

The UK Energy System and the role of Energy Networks

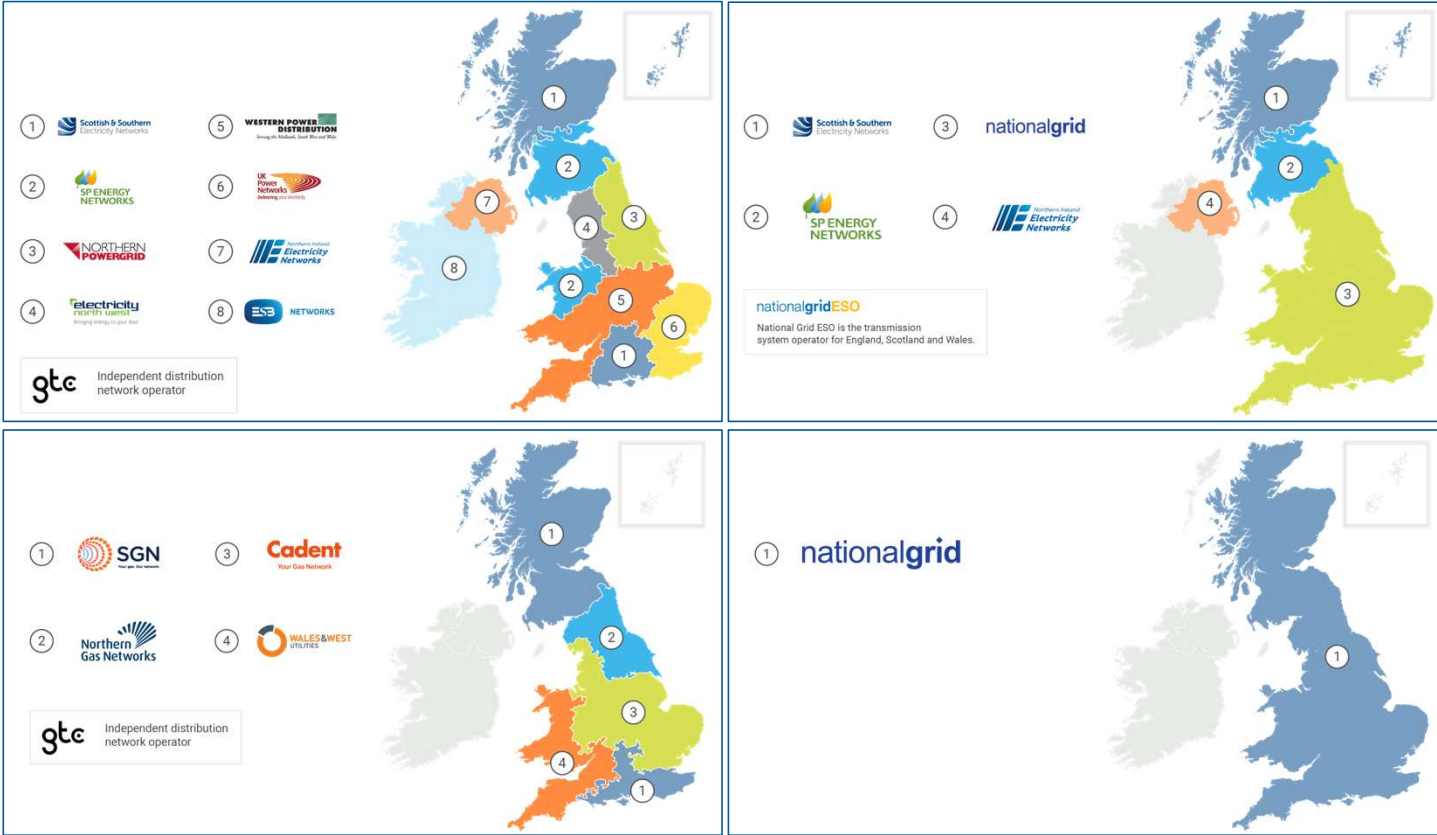
Randolph Brazier
Director of Innovation and Electricity Systems

