

Electricity
Transmission

Midlands: Future Network Blueprint

nationalgrid

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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;
1 new and 8 major
interventions



£1.7bn
investment

to maintain, upgrade
and develop our
network in T3



11 GW
demand

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



42 GW
generation

contracted to connect*;
900 MW estimated to
connect in T3



c400 km
of overhead line

reconductoring planned
within T3, equating to
22% of the region



strategic infrastructure
projects within the region



*including T3 and beyond

Information gathering



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Midlands

Regional context

National Grid's network in the Midlands encompasses Northamptonshire, Nottinghamshire, Leicestershire, Warwickshire, West Midlands, Worcestershire, Staffordshire and Derbyshire. The Midlands has a diverse mix of electricity demand profiles, with energy consumption spread across residential, commercial, and industrial sectors.

Electricity demand in this region typically peaks during winter due to requirements like heating needs in residential areas. To address this demand, we are developing a strategic plan with the West Midlands Combined Authority (WMCA), electricity distribution networks and other local authorities in this region.

The West Midlands, known as the UK's industrial heartland with a strong manufacturing base in automotive, aerospace, and heavy industries, is focusing on decarbonising these sectors as part of the UK's move towards net zero. NGET's network is crucial in this transition, providing reliable, low-carbon electricity for industrial processes and integrating new technologies like electrified transport and industrial heat pumps.

Major urban centres in this part of the region, such as Birmingham, Coventry, and Wolverhampton, where energy demand is high, rely on NGET's infrastructure for a stable electricity supply. This supports their sustainability strategies, including the electrification of public transport systems, the new high-speed rail (HS2) and the rollout of electric vehicle (EV) charging networks.

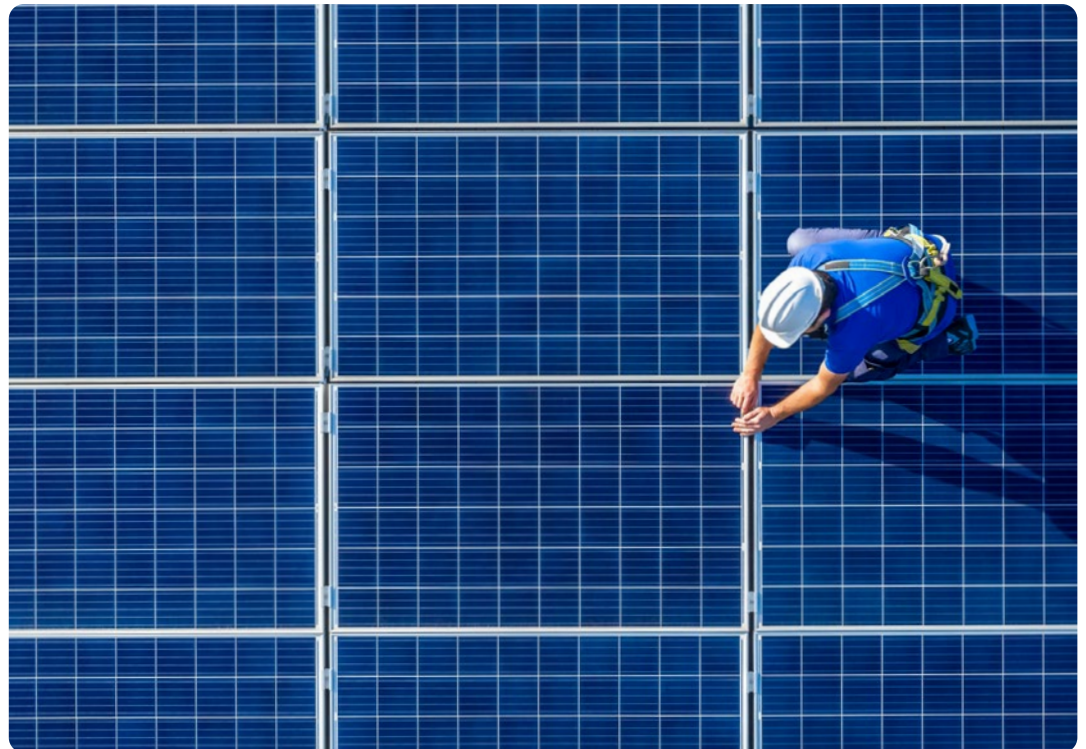
The East Midlands network spans a large geographic area, encompassing both urban and rural areas, including key cities and towns like Nottingham, Leicester, Derby and Northampton.

