Electricity Transmission

Pathway to Net Zero

Stakeholder Workshop
London - 31/10/23

nationalgrid

Housekeeping

Username:
No password

For those here **in person:**

- No planned fire drills

For those joining us **online**:

- Please mute yourself during presentations
- Please turn your camera on during the discussions (if your internet allows)
- If you have any questions during the presentations, please use the chat function and we will endeavour to respond

After each presentation, we will host breakout discussions. For those **online**, you will be moved to breakout rooms for the discussions. These will start and end automatically. You don't need to press any buttons

We would like to record today's workshop and take some photos. If you are not comfortable being recorded, please send a message in the chat to ' Vincent Luxmoore (EQ)', or make yourself known to the team if you're here in person

After each discussion session, we will ask you to vote on a series of questions using Slido.
You will need a mobile phone or iPad to vote so please have one handy

Agenda

Registration and Networking		**09:30**
1: Background context and planning holistically		**10:00 – 10:55**
Housekeeping	EQ	10:00 – 10:10
Presentation	NGET and NGESO	10.10 – 10.25
Discussion	All	10.25 – 10.45
Electronic voting	EQ	10.45 – 10.50
2. Developing a regional planning process into a net zero future		**10.50 – 11.55**
Presentation	NGET, UKPN and SSEN	10.50 – 11.15
Discussion	All	11.15 – 11.50
Electronic voting	EQ	11.50 – 11.55
Coffee break		**11:55 – 12.15**
Our connections strategy		**12:15 – 13.00**
Presentation	NGET	12.15 – 12:30
Discussion	All	12.30 -12.50
Electronic voting	EQ	12.50 – 12.55
Wrap up	NG	12.55 – 13.00
Panel Q&A	NGET, NGESO, UKPN and SSEN	13.00 – 13.30
Lunch		**13.30**

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Introduction

Ben Wilson
Chief Strategy and External Affairs Officer

National Grid Electricity Transmission

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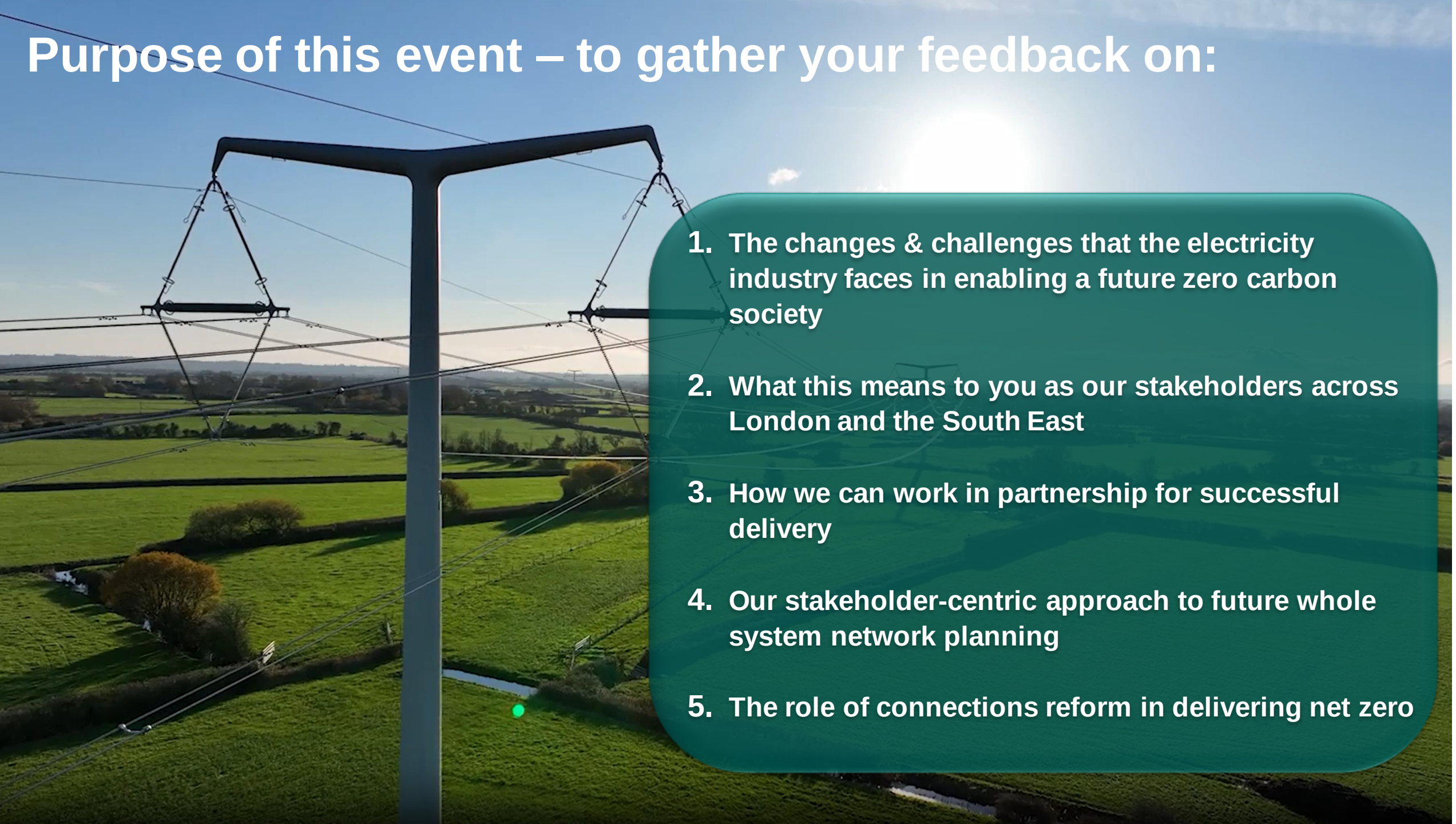
Purpose of this event – to gather your feedback on:



1. The changes & challenges that the electricity industry faces in enabling a future zero carbon society
2. What this means to you as our stakeholders across London and the South East
3. How we can work in partnership for successful delivery
4. Our stakeholder-centric approach to future whole system network planning
5. The role of connections reform in delivering net zero

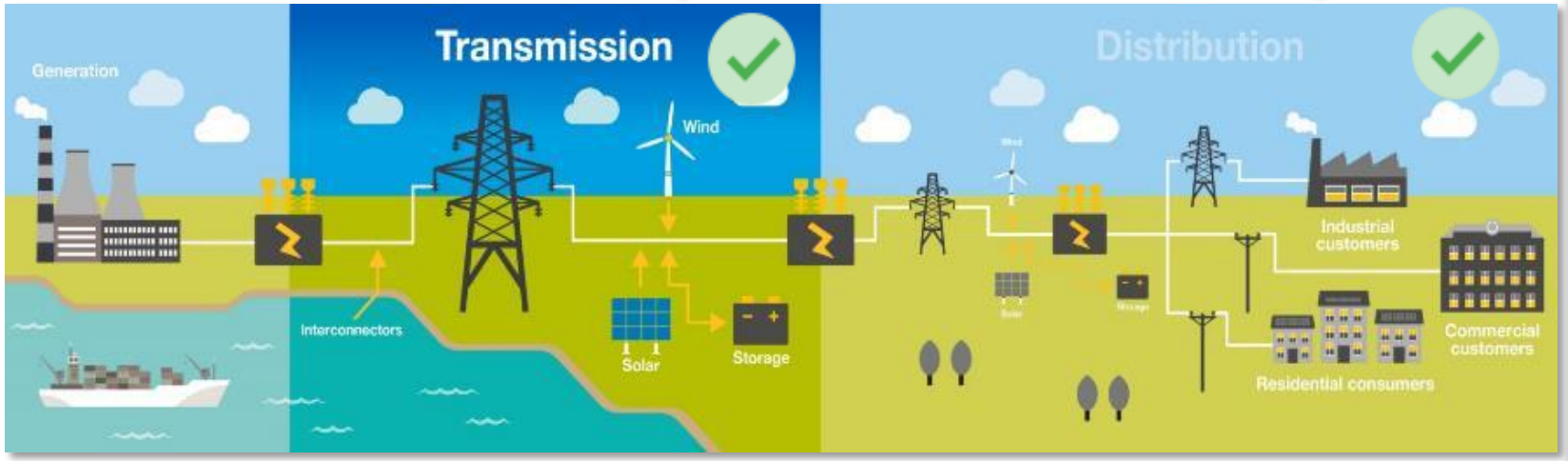
Networks in the electricity sector – who does what?

One Transmission Network Owner in England and Wales- National Grid Electricity Transmission

Transporting electricity from where it is generated to where it is needed.

Six Electricity Distribution Networks in England and Wales

Taking electricity from the transmission network and generated from other regional sources, and delivering it to homes and businesses across their respective regions.



