Shaping Our Energy Future: Local Area Energy Plans and Future Energy Scenarios

North Scotland regional webinar - 25th August 2020

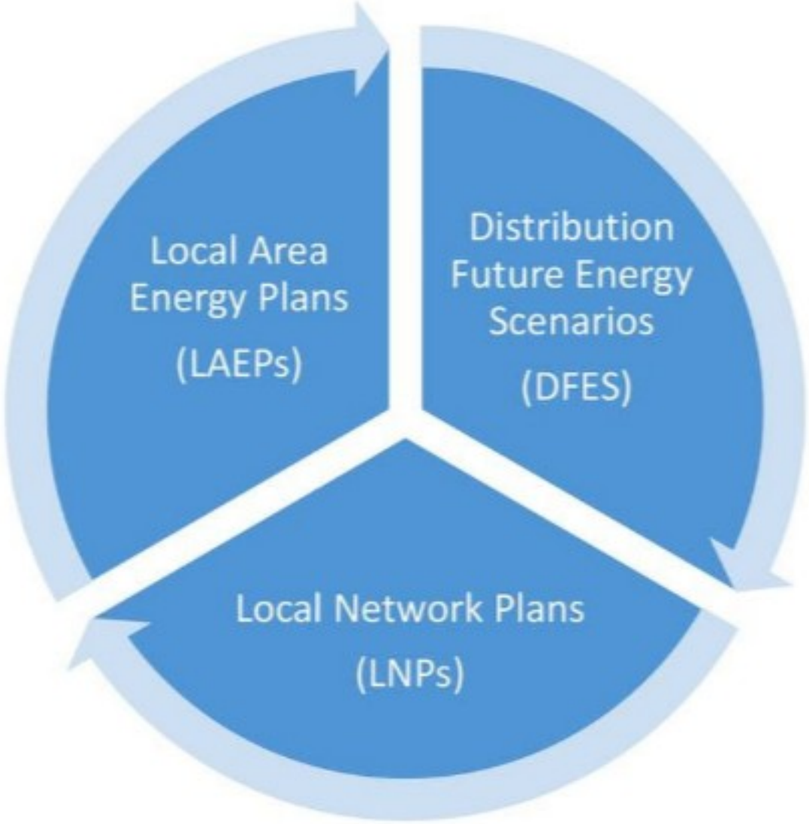
Welcome and Safety Moment

Graeme Keddie - Director of Corporate Affairs, Regulation and Stakeholder Engagement

What's the purpose of today's session?

CATAPULT Energy Systems

To inform and engage on the concept of **Local Area Energy Planning** and the importance of **robust energy data** and evidence, social process and governance.



regen transforming energy

To explain the role of **Distribution Future Energy Scenarios** in providing credible pathways for electricity demand and generation growth and understand your views on **the use of future energy technologies in your area**.

Scottish & Southern Electricity Networks

To set out the role of **Local Network Plans** in delivering an electricity network that supports **net zero ambition.** We will also explain how SSEN will work with local bodies to **build the evidence required** for our regulatory business plan.

Above all, we want your views, input and feedback...

Agenda and Housekeeping

Time	Activity	Presenter
10.00 – 10.10	Welcome and Safety Moment	Graeme Keddie – Director of Corporate Affairs, Regulation and Stakeholder Engagement (SSEN)
10.10 – 10.20	Introduction to SSEN and RIIO-ED2	Peter Williams – Head of Business & Network Strategy, ED2 (SSEN)
10.20 - 10.50	Planning Local Energy Systems	David Lee – Energy Systems Modelling Consultant (ESC) Bunmi Adefajo – Business Lead, Modelling (ESC)
10.50 – 11.00	***Break***	***All***
11.00 – 12.00	Regional Future Energy Scenarios **Interactive voting**	Ray Arrell – Head of Technical Development (Regen) Joel Venn – Head Analyst (Regen)
12.00 – 12.20	Local Network Plans	Trung Tran – Network Strategy Lead (SSEN)
12.20 – 12.30	**Q&A session and close**	Graeme Keddie and presenters

As we are expecting a large number of delegates, please help us manage the meeting effectively:

Please stay on mute unless invited to ask a question

To avoid bandwidth issues, only presenters should activate video

Please use the chat function to register a comment or question at any time.

If you'd like to ask a question during Q&A, please 'raise your hand'

Our Coronavirus Response – Four Key Priorities

Maintain critical operations and protect our employees

Support our customers, communities and partners

Emerge financially sound

Play our full part in the green recovery

Coronavirus (COVID-19)