NGET's network in the East Midlands is designed to efficiently integrate these renewable sources into the grid, ensuring that clean energy can be transmitted to areas of higher demand across the country.



Energy mix

The East Midlands is increasingly contributing to the UK's renewable energy mix with its growing portfolio of onshore wind farms, solar installations, and biomass facilities.



Midlands

Current network view

Network overview

The Midlands transmission network covers central England and consists of 400 kV north-to-south circuits in the east and a 400 kV outer ring and 275 kV inner ring in the west.

The transmission network in the Midlands is a significant demand centre and primarily acts as a net importer, with power flowing into the region due to high load demands in and around regional centres and manufacturing sites.

The Midlands functions as a ‘transfer hub’ enabling northern generation flows to reach demand centres located south of the region, while also serving as a central point for electricity flows to and from Wales and the East of England.

As generation and demand grows, the network across this region will be increasingly constrained, presenting an opportunity to increase capacity and reinforce this part of the network to facilitate vital network resilience and stability of supply.



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



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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.



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 Midlands

We continuously monitor and maintain our assets on a regular basis, undertaking replacements or refurbishments 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 256 km of overhead line in Midlands 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 Midlands 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

 256 km

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

Asset health intervention regional metrics

 1

Super grid transformer

 86

Circuit breakers

 78

Voltage management assets

 357

Bay assets

Customer connections

Regional overview

We leverage 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:



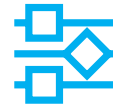
Standalone connection

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

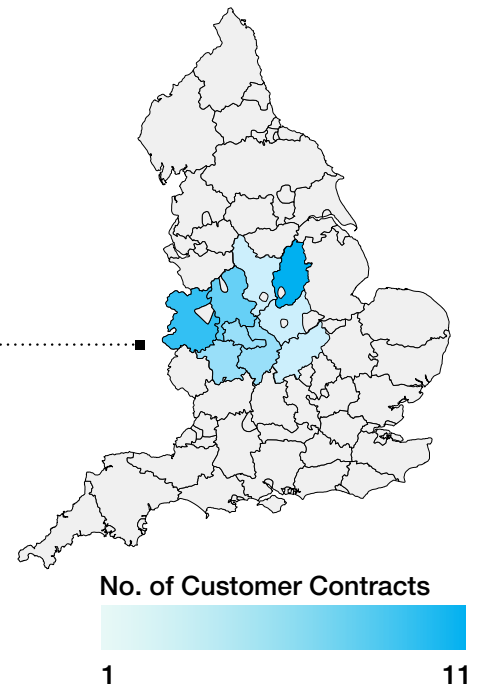
Demand connections – where power is taken from the grid

Generation connections – where power is added to the grid

Demand
11 GW

Generation:
42 GW

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



Customer connections Midlands demand and generation breakdown

New connections in the region: Generation

Due to its densely populated areas and high industrial loads like in manufacturing, the Midlands is referred to as a 'net importer'. This means power on the transmission network flows into the region rather than out.

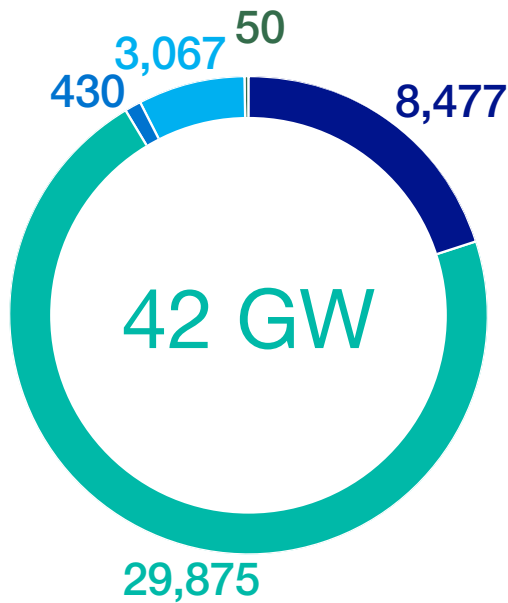
We have contracts for our customers to deliver into the mid 2030s which would connect up to 42 GW of generation. However, not all of this is expected to connect to the network.