National Grid Electricity System Operator (NGESO) operates the Great Britain's system to keep homes and businesses supplied with the energy they need 24/7, 365 days a year

National Grid businesses

Electricity Transmission and Strategic Infrastructure (ET & SI)

Electricity Distribution (ED) (previously WPD)

New York

New England

National Grid Partners

National Grid Ventures

Electricity System Operator (ESO) (*to be divested*)

Delivering for 2035

Upgrading the grid for a secure, clean and affordable energy future

1

Reform the planning system, centred around a strategic clean energy vision

- Finalise the National Policy Statements
- Streamline the NSIP process
- Establish a 'Strategic Spatial Energy Plan'

2

Ensure the regulatory and governance framework is set up for delivery

- Clarify regulators objectives
- Embed anticipatory investment
- Introduce a competitive market for transmission

3

Transform how clean energy connects to the grid, accelerating net zero projects

- 'Connect or move' connections process
- Develop strategic 'capacity hubs'
- Create a fast-track connection route for critical net zero projects

4

Putting communities and customer at the forefront of the transition

- Community benefits framework
- Regional System Planners
- Demand flexibility and a social tariff

5

Develop supply chain capacity and a skills pipeline across the country

- A more collaborative and flexible approach to the supply chain
- Incentives to attract potential clean energy manufacturers and training providers
- Annual net zero energy workforce report

Delivering a **clean, fair, and affordable** energy future

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Electricity Network Planning - the national context

Owen Wilkes
Network Development Manager
National Grid Electricity Transmission

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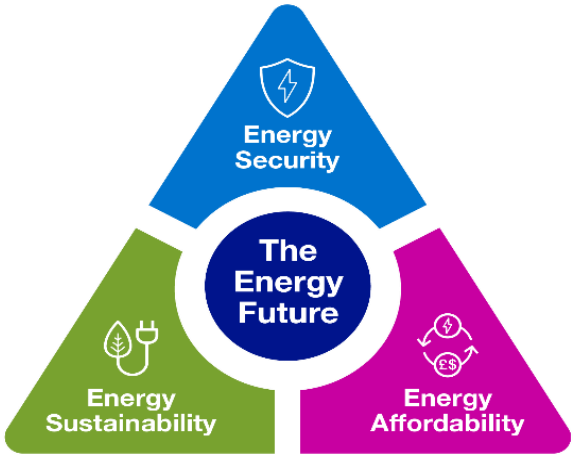
National Context – energy transition

Today - electricity networks deliver reliable & secure supply to meet societal needs

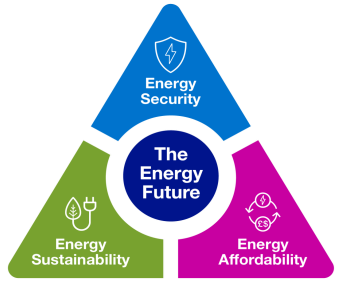
What do electricity networks need to do to enable the energy transition?

- Connect new and low carbon sources of electricity generation to our networks
- Meet increased electricity demand from decarbonising sectors such as heat and transport
- Increase future UK energy security by reducing fossil fuel dependence
- Maintain a safe and reliable electricity supply through our networks with society having a greater dependence on it for day-to-day life.
- Manage the cost impact to consumers of all network activities



We must achieve this in a way that manages the impacts of what we do on the environment and on communities

National Context – Delivering for 2035



We must systematically upgrade the E&W Transmission network to provide a sustainable 'platform' to service future electricity needs

Offshore wind

4.5 to 6 times
growth in capacity

Solar

2.5 to 5 times
growth in capacity

Interconnectors

2.5 to 3 times
growth in capacity

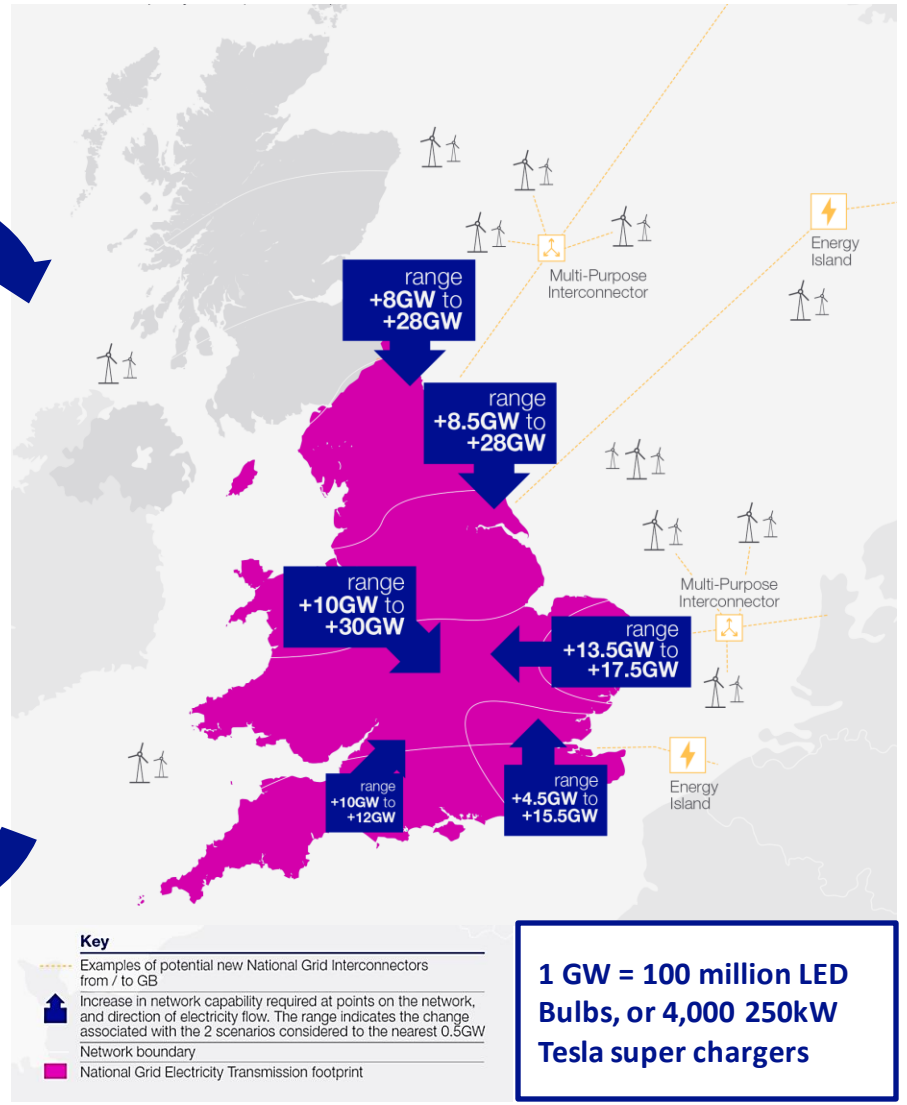
Battery storage

4.5 to 10 times
growth in capacity

At the same time cross sector electrification is expected to increase total electricity demand by around 50%.[5]

Building over
5 times more
transmission overhead or underground lines than we have built in the last 30 years.

Building around
4 times more
transmission marine cables than our current offshore network.



