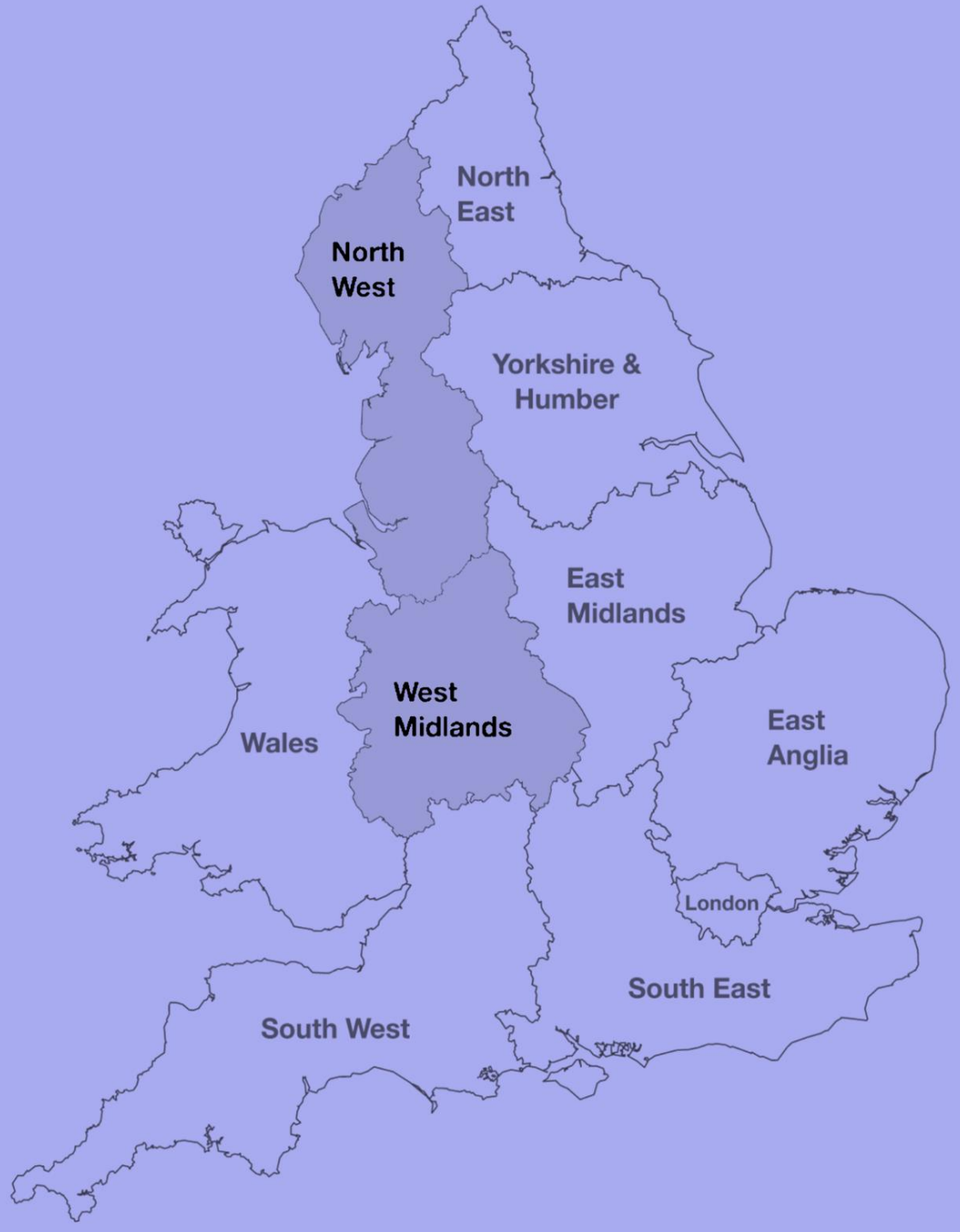
Electricity Transmission

Pathway to Net Zero

Stakeholder Workshop
Manchester, 10/10/23



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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, ENW and SPEN	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, ENW and SPEN	13.00 – 13.30
Lunch		**13.30**

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Electronic voting

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Introduction

Roisin Quinn
Director of Asset Operations

National Grid Electricity Transmission

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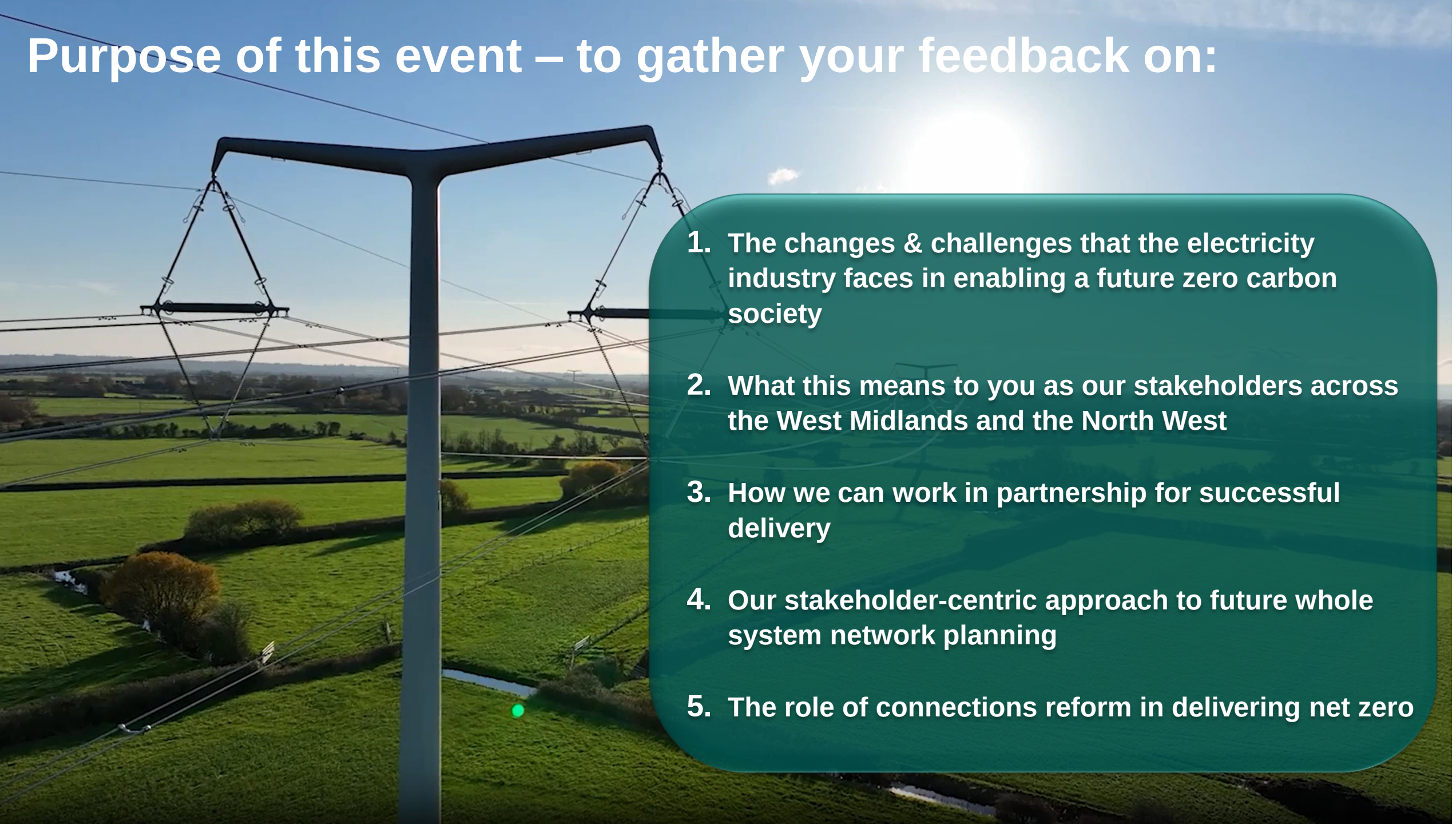
Purpose of this event – to gather your feedback on:



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 the West Midlands and the North West
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

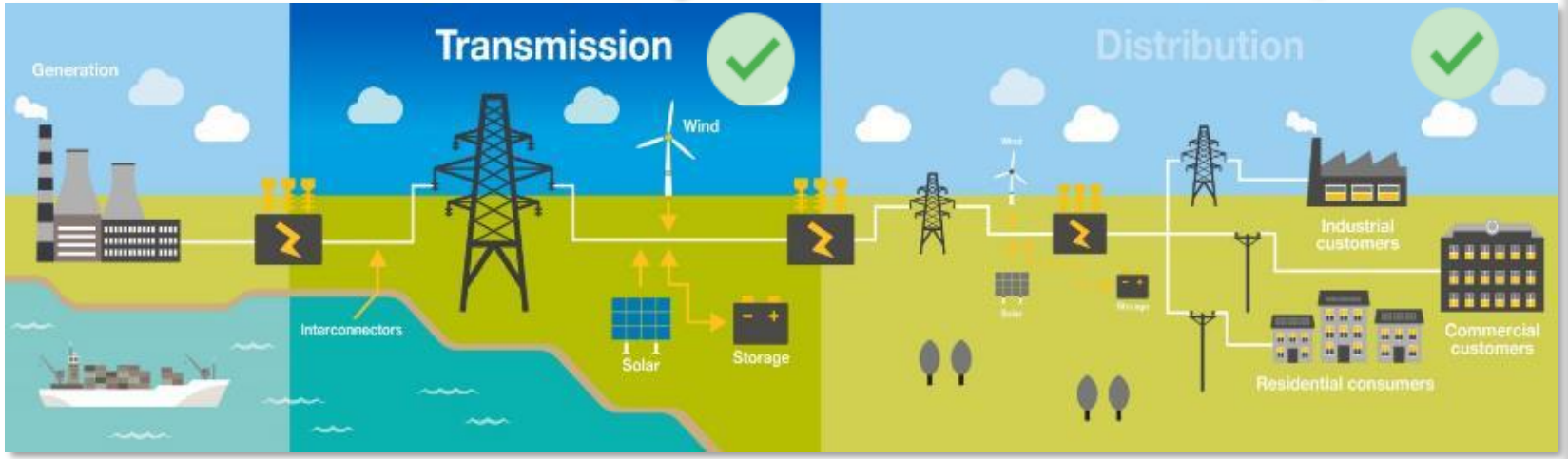
Networks in the electricity sector – who does what?