June 2022

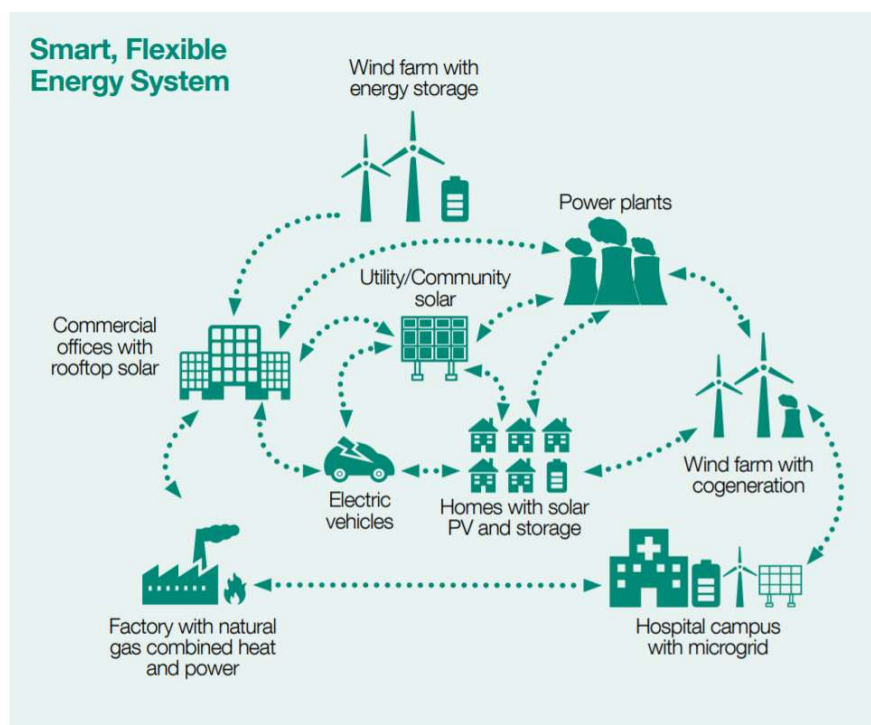
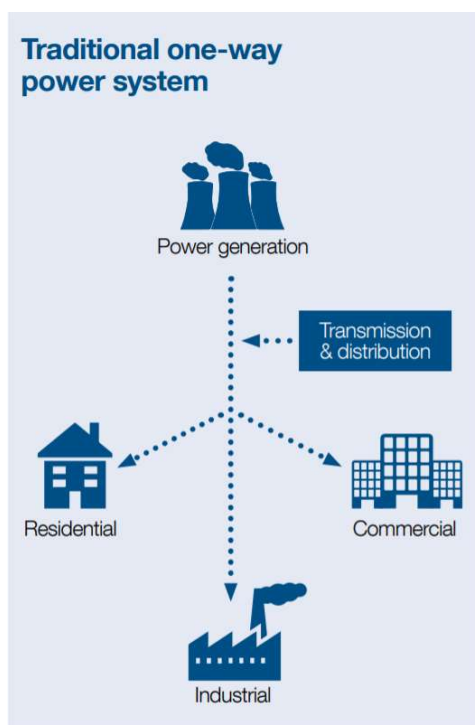
Introduction to ENA

The voice of the networks

- 29 million electricity customers
- 21.5 million gas customers
- 180,000 miles of gas network
- 519,304 miles of electricity network
- £60bn invested 2015-23



Energy Transition: The Challenge



- The Energy System is changing, driven by the 3Ds; **digitisation, decentralisation and decarbonisation**
- Need to decarbonise economically while maintaining high levels of service and reliability