1 GW = 100 million LED Bulbs, or 4,000 250kW Tesla super chargers

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The Great Grid Upgrade

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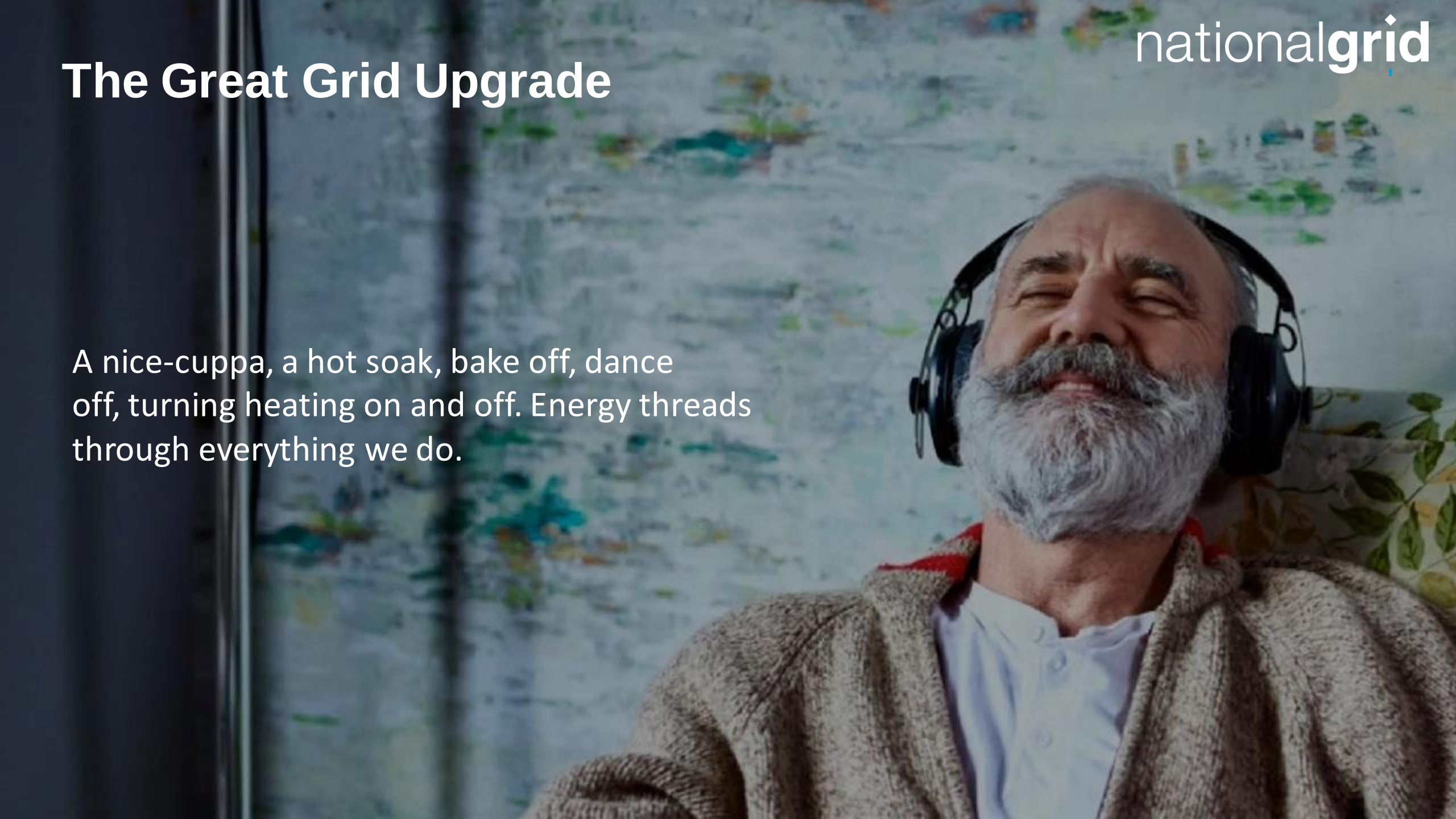
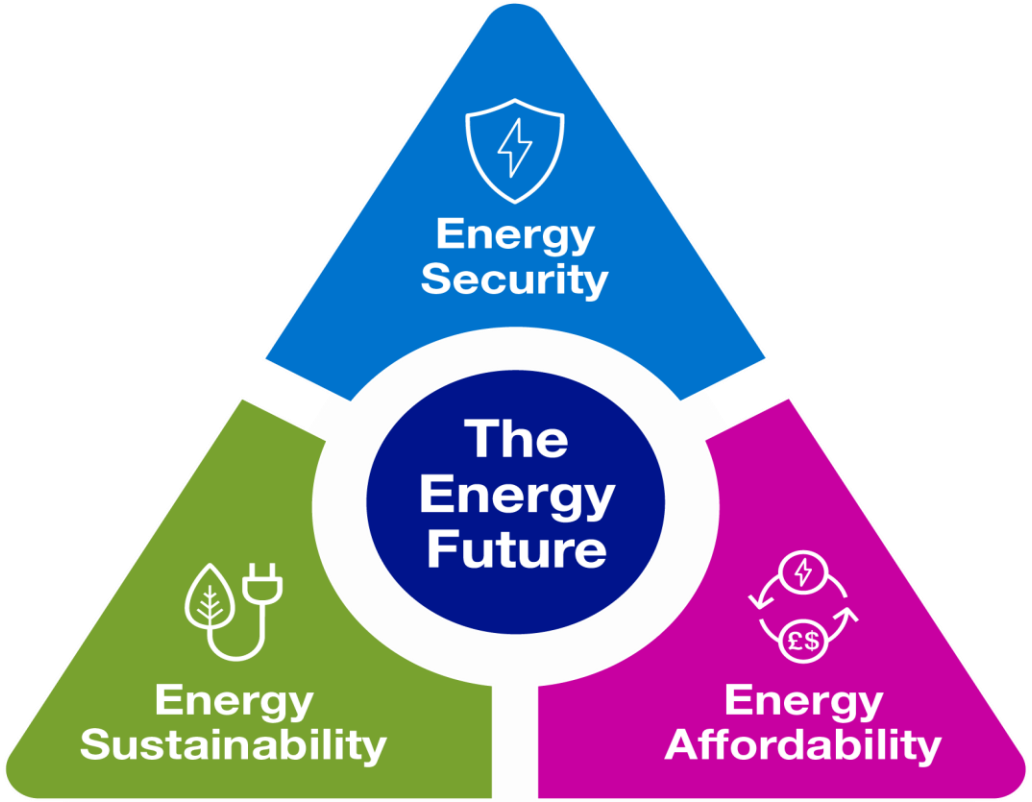
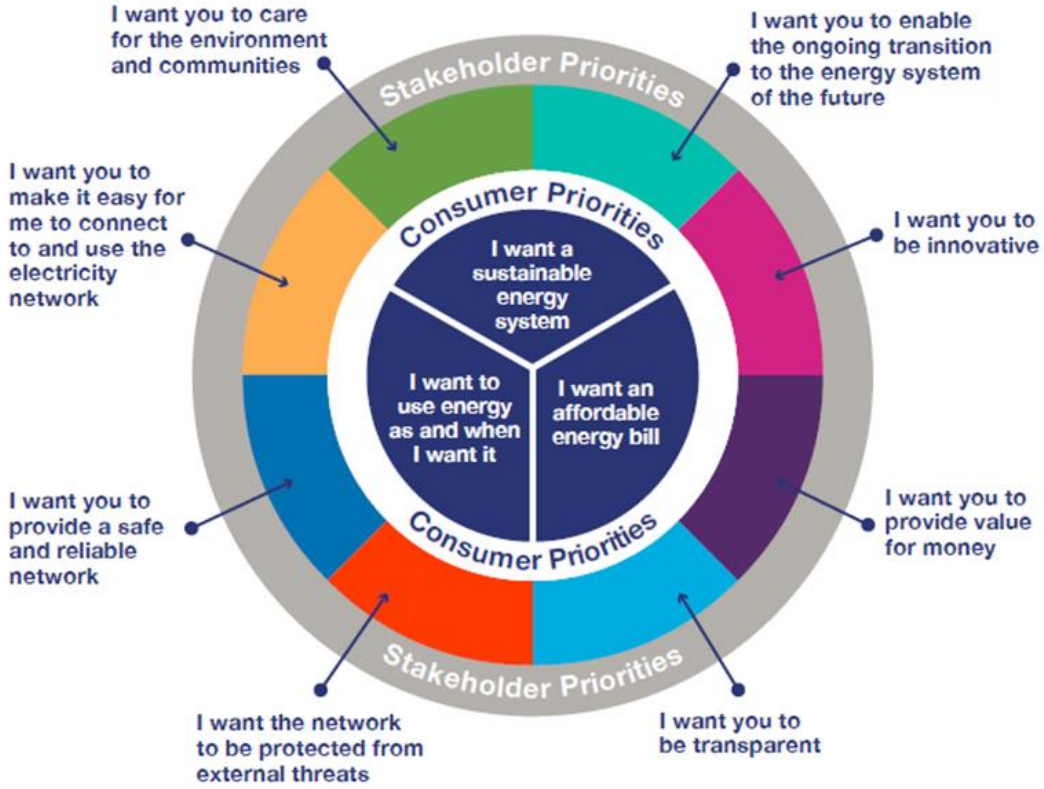
A nice-cuppa, a hot soak, bake off, dance off, turning heating on and off. Energy threads through everything we do.



