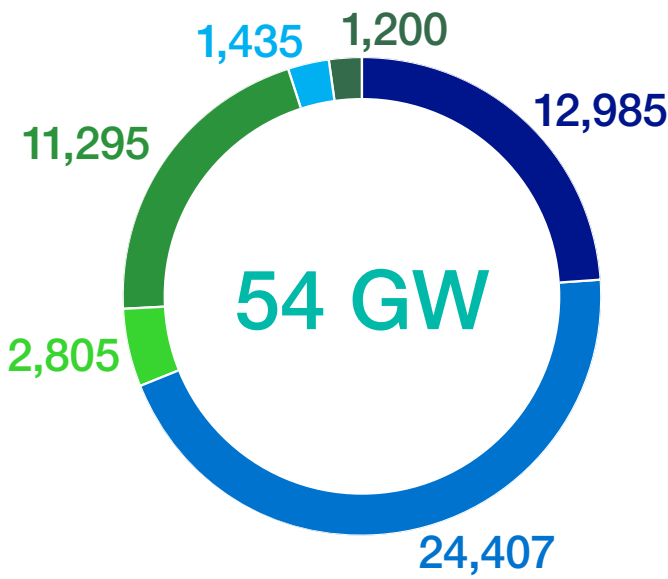
## New connections in the region: Demand

There is about **5 GW of demand connections** in the South East. However, not all of this demand is expected to connect.

We expect to add 1.6 GVA of additional capacity in T3.

- Battery storage
- Fossil fuel
- Transmission services
- Battery storage – hybrid
- Interconnector
- Solar
- Wind – offshore

- Data centre
- Manufacturing
- Embedded demand
- Industrial
- Embedded demand – Hybrid
- Rail



1.7 GW of generation expected to connect in T3

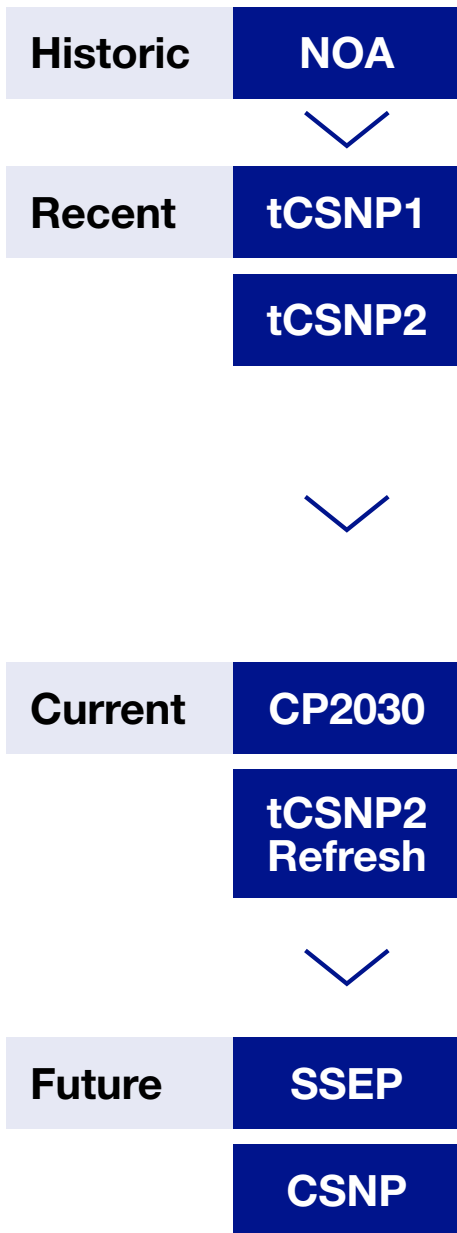
1.6 GVA of capacity to be added in T3

By providing a future ready system through our investments we are also creating options for additional connections.

# Strategic infrastructure Background

The National Energy System Operator (NESO) process for identifying strategic infrastructure on the electricity transmission network has significantly evolved to meet the changing demands of the energy landscape. NESO incorporates scenario analysis, market intelligence, and stakeholder engagement to predict future energy needs.

This includes integrating renewable energy sources, enhancing network resilience, and aligning with government policies on decarbonisation. The evolved process aims to ensure that strategic infrastructure development is proactive, addressing both current and future challenges, and supporting the transition to a sustainable and reliable energy system.



### Network Options Assessment (NOA):

The NOA is the annual process through which the ESO (now NESO) provided its recommendation for which network reinforcement projects should receive investment, and when.

### Transitional Centralised Strategic Network Plans (tCSNP1 and tCSNP2)

In recent years, the planning processes managed by the NESO has started to take a more holistic approach to network reinforcement with the introduction of the Holistic Network Design (HND), which has combined with the NOA to create the ‘transitional Centralised Strategic Network Plans’.