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

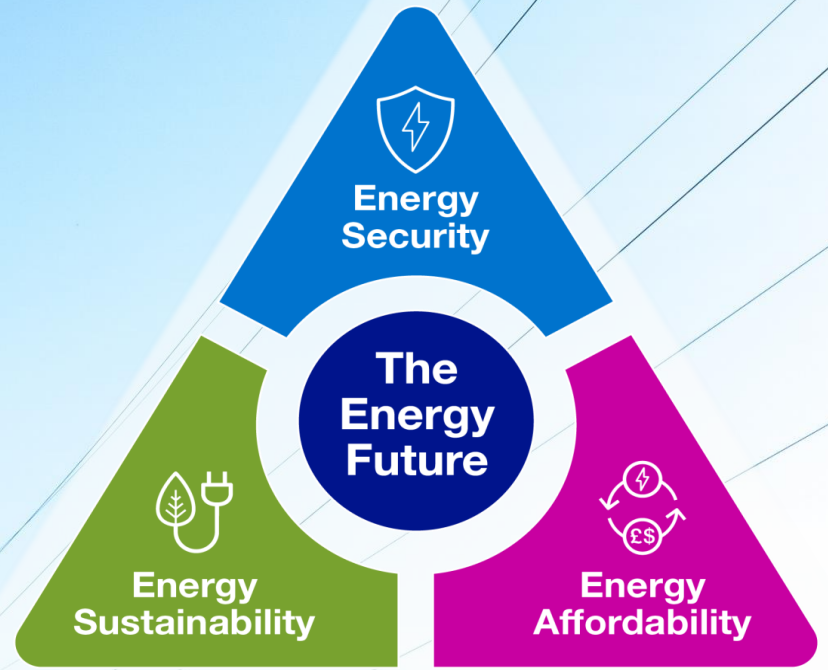
New England

National Grid Partners

National Grid Ventures

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

Delivering 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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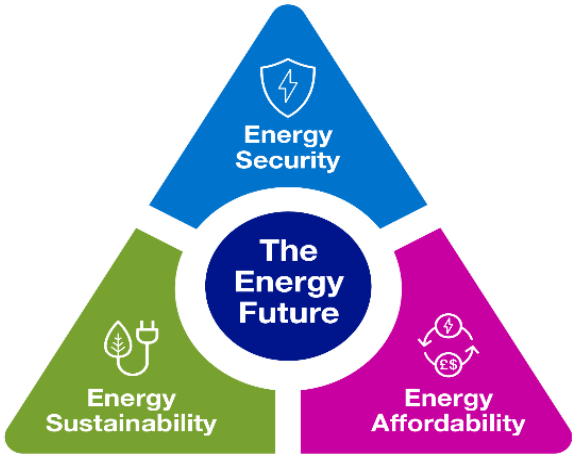
National Context – energy transition

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

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

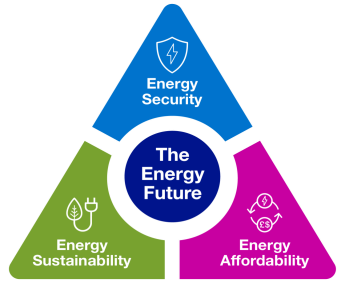
- Connect new and low carbon sources of electricity generation to our networks
- Meet increased electricity demand from decarbonising sectors such as heat and transport
- Increase future UK energy security by reducing fossil fuel dependence
- Maintain a safe and reliable electricity supply through our 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

