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A time of change – major shifts in grid & network policy

Chaired by Claire Mack, Chief Executive, Scottish Renewables

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What is happening with grid?

Scottish Renewables Grid Conference

15th February 2024

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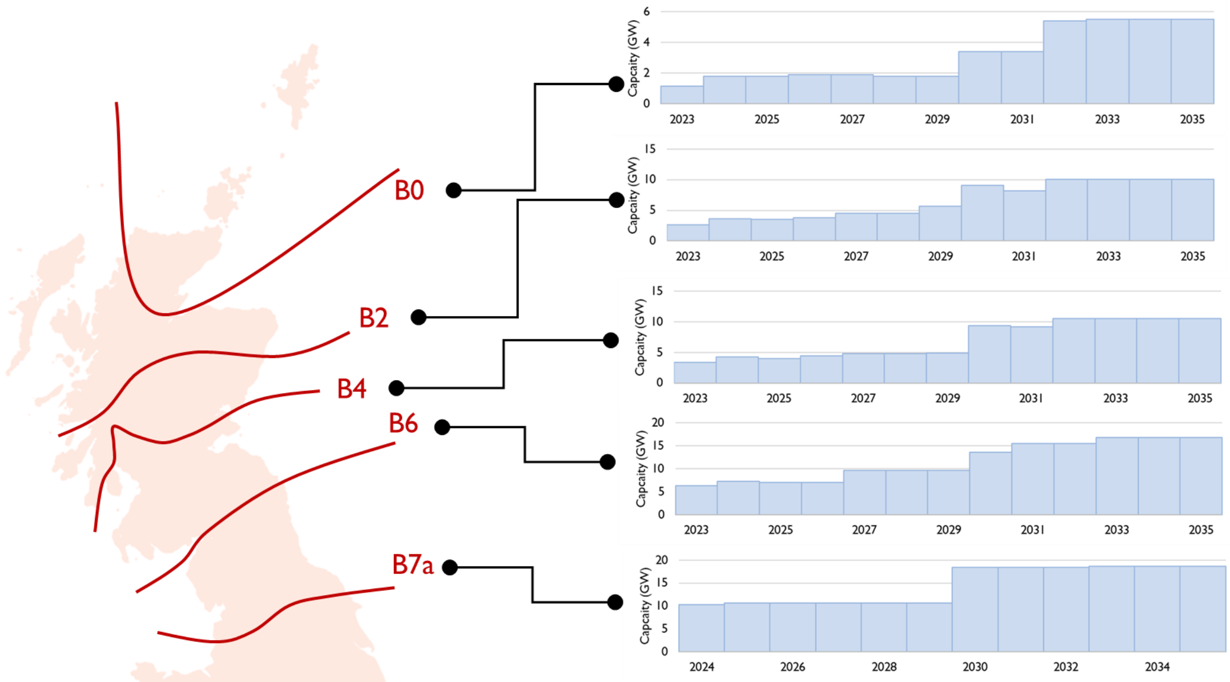
the energy landscape

The scale of gird upgrades planned



Secure boundary capacity increase between 2023 and 2035

4.4 GW or x 3.1

7.5 GW or x 3.9

7.1 GW or x 3.1

10.5 GW or x 2.7

9.3 GW or x 2.0

Source: NGESO ETYS 2023 main document and boundary capability chart (see download link at the bottom of the page)

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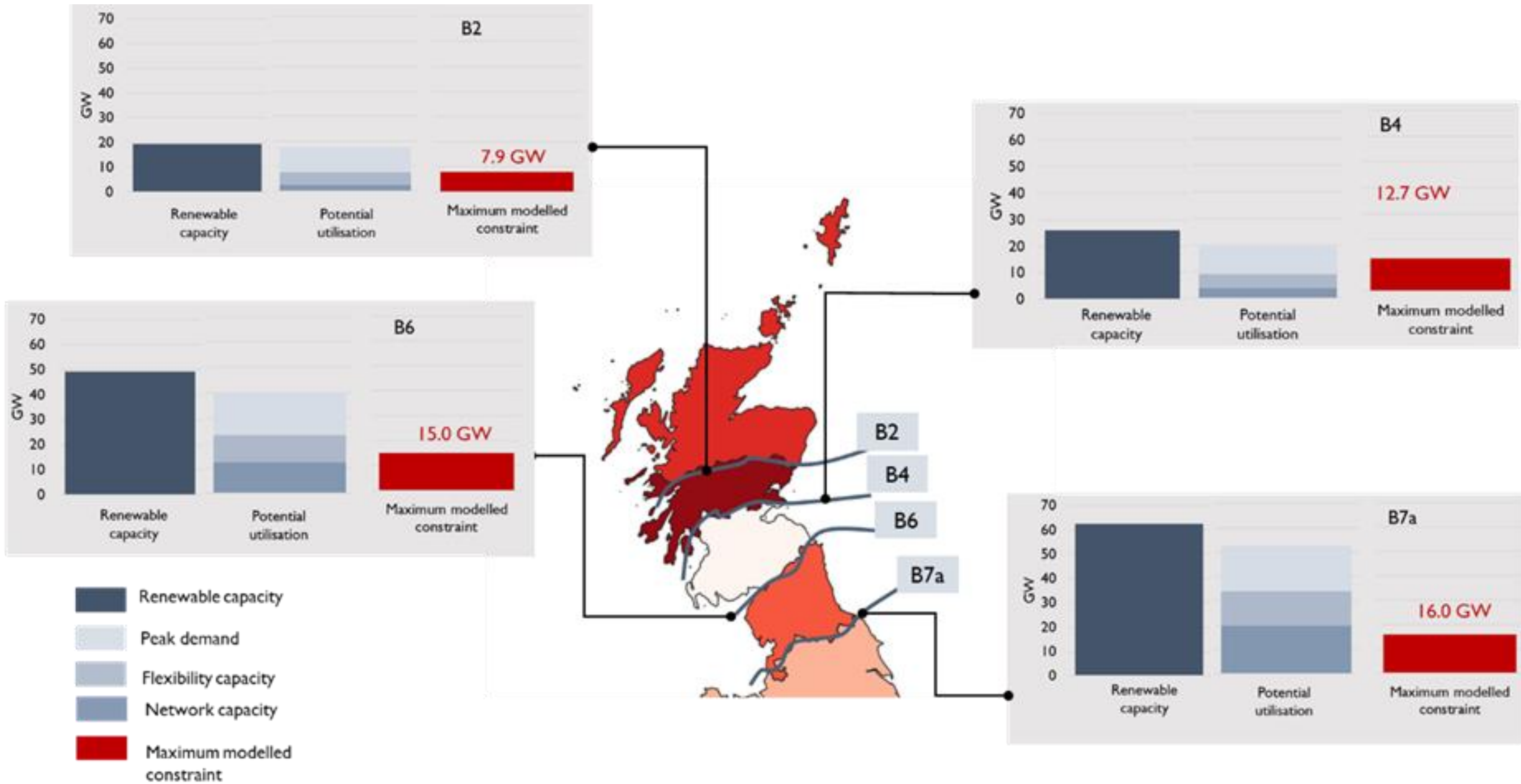
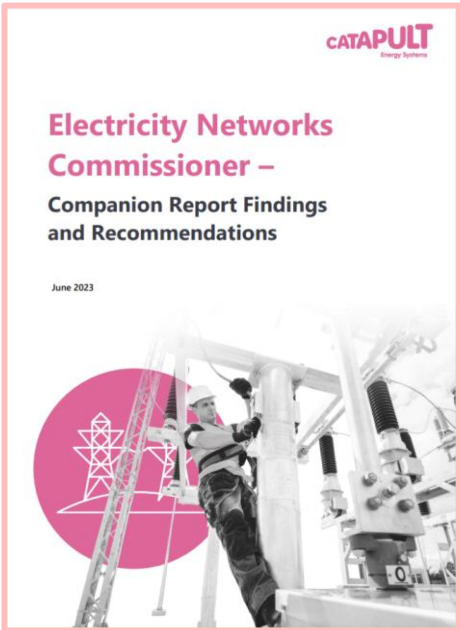
And what the Scottish system might look like in 2035



Source: Forthcoming work with University of Strathclyde (Keith Bell) and the Offshore Renewable Energy Catapult. Watch this space!

TEL the energy landscape

What has been happening?