A future business plan for a fair energy transition





Graham Stein

Network Planning Senior Manager

Electricity System Operator

Transitioning into an independent system body responsible for energy network planning

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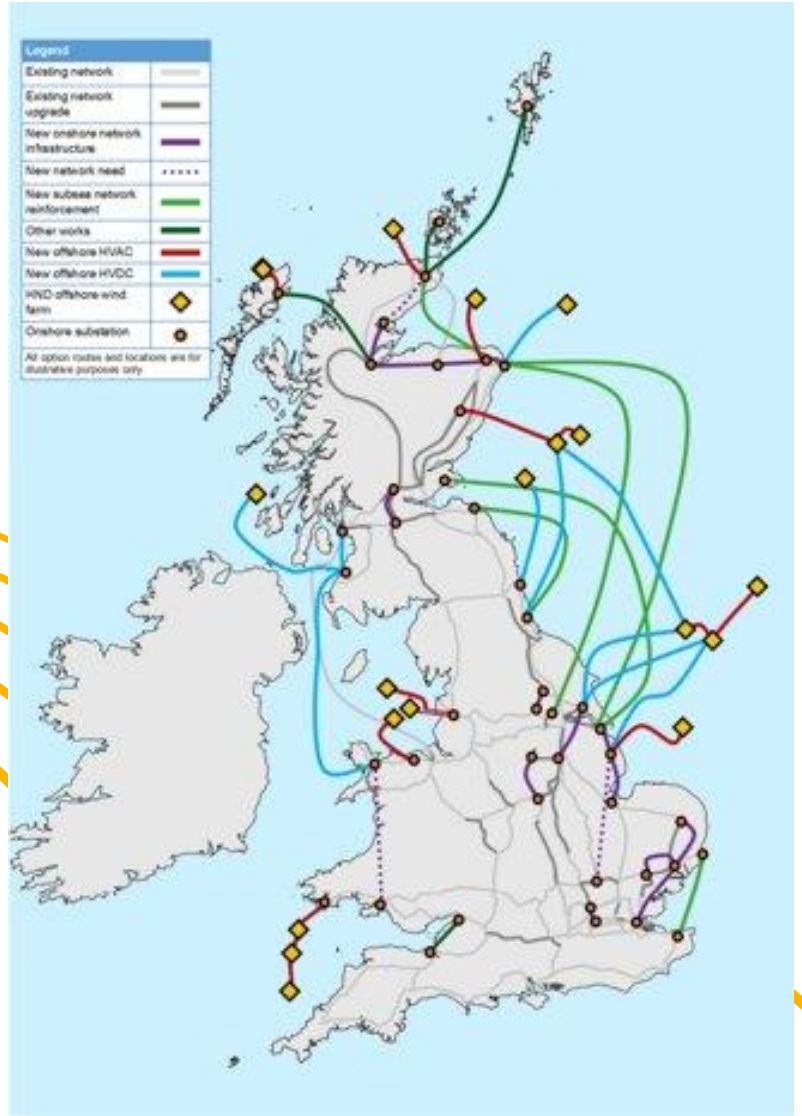
What does Electricity System Operator do?



- We are the electricity system operator for Great Britain. We operate the transmission networks, whereas Distribution Network Owners operator local networks.
- Our control room moves electricity around the country second by second to ensure that the right amount of electricity is where it's needed, when it's needed across Great Britain 24/7, 365 days a year.
- We don't generate or sell electricity – that's down to other companies. We also do not own the infrastructure the electricity travels through.
- One of our key responsibilities is to strategically plan the electricity network, through creating high level designs for companies to take forward and build. We currently do this GB wide for on and offshore electricity infrastructure.
- We are legally separated company within the National Grid Group. In 2024, we will transition into the Independent System Operator and Planner – a public body.

A new public body – Independent System Operator and Planner

An **independent** organisation with a mandate to deliver **net zero system operation**, with enhanced **data and digital capability**

Act with a **whole energy system view**, bringing parties together to support **optimised decision-making and action** in the decarbonisation of power, heat and transport

Working with policy makers and regulators, and advising more broadly across the energy sector, to **unlock value and accelerate the net zero transition**

Roles and responsibilities of the new public body

The ISOP is about the creation of an expert and impartial body with duties to facilitate net zero whilst also maintaining resilient and affordable whole energy system

Now

ESO today

‘Day 1’ of the ISOP

2024

We will introduce the **whole energy system capability** for:

- **Whole Energy Planning – including gas**
- **Gas Markets Strategy** and **Whole Energy Markets Strategy**
- The **Advisory** role to support DESNZ/Ofgem in decision making
- **Emergency Preparedness Activities**

Future of ISOP

2025+

Future responsibilities **may** extend to the following:

- **Regional System Planning**
- **Hydrogen**
- **Heat**
- **Transport**
- **CCUS**

Whole energy systems planning: regional system planner

Ofgem are currently consulting on the future of local energy planning and have proposed a new function – Regional System Planners – that the ISOP may be responsible for.

These will facilitate, develop and own a single plan per region optimising across vectors for the region and its customers against considerations of consumer value, net zero and security of supply.

Aim and responsibilities of the Regional System Planner

- Consistency across regions and coherent and coordinated with national energy system planning
- Coordinate, facilitate and ensue **effective participation** between local actors
- Governance arrangements to ensure there is **transparency**, **democratic accountability** and a proportionate allocation of risk.
- Whole system –leading to coordinated development across multiple vectors
- Ensure investment is made when and where it is needed to drive forward decarbonisation at pace – requires regional context to be embedded within planning assumptions
- Develop and own critical planning assumptions, using and collating inputs from local actors
- Provide independent **technical analysis and advice** to support decision making,

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Discussion

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Developing a regional planning process for a net zero future

Ben Haggerty
Future Network Blueprints Manager

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Delivering the electricity network that enables Net Zero

Our vision is to be at the heart of a clean, fair and affordable energy future.

Physical space at substations is becoming increasing challenging.

The **number and variety of customer connections** is significant, and driving a need to transform our approach

Network development, the **characteristics of the power system and the challenges** it faces are becoming more complex (power quality & reactive power)

Distribution Network Owners (DNOs) are telling us **they need more capacity** in their networks in order to grow

In days gone by the network was powered by large fossil fuel power stations

The modern network is powered by multiple sources, including low carbon fuels such as solar, wind, hydro and hydrogen.

Energy landscape has evolved from large fossil fuelled power stations to a modern renewables network.

To realise this vision, we must therefore:

1. **Systematically upgrade** our electricity transmission network to ensure it remains fit for future, in a more collaborative and whole system way to deliver net zero.
2. **Make our network plans transparent**, easy to understand and engage with for our stakeholders.

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Introducing Future Network Blueprints

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Future Network Blueprints – *our regional strategies*

Stakeholder centric approach levering the power and importance of whole system thinking

Consider a combination of known and anticipatory network drivers looking out to 2050

Known network drivers

- Customer Connection applications
- Asset Health of the current network
- Transmission network reinforcement (on and offshore)
- Environmental targets
- Distribution Network plans

Anticipatory network drivers

- Customer Connection applications
- Future Energy Scenario modelling
- Local and combined authority energy plans

Be a single live 'best view' of the required network development within regions

Future Network Blueprints…

- Allow us to **make more efficient and coordinated decisions**
- Consider **the nuances of different geographical area** network requirements
- Transmission, distribution and stakeholder inputs together to help **prioritise investments**
- Critical input to shape our individual **site and circuit strategies**
- **Signal future capacity** to customers wanting to connect

Electricity
Transmission

Manomay Roy
Senior Power System Lead

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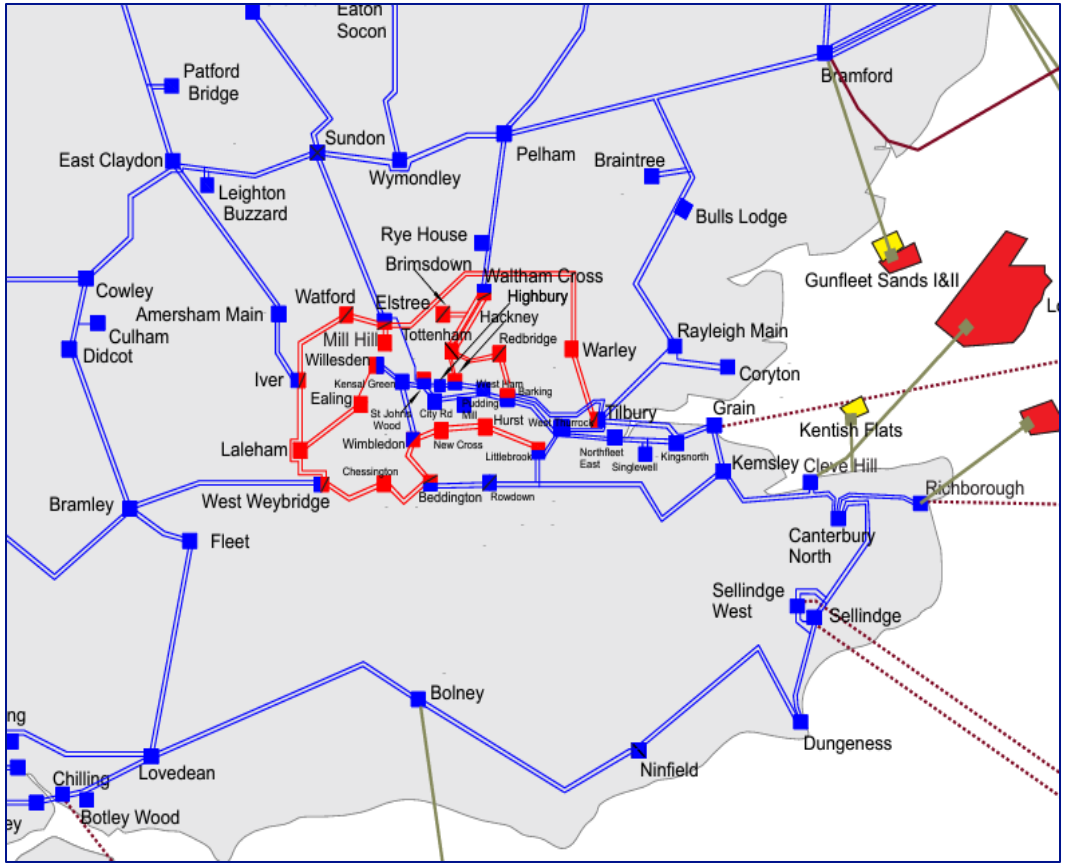
The network in the London and South East today

- The London and South East 275kV and 400kV transmission network is designed to meet **London's electricity needs** and support coastal **interconnector power exchange** capability.
- 10% of national power demand is within **Central and Greater London** area. Therefore, demand security is paramount year round:
  - High volume of commercial loads – particularly air conditioning,
  - Summer heatwave peak demand can exceed Winter Peak.
- The **Thames Estuary** transmission network contains several thermal power plants that traditionally supply power to London.
- The **South Coast** transmission network can be characterised as a net importer/exporter depending on interconnector power flows.
- Interconnectors create **dynamic network challenges** for the region.