We welcome your ongoing feedback and suggestions…

Introduction to SSEN and RIIO-ED2

Peter Williams - Head of Business & Network Strategy, ED2

SSE's Seven

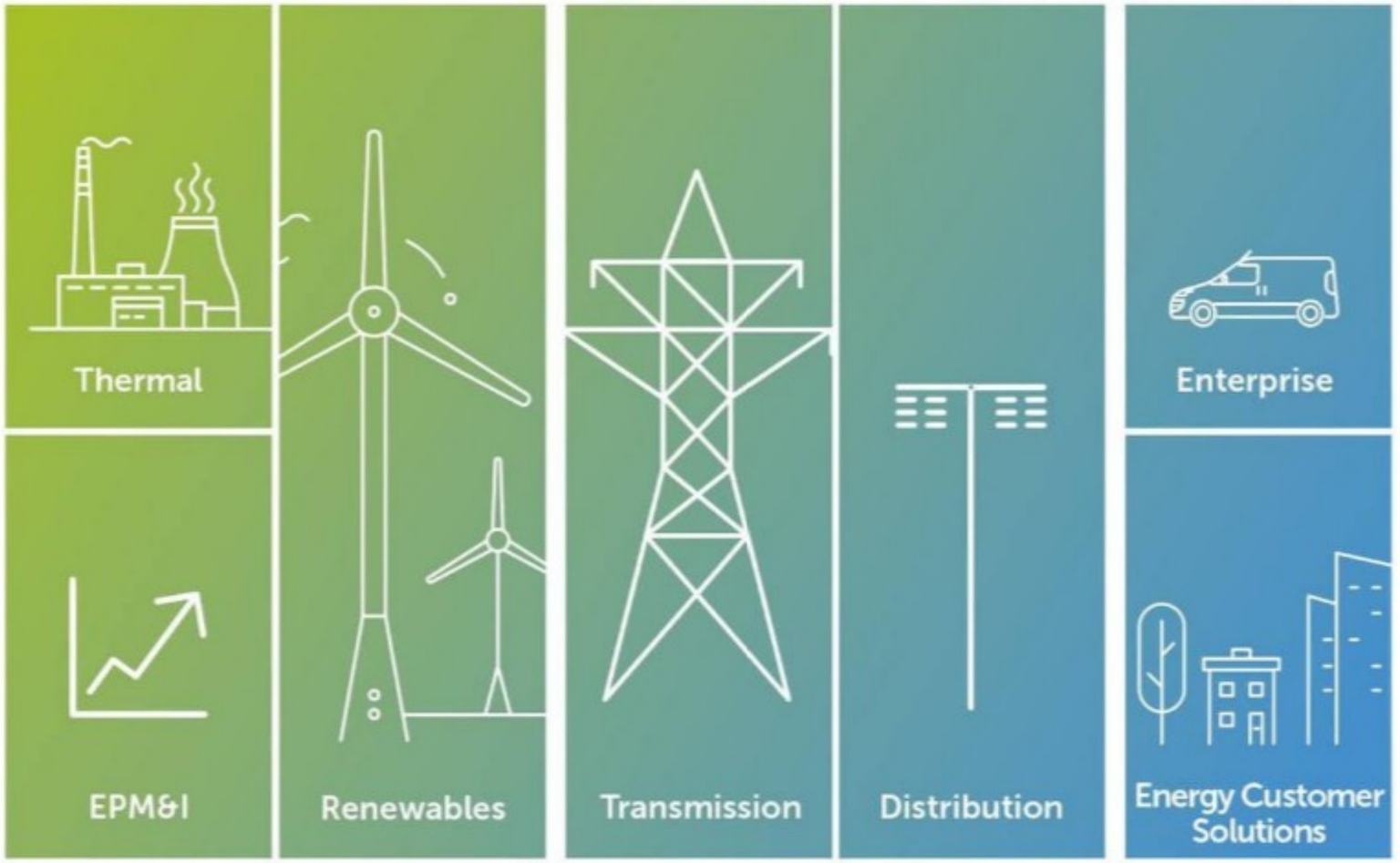
£8bn
NETWORKS RAV

4GW
RENEWABLE CAPACITY

COMBINED £1.5BN EBIT
FY19 EBIT SPLIT*

Renewables Networks Other

* Excluding Energy Portfolio Management



About SSEN

Our electricity distribution and transmission networks carry electricity to over 3.8 million homes and businesses across the north of the Central Belt of Scotland and Central Southern England.

Our skilled teams live and work in the communities they serve, supported by engineering and customer service teams based in major offices and depots in centres like Reading, Portsmouth, Perth and Inverness.

Our network at a glance

over **4,000** employees, working from 85 depots and offices in the heart if the community

130,000km of overhead lines and underground cables

106,000 substations

100+ subsea cables powering island communities

Power distributed to over **3.8m homes and businesses**

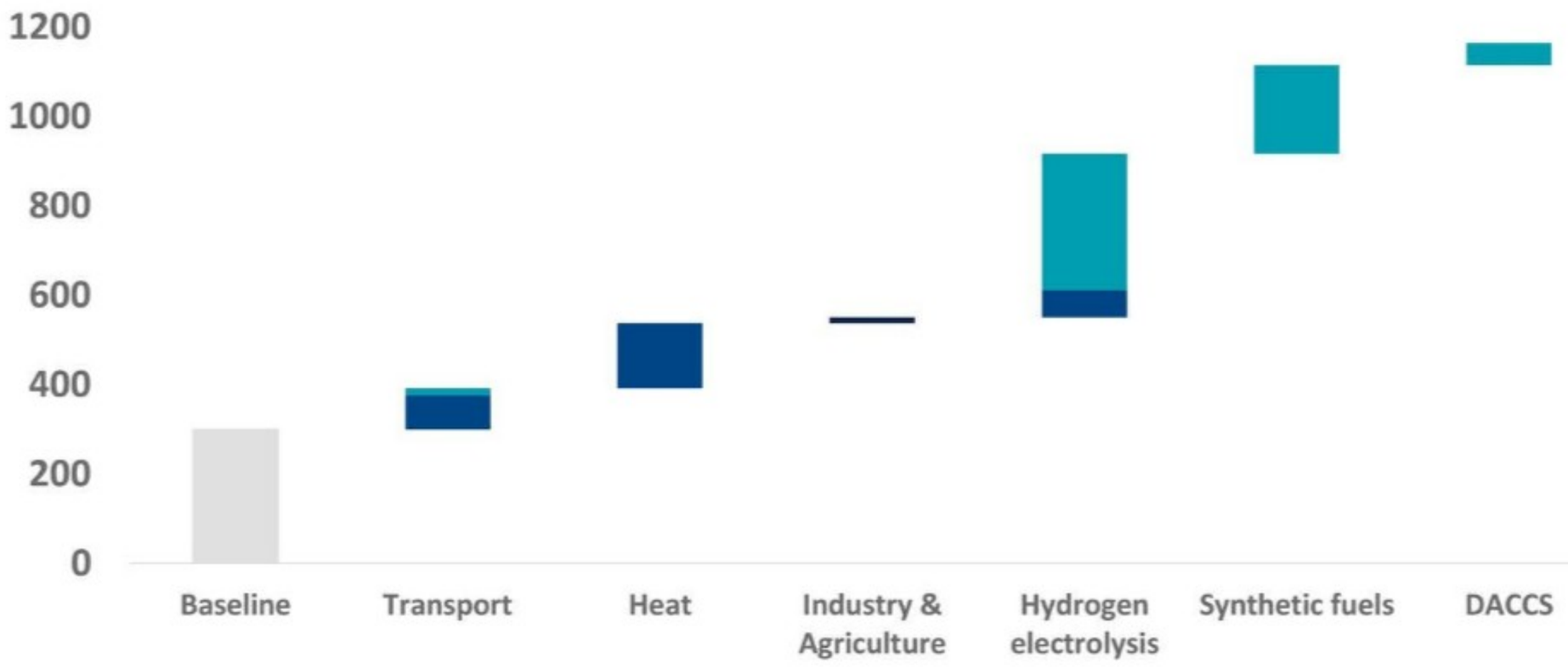
700,000+ vulnerable customers identified on our Priority Services Register