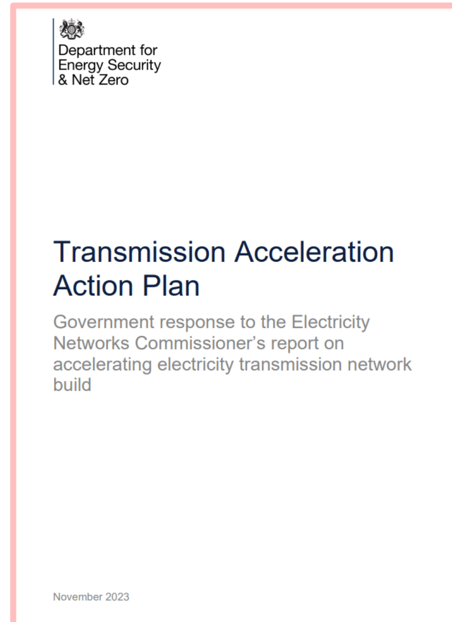

CATAPULT
Energy Systems

Electricity Networks Commissioner –

Companion Report Findings and Recommendations

June 2023

The Winser report


Department for Energy Security & Net Zero

Transmission Acceleration Action Plan

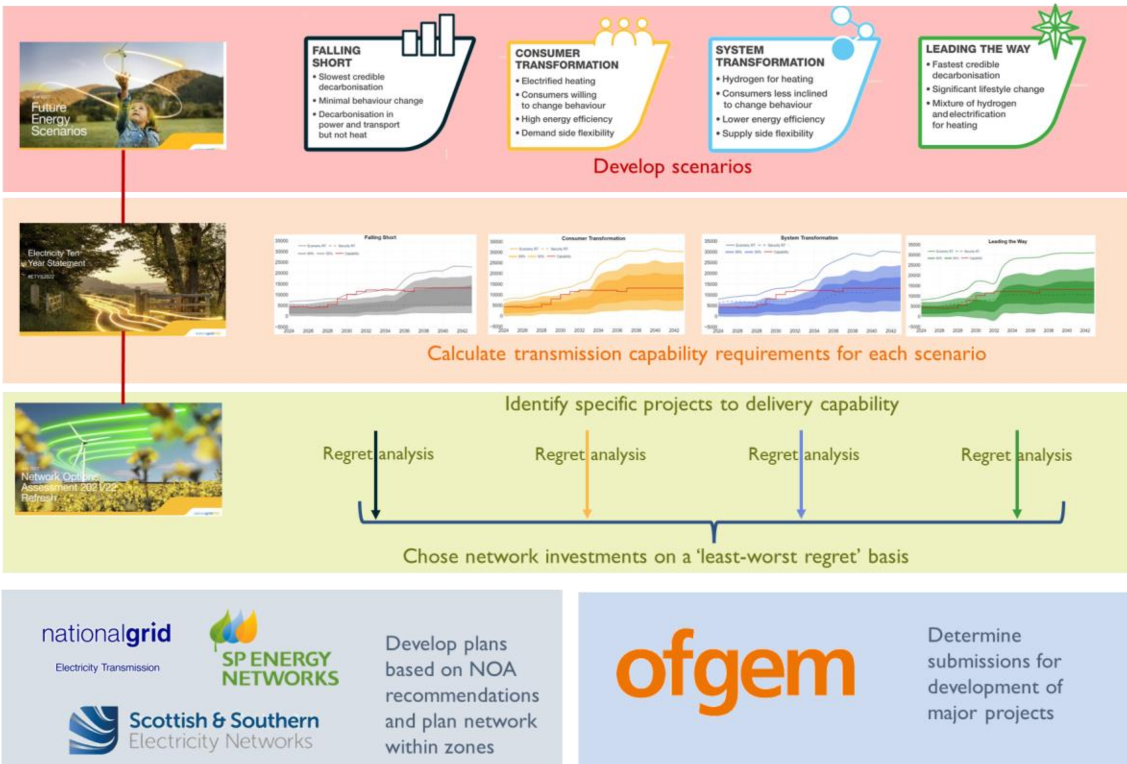
Government response to the Electricity Networks Commissioner's report on accelerating electricity transmission network build

November 2023

The TAAP

TEL the energy landscape

The old process (2015 – 2022): FES, ETYS, NOA



The existing process for planning the network was a 'follow the market' approach with market-led scenarios forming the input to the calculation of network needs.

the energy landscape

Improving the planning process (2022 – 2024)

The 'Holistic Network Design'

HND

A single-scenario planning approach driven by renewable targets

ofgem
Making a positive difference for energy consumers

Decision on accelerating onshore electricity transmission investment

Publication date:	15 December 2022
Contact:	RIIO team
Team:	Networks
Telephone:	020 7901 7000
Email:	RIIOElectricityTransmission@ofgem.gov.uk

The 'Accelerating Strategic Transmission Investment' Framework

ASTI

Regulation for a more coordinated, top-down network planning approach

TEL the energy landscape

A strategic planning approach to networks (2024 onwards)

Centralised Strategic Network Plan (CSNP)

TEL the energy landscape

A strategic planning approach to networks (2024 onwards)

Centralised Strategic Network Plan (CSNP)

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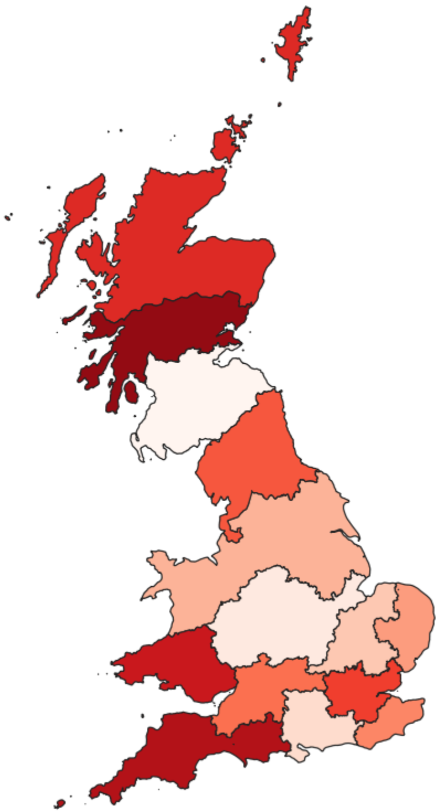
Not just the network and not just electricity: The Strategic Spatial Energy Plan



The SSEP will bridge the gap between government policy and infrastructure development plans. It will ultimately cover the whole energy system, land and sea, across Great Britain and will support the government in tandem with energy markets to determine the optimal location of energy infrastructure needed to transition to a greater supply of homegrown energy" (UK Government Transmission Acceleration Action Plan, 2023)

TEL
the energy landscape

What does this mean? What do we still need to know?

A **significantly greater role for strategic planning** to create a **net zero and energy security delivery plan** including an overarching system architecture and a **holistic infrastructure investment plan**.

regen transforming energy

[Regen response to the REMA consultation](), October 2022

Questions about the SSEP and the CSNP

Status	Geographical granularity	Network granularity	Implications for support	Uncertainty

TEL the energy landscape

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Market Development

Hitachi Energy

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Scottish Renewables Grid Conference

Alwyn Poulter

15th February 2024

Hitachi Energy

Offshore Transmission Network Review

HITACHI
Inspire the Next

Why review the offshore wind connection process

Delivery of 50GW offshore wind target required a step change in the grid process

Balancing environmental, social and economic cost - whist ensuring technical delivery

This led to a move away from radial connections only to a move coordinated approach

OTNR launched in 2020 and concluded in May 2023. Implementation process progressing

Who are the actors* and what was reviewed

Department for Energy Security & Net Zero

- OTNR review 'ownership'
- Delivering governance model
- Legislative change
- Stakeholder engagement

ofgem

- Regulation and licensing changes
- Offshore transmission divestment
- Anticipatory investment
- TNUoS principles

ESO

- Strategic network planning (HND)
- Connections process
- Bilateral connections contracts
- TNUoS delivery and code changes

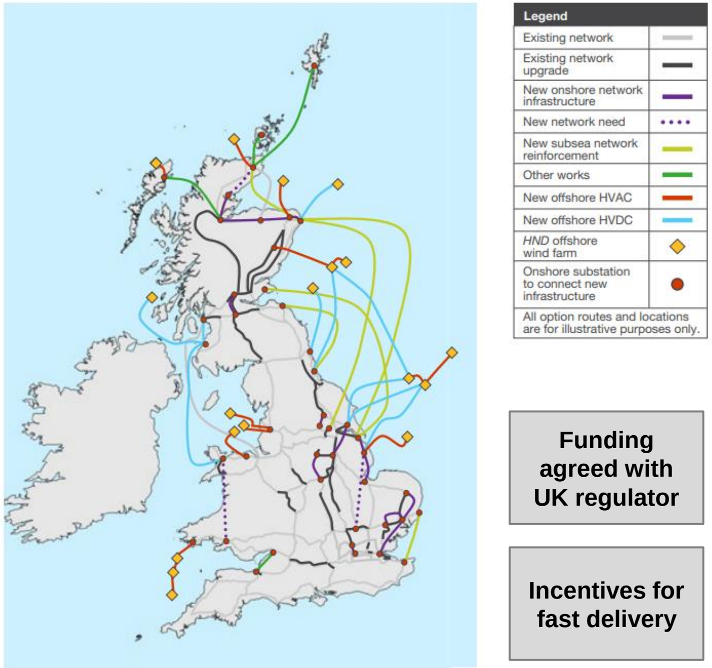
Grid is on a project's critical path - changing the process whilst keeping developments moving at speed requires a fine balance

*Devolved authorities, The Crown Estate, Crown Estate Scotland, DEFRA, HMT, Marine Scotland, MMO, TOs, TAs also involved in OTNR

Hitachi Energy

Holistic Network Design

A holistic transmission network plan to reach 2030



Funding agreed with UK regulator

Incentives for fast delivery

What is required to implement and deliver the HND

Delivery	OFTO tender regulations and E&W planning frameworks now include 'coordination' test
Who builds it	Ofgem asset classification, generator build model decision, technical change process
Interface & sign off	Detailed network design, anticipatory investment and early gateway process
Codes & charging	Contract updates, review of offshore TNUoS, grid code and technical standards update

Holistic Network Design connects 23GW of new offshore wind (11GW of ScotWind), further 21GW ScotWind due in TCSNP

Transmission Acceleration Action Plan

HITACHI
Inspire the Next

The TAAP established **43 recommendations to half the time of new build transmission**

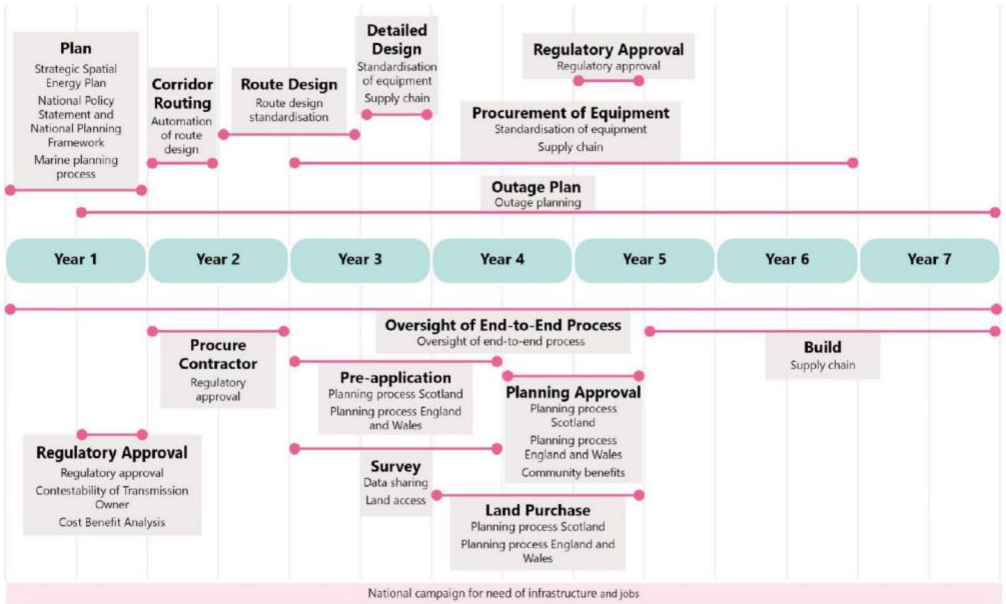
Includes a clear delivery road map and institutional ownership of the recommendations

UK Government agrees with the recommendations, and seeks to go further to deliver the ambition of halving the build time

Recommendations include:

- Creation of a GB wide strategic spatial energy plan by NESO and **network plans for all transmission links to 2050**. Plans recognised in permitting process
- 12 month **fast track permitting approvals** process in E&W.
- **Faster** and earlier **regulatory approval** by Ofgem
- **Community benefit** and greater community engagement
- TOs should form long term relationships with suppliers and **book bulk procurement slots** where possible and work to promote UK manufacturing
- TAAP **delivery board established** to track and monitor implementation

Figure 1: The Commissioner's new seven-year process map and recommendations required.