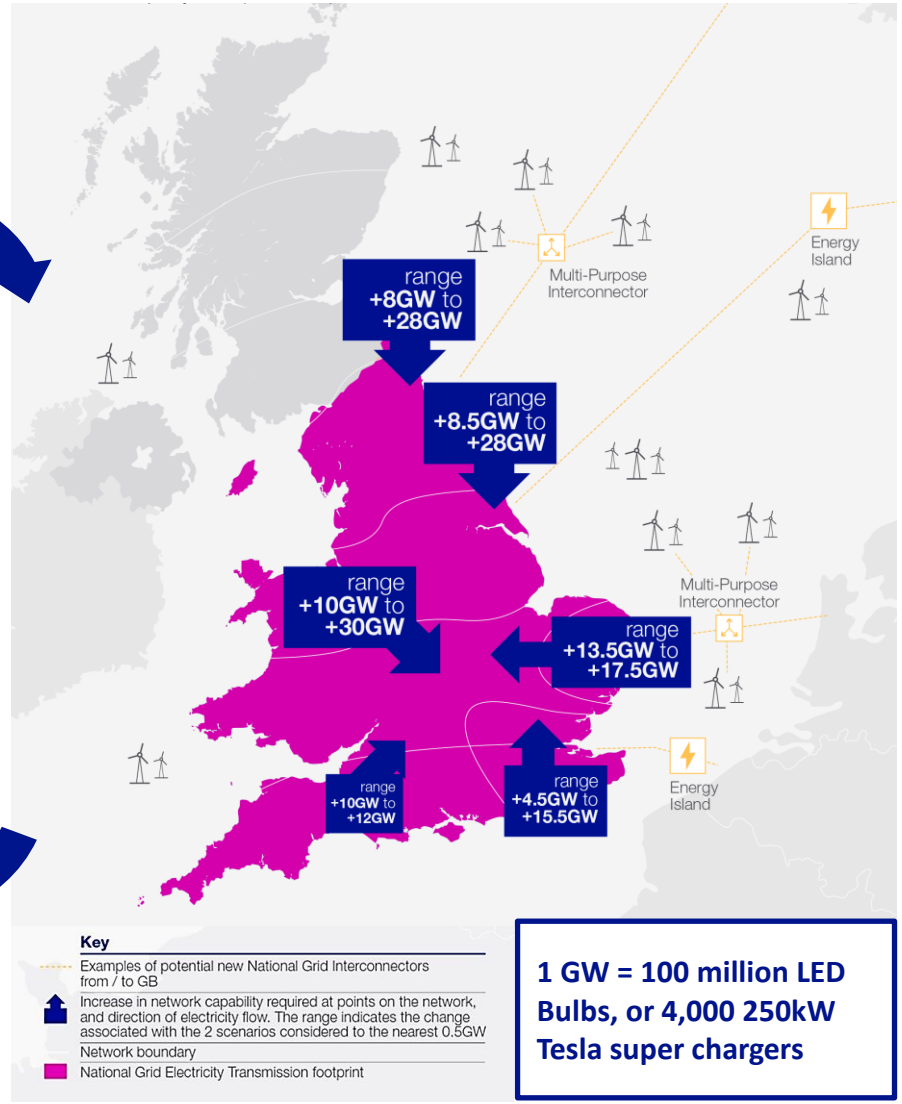
Battery storage

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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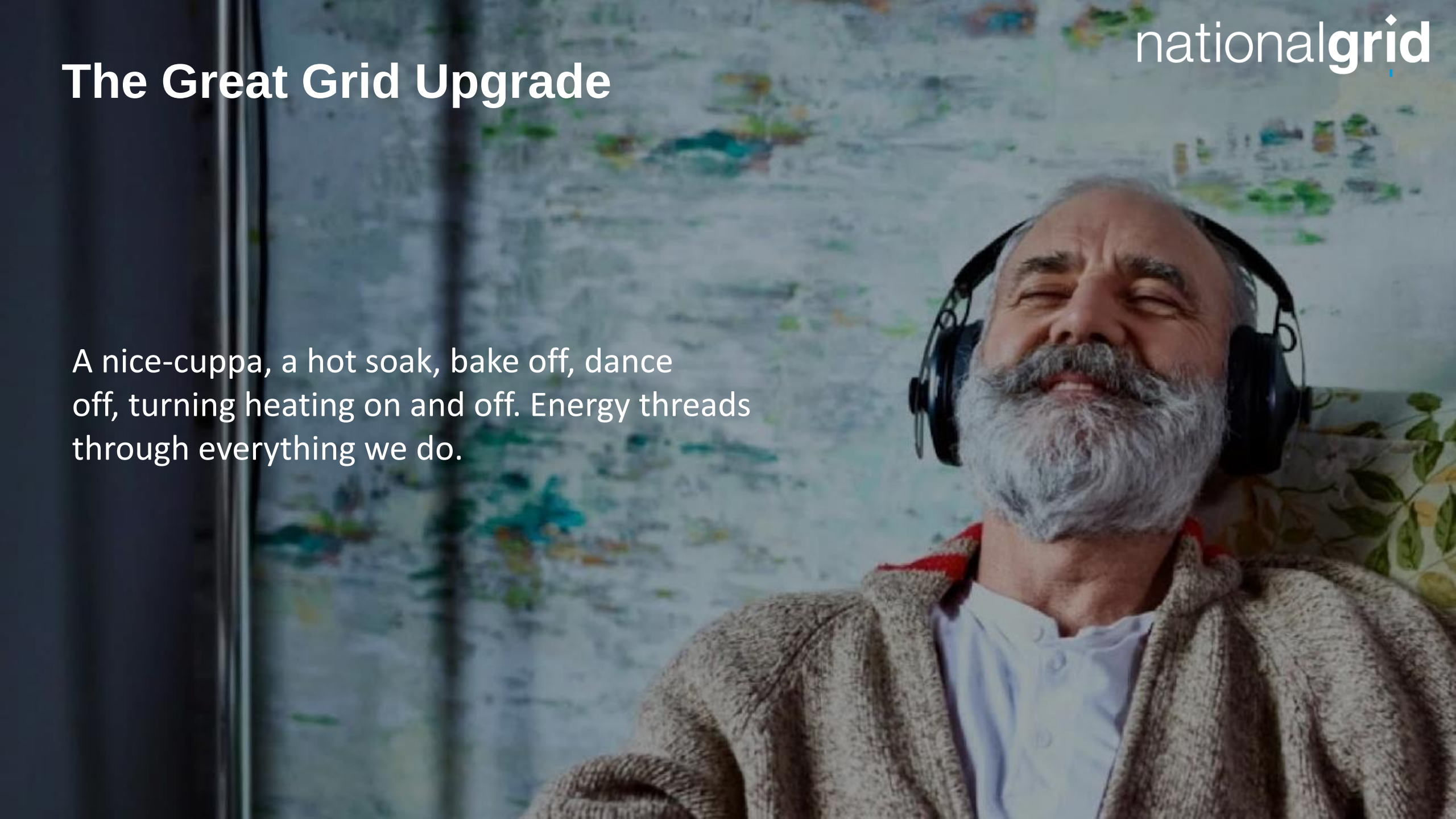
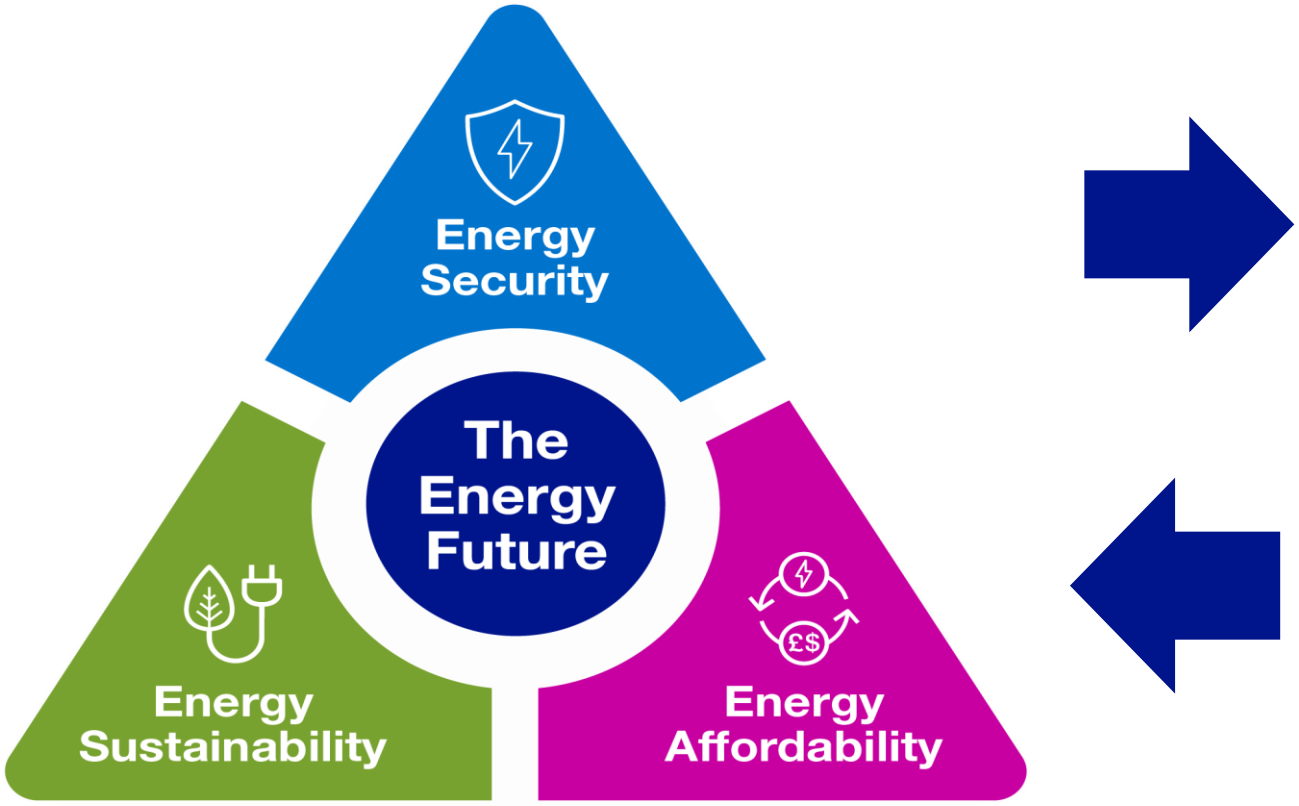
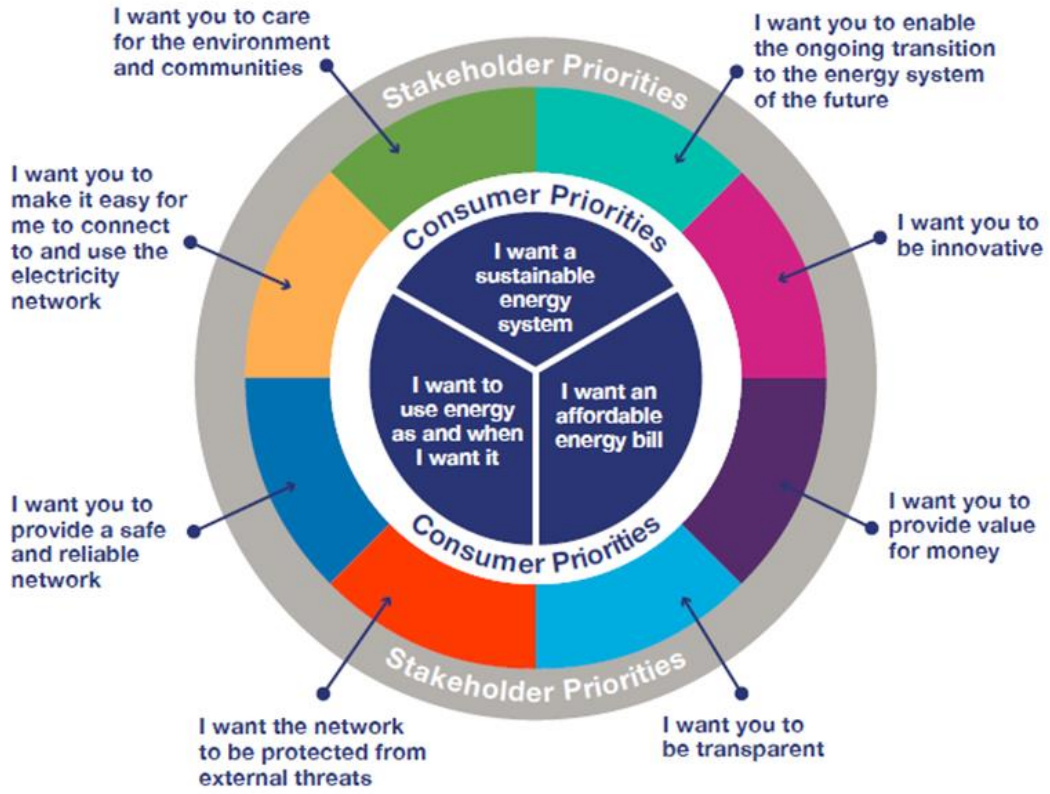


A nice-cuppa, a hot soak, bake off, dance off, turning heating on and off. Energy threads through everything we do.

A future business plan for a fair energy transition





James Whiteford

Electricity Modelling and Regional Strategy Manager

Electricity System Operator

Transitioning into an independent system body responsible for energy network planning

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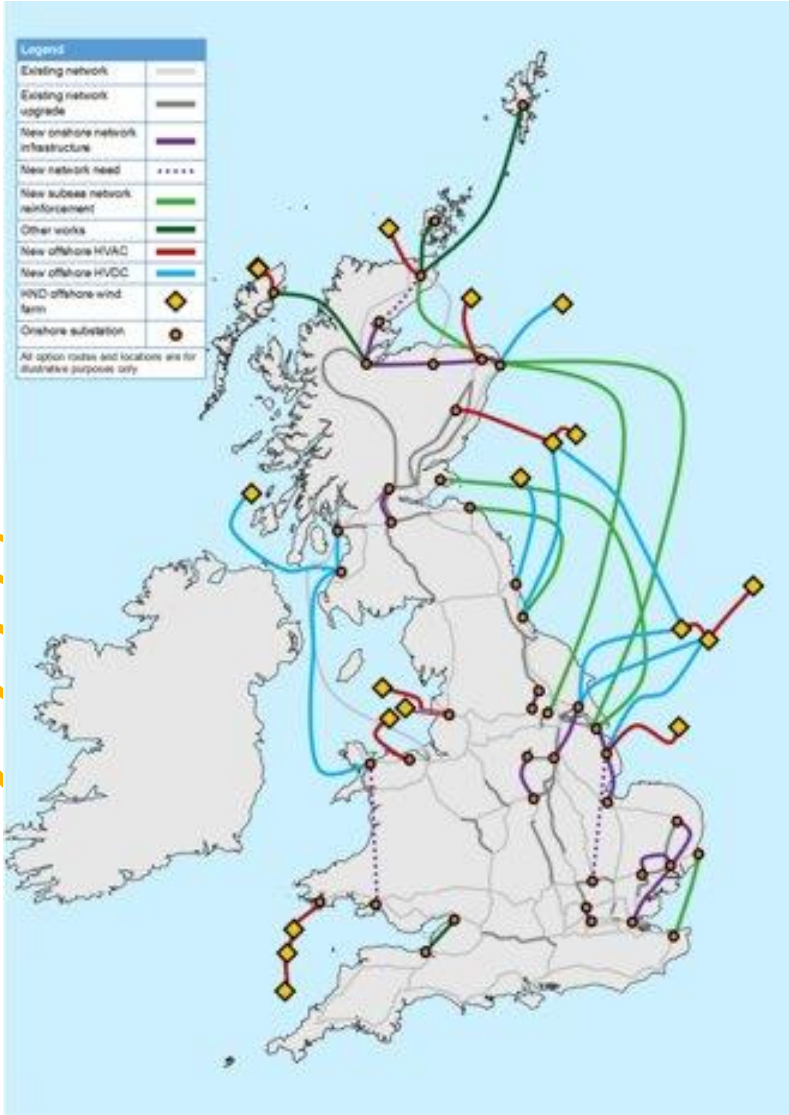
What does Electricity System Operator do?