Energy Trilemma

- **Net Zero,**
- **Renewables**
- **DER roll-out**

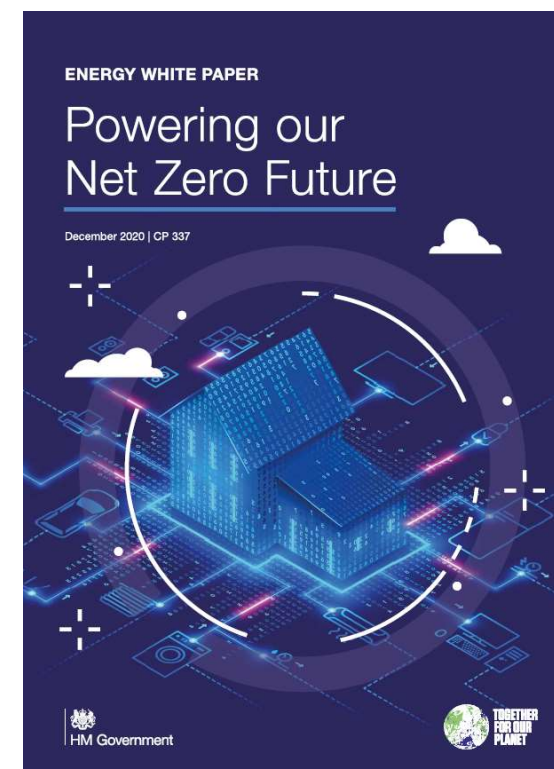


- **Energy security**
- **Cyber security**
- **Resilience**
- **Climate adaptation**

- **Who pays for what?**
- **Energy crisis**
- **Cost of gas**
- **Carbon price**
- **Fairness**

Energy Transition: Driven by Policy & Regulation

- Heavily supported by Government policy:
 - Net Zero target, Energy White Paper, PM's 10-point plan
- Strong incentives for new (green) technologies and world leading innovation programmes
- Covid-19: Opportunity to 'Build Back Better' in line with Government policy and accelerate the transition to Net Zero
 - We agreed £300m network investment to support Green Recovery
- Backed up with strong regulatory model
 - Performance-based framework



Regulation in GB

- Ofgem is the Regulator for Gas & Electricity Markets in Great Britain
- Networks are unbundled in GB
- We are heading towards our next regulatory period (RIIO2) starting in 2023 for Distribution (will include stronger T-D focus)
- Gas and Electricity Networks are governed by the 'RIIO' model: Revenue = Incentives + Innovation + Outputs
- Performance-based framework that includes a 'TOTEX' model
- RIIO has been successful; driving down costs for customers while incentivising innovation and non-build solutions where feasible
- Establishing an agile regulatory framework that encourages smart grid development and flexibility markets is essential

A large orange square graphic containing the text 'Network Regulation The RIIO model' in white, sans-serif font. The text is centered within the square.

Network
Regulation
The RIIO model

UK progress to date

- 43% renewables on the electricity grid in 2020
 - 29th January 2022 saw wind contributing 66% of electricity mix (19.6GW)
- 840k+ Electric Vehicles on the roads
- 30GW of distributed generation connected at a local level (85% renewable)
- World's largest portfolio of hydrogen projects
- World's largest local flexibility markets (3GW)
- All while maintaining one of the world's most reliable systems

However, a huge scale up is required to reach Net Zero, as described in the Energy White Paper



Transitioning to a Smart Grid

- No single definition
- Ultimately it means active monitoring, operation, automation and control of the Electricity Grid and connected assets, eventually in real time. Some of this will be direct control and some will be via markets.
- This needs to occur at all voltage levels
- There are a number of key enablers for Electricity Networks including telecommunications, data/visibility, new markets, digital platforms, monitoring devices, innovative technologies, new ways of working, etc

Co-ordination
&
Collaboration

Control &
Automation

Flexibility

Data &
Digitalisation

Innovation

ENA Strategy



- Delivering the smart grid in the UK
- Creating new markets for flexibility
- Electrification of heat and transport



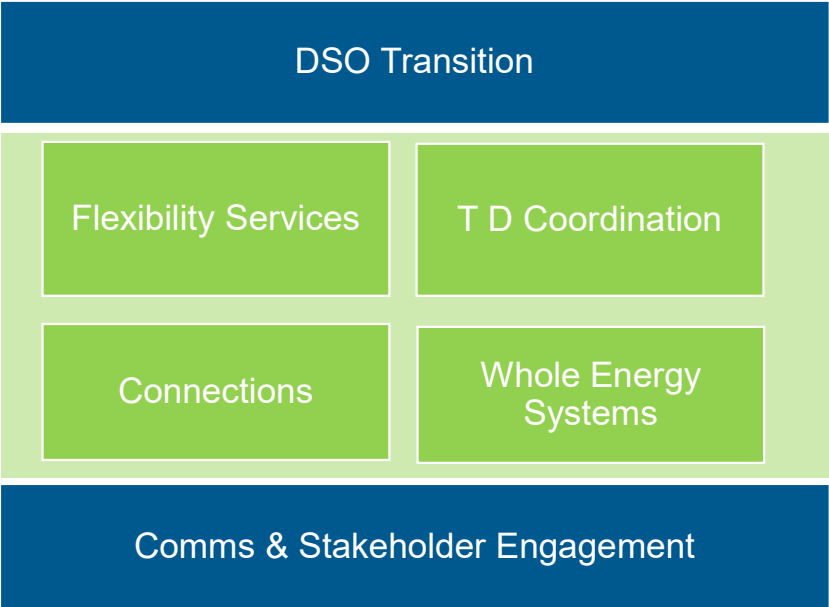
- Developing the world's first zero carbon gas grid
- Facilitating hydrogen economy
- Decarbonisation of heat, industry, heavy transport