Transmission Acceleration Action Plan recommendations need to be implemented in full and at speed

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GREG CLARKE, HEAD OF CORPORATE AFFAIRS TRANSMISSION

15 FEBRUARY 2024

Scottish & Southern Electricity Networks
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PATHWAY TO 2030

- In-flight Investments
- Pathway to 2030 Investments

- New Infrastructure (Routes shown here are for illustrative purposes)
- Upgrade/Replacement of Existing Infrastructure
- Existing Network

All new reinforcements remain subject to detailed consultation and environmental assessments to help inform route and technology options

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DELIVERING LEGACY BENEFITS

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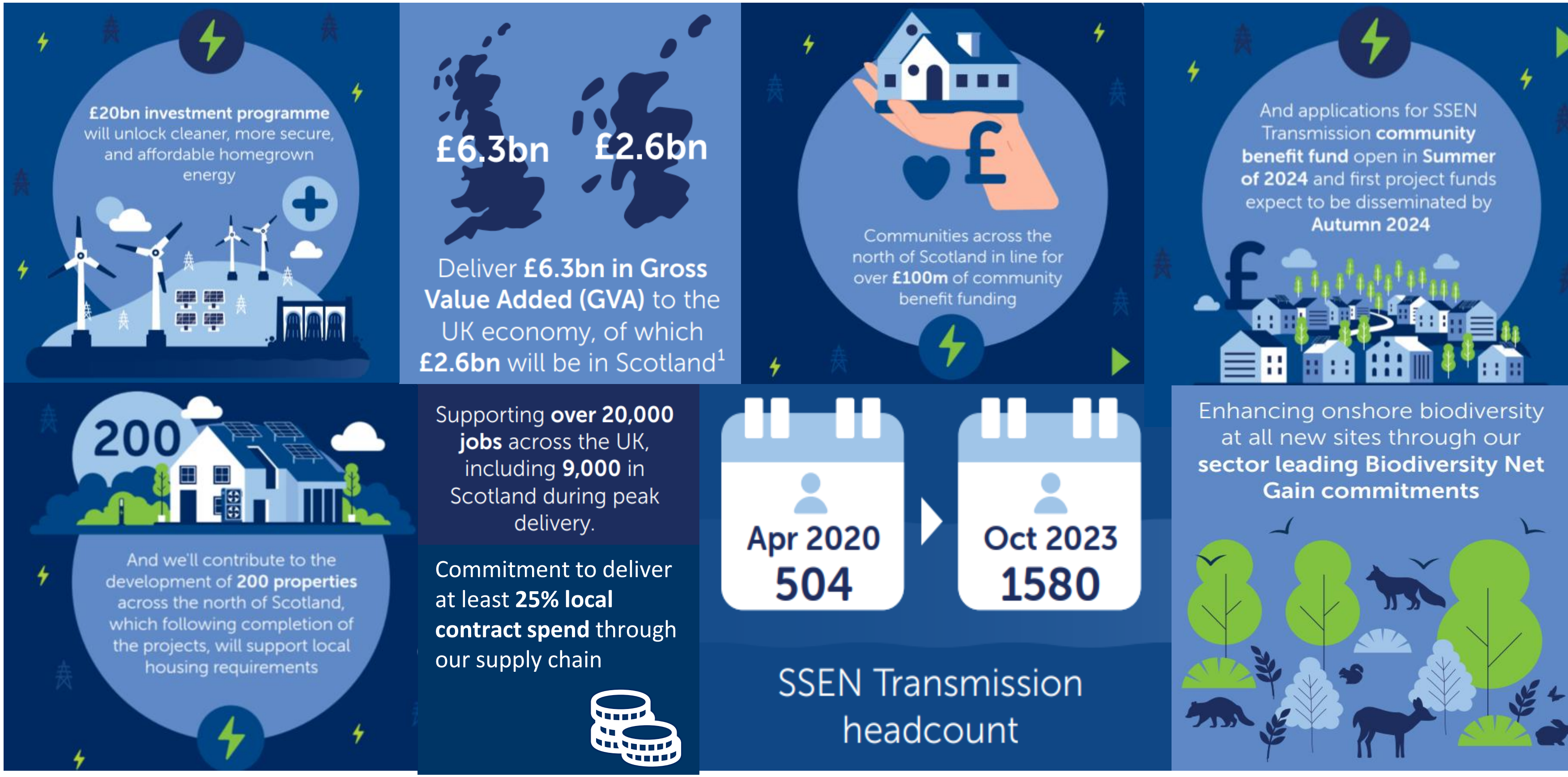

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Scottish Renewables Grid & Networks Conference

Imran Mohammed

15th February 2024

Renewable energy developers across the UK need long term certainty

Areas for consideration

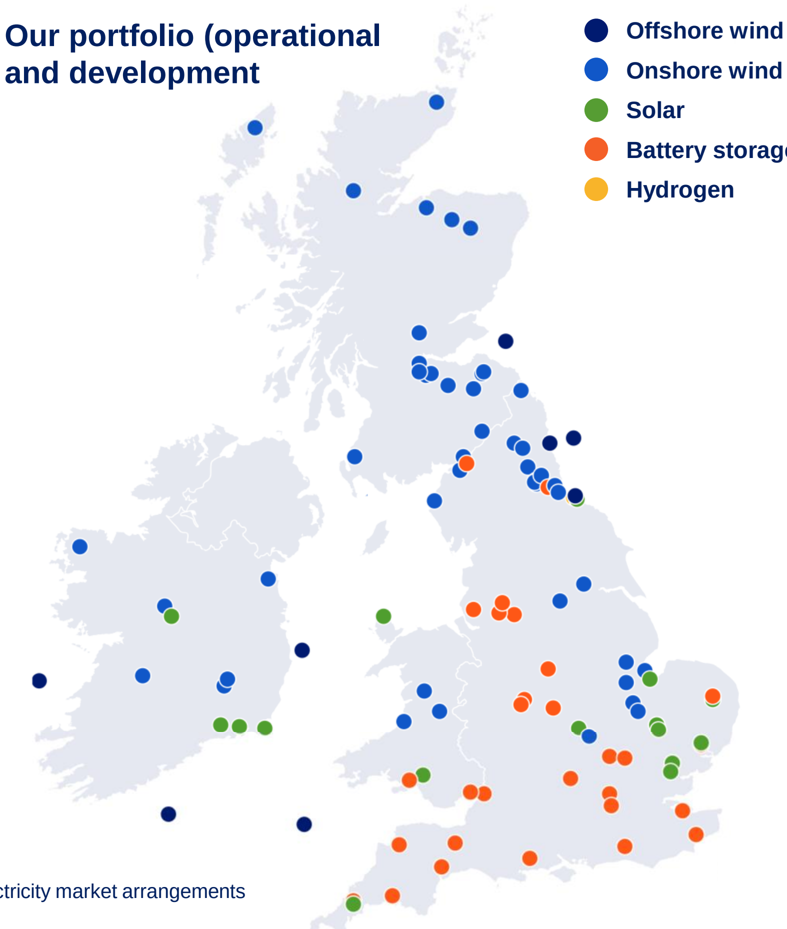
Significant pressures on margins through rising cost of capital and higher material costs across the supply chain.

Stable regulatory environment – ASTI, HND and TAAP provide direction however outstanding questions remain on REMA.

Clearer communication and visibility on the programme of works.

Increased collaboration across organisations is needed to ensure that we continue to receive community buy-in.

Our portfolio (operational and development)



ASTI – Accelerating Strategic Transmission Investment
HND – Holistic Network Design
TAAP – Transmission Acceleration Action Plan

REMA – Review of electricity market arrangements

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The need for speed – accelerating the connections process

Chaired by Neil Copeland, Associate – Advisory Services, Arup

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Head of Customer Connections

National Grid ESO

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The need for speed – Accelerating the connections process

David Wildash
Head of Connections – ESO
15 February 2024

Agenda

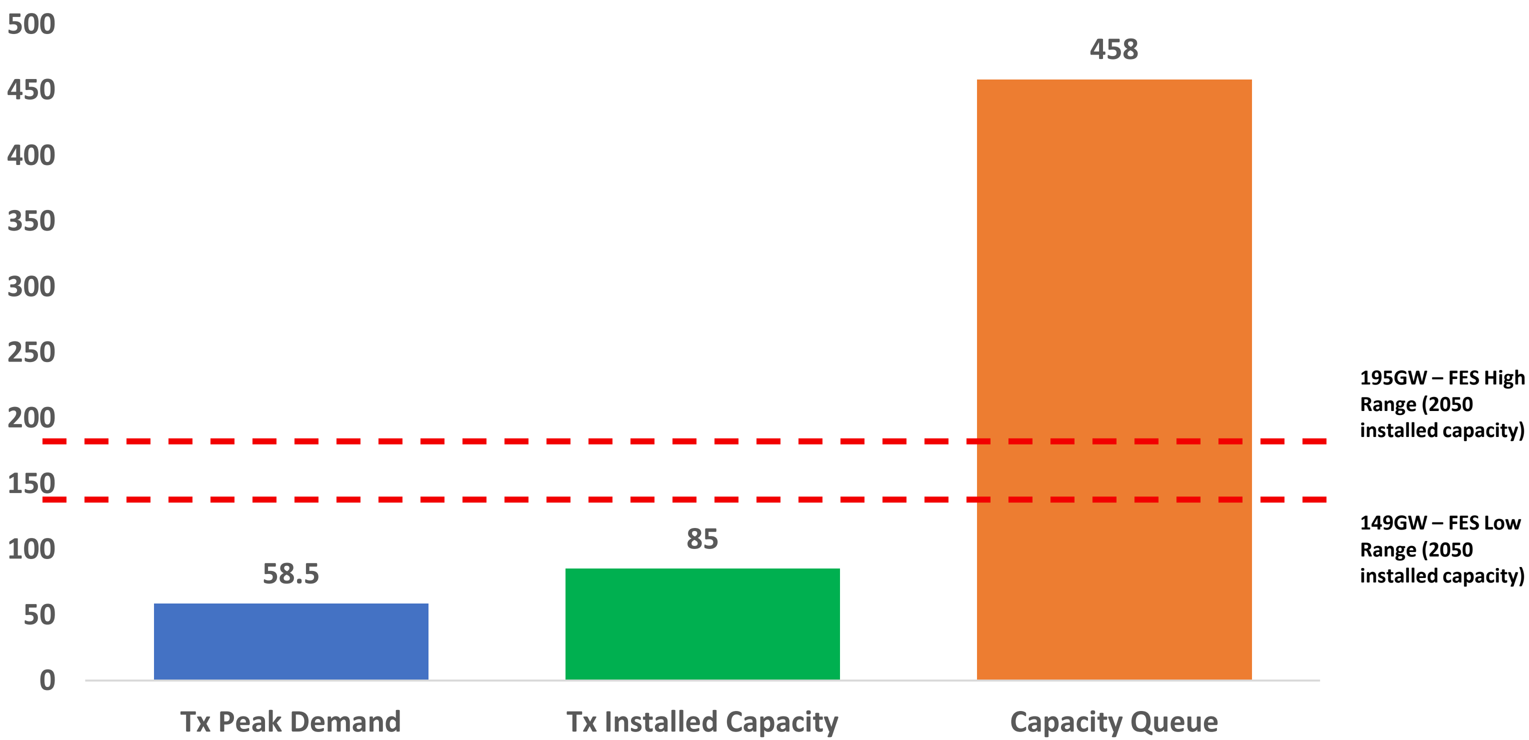
1. Current size and distribution of the Queue