Scottish & Southern Electricity Networks

Net Zero will fundamentally reshape electricity demand

Government advisers, the Committee on Climate Change, predict an **electrification of the economy**

POTENTIAL NEW ELECTRICITY DEMANDS TO 2050 TO MEET NET ZERO (TWh/year)



Committee on Climate Change

Electricity demand could increase by 2 or 3 times by 2050

RIIO-ED2 Regulatory Timeline

- RIIO-ED2 is a five year 'price control' period from April 2023 to March 2028
- Each DNO must put forward a business plan to the energy regulator, Ofgem, on the investment it requires for this period.
  - Initial business plan to be submitted by 1st July 2021
  - Full business plan by 1st December 2021
  - Determination by Ofgem to take place in late 2022

Our Strategic Outcomes

Based on stakeholder feedback we have developed **four strategic outcomes** for our business plan, backed up by **three core principles** below:

CORE PRINCIPLES

VALUE FOR MONEY

…focusing on efficiency and creating value for customers and communities

INNOVATION

…embracing new ways of doing things for the benefit of customers and communities

TRANSPARENCY

…being open and accessible in our activity and engagement

Planning Local Energy Systems

David Lee, Bunmi Adefajo
Energy Systems Catapult

August 2020

@EnergySysCat LinkedIn

Contents

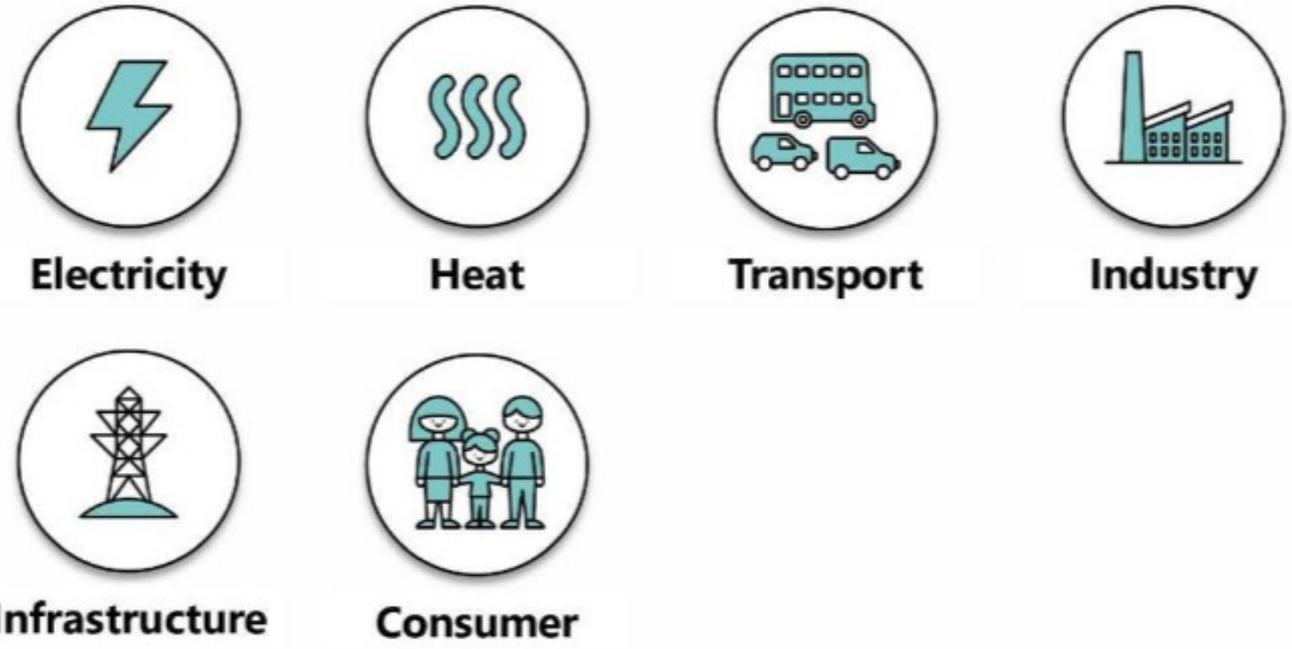
- Introduction to ESC
- Overview of approaches to planning local energy systems
  - Alignment with SSEN's Local Network Plans (LNP)
  - Best Practices
- Local area energy data
- Summary

About Energy Systems Catapult

MISSION

Unleash innovation and open new markets to capture the clean growth opportunity

WHOLE SYSTEM EXPERTISE AND APPROACH



Our capabilities and assets

CATAPULT Energy Systems

Modelling

- National Energy System Modelling
- Local Energy System Modelling
- Building Energy System Modelling