London and South East – Evolving network needs & our plans

How London and South East electricity network needs are evolving:

- Electricity demand is expected to grow as a result of the needs and expectations of modern society:
  - The Mayor of London's Net zero 2030 pathway – 20 years ahead of the national target.
  - Electrification of heating and transport (e.g. cars, buses, airports) across the SE region.
  - Other energy intensive industries requiring access to electricity (e.g. Data Centres, Energy Storage).
- Evolving connection customer demographics.
- Prevailing future power flow into and past London is expected to be increasingly diverse as regional demand growth is met by increased renewable power located across the country.
- Therefore, some of the circuits that feed or by-pass London will need upgrades to accommodate new network flows.

What we are planning for:

- More **network upgrades** to meet future regional electricity needs, including decarbonisation.
- **Reinforcement of the existing electricity network** where land and space do not prohibit, and where incremental capacity increases are sufficient or can act as a 'stop gap' whilst strategic infrastructure is delivered.
- **Strategic upgrades** that consider enduring network needs (2050 and beyond wherever possible) to enable Net Zero - balancing certainty of need, timely delivery and decisions that do not preclude any uncertain net zero futures.

Our Current Plans - Major Projects under development

Hackney to Waltham Cross Upgrade Project

- Reinforcement of the route between Pelham and Hackney substations to accommodate increased power flow whilst maintaining demand security in London.
- Building a new substation at Waltham Cross, uprating the voltage from 275kV to 400kV of overhead line between Hackney, Tottenham and Waltham Cross substations, plus local substation and circuit upgrades.

https://www.nationalgrid.com/electricity-transmission/network-and-infrastructure/infrastructure-projects/grain-to-tilbury

Grain to Tilbury

- The Grain to Tilbury project proposes electricity infrastructure upgrade through replacement of an existing cable tunnel beneath the Thames between Tilbury and Gravesend that is reaching the end of its useful life.
- Our proposals include construction of a new tunnel, installation of new cable circuits within it, and capacity upgrades to the existing overhead line to increase power carrying capacity.
- Public consultation is closed and feedback will be incorporated into the planning application in winter 2023.

https://www.nationalgrid.com/electricity-transmission/network-and-infrastructure/london-power-tunnels-project

London Power Tunnels

- 32.5km tunnels are being constructed deep below the road network between Wimbledon and Crayford.
- The new tunnels will increase power carrying capacity by replacing the existing 275kV cables with 400kV cables which currently run beneath the road network.
- The work is essential to ensure a continued safe and reliable electricity network.

Our Current Plans - Major Projects under development

https://www.nationalgrid.com/electricity-transmission/network-and-infrastructure/infrastructure-projects/sealink

Sea Link

- ~145km offshore 2GW subsea link between Suffolk and Kent, to reinforce capacity of both South East and East Anglian Network.
- This project is currently at the development stage, statutory consultation process is live now until 18th December, with the planning application intended to be submitted in late 2024.

New Substations

- Proposal to build new substations at Uxbridge Moor, Warley, North Hyde and Elstree B to accommodate growing customer connection requirements. The majority of new customers are data centres and battery storage.

Our Future plans

Defined network needs with solutions under early development:

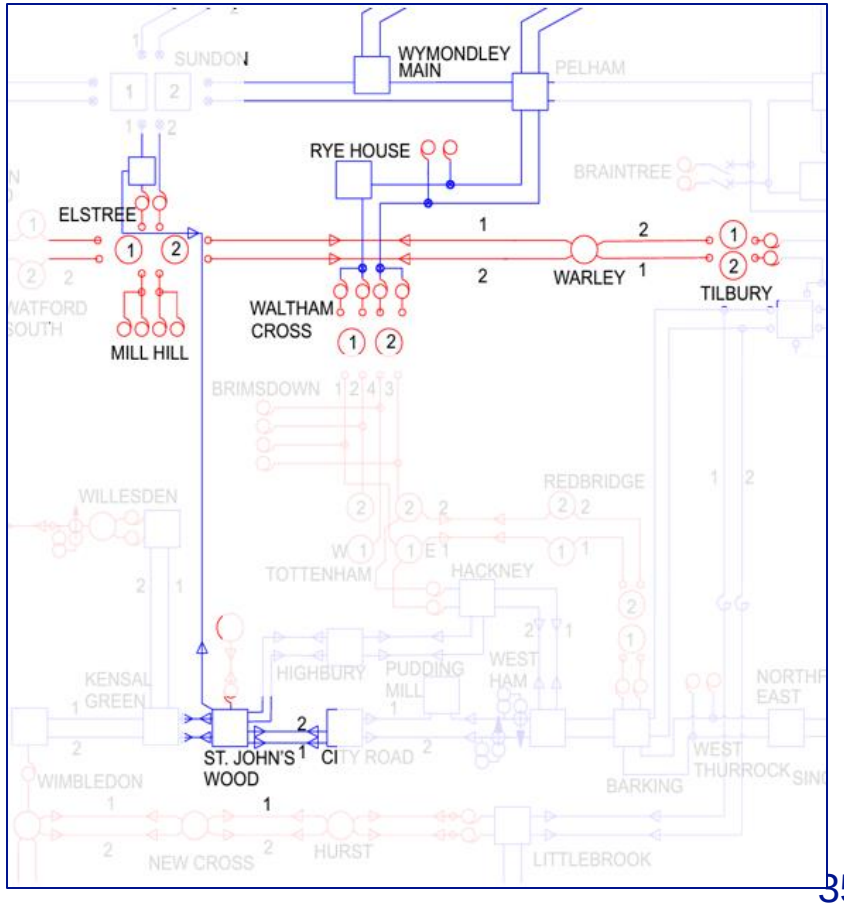
The Electricity System Operator leads regular assessment of future electricity network bulk power transfer needs, signalling to Transmission Owners where new network proposals to accommodate are needed. In the South East, proposals to further develop network solutions include:

Wymondley, Waltham Cross and Tilbury Upgrade

- This reinforcement proposes to create a new overhead line from Wymondley to Waltham Cross, connecting the existing Elstree to Warley to Tilbury 275kV circuit to Waltham Cross substation, and upgrading it to 400kV.

Second Elstree to St John's Wood 400kV circuit

- This reinforcement proposes to install a second cable circuit within the existing cable tunnel between Elstree and St John's Wood substation.



Our Future plans

Expected Future network needs with solutions to be developed:

- A Holistic Network Design (HND) follow-up exercise (FUE) is being undertaken in 2023 to refine an offshore electricity network capacity design, followed by a subsequent assessment of onshore network requirements.

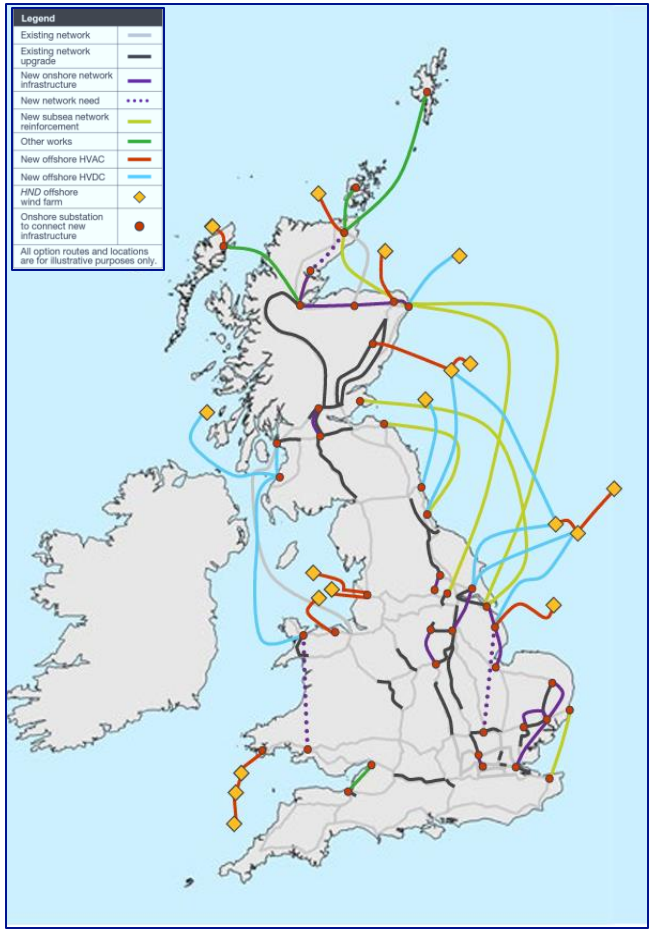
- HNDFUE focus has been transporting renewable power to demand centres like the South East by 2035.