New connections in the region: Demand

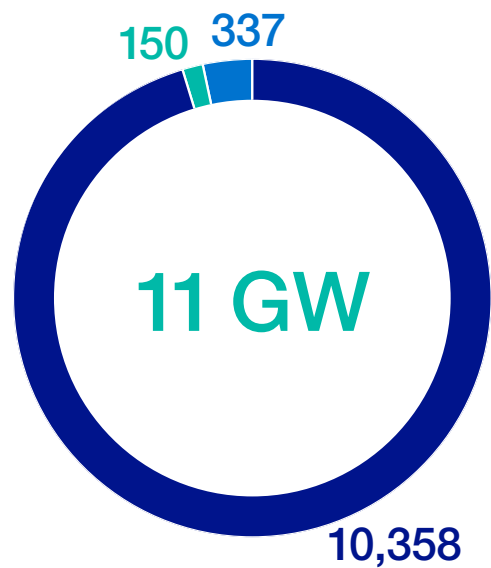
There is about **11 GW of demand connections** in the Midlands. However, not all of this demand is expected to connect.

We expect to add 492 MVA of additional capacity in T3.

- Battery storage
- Fossil fuel
- Battery storage – hybrid
- Solar
- Waste



- Embedded demand
- Embedded demand – data centre
- Rail



900 MW of battery storage expected to connect in T3

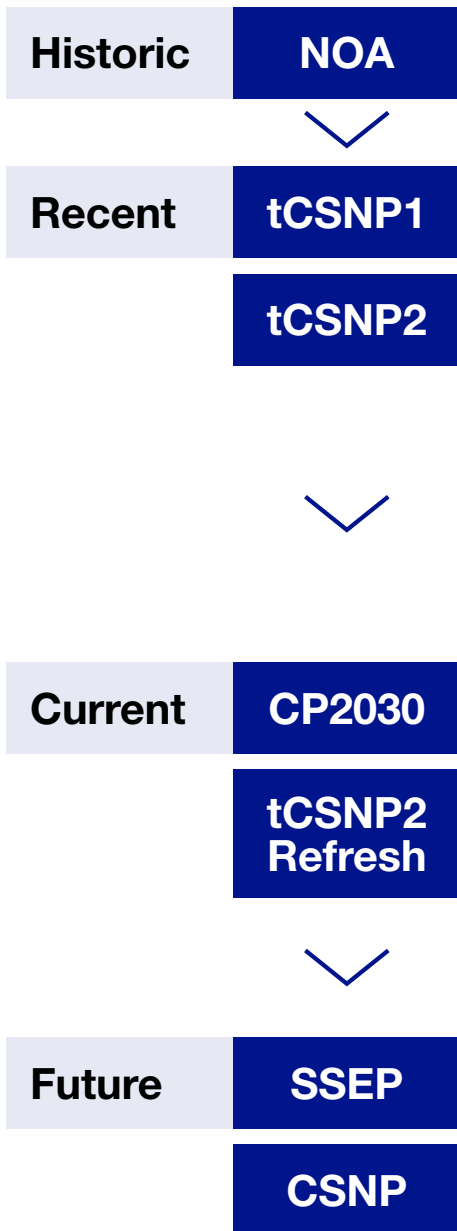
492 MVA of capacity to be added in T3

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 Midlands projects

In the **Midlands** 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 existing infrastructure.



neso.energy/publications/clean-power-2030

Specific projects include:

CGNC

New 400 kV double circuit between North Humber and High Marnham - Post T3

EDEU

400 kV upgrade of Brinsworth to Chesterfield double circuit and Chesterfield to High Marnham double circuit. New High Marnham and Chesterfield 400 kV substations – T3 period

EDN2

New Chesterfield to Willington 400 kV double circuit – Post-T3

EDN3

Replace the conductors on the existing circuits between Brinsworth and Thorpe Marsh, Brinsworth and Chesterfield, and Chesterfield and Ratcliffe with higher capacity conductors – Post-T3

SCORE

Staythorpe to Cottam reconductoring – T3 period

WRRE

West Burton to Ratcliffe-on-Soar reconductoring – T3 period



Develop options



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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 Midlands focuses on several strategic upgrades to increase capacity on the network and improve power flow through the region. This will serve the increasing demands of industrial and domestic customers – all while working towards building a cleaner, fairer energy system for the future.

The network in the Midlands serves as a key hub for power distribution around the country and our investments, such as the new circuit from Chesterfield to Willington, will bring low carbon, renewable power into this region as well as support demand in other regions. We are also expanding existing sites to facilitate connections for new renewable generation, and to meet emerging demands, including powering HS2.