Consumer Insight

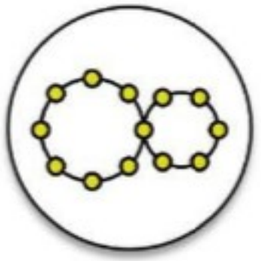
- Research
- Design
- Trials

Markets, Policy and Regulation

- Economic Analysis
- Corporate Positioning
- Policymaker interactions

Digital

- Home Energy Services Gateway
- Living Lab
- Data Science
- Data Systems
- Energy Knowledge eXchange™



Systems Integration

- Systems Engineering and Integration
- Business Model Innovation
- Dynamic Energy System Architecting and Simulation
- Energy System Integration Guides
- Future Power System Architecture
- Utility 2050

Infrastructure and Engineering

- Bioenergy
- Carbon Capture and Storage, Industry and Hydrogen
- Networks and Energy Storage
- Nuclear
- Renewables
- Transport

ESC Modelling tools

Expert whole energy system modelling to enable government, regulators, policy-makers and investors to better understand the pathways towards a **smarter low carbon future**

National Energy System Modelling and Analysis

Drawing on the internationally peer reviewed **Energy System Modelling Environment™ (ESME)** tool to inform and support government planning policy and industry decision-making.

Local Energy System Modelling and Analysis

Applying **EnergyPath Networks™** local area energy planning tool, to inform and support local authorities with cost effective low carbon energy transition.

Building Energy System Modelling and Analysis

Implementing a dynamic domestic energy modelling tool-kit (**Home Energy Dynamics**) to understand the interactions within a home, between different domestic heating systems, controls, building fabric, weather and consumer needs.

Local Area Energy Planning (LAEP)

Context

Decarbonisation - net zero by 2045 (Scotland) & 2050 (UK)

Rapid transformation of the energy system

What needs to happen – when and where?

To be cost-effective solutions will be dependent on place

Cost of meeting UK net-zero target: 1-2% (c . **£50bn**) of GDP in 2050[1]

Delivering the Paris Agreement will require annual global **investment** of **$1.6 – 3.8tn** on average **until 2050**[1]

https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf

Some of the toughest challenges for decarbonisation will likely require local and regional coordination and action

How to decarbonise buildings and what combinations of fabric upgrades, heating systems and infrastructure in different local areas

The future of the gas network (including the potential of hydrogen)

How to minimise the costs of the transition for consumers, including integration of electric vehicles and low carbon heating

Significant ambition and commitment from local areas to decarbonise ahead of national carbon budgets

Glasgow - aims to become the UK's first net-zero emissions city and is co-hosting COP26 in 2021

Bristol - ambition to be carbon neutral by 2030

Dundee – targeting net zero greenhouse emissions by 2045 or sooner

London - committed to being carbon neutral by 2030

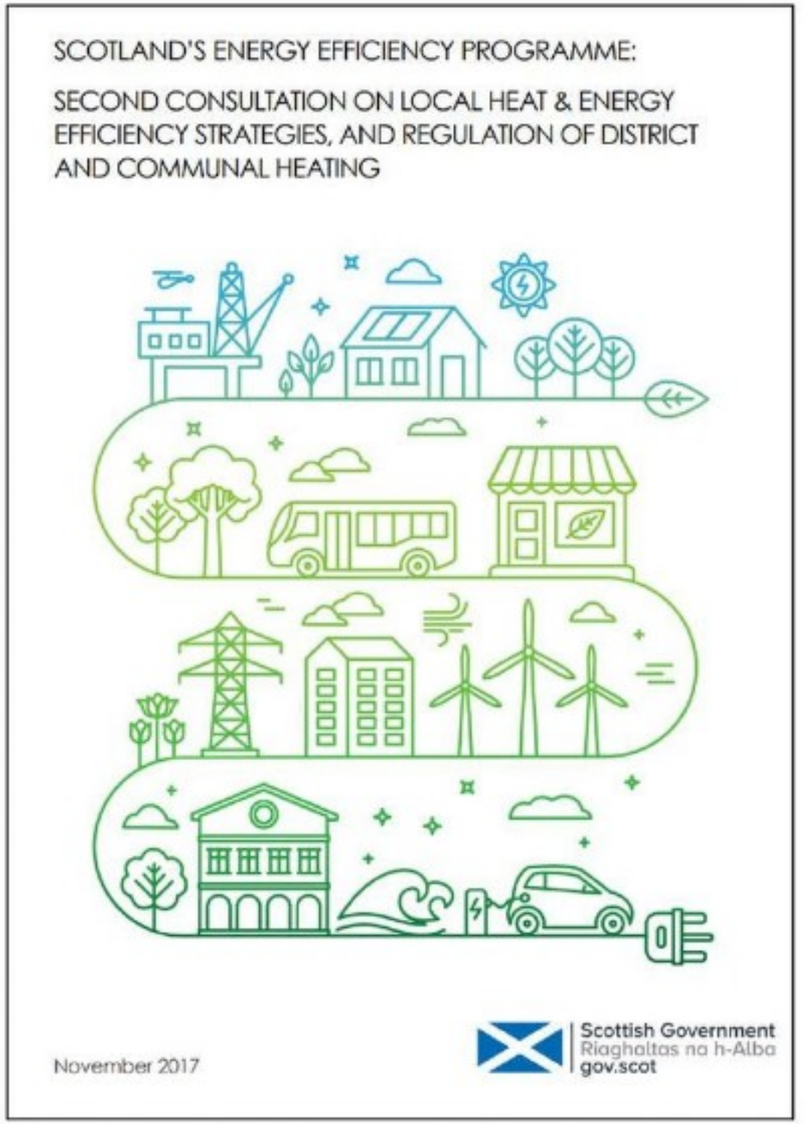
Greater Manchester - ambition to be carbon neutral by 2038

Local Heat and Energy Efficiency Strategies

- The Scottish Government are developing an approach to Local Heat and Energy Efficiency Strategies (LHEES)
- Pilots in all local authorities are mainly complete, the rest by December.
- Different methods and approaches have been tested across the pilots, which will lead to the development of a statutory LHEES methodology.
- Strong focus on local building stock and heat – which are key, but don't cover the whole system

Scottish Government
Riaghaltas na h-Alba
gov.scot

"One approach would be to build on LHEES to produce a more granular local area energy plan – one that encompasses all of the local energy system"



What is Local Area Energy Planning?