➤ **Net Zero is only possible with a 'Whole Systems' approach**

Areas of focus

Open Networks is delivering a smart grid by:

- ✓ [Opening local flexibility markets](#) to demand response and renewable energy
- ✓ Helping customers [connect faster](#)
- ✓ [Opening data](#) to enable customers identify best locations to invest
- ✓ [Delivering efficiencies](#) between network companies to operate secure and efficient networks

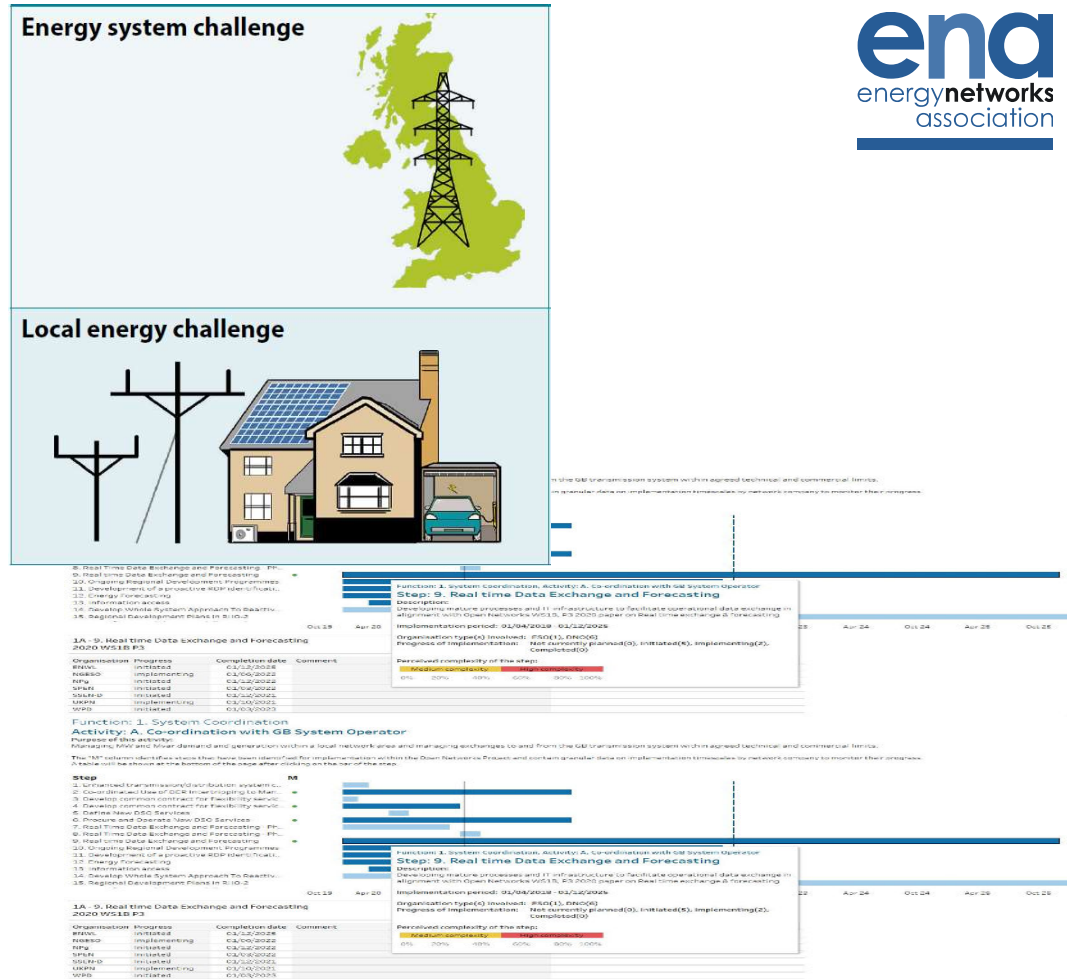


Open Networks Approach



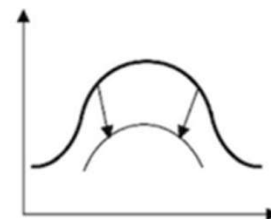
DSO Transition Plan

- The Energy Transition presents challenges at both a national and a local level
- The Distribution Networks in particular need to become much more digitalised, automated and controllable
- We have modelled different ways in which this could occur in GB, including identifying new functionality within the DSOs
- We have produced an interactive roadmap that shows how the smart grid is being rolled out in GB

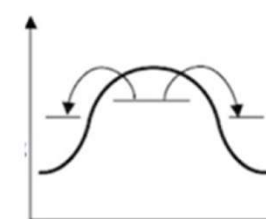


Flexibility is Key

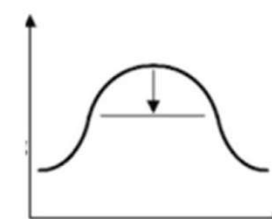