- 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.

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

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

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 evolution 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, resilient, intelligent and efficient 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

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

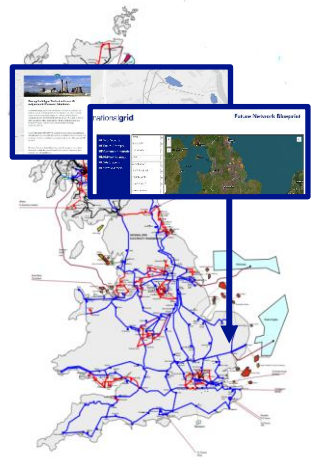
Anticipatory network drivers

- 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…

- Pre-date the idea of regional system planners
- All transmission and distribution network inputs together.
- A more coordinated approach to network development
- Ultimately saving bill payers money!



As a network owner, we still need future network blueprints to help us shape and form a more rounded network plan.

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Manomay Roy
Senior Power System Lead

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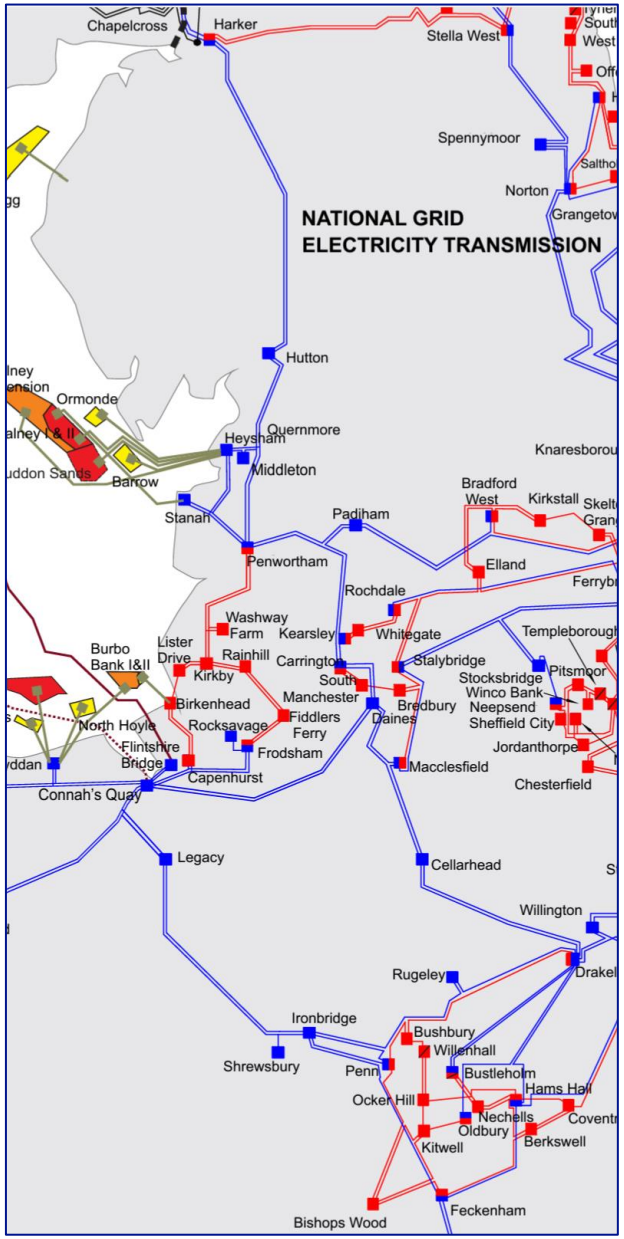
Northwest & West Midlands

Dates each Combined Authority aims to meet 100% of its electricity needs from renewable sources: Greater Manchester 2038, Liverpool 2040, West Midlands 2041



The network in Northwest & West Midlands

- Northwest and West Midlands transmission network is ranging from Cumbria and the Scottish border to Wales in the west, extending to Staffordshire in the South and Yorkshire & Derbyshire to the east
- The transmission network within Northwest of England consists of 400kV substations. This region is characterised as **net exporter of electricity**
- The Mersey Ring and Greater Manchester consist of 275kV networks and are characterised as **net importers of power** due heavy demands together with a lack of generation
- The West Midlands' transmission system consists of a 400kV outer ring and 275kV inner ring. The network acts as net **importer of power follows** due to high density of demand.

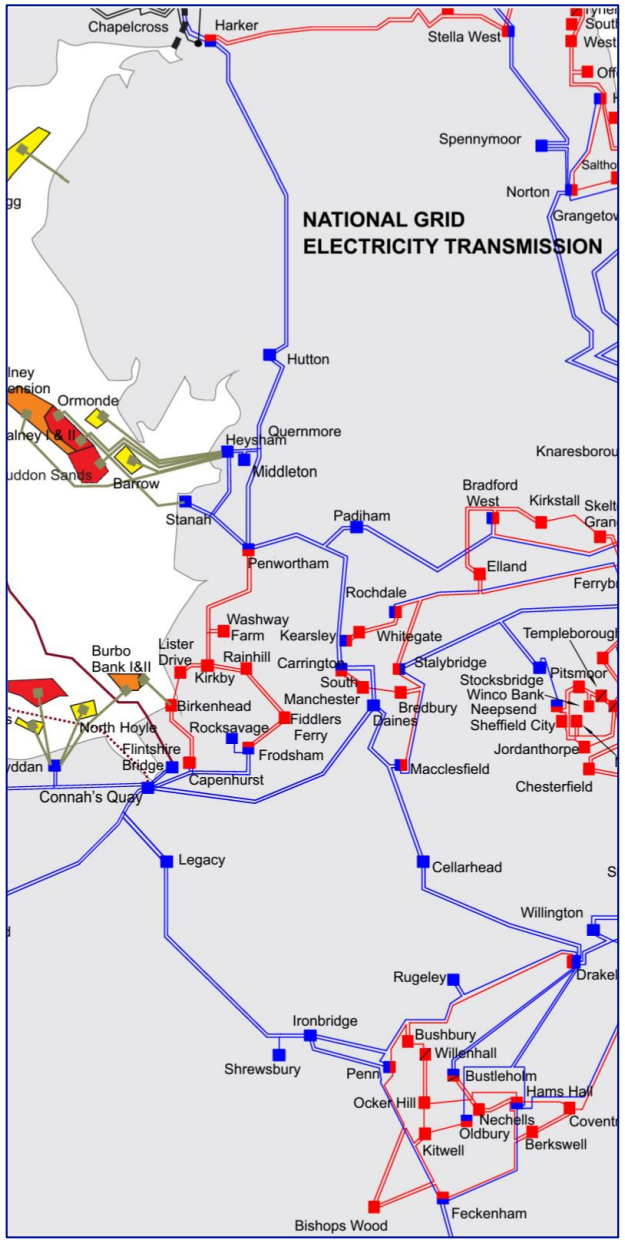
What we are seeing

- Huge amounts of renewable power generated in Scotland of up to ~**28GW** flow into northern England. Bottlenecks on the existing network will be experienced around Penwortham in the west.
- Local authorities plan for urban development including housing, EV charging, hydrogen demand and tidal mega project

What this means

- More **network upgrades are needed** due to the high volume of power flow from Scotland to deliver low carbon power to the Northwest, West Midlands and beyond
- We are **reinforcing the existing electricity network** before we build any new infrastructure
- **Strategic upgrades** will still be needed in addition to incremental ones

Northwest & West Midlands



Major Projects under development (examples)

- Harker substation rebuild

Defined network needs with solutions under early development

- South-East Scotland to Northwest England Circuit
- Northwest England and Lancashire New Circuit
- West Coast Anglo Scottish New Circuit
- Northwest England and North Wales offshore link
- Maximising existing and/or increasing capacity of key Northwest and West Midlands circuits
- Improving east-west power transfer to maximise existing north-south network capacity *

Our responsibility as a business goes beyond safely building new energy infrastructure to enable a cleaner, fairer and affordable future