Local Area Energy Planning (LAEP) is a concept developed by the ESC to enable data-driven, spatial and collaborative planning of local energy systems – summarised by these 7 steps.

Each local area is different - its people, geography, building stock, energy networks and ambitions and priorities

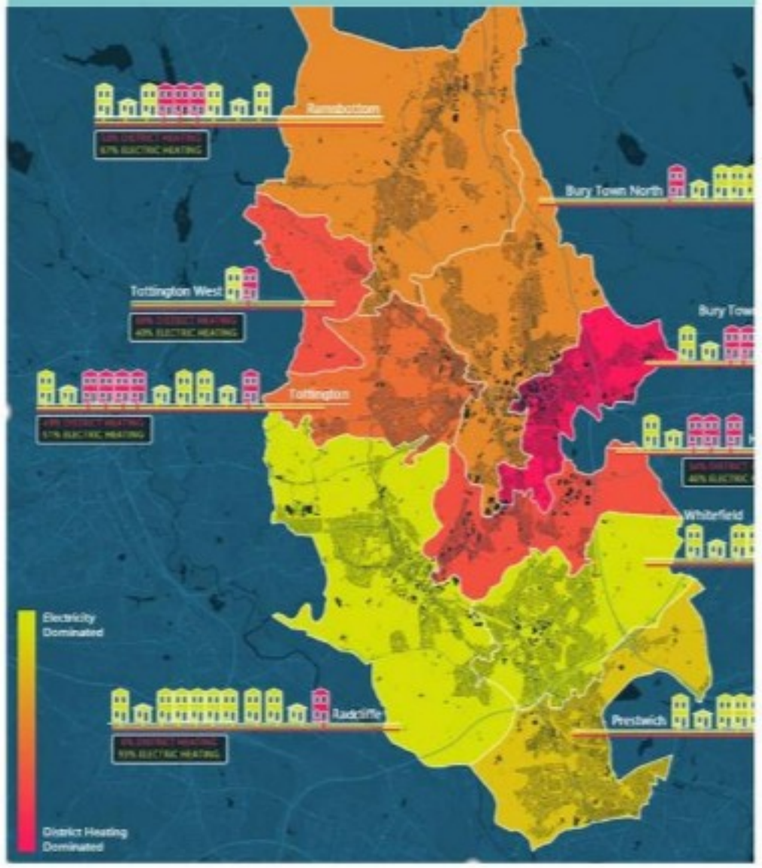
Local Area Energy Planning provides a data driven, spatial and collaborative means, involving local government & network operators, of exploring a range of possible future local energy scenarios to cost-effectively decarbonise

Resulting in the identification of energy network and system choices to support carbon neutral aspirations - informing what local action is needed and where

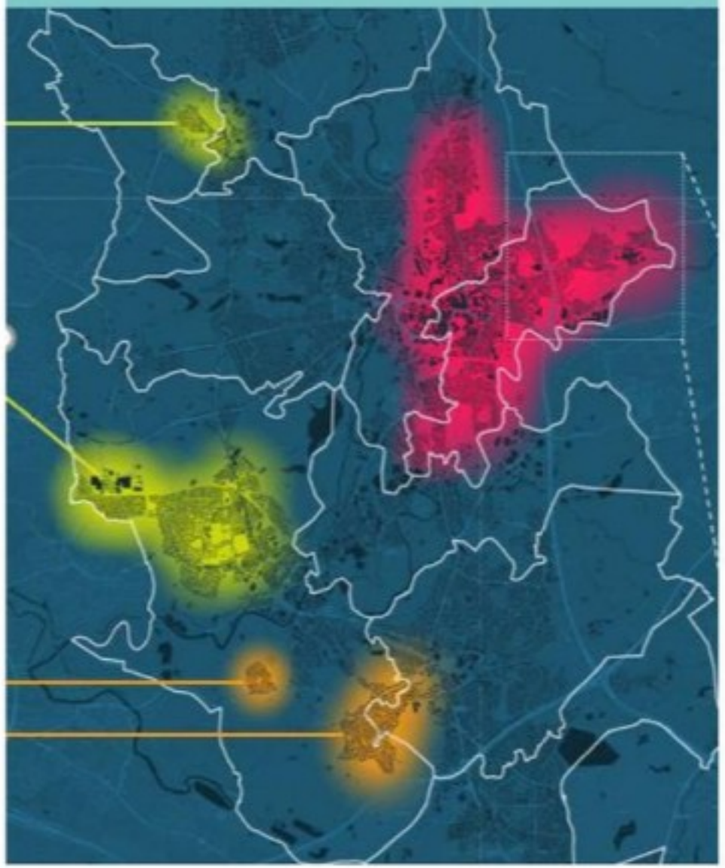
Developed a structured & repeatable framework to produce a Local Area Energy Plan

Understand **local options and choices for heat** in whole system context

Collaboratively develop a **long term evidence based plan** to decarbonise



Resulting in data and insight to **target innovation and deployment** projects



Piloted in three different UK cities

Smart System Heat Phase 1 & 2: Piloted local area energy planning with three different local areas

Bridgend

Newcastle

Greater Manchester

Based on these pilots, we developed the approach with Ofgem to produce guidance for a future LAEP methodology and also on the Energy Data Task Force to set out **Data Best Practice Principles** to help networks open up relevant data.