2. What was achieved in 2023

3. How to resolve going forward

ESO

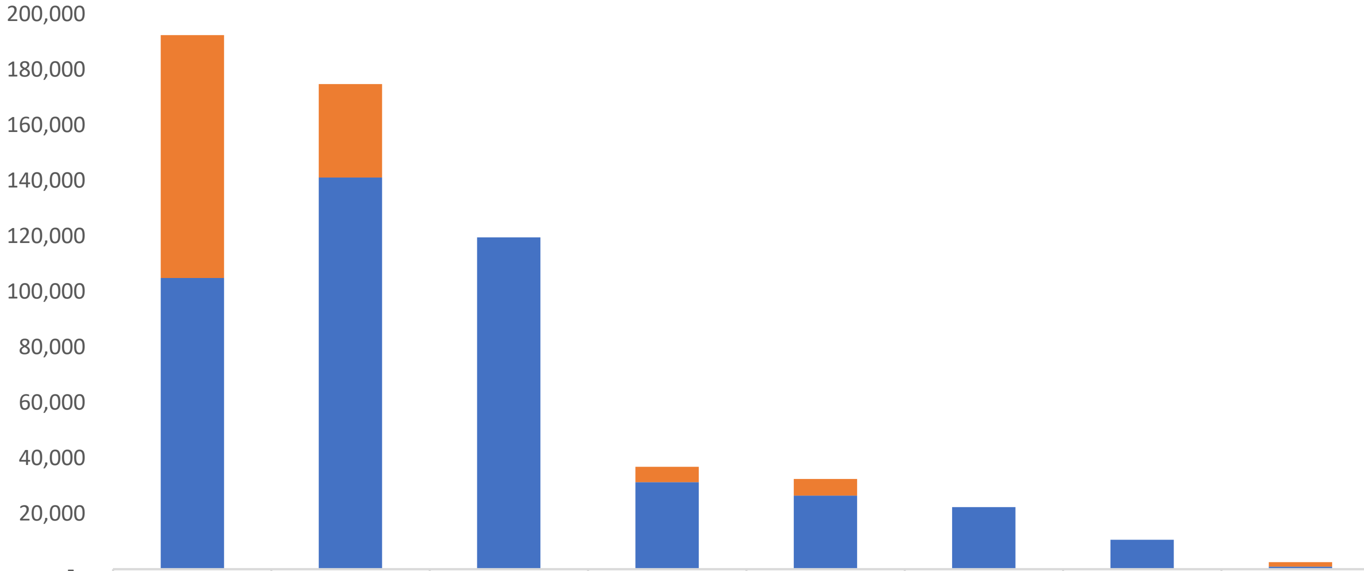
The current connections process is oversubscribed Vs the view from our Future Energy Scenarios



Note: all demand, generation and FES figures are transmission only.

ESO

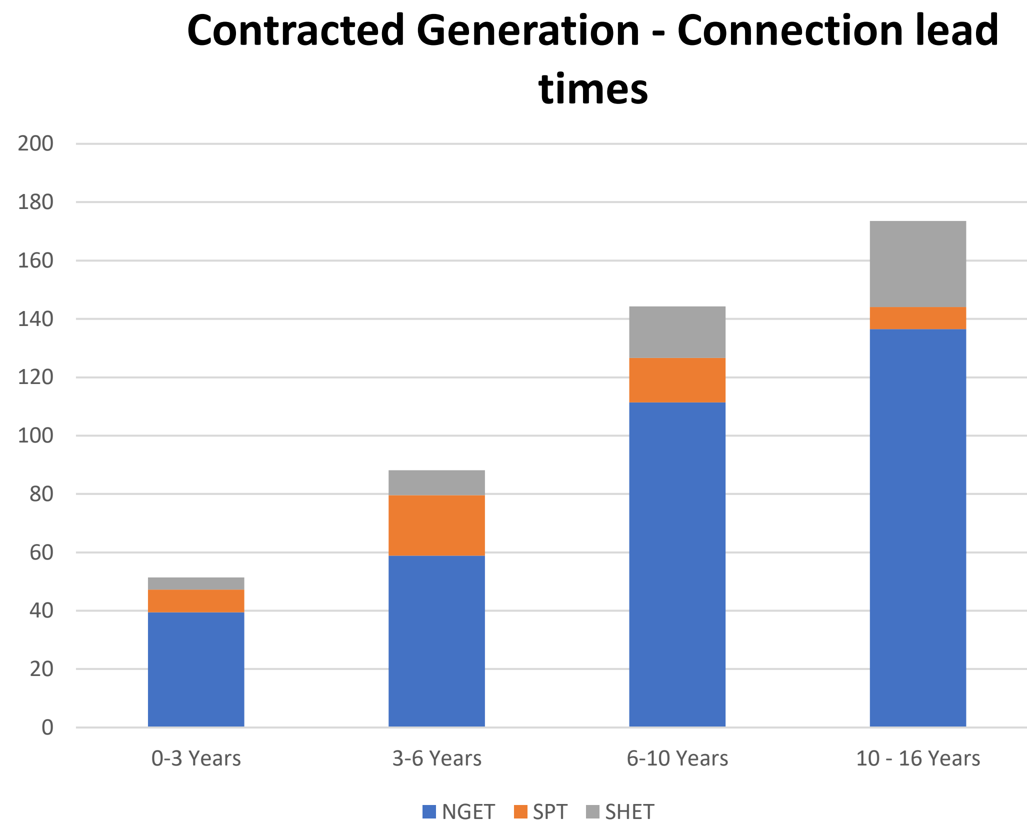
With the addition of Distributed Connected applications, we are approaching 600 GW of capacity



	Storage	Solar	Wind Offshore	Wind Onshore	Non-Renewable	Interconnector	Nuclear	Other Renewable	
Distribution	87,499	33,645	-	5,466	5,996	-	-	1,585	134 GW
Transmission	104,928	141,185	119,546	31,405	26,536	22,454	10,680	1,010	458 GW
	192.5	175	119.5	37	32.5	22.5	10.5	2.5	592 GW

Lead times determined by the need for major network reinforcements

Long lead times for new Substations and major reinforcements, is dictating connection lead times



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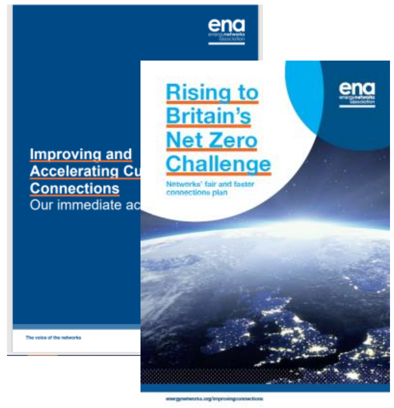
During 2023 multiple industry initiatives were progressed to support reform



10 GWs Non Firm Storage offers

4 GWs TEC Amnesty

CMP 376 Now Live

Strategic Connection Group

3 point plan

30 GWs – Tech Limits

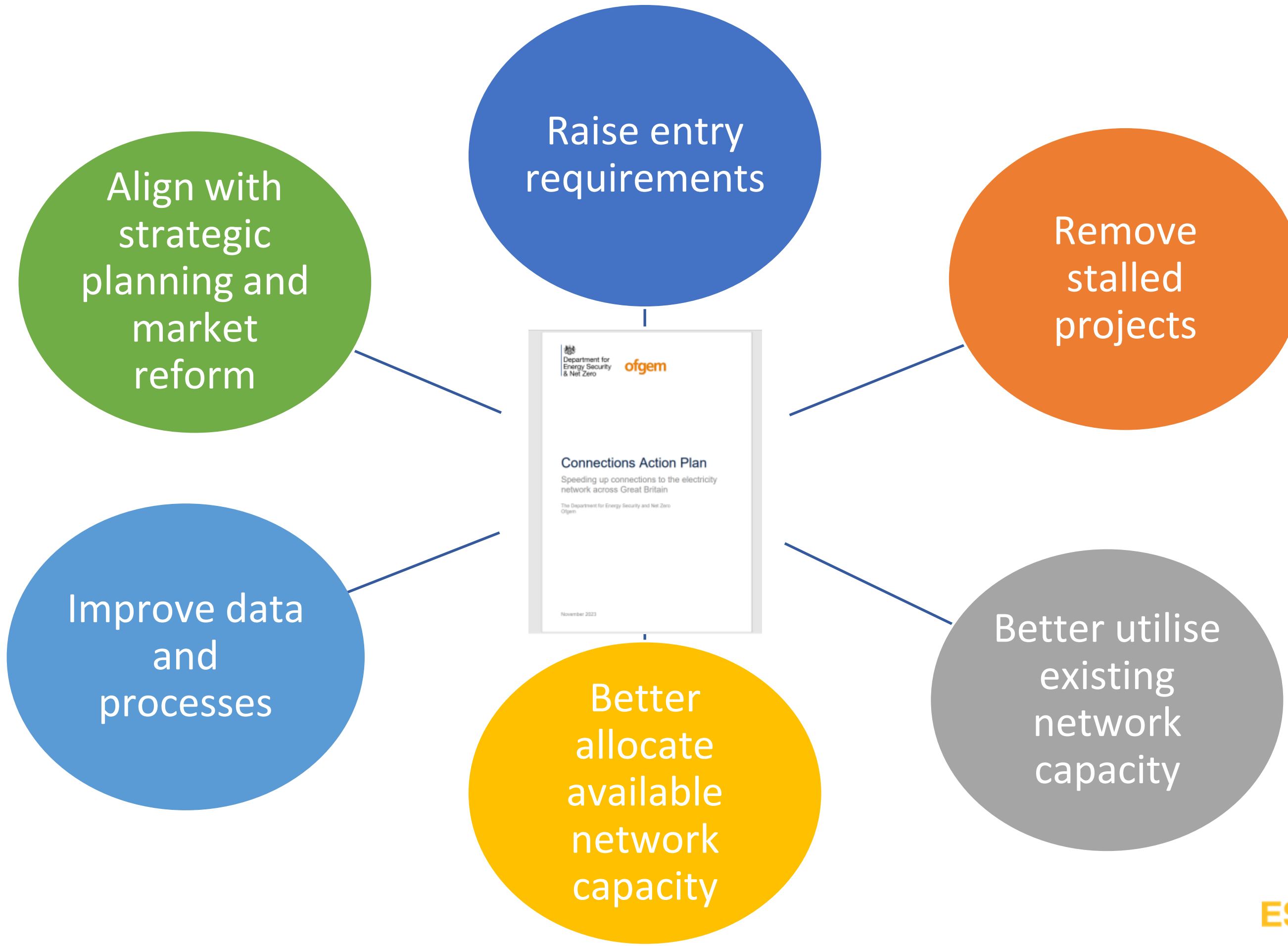
80 responses to initial recommendations

~ 1000 Stakeholder interactions

ESO

Connection Action Plan – Summary Actions

Governance and oversight for delivery will be overseen through the **Connection Delivery Board**