We will work with stakeholders and communities to understand their priorities around skills, employment, natural environment and delivering net zero

electricity north west

Bringing energy to your door

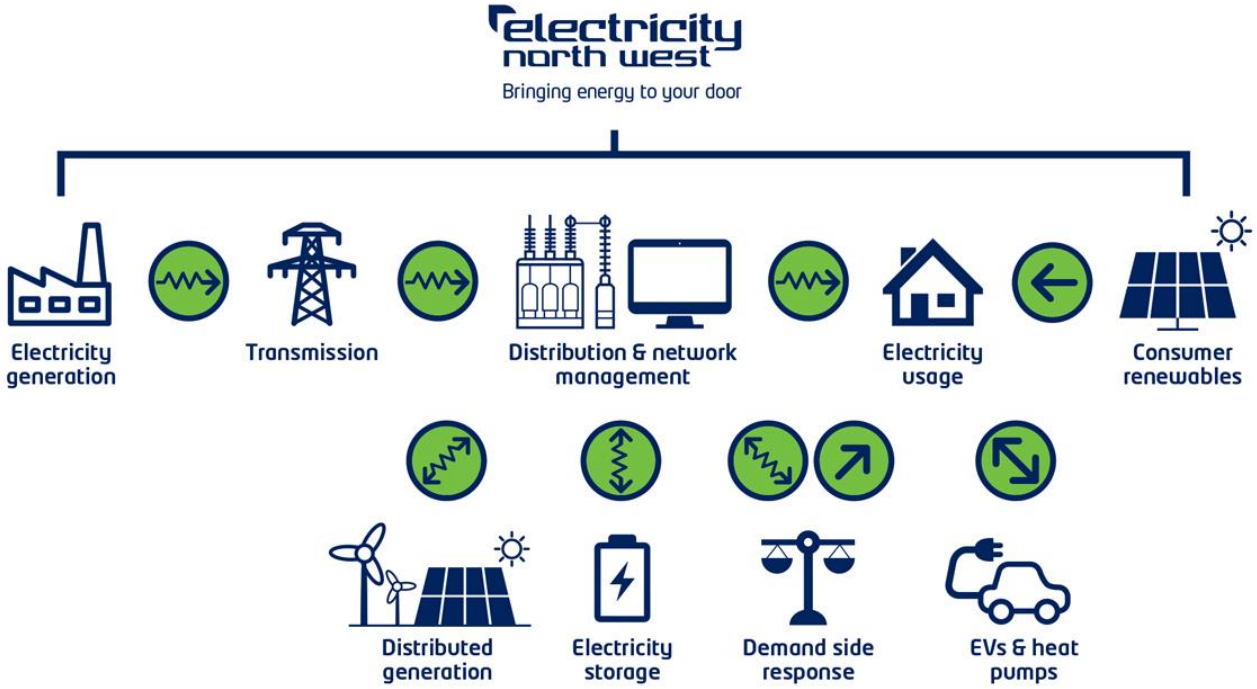
Leading the North West to Net Zero

Christos Kaloudas, PhD, MEng, MIEEE
Capacity Strategy Lead (DSO)

Get in contact on your plans (incl. LAEPs):
development.plans@enwl.co.uk

Electricity North West – who we are

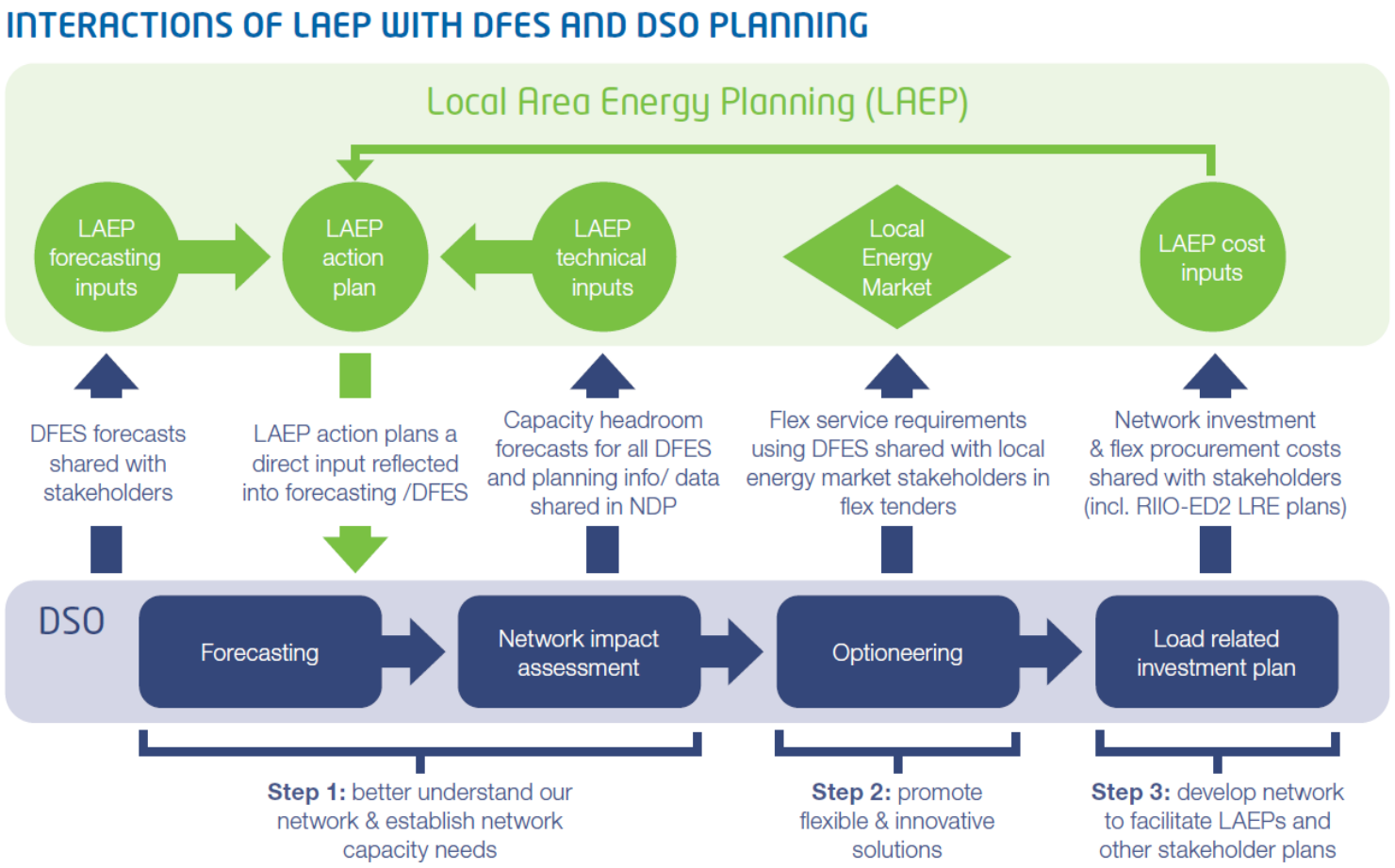
- own & operate the electricity distribution network in North West
- £2 bn investment in North West in next five years
- 2.4 million customers
- 44,000km overhead lines, 13,000km cables
- 500 G&P substations (132 to 33kV) , 37,000 secondary substations



Stakeholder engagement – driving our network development

- Distribution System Operation (DSO) to transparently use stakeholder engagement inputs to inform network development (Open Data portal: www.enwl.co.uk/future-energy/data-and-digitalisation/data-portal/)
- LAEPs and planned developments a direct input into our forecasts (DFES)
- DFES driving our network development plan (NDP) in North West. Examples:
  - Manchester hot spot (uprated & new 132 and 33kV substations around Manchester / Salford)
  - Cumbria ring (sub-transmission network to facilitate renewable generation)
  - Lancashire (Blackpool airport, business development areas)
  - Motorway service areas (rapid chargers)
  - Bus depot chargers

Electricity North West's process to support & facilitate Local Area Energy Plans (LAEPs)



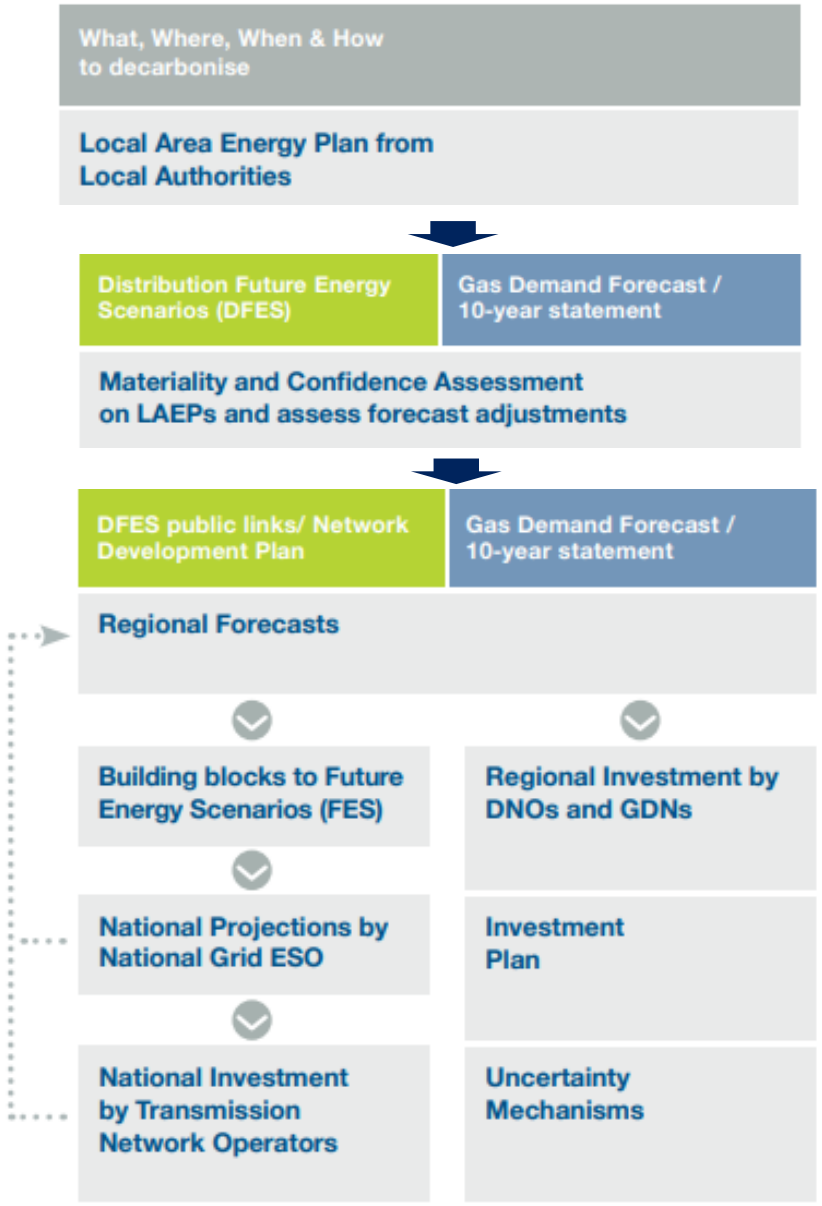
Find online more on our network development plans: www.enwl.co.uk/ndp