LAEP – The Best Practice Method

There are 4 key elements that constitute LAEP:

The use of **robust technical evidence** produced using analytical techniques which consider the whole energy system and make consistent use of available data

A comprehensive assessment of **wider non-technical factors** which need to be understood and addressed to secure change

A well designed and involving **social process** which engages appropriate stakeholders effectively, uses the technical evidence appropriately, and manages vested interests effectively, thus ensuring the resulting plan can be seen as an informed and legitimate representation of local intent in relation to energy system decarbonisation

A credible and sustained approach to **governance and delivery**

SSEN Local Network Plans

- SSEN is developing local network plans to better understand the impacts on its network.
- This helps SSEN make strategic investment decisions that will support decarbonisation in its network areas.
- As led by SSEN, the local network planning approach focuses on the electricity side of the system, at a level of detail that allows coverage of the network area
- This acts as key component of the technical part of a local area energy planning process and is a crucial stepping stone to the full process – which would also include:
    - The other energy vectors
    - A greater level of spatial detail
    - A wider social engagement process
    - Assessment of future uncertainty

The full process would need the local authority and all local network operators to work together

Local Energy Data

Create & understand the local area energy system

The Local Area Energy Planning (LAEP) process involves assessment and creation of a baseline energy profile for a specific local area. ESC has developed a Local Energy Asset Representation (LEAR) tool to aid this.

Local Energy Asset Representation (LEAR) is built on national data:

Ordnance Survey

Office for National Statistics

Scottish Government
Riaghaltas na h-Alba
gov.scot

Department for Business, Energy & Industrial Strategy

Llywodraeth Cymru
Welsh Government

Valuation Office Agency

National Atmospheric Emissions Inventory

ZAP MAP

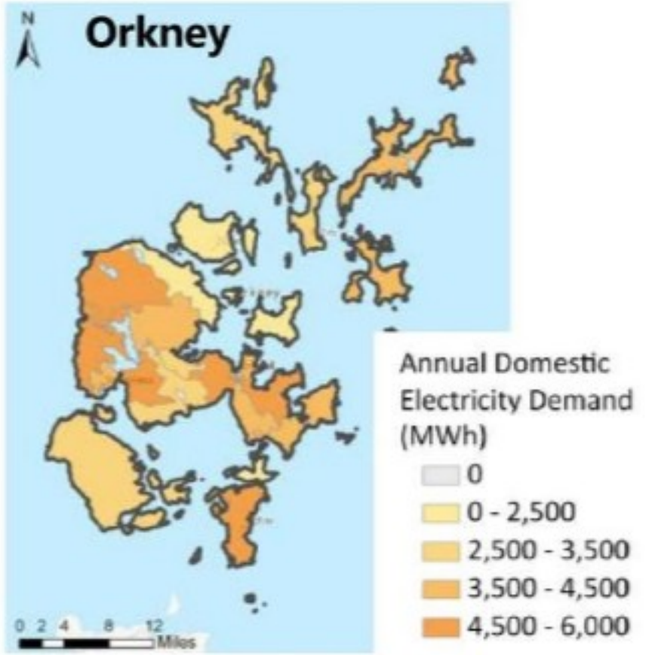
Have you...

- ❑ Understood the local area's current energy system, demands and other relevant characteristics?
- ❑ Identified the resources and approach to create a local area representation?
- ❑ Considered how data will be collated, assessed and utilised in the future to maximise its potential?
- ❑ Created a spatial representation of the local area's current energy system and future energy requirements?

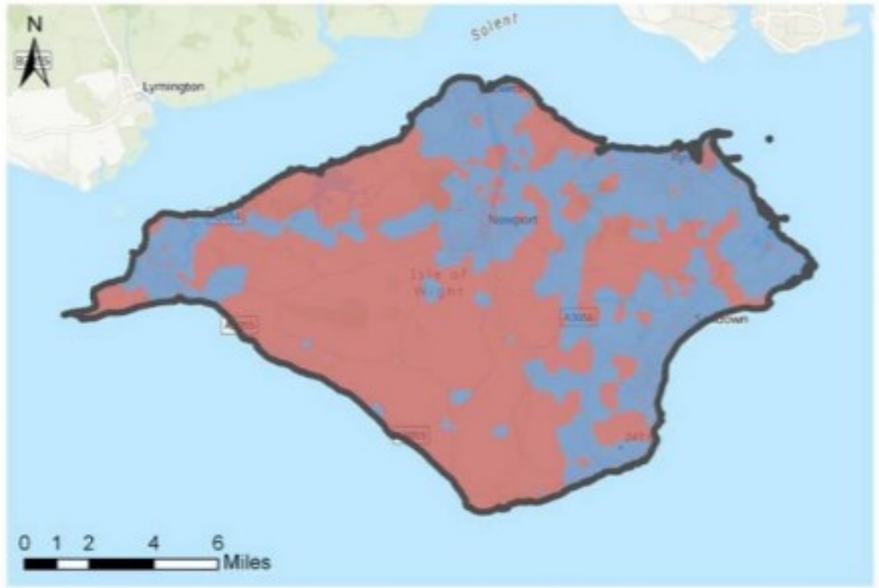
Create & understand the local area energy system

LEAR can represent the energy assets of a local area including:

- Houses
- Energy Networks
- Social Data
- Commercial and public buildings
- Energy Demands
- Embedded Generation
- EVs and Charge points
- Listed Buildings and Heritage Sites
- Data Quality and Completeness