- Resulting onshore network reinforcement plans must also be sufficiently granular to account for the specific South East regional and local demand growth that the renewable power supports:

    - Potential 'lag' (vs. HNDFUE publication timing) in clarity of demand growth requirements as large existing and new customers formalise and communicate their decarbonisation plans.

    - Local Area Energy Plans are progressing in the region (e.g. GLA coordination of London boroughs).

- **Stakeholder engagement key to ensuring that network upgrades do not preclude collective regional decarbonisation plans.**



Luke Hughes

Head of Network Planning

UK Power Networks
Delivering your electricity

INVESTORS IN PEOPLE™ We invest in people Platinum

NES NATIONAL EQUALITY STANDARD

THE UK'S TOP 5 BEST BIG COMPANIES TO WORK FOR 2023

About UK Power Networks

8.3M homes and businesses
28% of UK Total

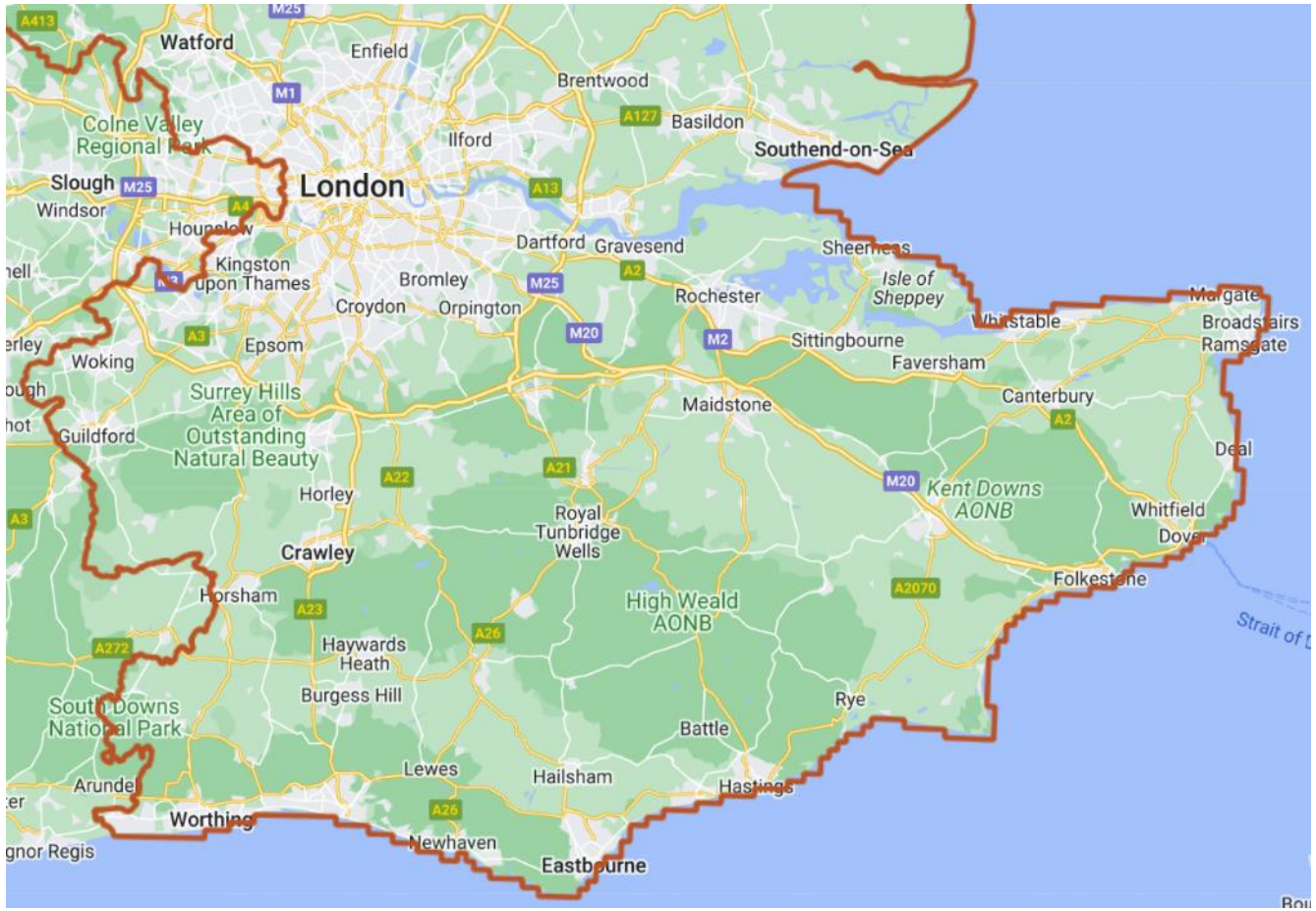
9.3GW+ Distributed Generation Connected
32% of UK Total

16GW+ Peak Demand
28% of UK Total

UK Power Networks
Delivering your electricity

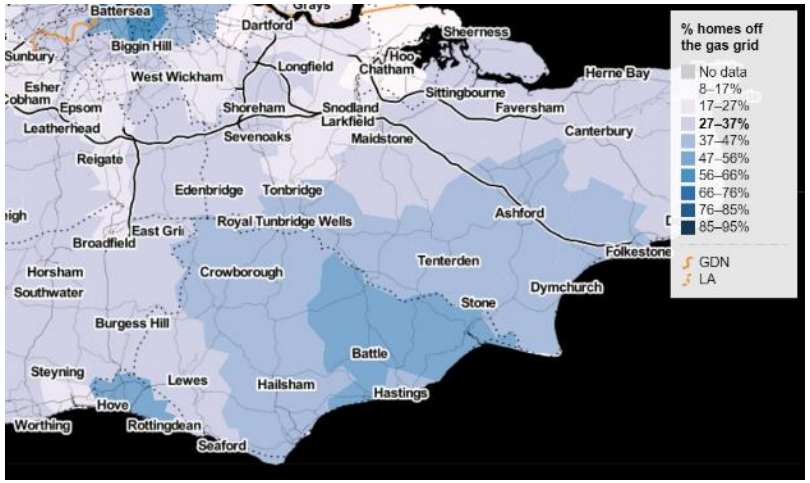
Regional Focus

- Ensuring we provide the best service and provide capacity for the future, three key focus areas across London and the South East:
- **Local Engagement**
  - Understanding growth across the region both in terms of energy use and future development areas.
- **Detailed Forecasting Models**
  - Developing and sharing class leading forecasts which support co-ordinated collaborative working.
- **Efficient Targeted Delivery**
  - Where investment is needed a flexibility first approach is driven to ensure rapid provision of cost effective capacity.



Examples of Work Underway

- Local Area Energy Planning
- Local Growth Enabling Projects
- Motorway Service and EV Hub capacity
- Capacity for off gas grid homes
- Unlooping Services



Above: New transformer installed at Leicester Square

Left: Off Gas Grid Map (source nongasmap.org.uk)

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Delivering your electricity

SSEN: SOUTH EAST OVERVIEW

Andy Wainwright
Whole Systems Manager

Scottish & Southern Electricity Networks

DSO Powering Change

OUR NETWORKS AT A GLANCE

Our electricity distribution network delivers power to over 3.9 million homes and businesses across the diverse and unique geographies of the north of Scotland and central southern England.

