Electricity
Transmission

East Anglia: Future Network Blueprint

nationalgrid

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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

13

substation investments; 8 new and 5 major interventions in the region

£9.6bn

of investment

to maintain, upgrade and develop our network in T3

6 GW

demand

contracted to connect*, **240 MVA** of additional capacity expected to be installed in T3

90 GW

generation

contracted to connect*; **12.6 GW** of new low carbon electricity expected to connect in T3

340 km

of overhead line

reconductoring planned within T3**, equating to 24% of the region

9

strategic infrastructure projects within the region

*Including T3 and beyond
**Includes 99 km for BRRE which has already been completed in RIIO-T2

Information gathering

In this section

East Anglia
Regional context

East Anglia, encompassing Norfolk, Suffolk, Essex and Cambridgeshire, is a key player in the UK's energy landscape, particularly in renewable energy. The region's extensive coastline and proximity to the North Sea make it ideal for offshore wind energy, with major projects like East Anglia ONE leading the way.

NGET's East Anglia Region is strategically important for the future transmission of renewable energy from the North to Southern England and Europe. Significant increases in offshore windfarm energy are already consented, with new interconnectors and large-scale battery storage for solar and wind farms planned.

The flat landscape also supports a growing number of solar farms. The growth in renewable generation within this region alongside a 1960s-built network provides strong justification to improve security and reliability of supply whilst increasing its capacity for the future. The Norwich to Tilbury project has already started this proposed transition as part of a wider programme.

Historically, East Anglia has been a site for natural gas production, particularly from offshore fields in the North Sea. While the focus is shifting towards renewables, the region still has infrastructure related to gas, including pipelines and processing facilities.

In addition to its renewable energy developments, East Anglia also plays a significant role in the UK's nuclear energy sector. The region is home to the Sizewell nuclear power station in Suffolk, which has been a crucial part of the UK's energy mix for decades.

Sizewell B is currently operational, and the proposed Sizewell C is a major new development which underscores the region's ongoing commitment to nuclear energy as a stable, low-carbon energy source.

The construction of Sizewell C and increase in renewable projects is driving economic growth, job creation, and positioning East Anglia as a leader in the UK's path to Net Zero.

Until now, the existing high voltage electricity network has been sufficient to meet demand. However, as electricity needs grow, the capacity of the electricity transmission network will also need to increase.

Local and national policies support renewable energy development in East Anglia. The expansion of nuclear facilities, renewable project infrastructure, and NGET's own network upgrades emphasise the importance of working with local communities and addressing the impacts of construction.

We have been working with key stakeholders, such as UK Power Networks (UKPN) and National Grid Electricity Distribution (NGED), as well as county authorities, RenewableUK, and the Offshore Wind Industry Council. Government strategy places East Anglia at the heart of revitalised GB energy plans, promoting sustainable energy independence.

Nuclear energy

East Anglia plays a significant role in the UK's nuclear energy sector

East Anglia
Current network view

Network overview

The northern section of the East Anglia network integrates with circuits extending south from Lincolnshire and comprises a 400 kV circuit route along the east coast, picking up renewable offshore wind and onshore generation.

The southern section consists of 400 kV network connecting Norfolk and Suffolk with Essex. This network is being upgraded to secure the transmission of the new and increased low carbon electricity generated in the region.

The East Anglian electricity transmission network has historically been a net importer of power and is developing into a net exporting region. The existing network can also be influenced by future development outside of the region such as wind generation in the North and flows on the interconnectors to Europe on the South Coast. 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. National Grid is ensuring these changes are factored into our network development plans.

Electricity demand is expected to grow over the next 20 years as the region continues its decarbonisation plans. Similar to other regions in England and Wales, East Anglia has embedded generation within its electricity distribution networks. When considering the growth in electricity demand in East Anglia, it's important to understand how this embedded generation relates to the transmission network, as it offers opportunities for creating integrated whole system solutions.

Looking forward, about a third of today's UK energy demand could be met by the energy that will be coming into East Anglia in the next decade or so.

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

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

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

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

How we deliver is as important as what we deliver

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

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

Transform our capabilities to deliver for consumers

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

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

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
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.	Provided critical data on asset health, maintenance, and operational performance, ensuring the blueprint aligns with current capabilities and future needs.	Offered insights on customer demand and generation trends, helping us forecast future service requirements and growth areas.	Delivered input on large-scale projects and alignment with government initiatives, plus network compliance which are pivotal in shaping long-term infrastructure investments.

Stakeholder engagement
East Anglia

Distribution networks

nationalgrid Electricity Distribution

UK Power Networks

Within your region, what do you see bringing the greatest demand for connections to the electricity network over the next 10 years?