Stakeholder engagement – core of whole system planning

- DSO DFES forecasts capturing local stakeholder plans (LAEPs, connections activity, planned developments, decarbonisation plans)
- DFES forecasts shared with NGET and NGESO through various channels (whole system FES building blocks, connections, Week 24 etc)
- National System (transmission network & system operability) informed by DFES data
- Standardisation
  - ENA's (Energy Networks Association) whole system guide: showing LAEPs informing DFES and DFES informing FES and NGET planning
  - whole system FES building blocks (ENA Open Networks): stand data submission to inform ESO FES
  - Week 24 data submission (all DNOs)

Find online more on our DFES: www.enwl.co.uk/dfes

ENA's whole system guide on how network operators can support Net Zero plans

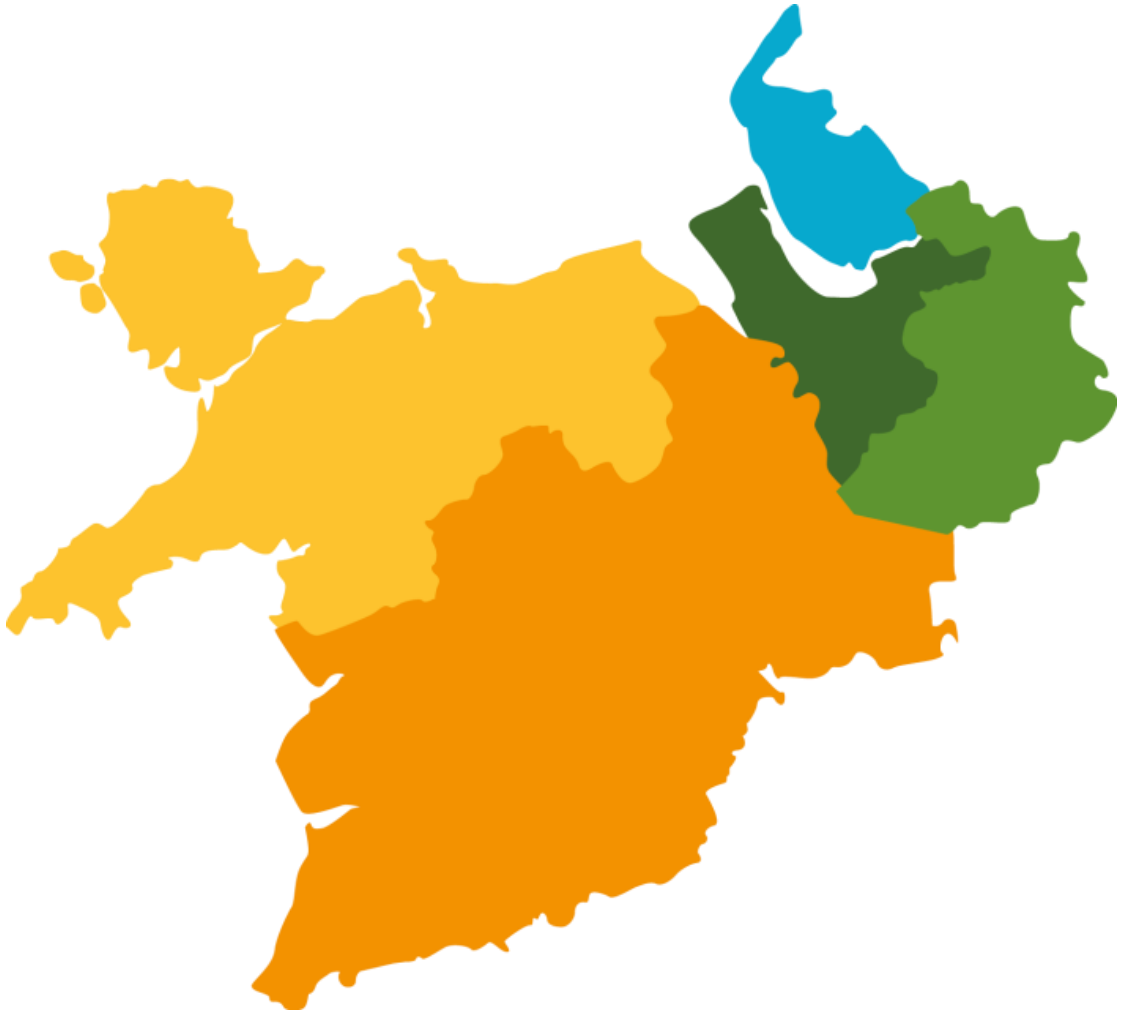


Rachel Shorney

SPManweb: Stakeholder & Community Engagement Manager

SP ENERGY NETWORKS

SP Manweb Licence area of SP Energy Networks



1.4 million domestic customers	**100,000** industrial & commercial customers
4 Local Government Bodies	**18** Local Authorities
1 National Park Eryri (Snowdonia)	**4** Areas of Outstanding Natural Beauty (Llyn, Anglesey, Shropshire Hills, Clwydian Range & Dee Valley)
850 Staff in SP Manweb with 900 supporting in SPEN	**3,500** Total Staff in SP Energy Networks
89 Service Partners across SP Manweb	**1,000** new jobs over next 5 years
3.1GW Peak Capacity	**Over 4GW** Contracted & Connected Generation

SPEN Sharing Data – LTDS, DFES, NDP & Open Data Portal

Sharing data is key to the efficiency of the energy system as we decarbonise to Net Zero.

It enables customers and stakeholders to assess market opportunities and participate in flexibility markets as well as promote network companies and key stakeholders to work together to facilitate efficient whole system planning and operation.

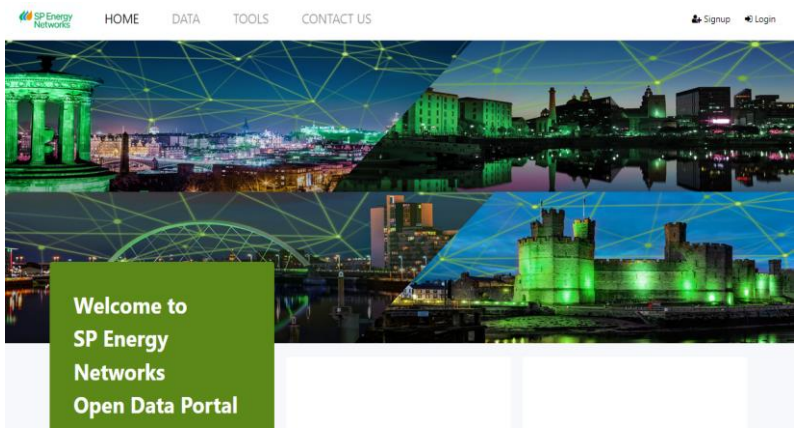
As a DNO we publish network planning and development documents including:

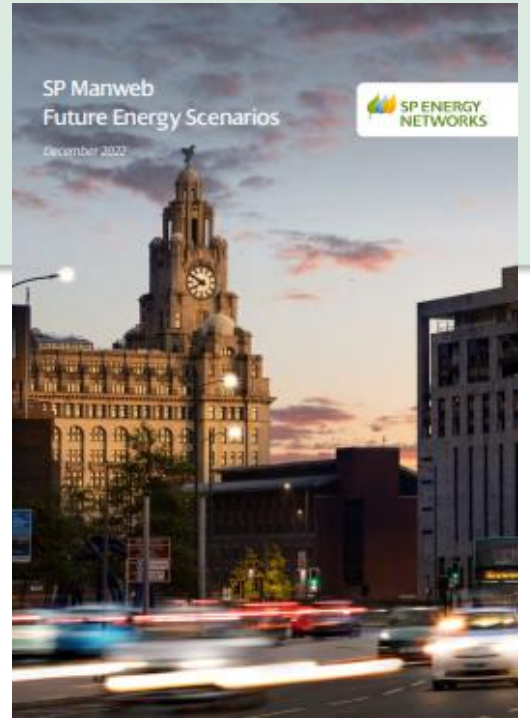
Long Term Development Statements (LTDS)