Connection Reform – Details

Final Recommendations Include

- Applicable to all **new generation**, **interconnection** and **demand** connection applications
- Application **windows** and two formal **gates**
  - Gate 1: connection location and connection date
  - Gate 2: accelerate 'priority projects'
- **Letter of Authority** entry Requirement
- Reserve **capacity for DNOs** - Not to hold up Embedded Generation

Customer and Consumer Benefits

- Greatest opportunity for **earlier connection dates**, on a **first ready first connected** basis;
- More efficient and **coordinated future planning** of the network
- supports ability to **build network** more efficiently **in anticipation** of need
- better **facilitates competition**, innovation and introduction of **non-build solutions**; and
- **Future-proofed** - aligned with other programmes

In Summary

The current Combined queue **is 600 GW**, which is **three times** what is required to **reach 2050 targets**

Industry efforts have driven forward initiatives that have so far **delivered 40GW** of enhanced offers. We need to **adopt all** of the recommendations within the **Connection Action Plan** as a minimum as well as those in the **Transmission Acceleration Action Plan**

Our model for transitioning to an **enduring Connection Reform**, allows better coordination and alignment with other major industry initiatives – but we need to **keep additional actions** to go further faster **on the table**

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Associate – Advisory Services, Arup

David Wildash
Head of Customer Connections, National Grid ESO

Tessa Hall
Head of Electricity Connections, Ofgem

Merlin Hyman
Chief Executive Officer, Regen

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Charging ahead? Wrestling with the beast that is network charging

Chaired by Morag Watson, Director of Policy, Scottish Renewables

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Senior Grid & Regulations Manager

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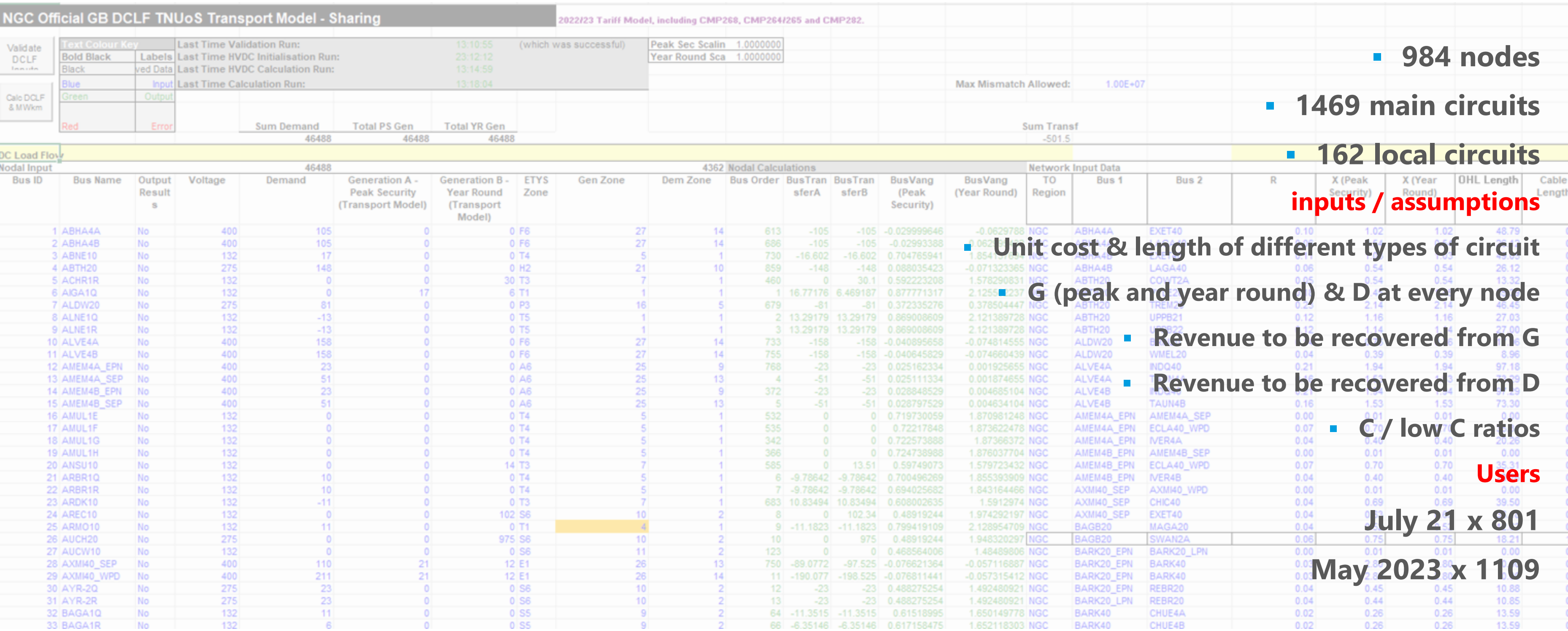
Designated charger

TNUoS model



- 984 nodes
- 1469 main circuits
- 162 local circuits

inputs / assumptions

- Unit cost & length of different types of circuit
- G (peak and year round) & D at every node
- Revenue to be recovered from G
- Revenue to be recovered from D
- C / low C ratios

Users

July 21 x 801

May 2023 x 1109

Key points

- Accepted that current TNUoS regime is unsustainable
  - Conceived with few large generators and unchanging network
  - That's not where we are now

- Charges are unpredictable and unstable
  - Unintended consequences of changes
  - Deeply technical and also political in one spreadsheet

- Is it transparent when it is so complex?

- Change process is a huge commitment in time & expertise

- It's a consultants dream and an investors nightmare

- Cost reflectivity of a system that is inherently complex is challenging
- Is 'sharp' locational charging still useful with strategic planning?
- Don't underestimate the practicalities of wholesale change

- Get involved if you can!

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Ocean Winds

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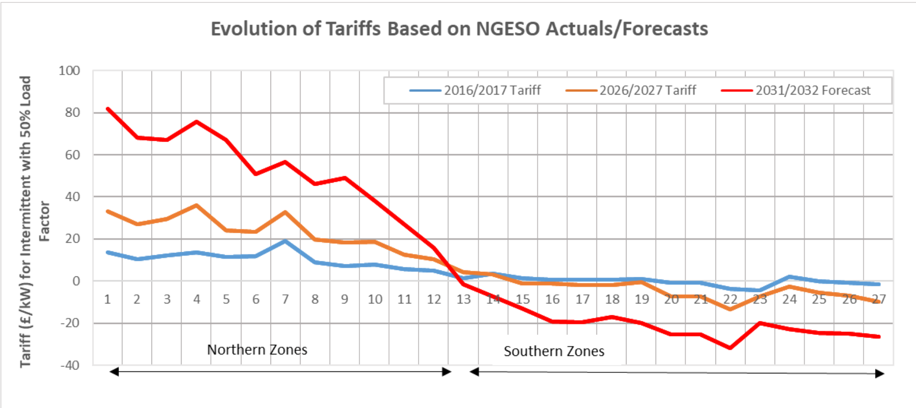
The cost to the consumer of locational signals in network charges

OCEAN WINDS

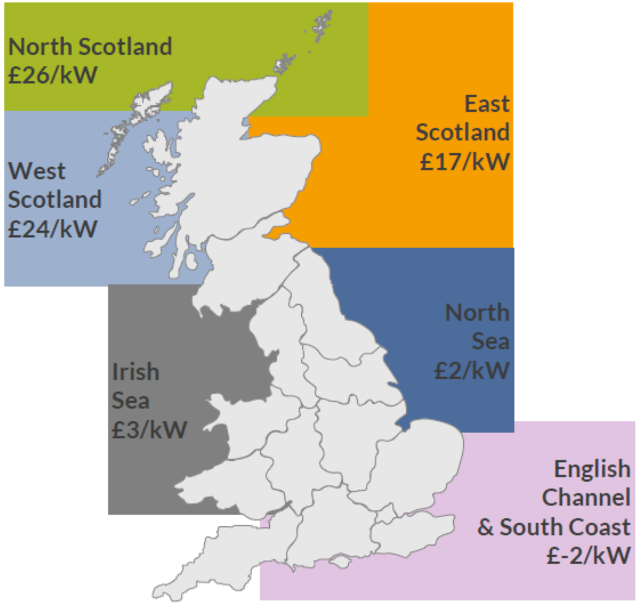
2024

1. TNUoS Trends

- TNUoS tariffs aim to be reflective of the cost of using the network to help network users make efficient decisions about where and when to use the National Electricity Transmission System (NETS). Generating far from demand entails more expensive charges to transmit electricity.
- In practice, this has historically meant that generators in the North of GB pay increasingly high prices while generators in the south are often subsidised to use the NETS.
- In Scotland, final generation TNUoS tariffs in 2016/2017 compared to NGESO forecast for 2026/2027 show an increase of roughly 217% across the ten years. Looking forward further 5 years to 2031/2032 in line with the recently published 10-year projection and the gap increase grows to over 500%.
- Tariffs of up to £80/kW in zone 1 (2031/32, equivalent to around £20/MWh) will effectively erode value from existing operational projects who cannot respond to these signals, while at the same time deter renewable deployment in the north of GB.