The engagement sessions found that new connections in the area can trigger the requirement for uprating equipment and infrastructure across the transmission and distribution networks. We have identified opportunities which will be explored into 2025 to co-optimise these areas of the network aiming to deliver better value for the consumer.

What did stakeholders in East Anglia tell us?

‘Anticipatory investment would reduce connection timescales. We're not thinking about what might come, but what's there already.’ – (Local Authority)

‘Bringing in the communities and making them feel supported.’ – (Local Authority)

‘Better communication between local area energy planning strategies and other organisations is needed.’ – (Local Authority)

We are working with local distribution networks (DNOs) to understand the impacts and requirements in that region. Working with the DNOs, we collaboratively and continually make certain that a whole system approach is always considered in our planning.

We have been engaging with DNOs to strengthen our regional strategic partnerships and develop robust whole system capabilities.

15

The above number indicates the amount of whole system opportunities we have identified in East Anglia.

A ‘**whole system opportunity**’ refers to areas where we can collaborate to find more integrated solutions. This could involve infrastructure planning, enhancing the quality and depth of data, or improving network design.

Safe and reliable network

There are over 500 substations, 7,200 km of overhead line (OHL) and 1,400 km of high voltage (HV) 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 East Anglia

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 two 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 5 km of overhead line in East Anglia requires replacement in the next 10 years. Some of this will also be uprated alongside other work.

Natural hazard resilience
By the end of 2025, all relevant East Anglia 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.

2
High voltage substations identified in region that require enhanced asset health intervention

5 km
Overhead line in region that requires replacement in the next 10 years

Asset health intervention regional metrics

1
Super grid transformer

62
Circuit breakers

58
Voltage management assets

355
Bay assets

Customer connections
Regional overview

We leverage National Energy System Operator's (NESO) 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

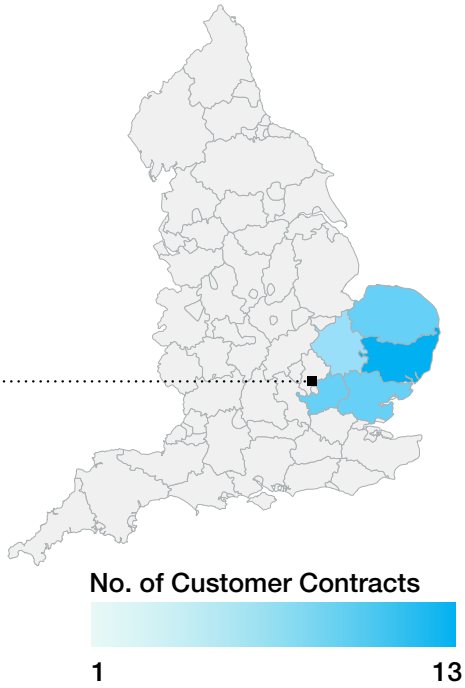
Demand connections – where power is taken from the grid

Generation connections – where power is added to the grid

Demand:
6 GW

Generation:
90 GW

Shows a heat map for the number of contracted connections within East Anglia region out to 2036.



Customer connections
East Anglia demand and generation breakdown

New connections in the region: Generation

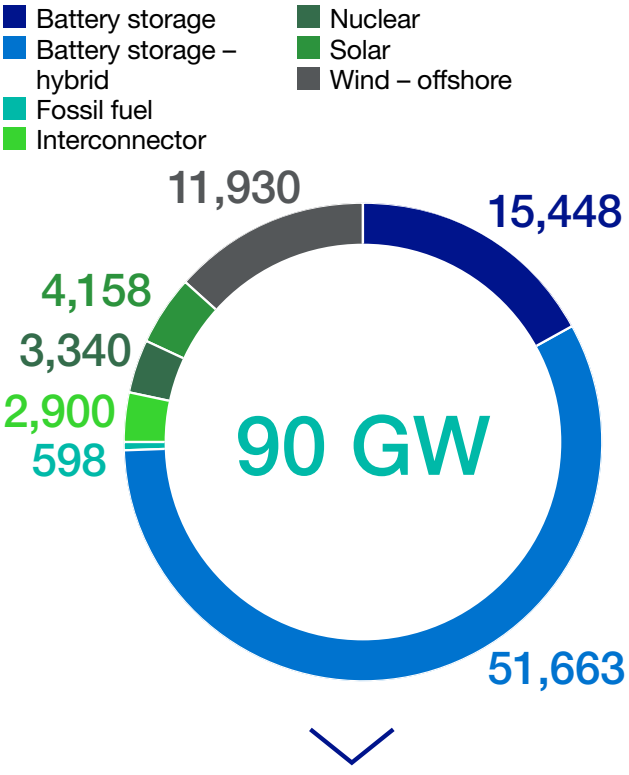
East Anglia has historically been a net importer, but significant growth in low carbon and renewable generation will transform the region into a net power exporter. The coordination of offshore generation and interconnectors will greatly influence power flow in the region.