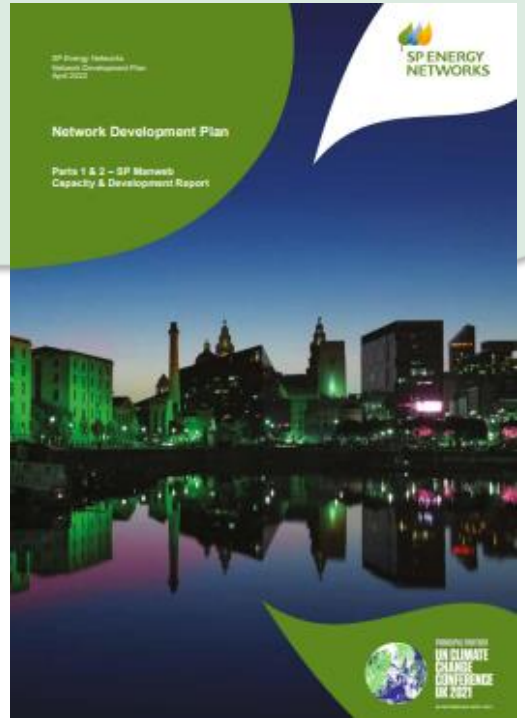
Distribution Future Energy Scenarios (DFES)

Network Development Plan (NDP)

Open Data Portal (Energy Data Hub)

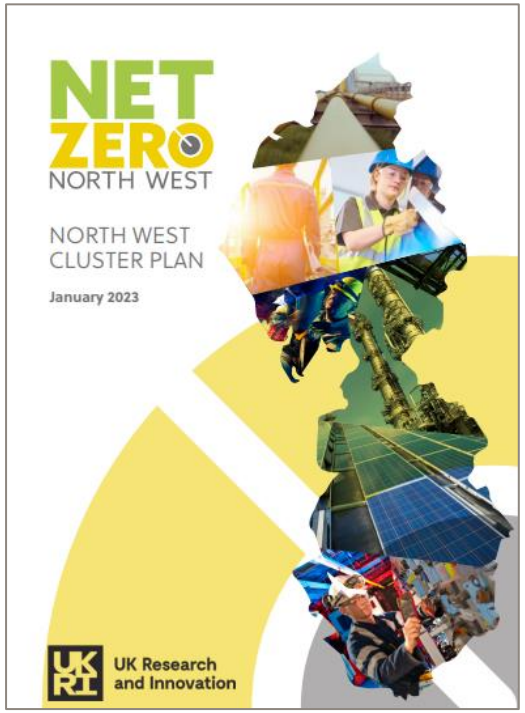


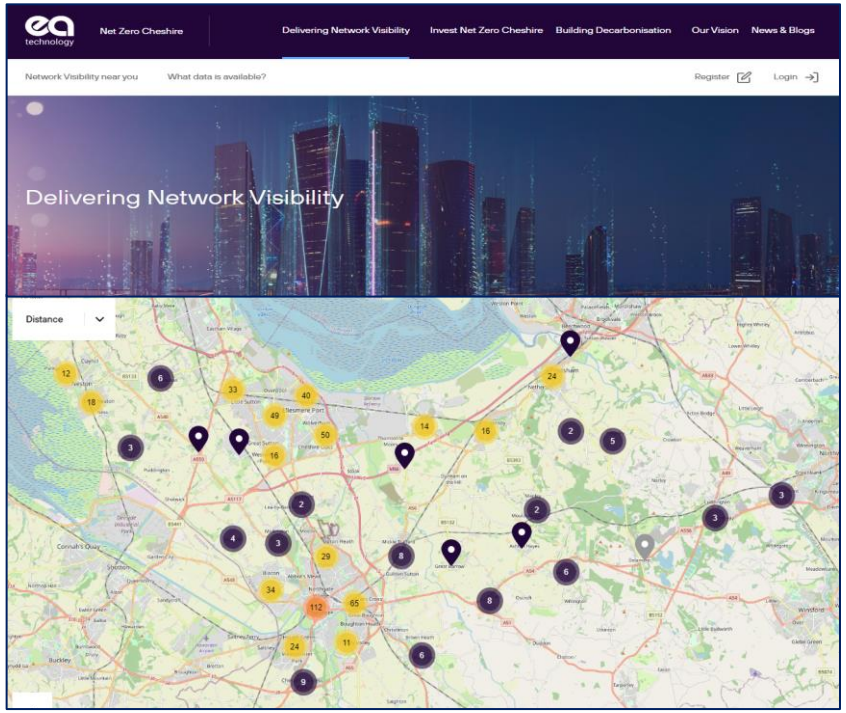




Supporting Local Government Initiatives across SP Manweb

- Net Zero North West Cluster Plan
- North East Wales Industrial Decarbonisation Plan
- Local Area Energy Planning & Regional Energy Strategies
- Liverpool City Region Decarbonisation Plans
- Cheshire & Warrington LEP VISNET Monitoring Project
- SPEN Green Recovery Projects
  - 5 Motorway Service Areas – Burtonwood, Hapsford, Lymm, Knutsford & Sandbach
  - 3 LCT Housing Sites – Cowley Hill St Helens, Festival Gardens Liverpool & Warrington
  - Birkenhead Regeneration and Heat Network
  - New Train Station at Headbolt Lane





National Grid Electricity Distribution (NGED)

Mohammed Jaffar
DSO
System Planning

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About National Grid Electricity Distribution

Formerly *Western Power Distribution*, we are now part of the National Grid plc group.

National Grid Electricity Distribution are responsible for electricity distribution across the Midlands, South West and South Wales.

Our business serves over 8 million customers and we employ over 6,500 members of staff. National Grid employs 29,000 members of staff worldwide.

The distribution network includes voltages from 132 kV to low-voltage (415 V).

Strategic planning process

Distribution strategic planning process

Following this process allows NGED to understand the electricity needs of customers now and into the future, and to develop our network in an economic, efficient and coordinated manner to accommodate these ambitions.

Development of strategic planning process

2016 - published our long-term scenario forecasts for the South West licence area

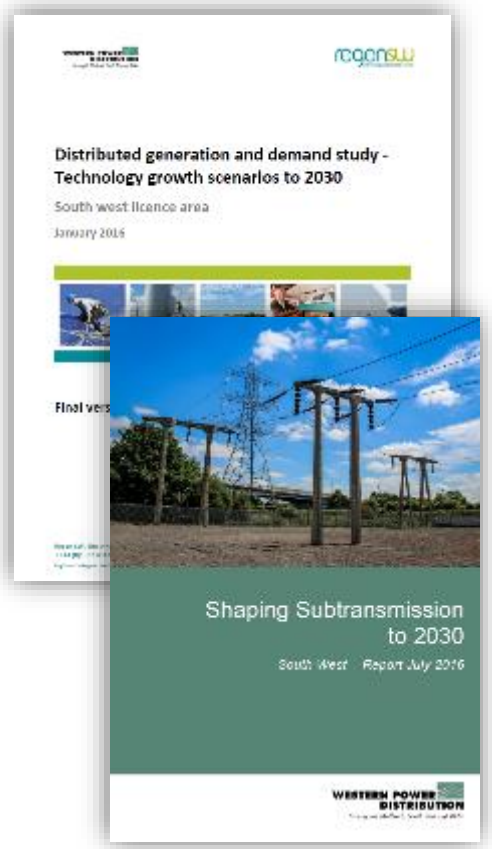
2016 to 2020 - published ‘Shaping Subtransmission’ analysis report for all licence areas

2021 - Published DNOA report to assess the use of flexibility versus conventional reinforcement

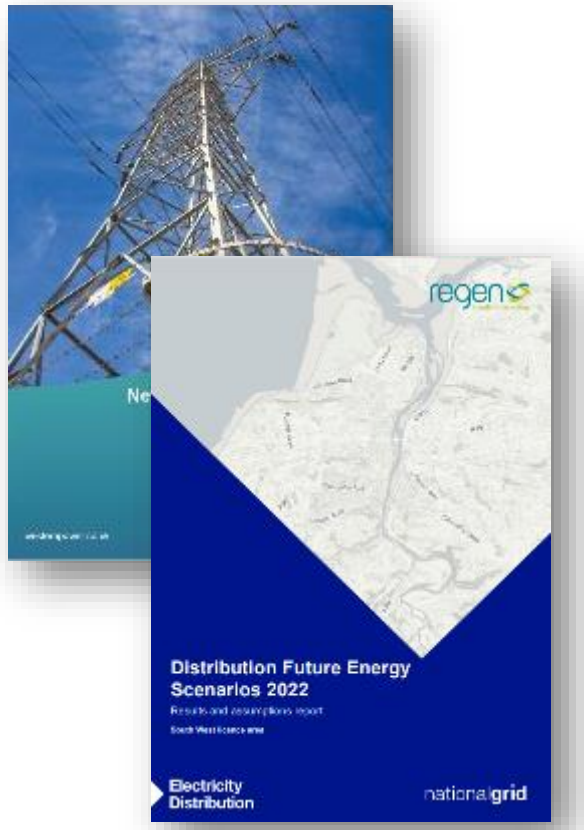
2022 - marked the first publication of the Network Development Plan as a Licence Condition

Examples of West Midlands projects include:
Cellarhead, Shrewsbury, Hereford

2016/17



2022



Strategic planning: distribution-transmission interface

Alignment with existing processes	**Processes exist currently between DNOs and ESO/TOs to highlight future transmission capacity requirements.** • How do these need to be reformed with Future Network Blueprints, and alignment between demand and generation triggered investment.
Interaction with connections queue	**The connections queue has already triggered significant works across the transmission network** • The development of the whole electricity system needs to be coordinated and aligned to current actions being implemented by DNOs and ESO.
Benefits of local engagement	**Requirement for engagement with local stakeholders to be coordinated between transmission and distribution, to avoid duplication.** • This could be achieved through better visibility of distribution forecasts with transmission, to enable the wider system benefits to be quantified.