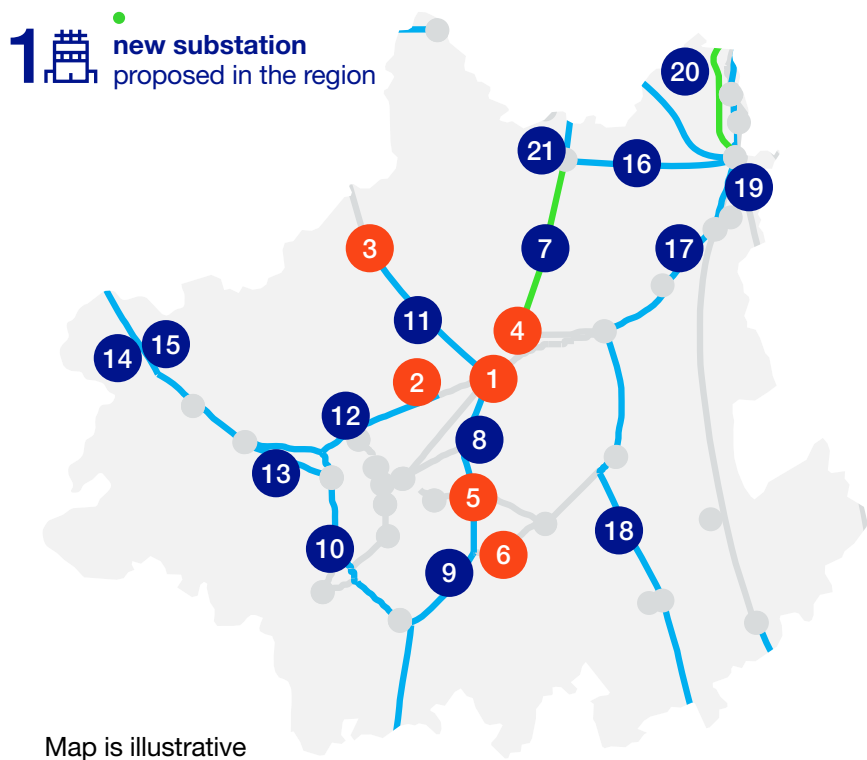
Midlands Strategy



Substations

- 1 **Drakelow 400 kV and 132 kV**
Upgrades – T3 period
- 2 **Rugeley 132 kV**
Rebuild – T3 period
- 3 **Cellarhead 400 kV and 132 kV**
Upgrade – Beyond T3
- 4 **Willington 400 kV**
Upgrade – T3 period
- 5 **Hams Hall 400 kV**
Upgrade – T3 period
- 6 **Berkswell 275 kV**
Upgrade – T3 period

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



Circuits

- 7 **EDN2 – Chesterfield to Willington** – New circuit – Beyond T3
- 8 **Drakelow-Hams Hall** – Reconductor OHL circuit – T3 period
- 9 **Feckenham-Hams Hall** – Reconductor OHL circuit – Beyond T3
- 10 **Feckenham – Ironbridge** – Reconductor OHL circuit – T3 period
- 11 **Cellarhead – Drakelow 1 and 2** – Reconductor OHL circuit – T3 period
- 12 **Ironbridge – Rugeley** – Reconductor OHL circuit – T3 period
- 13 **Ironbridge – Penn 2** – Reconductor OHL circuit – T3 period
- 14 **Ironbridge – Legacy – Shrewsbury** – Reconductor OHL circuit – T3 period
- 15 **Ironbridge – Legacy 2** – Reconductor OHL circuit – T3 period
- 16 **EDEU – Brinsworth – Chesterfield – High Marnham** – Upgrade circuit – T3 period
- 17 **WRRE – West Burton to Ratcliffe-on-Soar** – Upgrade circuit – T3 period
- 18 **East Claydon – Enderby – Patford Bridge 1 and 2** – Reconductor OHL circuit – T3 period
- 19 **SCRE – Staythorpe to Cottam** – Upgrade circuit – T3 period
- 20 **CGNC** – New 400 kV double circuit between North Humber to High Marnham – Post-T3
- 21 **EDN3** – Reconductor circuits Brinsworth – Thorpe Marsh, Brinsworth – Chesterfield, and Chesterfield – Ratcliffe at a higher capacity – 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.