- A key enabler for the Energy Transition is **flexibility**
- Flexibility is about changing where or when electricity is consumed or generated
- Sources of flexibility include:
 - Storage
 - Demand side response (DSR)
 - Electric Vehicles
 - Flexible heat pumps
 - Backup generation
 - Electricity interconnectors
 - Network hardware, software and services*
- EU dictates most of this (except *) cannot be owned by Networks – hence need markets



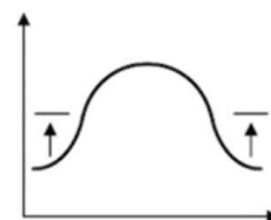
Conversion and energy efficiency



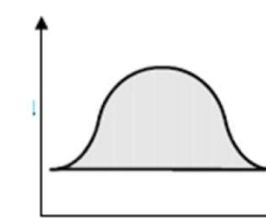
Load shifting



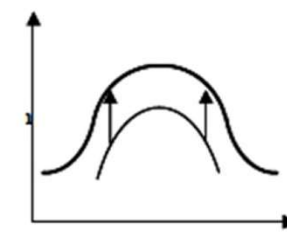
Peak clipping



Valley filling



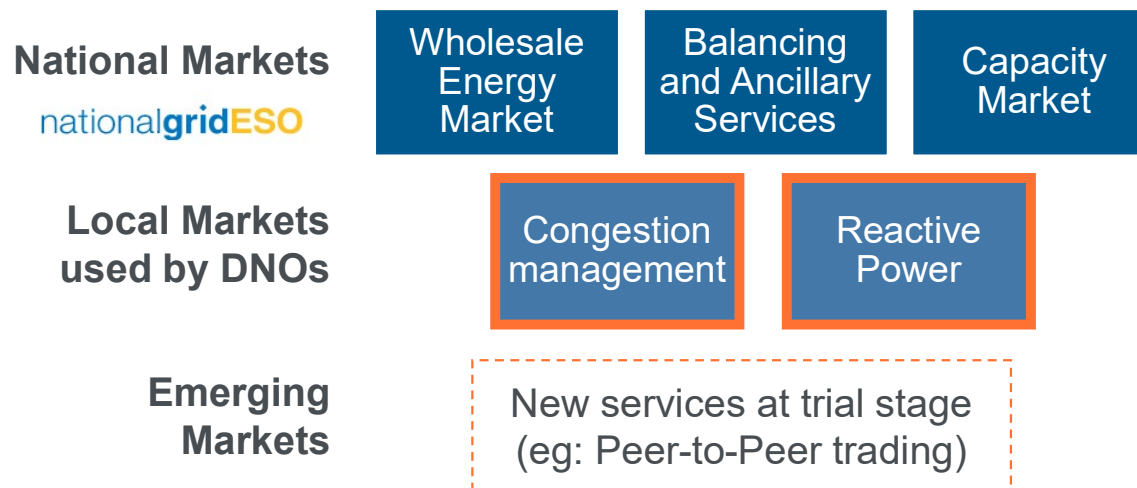
Flexible load shape



Electrification

Flexibility Markets in Great Britain

- Flexibility is about changing where or when electricity is consumed or generated
- Sources of flexibility include: Storage, Demand side response (DSR), Electric Vehicles, etc
- With all these devices, we need range of different energy markets, some that exist but will need changing, some are completely new:



- Open Networks is looking at the interface between these markets

Flexibility Commitment

- In the UK, network congestion is a reality at a local, regional and national level
- There are a range of solutions in the network “toolbox” to solve congestion; network reinforcement, (automated) reconfiguration of the network, smart grid solutions, 3rd party flexibility services, etc
- One key solution is 3rd party flexibility
- Britain’s Networks have made a “Flexibility Commitment”; using cost-efficient flexibility to relieve network congestion
- These ‘Local Flexibility Markets’ are now BaU



Local Flexibility Markets in Great Britain

- 2.9GW of local flexibility services being tendered this year

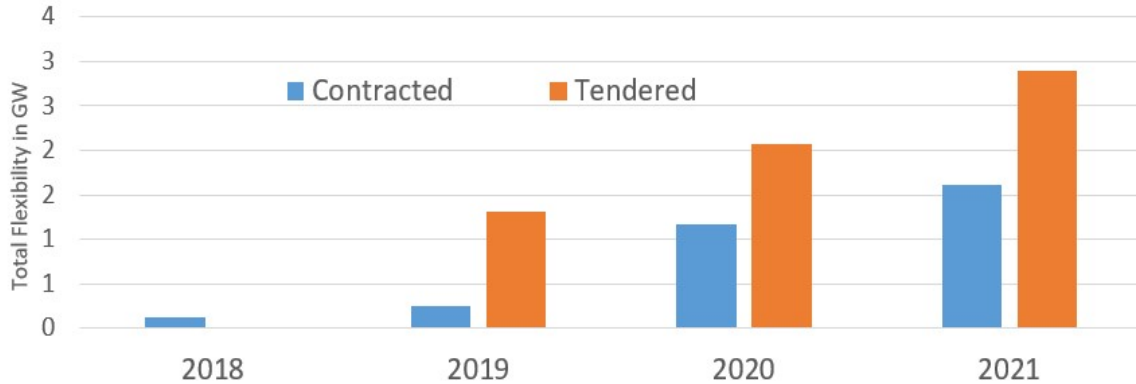
| DSO Flexibility Tenders | Sustain (MW) | Secure (MW) | Dynamic (MW) | Restore (MW) | Reactive Power (MVar) (if applicable) |
|-------------------------|--------------------|--------------------|--------------------|--------------------|---------------------------------------|
| | Peak Capacity (MW) | Peak Capacity (MW) | Peak Capacity (MW) | Peak Capacity (MW) | Peak Capacity (MVar) |
| Contracted for 2018 | 0 | 24 | 34 | 59 | 0 |
| Contracted for 2019 | 0 | 10 | 121 | 125 | 0 |
| Contracted for 2020 | 2 | 105 | 556 | 503 | 0 |
| Tendered for 2020 | 14 | 494 | 771 | 779 | 7 |
| Contracted for 2021 | 13 | 263 | 730 | 603 | 0 |
| Tendered for 2021 | 31 | 692 | 1203 | 955 | 9 |

4 Real Power Products:

- Sustain: Scheduled Constraint Management
- Secure: Pre-Fault Constraint Management
- Dynamic: Post-Fault Constraint Management
- Restore: Post-Fault Restoration

| | |
|---------------------------------|-------|
| % of Tender contracted in 2018 | n/a |
| % of Tender contracted in 2019 | 19.6% |
| % of Tender contracted in 2020 | 56.5% |
| % of Tender contracted in 2021* | 55.7% |

* Contracted to date, more expected over the remainder of 2021



Local Flexibility Markets – Process & Standardisation

DSO service products

- Active power
- Reactive power

Forecasting driving system needs

Visibility of service needs

- Pico and other platforms
- Official Journal of the EU (OJEU) Processes
- DSO advertising/ procurement