Electricity Transmission

Discussion

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Electronic voting

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Coffee Break

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The connections challenge

Jade Ison
Connection Reform Manager - NGET

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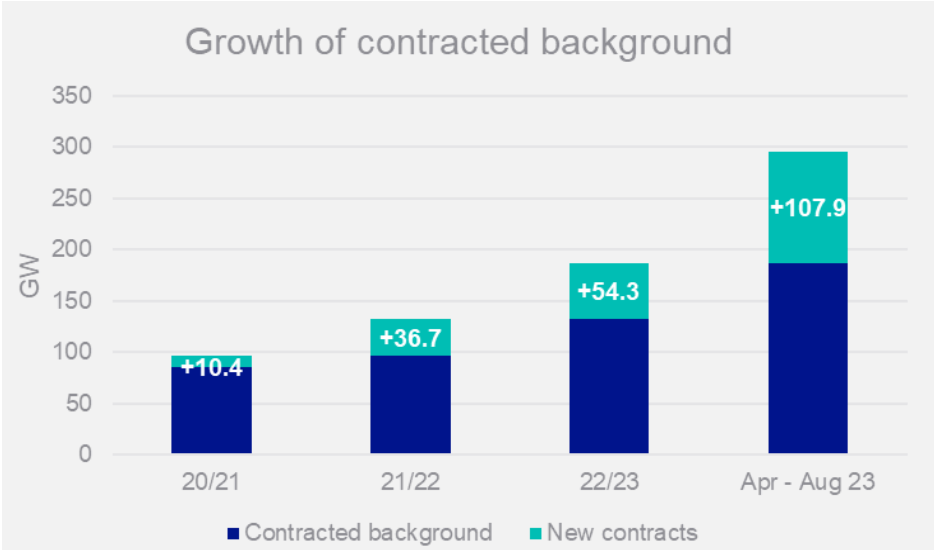
The pace and scale of change in the connections landscape is vast

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).

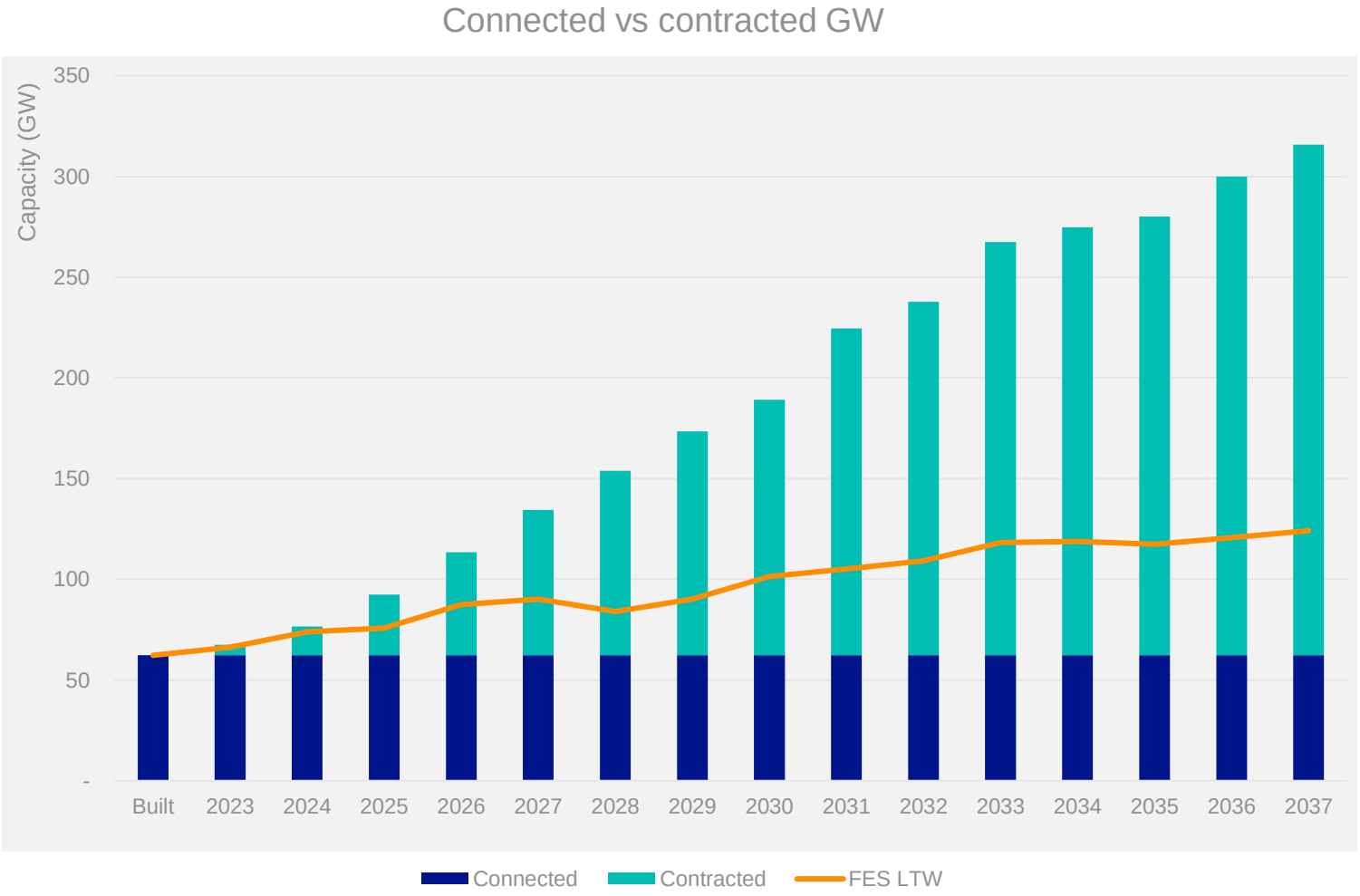


The volume of contracted connections is more than we will ever need and continues to grow at pace

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**

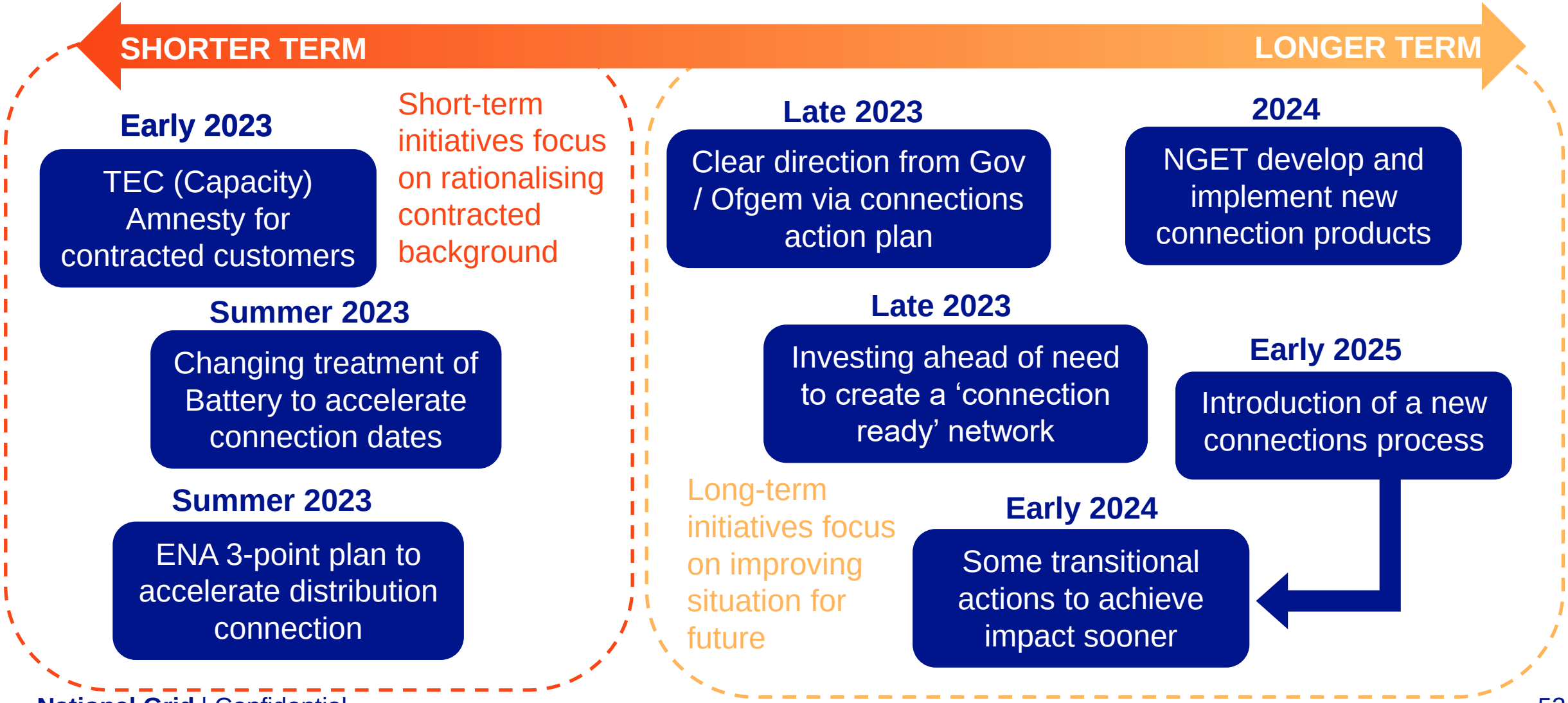
Contract

- 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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Transmission

Electronic voting

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Discussion

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Next steps

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Thank you

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.

Electricity Transmission

Q&A

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Panel

Owen Wilkes	NGET
Ben Haggerty	NGET
Manomay Roy	NGET
Jade Ison	NGET
Rachel Shorney	SPEN
Christos Kaloudas	ENWL
Mohammed Jaffar	NGED
James Whiteford	NGESO