Isle of Wight Postcodes not on Gas Network



LEARs also include Automated Spatial Analysis

- such as to identify off-street parking and rooftop PV sites

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Homes with potential space for off-street parking for charging electric vehicles

Percentage of dwellings on road with potential for off-street parking

- 0% - 20%
- 20% - 40%
- 40% - 60%
- 60% - 80%
- 80% - 100%
- N/A

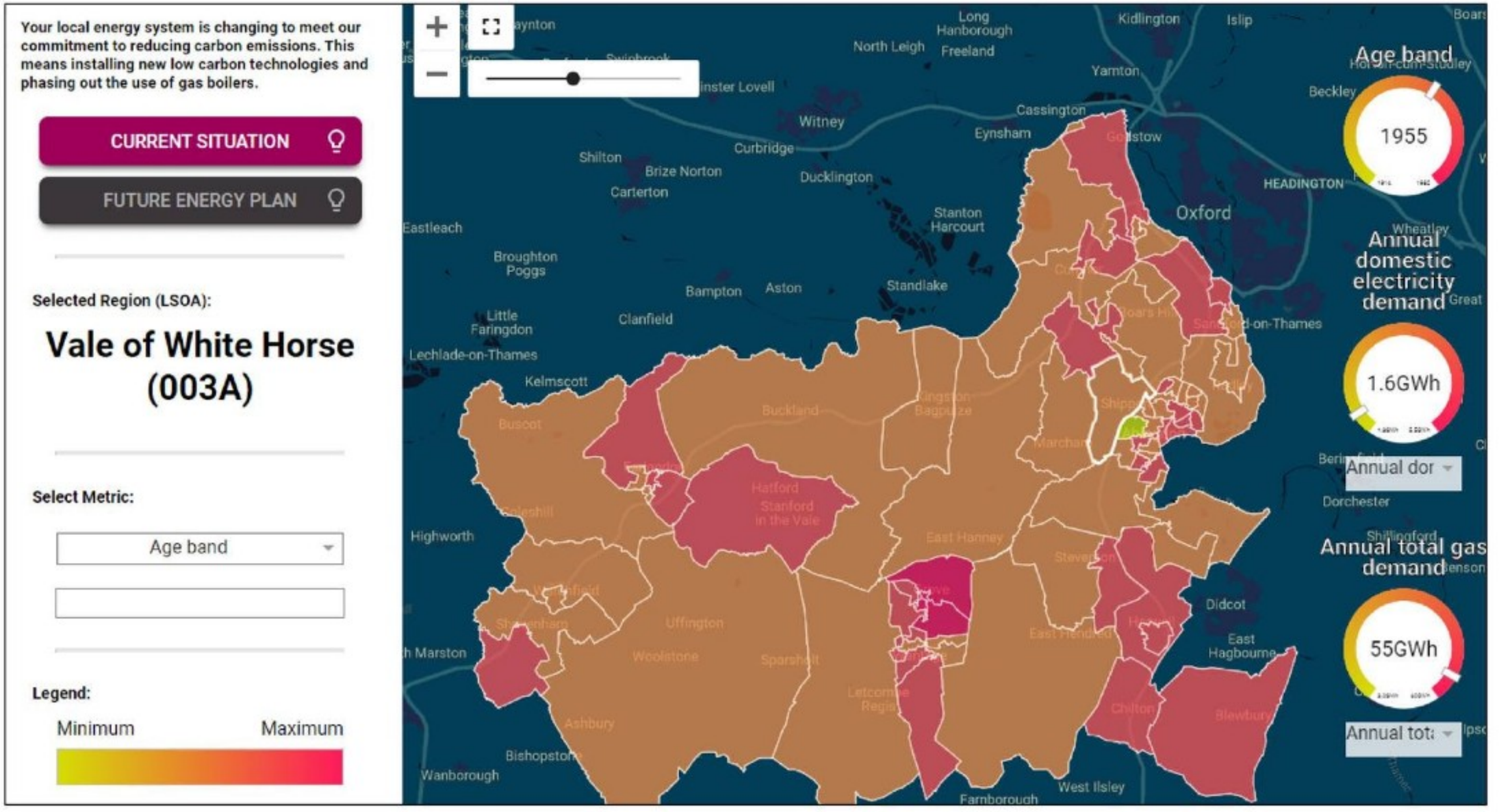
Homes suitable for rooftop solar panels

- Not suitable
- Suitable

Dwellings eligible for PV in area: 587

Combined capacity of these dwellings: 1,358kW

Data Visualisation



Summary

Local Area Energy Planning (LAEP) is a process to enable data-driven, spatial and collaborative planning of local energy systems, to ensure cost-effective decarbonisation of local areas

There are 4 key elements that constitute LAEP:

- robust technical evidence
- wider non-technical factors which need to be understood and addressed to secure change
- well designed and involving social process which engages appropriate stakeholders
- credible and sustained approach to governance and delivery

Data is Key – our work on the Energy Data Task Force sets out Data Best Practice Principles to help networks open up relevant data, and unlock innovation to help decarbonise local areas

CATAPULT
Energy Systems

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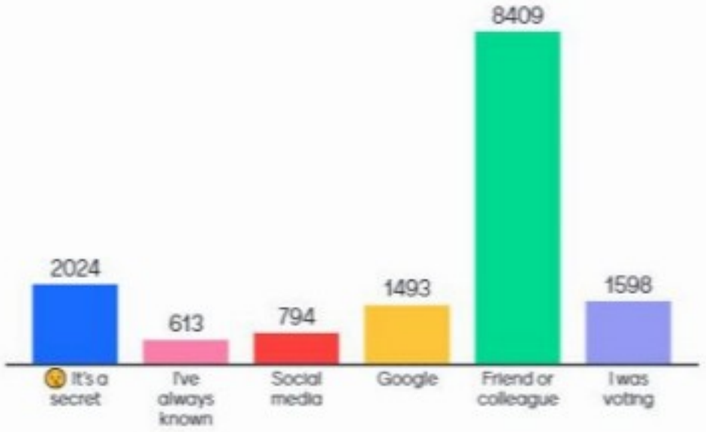
Introduction to Mentimeter

→ Ray Arrell - Head of Technical Services, Regen

Go to **www.menti.com** and use the code **65 79 30**

How did you find out about Mentimeter?