- tCSNP1 is the combination of HND1 and the NOA 2021/22 refresh and identified the ‘Accelerated Strategic Transmission Investment’ (ASTI) projects. The report published by the NESO is also referred to as “Pathway to 2030”.
- tCSNP2 is the combination of the HND Follow up Exercise (HND FUE) and the NOA, published in 2024 and facilitates the connection of an additional 21 GW of offshore wind, plus other low carbon generation across Britain. The report published by the NESO is also referred to as “Beyond 2030”.

### Clean Power 2030 (CP2030)

In November 2024, the NESO provided advice to government on how to achieve clean power by 2030. The Government published its Clean Power Action Plan in December 2024. This will inform the policies, investments in renewable energy and network, and technological advancements required to achieve clean power by 2030.

### tCSNP2 Refresh

NGET is developing the options recommended in the tCSNP2 to a greater level of maturity and those options will be re-assessed by NESO through the tCSNP2 Refresh.

### Strategic Spatial Energy Plan (SSEP):

The NESO will produce the SSEP with the first plan being published by the end of 2026. It will assess the optimal locations, quantities and types of energy infrastructure required to meet our future energy demand, helping enable the clean, affordable and secure supply, and be a key input into the CSNP.

### Centralised Strategic Network Plan (CSNP):

The CSNP will be produced on a 3-year cycle, allowing a more integrated approach to network planning and more developed recommendations than the NOA. It will provide a more strategic, long-term view of the transmission network’s development, using the SSEP as a key input. The first CSNP is due to be published by the end of 2027.

# Strategic infrastructure South East projects

The energy needs of the **South East** are already the highest in the country and are expected to continue to grow. It is therefore key that the area's infrastructure can cope with this rise in demand. The electricity network in the region experiences times of very high congestion, especially around the north Kent area.

In T3, we are therefore carrying out upgrades that increase the number of connections within the region and improve upon the existing network capability. These upgrades will help make sure that the South East has the infrastructure it needs to ensure a resilient grid for the region while also providing access to cleaner electricity sources from elsewhere on the network.

## Specific projects include:

### SCD1

Sea Link HVDC between Suffolk and Kent – Post-T3

### SGRE

Replace the conductors on the existing circuit between Grendon and Sundon with higher capacity conductors – T3 period

### TKRE

Grain to Tilbury upgrade – T3 period



[neso.energy/publications/clean-power-2030](https://neso.energy/publications/clean-power-2030)



# Develop options



## In this section

**20** Our strategy

**21** Strategy map

# Develop options Our strategy

We carry out 3 simple steps to test our thinking around strategic options.

## '2050' Backwards

We take step back and look across the network region by region to understand if we are being ambitious enough.

- Q. Are we embedding the stakeholder design principles that have been set?
- Q. Have we provided a long-term focus?
- Q. Have we addressed possible operability challenges in the future?
- Q. Have we considered all known and potential drivers for the site/circuit?

## Network compliance

System analysis is undertaken to plan and develop the network to meet the requirements of the **Security and Quality of Supply Standards (SQSS)**.

- Ensure the transmission network can withstand equipment faults and failures.
- Determine network solutions that provide the necessary transmission infrastructure to maintain the long-term secure and resilient supply of electricity to consumers.
- Deliver new connections to the transmission network.

## Network design principles

We then test our view against our **Network Design Principles**.

- **Enabling investments** – We will plan and build a network platform today that is ready for future requirements, making sure we are not the blocker to the energy transition.
- **Do it once, do it right for the future** – We will plan the scope and timing of network investments to address multiple drivers at once. We will coordinate delivery to reduce system access requirements, increase efficiency and minimise disruption to communities.
- **Whole system network planning** – We will work with other utilities, across vectors and with stakeholders at all levels to ensure planning and delivery of our future network is coordinated and optimised for the UK.

## Our plan

National Grid's electricity transmission strategy in the South East focuses on upgrading and expanding several substations to accommodate new connections including new interconnectors from continental Europe which help secure UK energy supplies and resilience.

Along the South Coast we are undertaking work at Fawley and developing cable replacements to strengthen network resilience and increase capacity in the Solent area.

Further north, we are rebuilding sites and investing to strengthen the circuit network in Oxfordshire and Buckinghamshire areas to enable increasing demands in both.

Sea Link is a proposed electricity transmission network reinforcement between Kent and Suffolk, via a new, primarily offshore 2 gigawatt (GW) high voltage direct current (HVDC) link. The proposals include a new substation and converter station, underground cable, and new overhead lines.