Over **3.9 million** homes and businesses served by our networks

More than **783,000** vulnerable customers identified on our priority services register

Over **4,000** employees across the country

over **127,000km** of overhead lines and underground cables

115,000 substations

460km subsea cables powering island communities

OUR SEPD LICENCE AREA

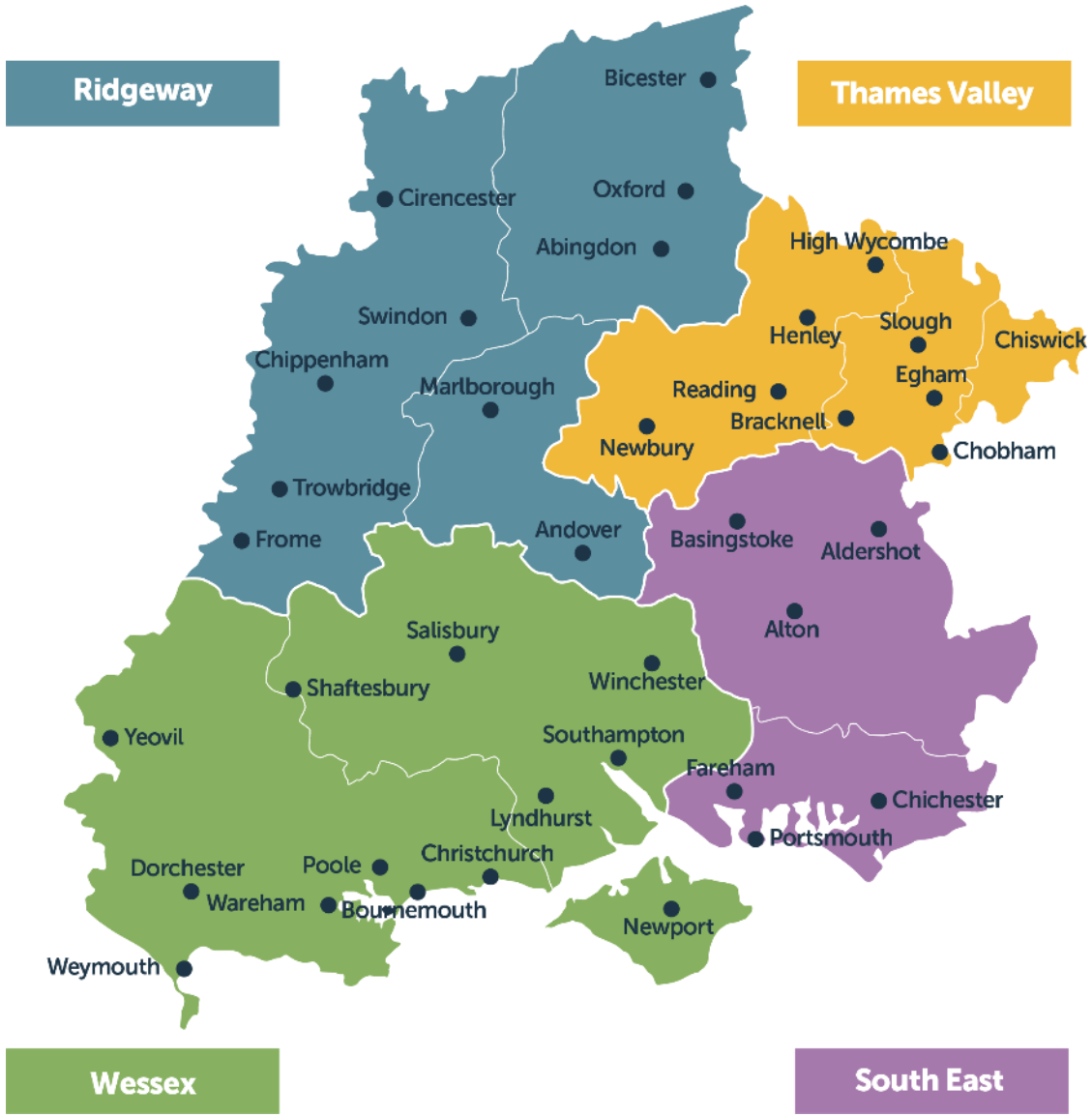
Underground cables
37,700km

Overhead lines
64,267km

Customers
3,092,275

PSR Customers
617,803

Low Carbon Growth
Over 3m EVs and 1m Heat Pumps by 2035

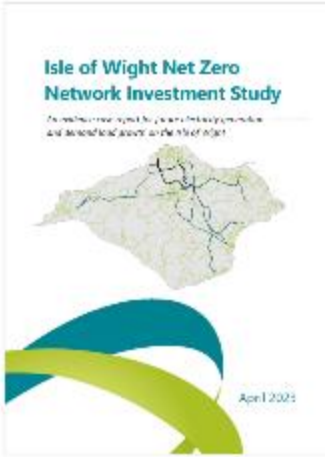


EXAMPLES OF WORKS UNDERWAY

How we're helping facilitate Net Zero for you

Transition

Developing smart local flexibility markets across Oxfordshire. The outputs from this innovation project are now embedded in our flexibility markets.



Isle of Wight assessment

Working with the Isle of Wight council to develop a load growth evidence case to enable future investment,

LENZA (Local Energy Net Zero Accelerator)

This geospatial planning software, empowering planners to make better informed decisions about where to install new energy assets in their local areas

West London demand acceleration

We are trialling new ways to get demand connected in congested areas of our network.

ENGAGE WITH US

For any queries or to request further information, please contact us on:

stakeholder.engagement@sse.com

www.ssen.co.uk

twitter.com/ssencommunity

facebook.com/ssencommunity

linkedin.com/company/ssencommunity

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The connections challenge

Paul Lowbridge
Head of Customer Management
NGET

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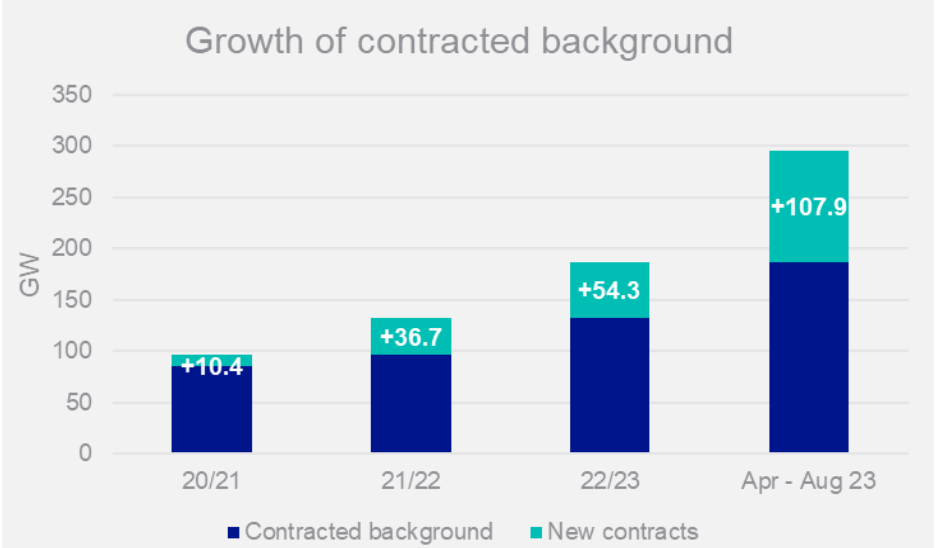
The pace and scale of change in the connections landscape is vast

The connection landscape has undergone an extensive transformation in the past 10 years, we have moved from a fossil fuel led energy mix, to clean low carbon generation and innovative demand technologies, all of which require connection to the Transmission or Distribution networks

We're keeping up with the challenge to connect over 60GW of low-carbon generation by 2035 to meet net-zero targets.

The market has responded to Government targets with significant volume of low-carbon technologies coming forward to connect – and the volume is still increasing!

We have gone from connecting a handful of large-scale developments per year, to managing a **contracted background of almost 300GW and over 700 contracts** (for England & Wales alone).