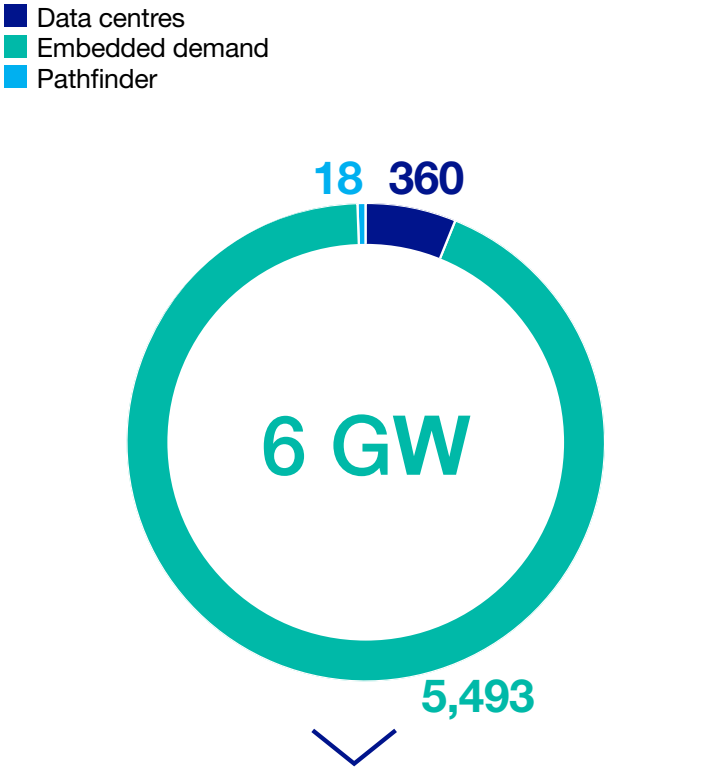
We have contracts for our customers to deliver into the mid 2030s which would connect up to 90 GW of generation. However, not all of this is expected to connect to the network.

New connections in the region: Demand

There is about **6 GW of demand connections** in East Anglia. However, not all of this demand is expected to connect.

We expect to add 240 MVA of additional capacity in T3.





12.6 GW of generation expected to connect in T3

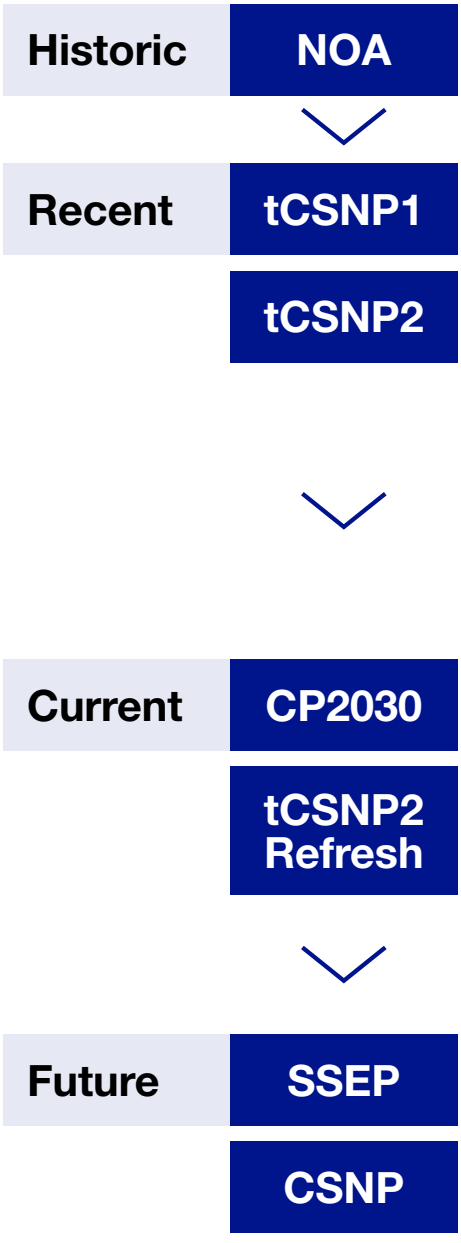
240 MVA of capacity to be added in T3

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
East Anglia projects

In **East Anglia** we will develop new infrastructure and enhance existing networks to ensure adequate capacity for electricity transmission in and out of the region. This plan includes establishing new circuits whilst upgrading current circuits and infrastructure.