Sea Link has been designed to increase the capability of the network to carry low-carbon and renewable energy from where it is generated to where it is needed. Sea Link forms part of The Great Grid Upgrade, which will help with the transition to more affordable, secure, and cleaner forms of energy, helping to meet the UK's net zero target.

# South East Strategy

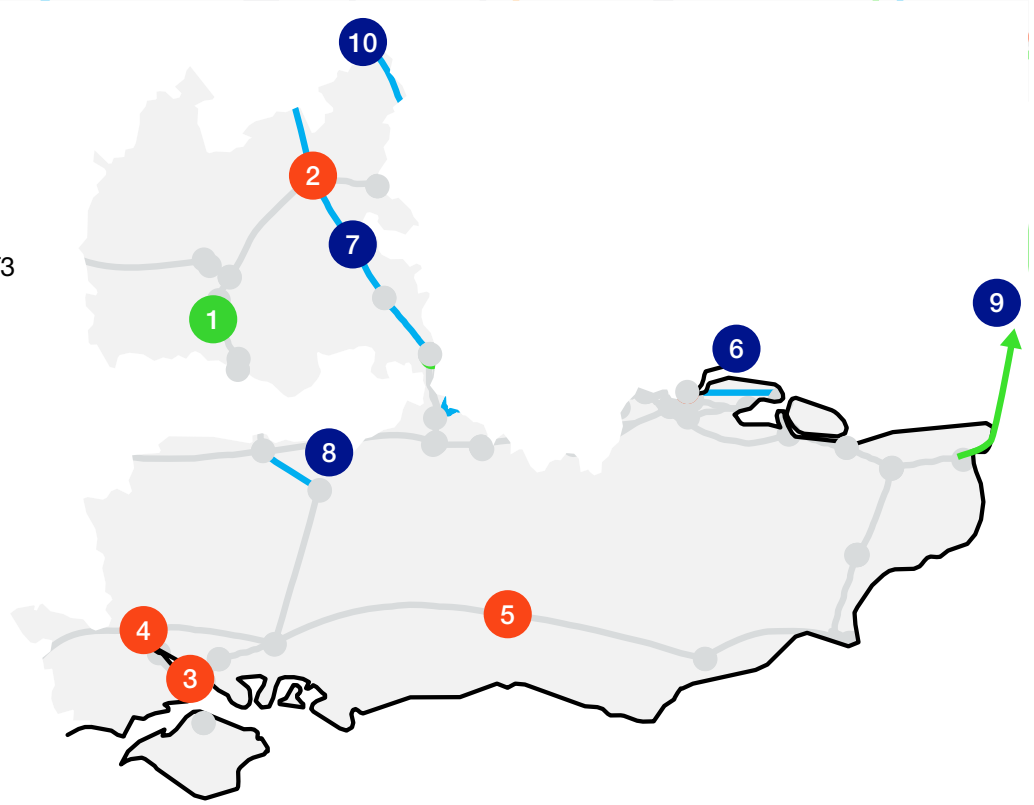


## Substations

- 1 Didcot 132 kV**  
New Substation – T3 period
- 2 East Claydon 400 kV and 132 kV Rebuild** – T3 period
- 3 Fawley 400 kV and 132 kV Rebuild** – Beyond T3
- 4 Nursling 400 kV**  
Upgrade/extension – Beyond T3
- 5 Bolney 275 kV**  
Upgrade/extension – T3 period

- Major site strategy
- New substation
- Coastline
- Existing network
- Upgrade existing
- New build
- - Developing only\*

**5** 5 new substations proposed in the region.



Map is illustrative



## Circuits

- 6 TKRE Grain to Tilbury**  
Reconductor/upgrade – T3 period
- 7 Amersham – East Claydon – Iwer 1 and 2** – Reconductor OHL circuit – T3 period
- 8 Bramley – Fleet 1 and 2,**  
Reconductor OHL circuit – T3 period
- 9 SCD1 – Sea Link** – HVDC link between Suffolk and Kent – Beyond T3
- 10 SGRE**  
Replace the conductors on the existing circuit between Grendon and Sundon with higher capacity conductors – T3 period

Map is illustrative. New build and some upgrades are subject to planning permission. The lines shown here should therefore not be regarded as defined or proposed routes but reflective of various required reinforcements published by NESO. Includes baseline and pipeline projects. Major site strategy includes existing substations where we plan a rebuild or significant extension (> £20m). Does not include new tCSNP2 circuits onshore and offshore which are subject to the outcome of NESO's tCSNP2 refresh. This network region reflects the geographical area of East Anglia, but includes some network from parts of neighbouring regions.

\*As indicated by NESO; final network solution/route may differ.