Procurement process and selection

- E-tenders
- Pico
- And other platforms

Operational dispatch

Settlement

Reporting

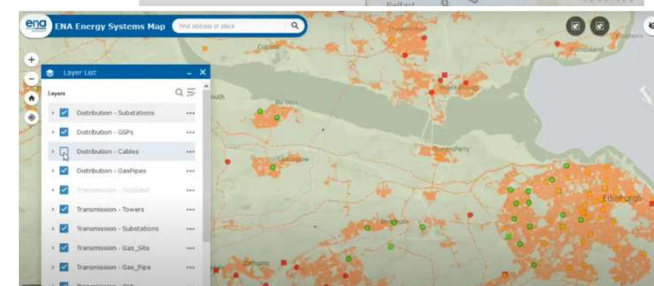
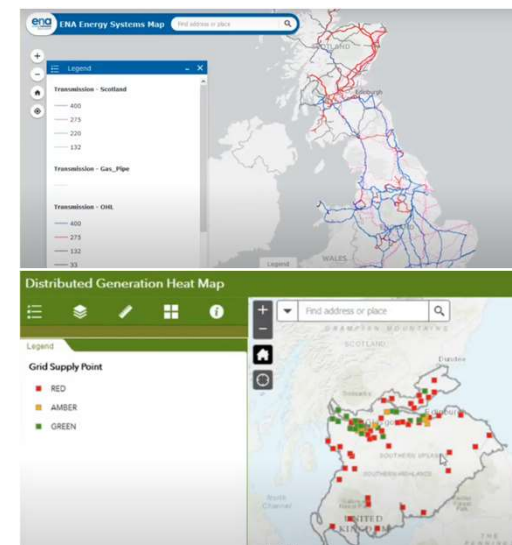
Next Steps: Liquidity

- Increasing market size, but DNOs still not procuring all they need
- Constraints are geographical but.....
 - Innovation trials
 - Common products
 - Better visibility and ease of access
 - Standardised contractual terms
 - Non exclusivity
 - Consistent reporting and monitoring
 - Lower barriers to entry (eg: size)
 - Co-ordination with TSO and wider energy markets
 - Open Data
 -
 - **More stakeholder engagement & market co-ordination critical!**



Data & Digitalisation

- Data & Digitalisation is critical to enabling the Smart Grid
- Better LV monitoring and visibility is required
- National Energy System Map (NESM)
 - Referred to as “the Google Earth of Energy”
 - Integration of data from multiple networks, geospatially presented
 - What assets, where and who owns them
 - Integration of third party datasets to enable informed analysis (e.g. public chargepoints, storage sites, etc)
- Digitalisation of the Connections Process
 - Improving the customer connections journey
 - Enabling mass scale up of connections

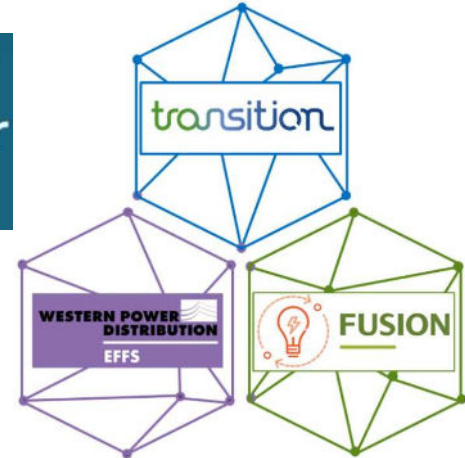


Learn-by-doing: Innovation Projects

- The UK Energy Networks take a learn-by-doing approach
- <https://smarter.energynetworks.org/>