Individual codes are assigned to infrastructure projects to identify what they are and provide a link between government, NESO, and NGET documentation.

neso.energy/publications/clean-power-2030

Specific projects include:

AENC
New circuit between Norwich and Tilbury (North) – Post-T3

ATNC
New circuit between Norwich and Tilbury (South) – Post-T3

BPRE
Reconductor second Bramford – Pelham – Braintree – Rayleigh Main Circuit – T3 period

BTNO
Bramford to Twinstead reinforcement – T3 period

ECSC
Install power flow control devices within East Anglia – Post-T3

NLR
Uprate Hackney, Tottenham and Waltham Cross 275 kV to 400 kV – T3 period

LRN6
New transmission capacity between South Lincolnshire and Hertfordshire – Post-T3

SCD1
Sea Link offshore HVDC link between Suffolk and Kent – Post-T3

SGRE
Reconductor existing circuit between Grendon and Sundon with higher capacity – T3 period

Develop options

In this section

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 East Anglia focuses on upgrading and expanding the network to support the connection and integration of significant offshore wind generation to help support the UK’s clean power ambition.

Many of these reinforcements are being delivered through The Great Grid Upgrade initiative which supports the region’s increasingly strategic role in the UK’s energy transition.

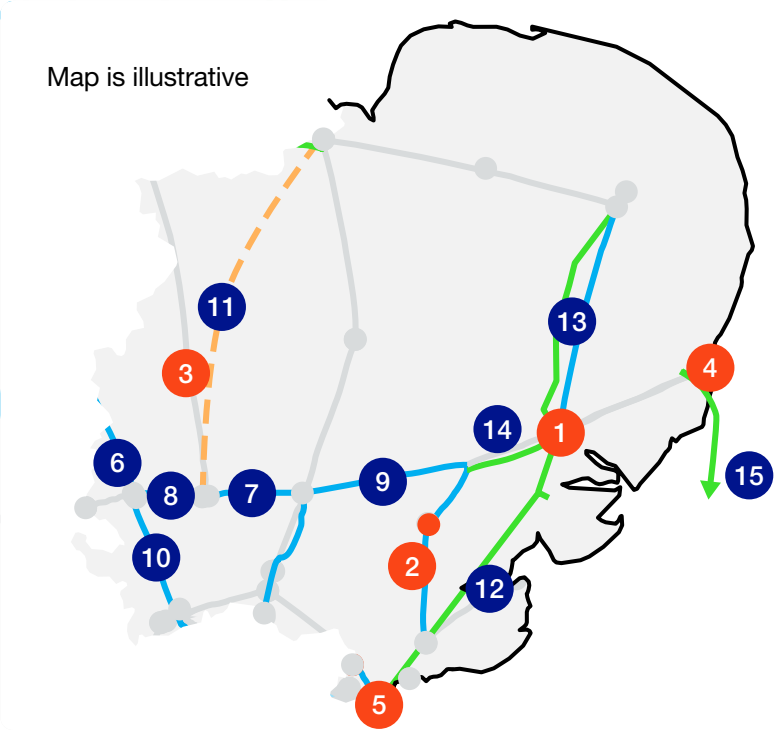
Alongside these projects, we are also enabling capacities at distribution level. In addition, we are enabling the connection of new Sizewell C Nuclear generation that will further support the long-term security and resilience of the UK energy supplies.

East Anglia Strategy

Substations

1. **Bramford GIS 400 kV** Upgrade/extension – T3 period
2. **Bulls Lodge 400 kV** Upgrade/extension – T3 period
3. **Eaton Socon 400 kV** Rebuild – Beyond T3
4. **Sizewell 400 kV** Rebuild – Beyond T3
5. **Tilbury 275 kV** Rebuild – Beyond T3

8 In addition we will be investing in 8 new substations with the region.



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

Circuits

6. **SGRE Grendon to Sundon 1 and 2** – Reconductor OHL circuit – T3 period
7. **Pelham to Sundon** – Reconductor OHL circuit – T3 period
8. **Sundon to Wymondley** – Reconductor OHL circuit – T3 period
9. **BPRE Bramford – Pelham – Braintree – Rayleigh** Reconductor second main circuit – T3 period
10. **SER1 Elstree to Sundon 2** – Reconductor OHL circuit – T3 period
11. **LRN6 – New transmission capacity between South Lincolnshire and Hertfordshire** – Beyond T3
12. **ATNC – New circuit – between Norwich and Tilbury (South)** – Beyond T3
13. **AENC – New circuit – between Norwich and Tilbury (North)** – Beyond T3
14. **BTNO Bramford to Twinstead** Reinforcement – T3 period
15. **SCD1 Sea Link HVDC link between Suffolk and Kent** – Beyond T3

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.