TNUoS Wider Tariff – 2023[2]
£/kW/year (real 2022)

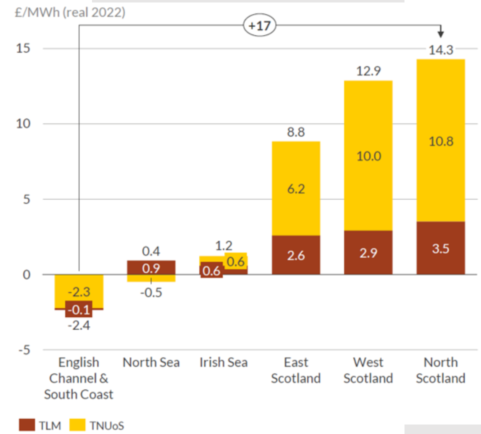


2. How does TNUoS disparity impact consumers?

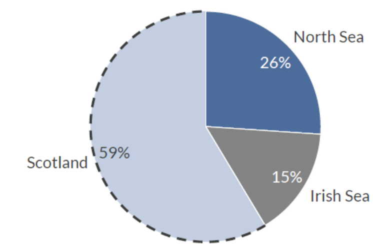
- Aurora Energy Research found that TNUoS and transmission network loss costs (TLMs) are (and will continue to be) the competitive differentiator in determining the merit order in CfD auctions.
- TNUoS charges combined with the TLMs lead to differences of up to £17/MWh in CfD bid prices of offshore wind farms across regions.
- Wind farms in Scotland could set the CfD strike price for the majority of subsidised offshore wind capacity added in 2025-2050.
- The rise of TNUoS compared to 2017 levels leads to an increase of the annual costs of CfD-backed offshore wind generation to consumers by £220m on average and up to £390m in 2025-2050. **This corresponds to £5.6bn of cumulative additional cost to consumers in 2025–2050[1].**
- A large share of these additional costs, 28% on average in 2030-2050 woud be due to wind farms South of GB receiving a strike price set by wind farms in Scotland (''TNUoS uplift'').

1. The analysis does not consider (i) the further impact of TNUoS variability on cost-of-capital and the subsequent cost to the consumer (NERA Economic Consulting found that higher costs of finance for future wind project resulting from TNUoS volatility may cost consumers between £122 million and £391 million per year by 2030), (ii) The report does not include the cost to consumer that has already been incurred as a result of allocation rounds up to AR5, (iii) Aurora's assessment only accounts for the impact of offshore wind. Including onshore wind and other technologies in the same pot in the analysis would result in a substantially higher consumer impact.

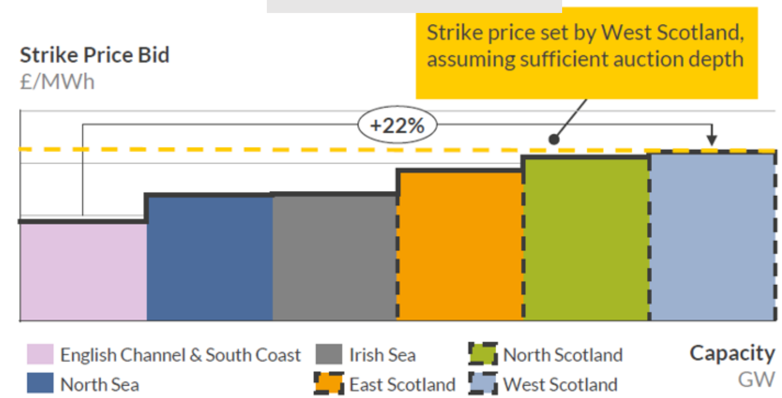
Estimated Impact on Offshore Wind CfD Bid Price – 2025 Entry



Total New Build CfD-Backed Offshore Wind by Strike Price Setting Region % (subsidised capacity beyond Allocation Round 4.)



Illustrative CfD Strike Price Bid Stack



Ocean Winds TNUoS Reform Principles

OCEAN WINDS

As reforms advance across different workstreams such as the TNUoS Task Force, Ofgem's open letter, and CUSC modifications, it is crucial to have central Principles serving as benchmarks. These Principles will be essential in rigorously evaluating all progressive TNUoS reform initiatives, ensuring their alignment and mutual reinforcement.

TNUoS charging methodology must provide long-term certainty for capital intensive, new build generation

TNUoS Methodology should enable not hinder Net Zero and should consider the ability of system users to retrospectively respond to locational signals

Solutions must consider the impact on current operational assets

Reform is needed with urgency

If it is being used to send a locational signal, TNUoS should send a signal based on future strategic network plans and not the status quo

Locational signals must not cause avoidable cost-to-consumer through driving CfD clearing prices

The charging methodology should deliver tariffs which are sustainably compliant with the €0-2.50/MWh allowable range and must be cognisant of interconnected markets

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OpTIC

Optimised Transmission Investment Cost

Joe Dunn
Head of Grid & Regulation

Scottish Renewables Grid Conference – Feb 2023

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Journey to Date

The transmission charging methodology requires reform to remain fit for the future net zero system.

SP's proposal journey

- Reform explored options to address volatility and cost reflectivity.
- Clear that the challenges called for improvement beyond small tweaks.
- OpTIC socialisation raised discussion on REMA and LMP.
- Reform required to address the short-run signal also as OpTIC aim addresses long-run marginal cost signal.
- Work now triggered to sit alongside OpTIC to consider improvements to operational dispatch (BM Reform).

Work commenced with Trident

Q3 2022
Socialisation began

Workshops and Bi-laterals meetings ongoing

OpTIC only addresses the long-run locational signal

Other reform is required to address short-run operational dispatch inefficiencies

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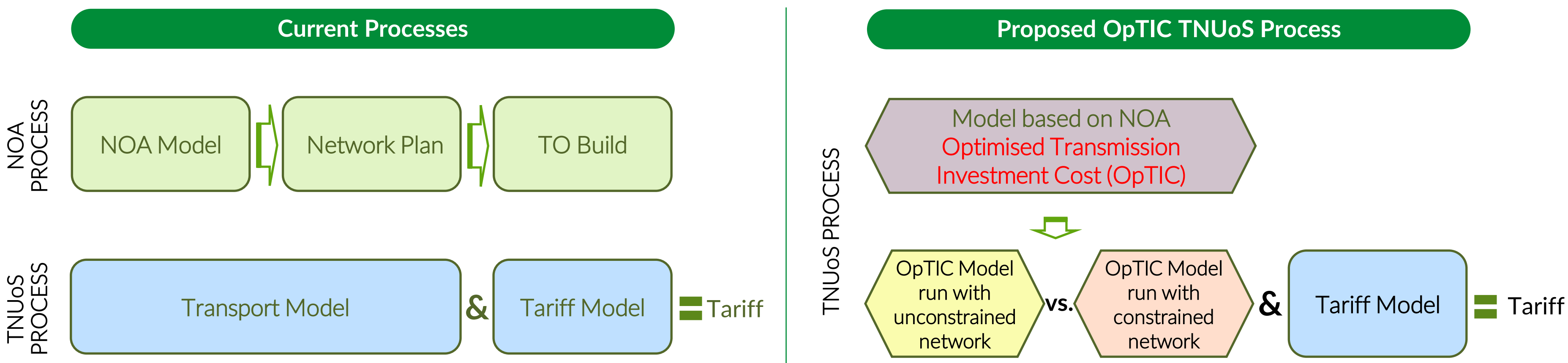
What is OpTIC?

OpTIC is an economic model that determines network charges based on the value of electricity in different locations using the optimal future network.

OpTIC replaces ICRP, incentivising users to locate where it is economic and efficient in a network of the future thereby maximising the value of electricity within that system.

Approach: Current Processes vs. Proposed OpTIC

*Currently, NGESO proposes economic TO build proposals through the NOA, ‘**separate**’ to a proxy TNUoS transport model.*
Under OpTIC TNUoS charges are determined on the same basis as the NOA in an optimised system.



- the unconstrained run mimics status quo, (with national market price)
- the constrained run mimics a market with zonal local marginal pricing

The transmission charge for a generator user would be calculated as the expected annual aggregate profit between: i) selling at a local electricity value and ii) selling at a uniform market price, assuming an optimised transmission system.

OpTIC's Key Features

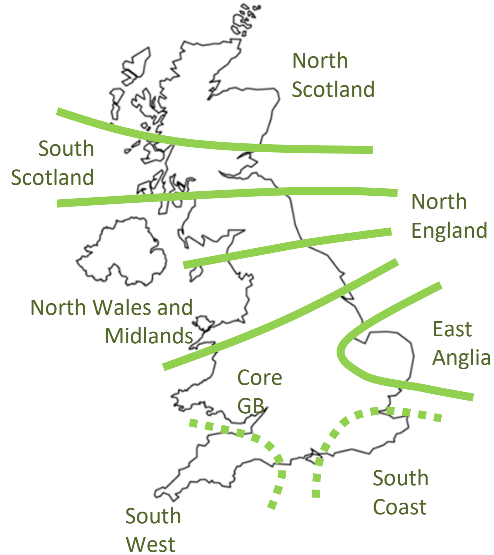
Relative to areas being addressed by the TNUoS Task Force, OpTIC provides a number of positives.
Excepting dispatch considerations, OpTIC realises the siting benefits associated with LMP without its disruption and uncertainty

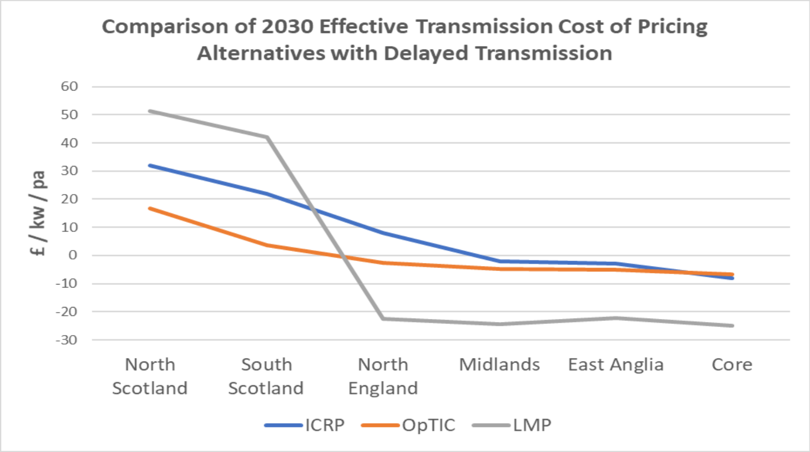
- The optimal network is used to derive charges, providing a long-run signal focussed on the end goal of transmission investment, smoothing the signal over time, **removing lumpiness of transmission investment** and **unaffected by delays in network investment**.
- Locational investment signal and siting benefits considers **available capacity/ capacity restrictions** and **constraint costs**.
- **All technology types can be covered**, with OpTIC using individual technology specific characteristics.
- Incorporates the **changing pattern** of demand and generation, driving differences in electricity value by location and over time.
- OpTIC charges would work alongside **national wholesale pricing**, while retaining **fixed annual zonal charges**.
- Reflects the **locational value of electricity**, while removing most of the existing challenges with the current TNUoS methodology.