Smarter Networks Portal

Search for a project

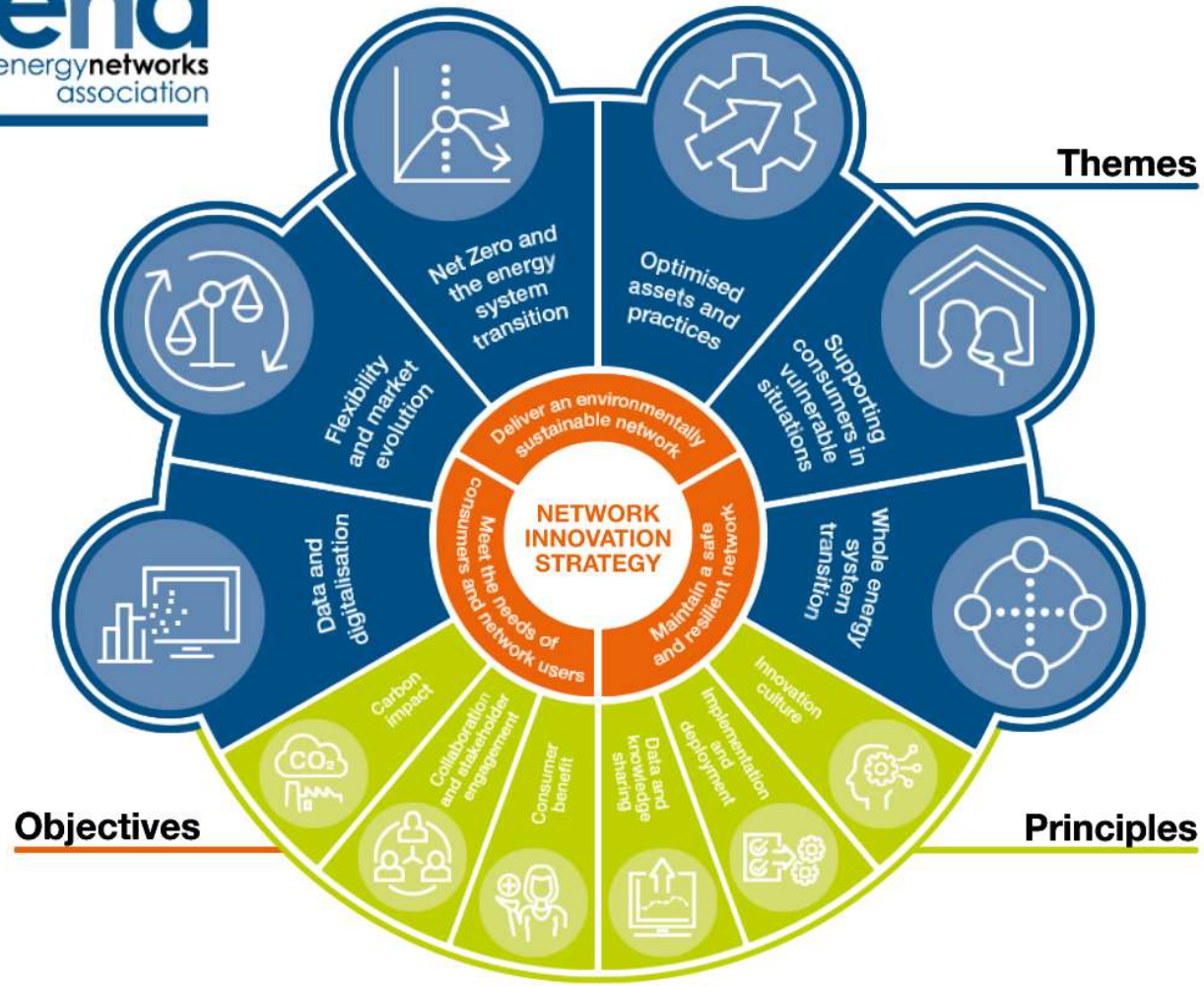


Cornwall Local Energy Market

centrica



Innovation Strategy



We still have a way to go: A view to the future

- Better visibility, particularly at LV
 - Investment in digital systems
 - Reforms to enable price driven flexibility, eg: Time-of-Use (ToU) tariffs and similar dynamic signals
 - New forms of storage, inc. seasonal storage
 - Vehicle-2-Grid (V2G) and Vehicle-2-Home (V2H) and the role it can play in markets
 - Aggregation of devices (EV, battery, Heat Pump, smart fridge, etc) and optimising them in the home to sell services to the networks - Energy-as-a-Service
 - New vehicle ownership models - Mobility-as-a-Service
 - The role of AI and Machine Learning
 - Community Energy Schemes
 - Peer-2-Peer trading
-All in the pursuit of Net Zero

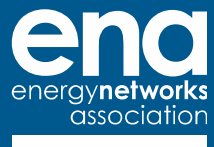
How to get involved

Public
Consultations

Public Events

Mailing List

Click [here](#) to join our mailing list



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Thank you!

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The voice of the networks