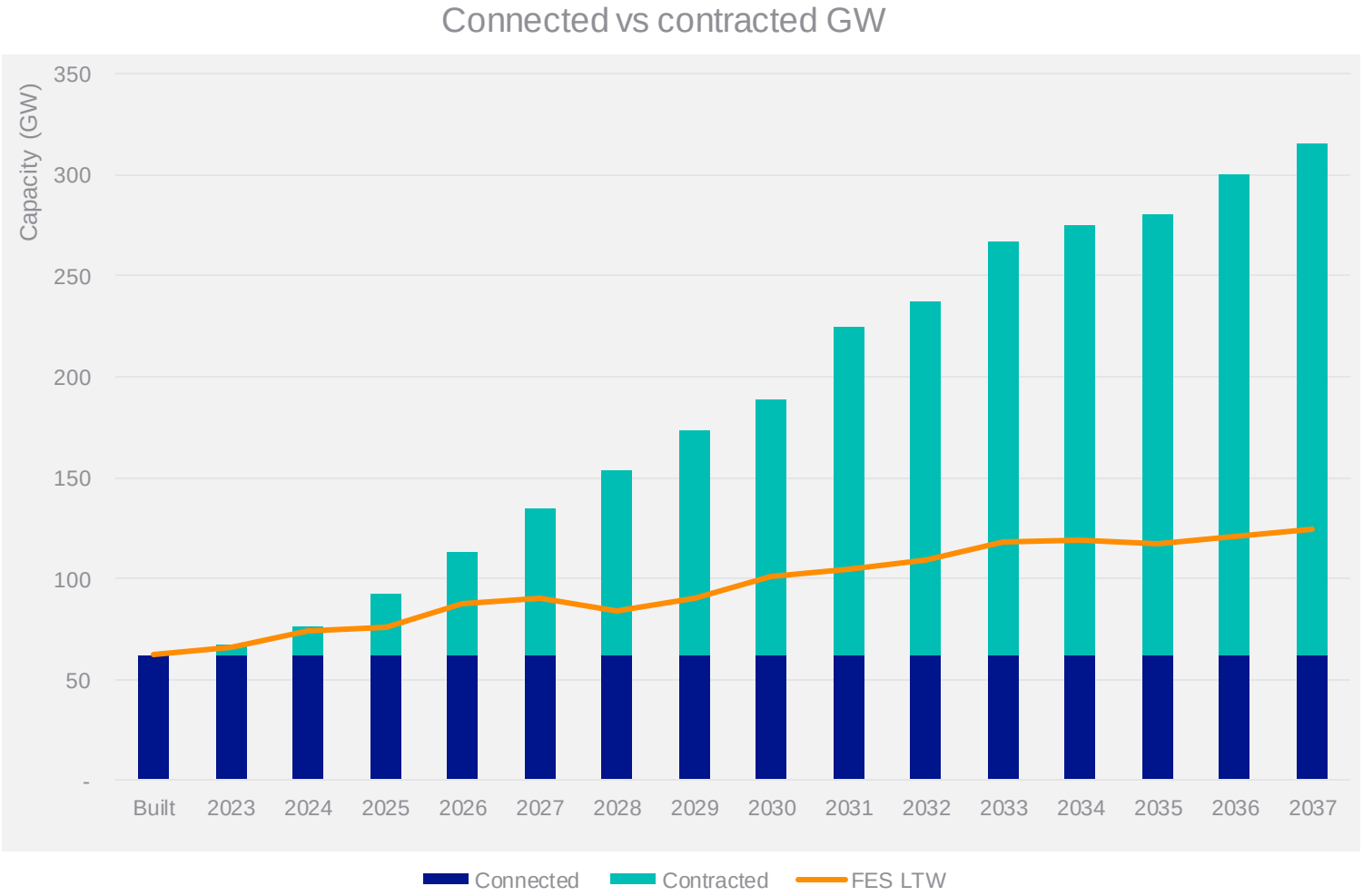


The volume of contracted connections is more than we will ever need and continues to grow at pace

The volume is there to meet net-zero targets and future demand requirements.

However, problems arise with this volume;

- **Complexities of connecting on a live network** that is required 24/7
- Lengthening **connection timescales for customers** applying to connect
- **Uncertainty around who will connect** (the ESO suggest only 20-30% will progress)



What's caused these problems?

There is not one problem nor one solution

Market

- Customers can **apply when they want**, for what they want and **get allocated capacity** on a **first come first served basis** – resulting in a pipeline of **almost 300GW of generation and demand connections** to the network in England and Wales

Contract

- **Lack of contractual discipline and authority** to effectively manage customer contracts and ensure efficient connections for connecting customers

Physical works

- **Required network investment is based on a view of those wanting to connect** (currently an extreme unlikely reality of almost 300GW – and roughly only 70GW required to connect to meet net zero and 2035 demand)

NGET ambition for future connections

A collaborative effort is required

Market

- The market sends the **right signals** for **customers to act rationally** in line with Government ambition and energy strategy
- There are appropriate levels of **entry criteria** to ensure **only viable applications**

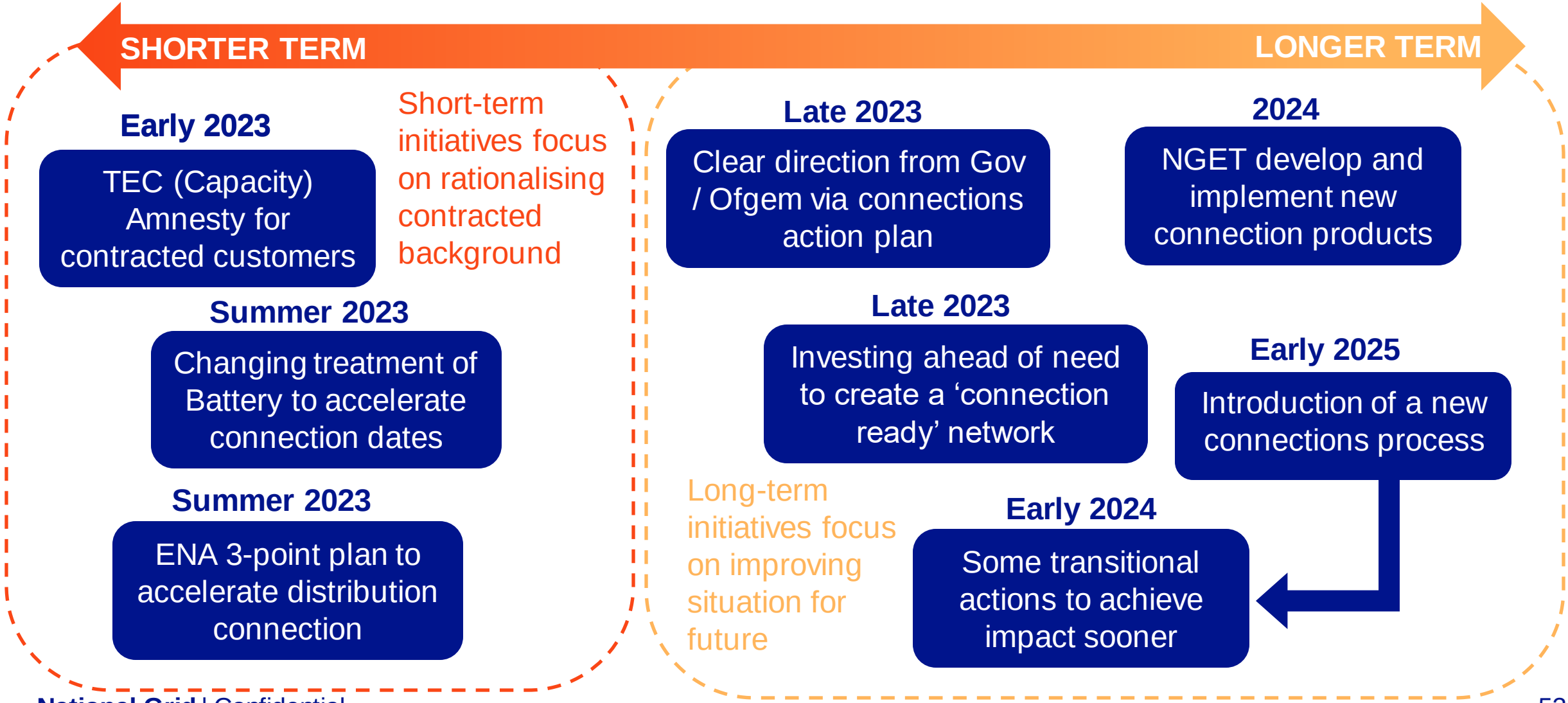
Contract

- Customers are encouraged to **'connect or move'** to **allow others to progress**
- **Contracts and allocated capacity** have the **flexibility** needed to **ensure connections are delivered efficiently**

Physical works

- **Network investment takes place ahead of need to ensure a 'connection ready' network**
- **Innovative connection products** are available to help deliver **faster connections**

What is being done to improve connection timescales for customers and communities?



Connections - Relationship with Future Network Blueprints

Future Connections Require:

- The right signals for customers to act in line with government ambition and energy strategy
- Contracts and allocated capacity to have the flexibility to deliver connections efficiently
- Network investment to take place ahead of need –i.e. a 'connection ready' network

Future Network Blueprints are:

- A single coordinated best view of network investment in the context of delivering net zero.
- A baseline from which we will refine, evolve and enhance our future network plans based on our engagement with stakeholders.
- Coordinating complex electricity network requirements across multiple time horizons - when and how to replace, expand and/or strategically upgrade our infrastructure.

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Electronic voting

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Discussion

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Next steps

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Thank you

To keep in touch, or if you have any questions, please contact us on the below email:

pathwaytoNZ@nationalgrid.com

We will:

- Gather and record all the valuable feedback we receive today through the polls, discussion sessions plus Q&A
- Follow up on any clarifications, reinforce the new stakeholder links formed from today
- Liaise across network businesses to incorporate and evidence todays feedback into our network plans
- Research study by our partners at Yonder. This will be emailed out and be grateful if you can fill it in.

Keeping you updated

Please scan the QR code to keep the conversation going and to sign up for regular updates.

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Q&A

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