OpTIC provides a long run marginal cost associated with optimised planned future network investment, realising the benefits of locational signals

OpTIC -Impact of transmission delay

Scenario run to show transmission build delay capping capacity at 9GW behind the South Scotland to North England boundary with an optimised addition of 13.5GW.





Results produced by Trident Economics

OpTIC replicates the siting signals of LMP in an optimally designed network,
offering the siting benefits of LMP without the implementation challenges and uncertainties associated with it.

EVENT PARTNERS

ESO Scottish & Southern Electricity Networks TRANSMISSION ScottishPower Renewables

Harriet Harmon

Head of Electricity Transmission Charging

Ofgem

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ofgem Making a positive difference for energy consumers

Transmission Charging

Harriet.harmon@ofgem.gov.uk

Feb 2024

OFG1161

TNUoS will recover c.£4.1bn in 2024/5 FY		
Wider Charges	Relate to the 'meshed network' and vary by zone	c.£307m
Local Charges	Relate to the assets used to take your connection to the meshed network and are circuit-specific	c.£750m
Demand Charges	Contributions made based on import load/volumes	c.£3,100m

'Open Governance' means we make decisions on the proposed changes to the methodology put forward by industry – there are 24 with the Transmission Charging Team at various stages of the process

Near-term:

- How do we tackle the issue of **unpredictability** in Wider charges?
- What's the appropriate treatment of **new network configurations** like offshore co-ord and bootstraps?
- Are storage and other generation **technologies' effects** on the network accurately captured?
- To what extent should charges be based on proximity to demand? Does this **match** how the **system is planned**? **Should it**?

Longer-term

- What is the **future purpose** of TNUoS?
- In the long-term, what are the appropriate **access** and **charging** arrangements to complement the future system and potential reforms under REMA?
- Under the CSNP, SSEP etc. how **useful** is a locational charging signal? Who can respond to it, and how?
- Is the **current split** between connection, local, and wider charges appropriate in the context of broader reforms through REMA?

Our **Task Force** is working to identify root cause(s) of **unpredictability**, and live proposals raise other **important near-term questions**.
Long-term, there is a set of more existential questions on **TNUoS** and **connection charges**

Every policy question in charging requires consideration of sometimes **competing objectives and principles** to reach an answer.

- Net Zero could mean increased renewable deployment, and network build – we need to strike a balance between direct **consumer cost** and the **crucial generation investment** to reach NZ.

- Charges have to be **cost-reflective**, but if as a result of high degrees of cost-reflectivity they're **unpredictable**, are they an effective investment signal?

- Charges which best-reflect the network planning and build regime, and the effect of users might be very **complex**: how do we ensure that charges are as accurate as reasonably possibly without their complexity **becoming a barrier**?

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GRID & NETWORKS CONFERENCE 2024

No transition without transmission – the Leaders' Debate

Chaired by Professor Keith Bell,
ScottishPower Chair in Smart Grids,
University of Strathclyde

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No transition without transmission

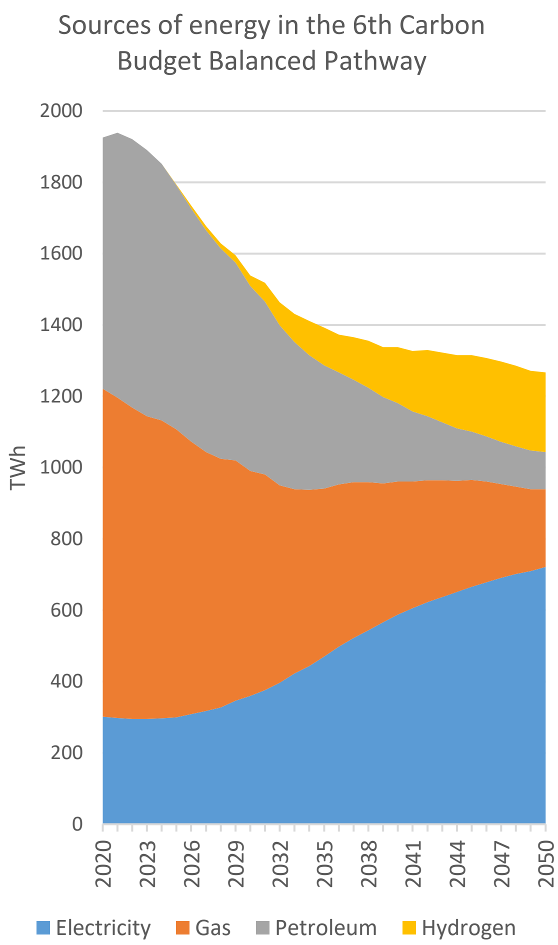
Introduction by Keith Bell

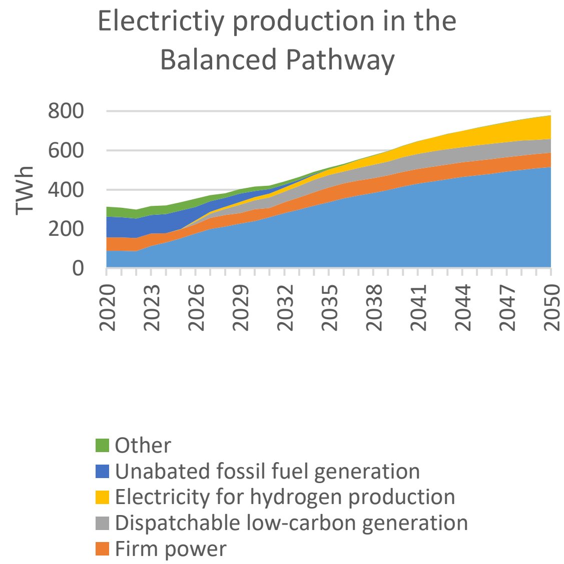
Holder of the ScottishPower Chair in Future Power Systems at the University of Strathclyde,
a co-Director of the UK Energy Research Centre
and a member of the UK's Climate Change Committee
http://www.strath.ac.uk/staff/bellkeithprof/

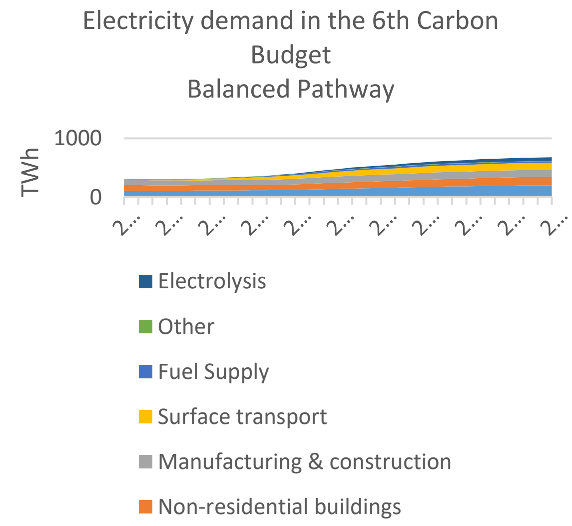
Scottish Renewables Grid Conference
Glasgow, February 15th 2024

Decarbonising the UK's energy system

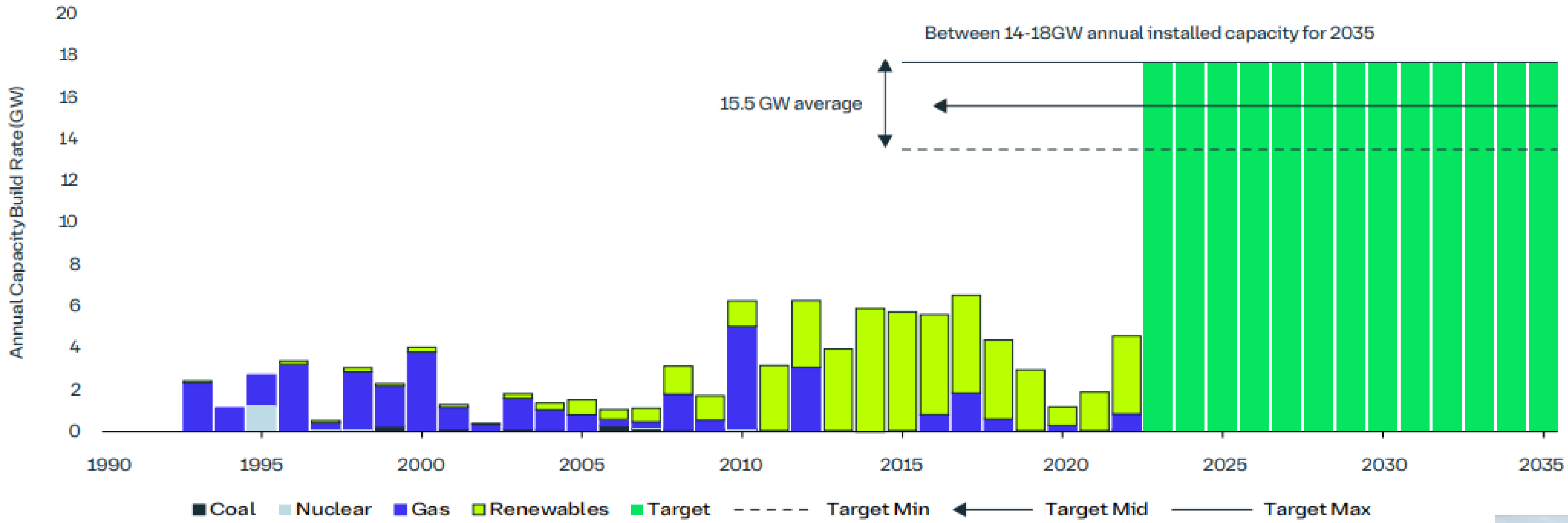
Source: CCC Analysis, Balanced Pathway

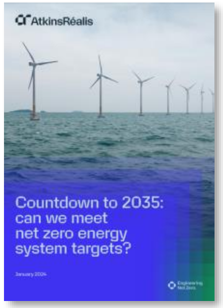






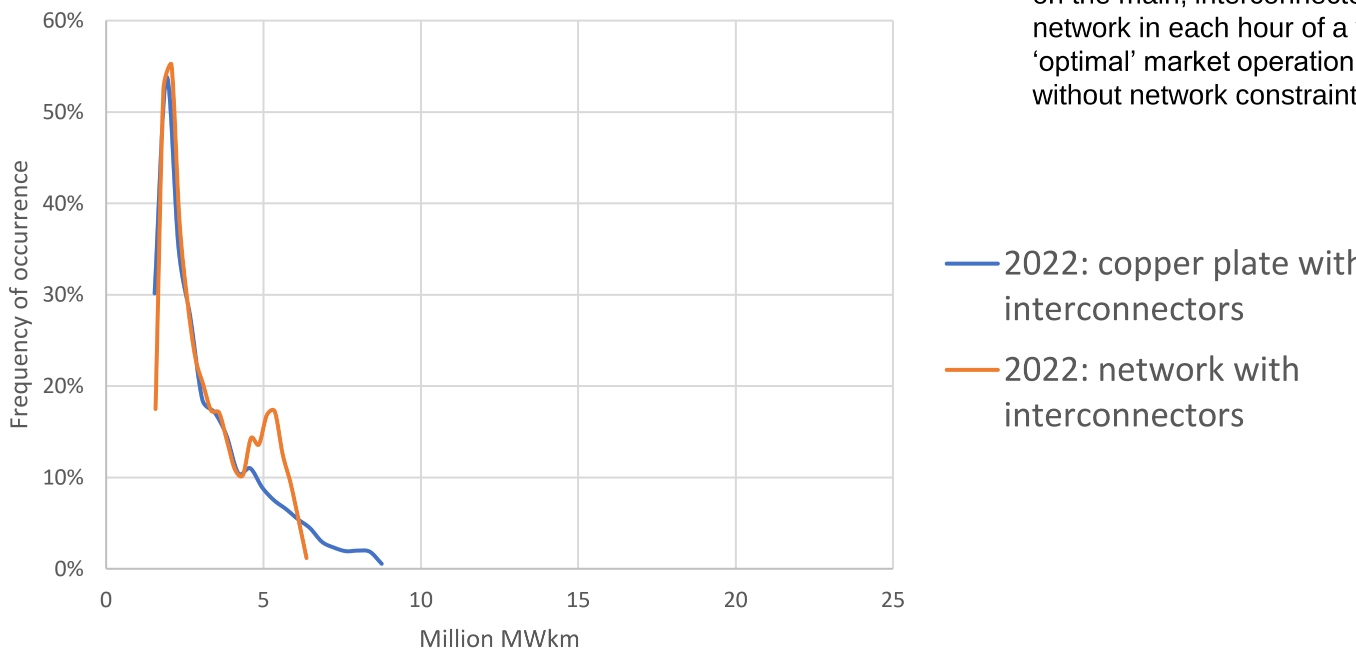
Scaling up investment in generation capacity





https://www.atkinsrealis.com/en/media/trade-releases/2024/2024-01-16

Need for the transmission network: how far does how much power travel?



Total ‘bulk transfer’ MWkm between zones on the main, interconnected transmission network in each hour of a year of simulated ‘optimal’ market operation, with and without network constraints

Analysis by Simon Gill for University of Strathclyde and ORE Catapult

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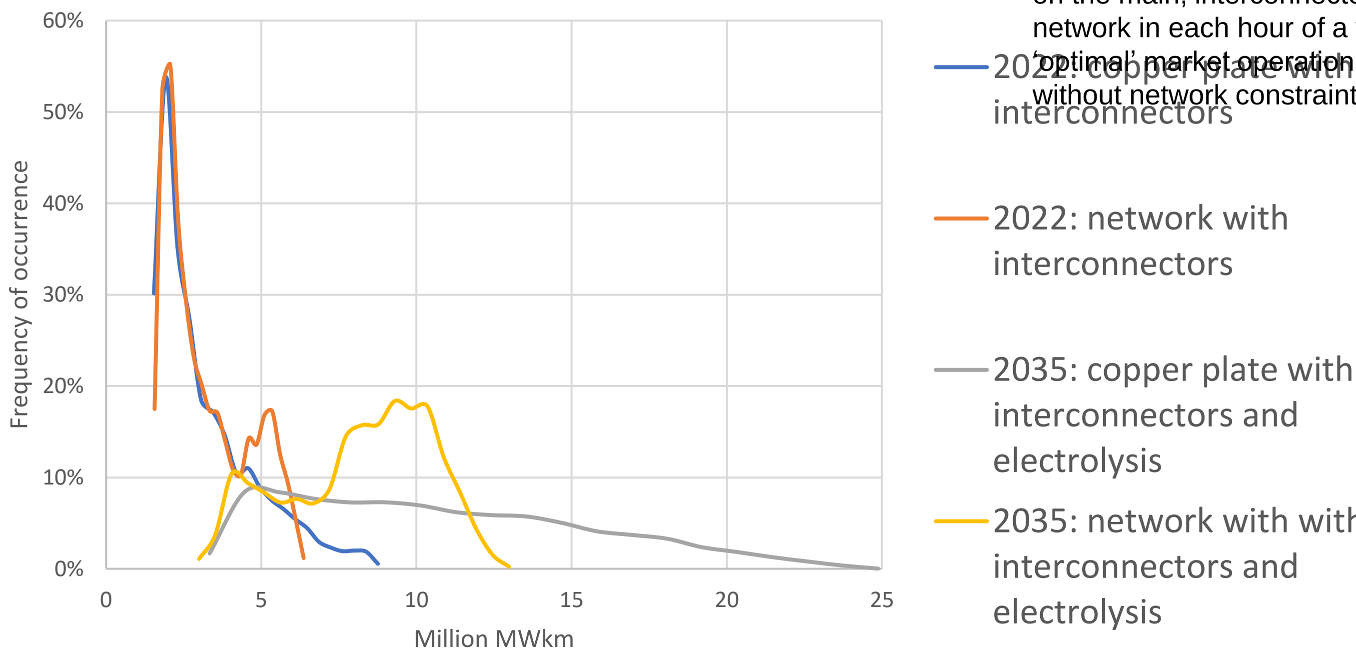
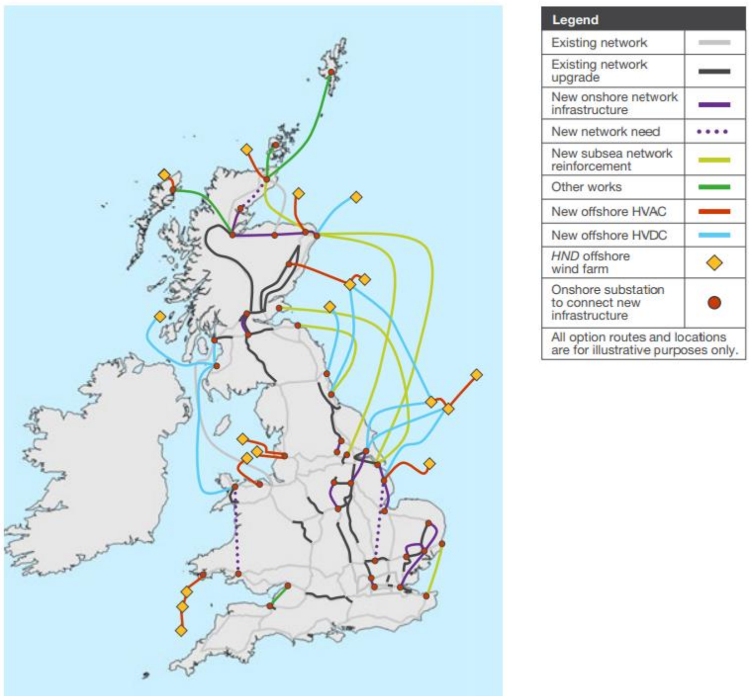


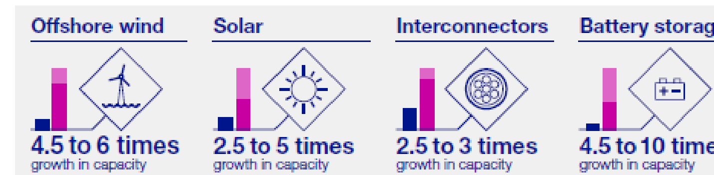
Analysis by Simon Gill for University of Strathclyde and ORE Catapult

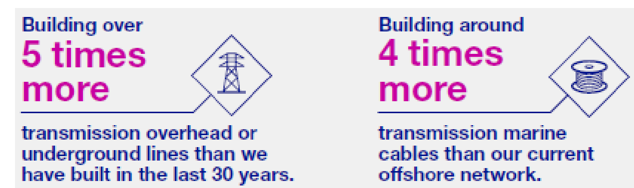
Current network investment plans



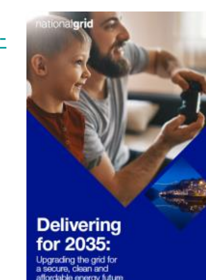
Major network reinforcements recommended by the ‘Holistic Network Design’
https://www.nationalgrideso.com/document/262676/download

According to NGET, by 2035:





https://www.nationalgrid.com/national-grid-sets-out-urgent-reform-energy-transition



Framework for the FSO's Centralised Strategic Network Plan

Supply & demand modelling and planning	Identify system need	Identify options	Cost-benefit analysis	Develop a CSNP	Handover to delivery body
• Credible future energy scenarios • Strategic Spatial Energy Plan: "**will determine the optimal mix, scale and location of generation infrastructure to transition to homegrown energy**"	• Identify developments needed to comply with the Security and Quality of Supply Standard (SQSS)	• "FSO, TOs and third parties identify a range of options to address network needs • "Includes network, non-network solutions, or wider strategic energy system solutions"	• "FSO carries out an appraisal of the technical, economic, social and environmental aspects of each option to form a strategic plan to 2050"	• economic, efficient, deliverable, and operable • compliant with the SQSS • has acceptable impacts, on environment and communities • facilitates decarbonisation	• The delivery body may be the TOs or third parties • Provide advice and guidance on strategic energy system solutions to government and Ofgem

https://www.ofgem.gov.uk/publications/decision-framework-future-system-operators-centralised-strategic-network-plan

How confident can we be that what's in the SSEP will be delivered?

- How much detail will it give?

No transition without transmission

Our panel

- Paul Wakeley
  - Head of Strategic Network Planning, National Grid ESO
- Aileen McLeod
  - Director of Business Planning and Commercial, SSEN Transmission
- Gareth Hislop
  - Head of Market Development and Commercial Operations, SP Energy Networks

Please feel free to use sli.do to pose questions. (Please use your name)

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