Mentimeter



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Mentimeter

Please enter the code

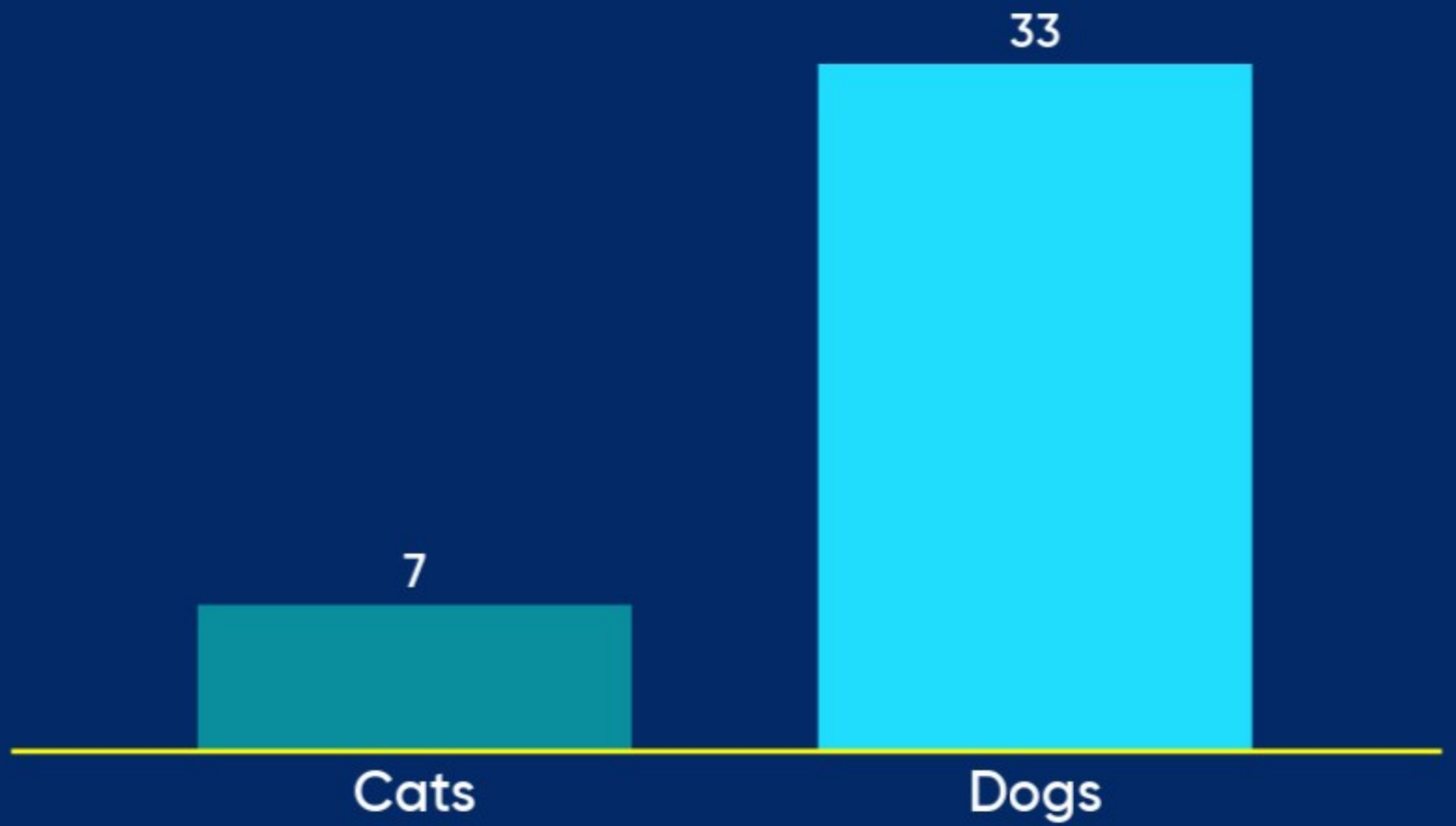
12 34 56

Submit

The code is found on the screen in front of you

Powered by Mentimeter Terms

Test question! Which is your favourite?



Break - see you in 10 mins

Welcome back...

Distribution Network Future Energy Scenarios (DFES)

- Ray Arrell - Head of Technical Development, Regen
- Joel Venn - Head Analyst, Regen

A bit about Regen...

Regen is a not-for-profit centre of energy expertise and market insight, based in Exeter, Devon whose mission is to transform the world's energy systems for a zero carbon future.

We have delivered Distribution Network Future Energy Scenarios (DFES) assessments since 2015

In this session we will be...

- Briefly summarising what DFES' are and how we do them
- Asking for your views on future energy technologies in North Scotland
- Giving you an opportunity to ask us some questions about DFES

DFES analysis is part of wider future forecasting and network planning processes

The DFES uses the National Grid ESO Future Energy Scenarios 2020 framework:

Credit & source: National Grid ESO, July 2020

- Underlying societal/economic framing of scenarios
- Future technology assumptions
- National UK trends
- Regional datasets (where available)

The DFES assesses:

1) Key distributed generation and storage projects that are (or will) directly connect to SSEN's electricity distribution network:

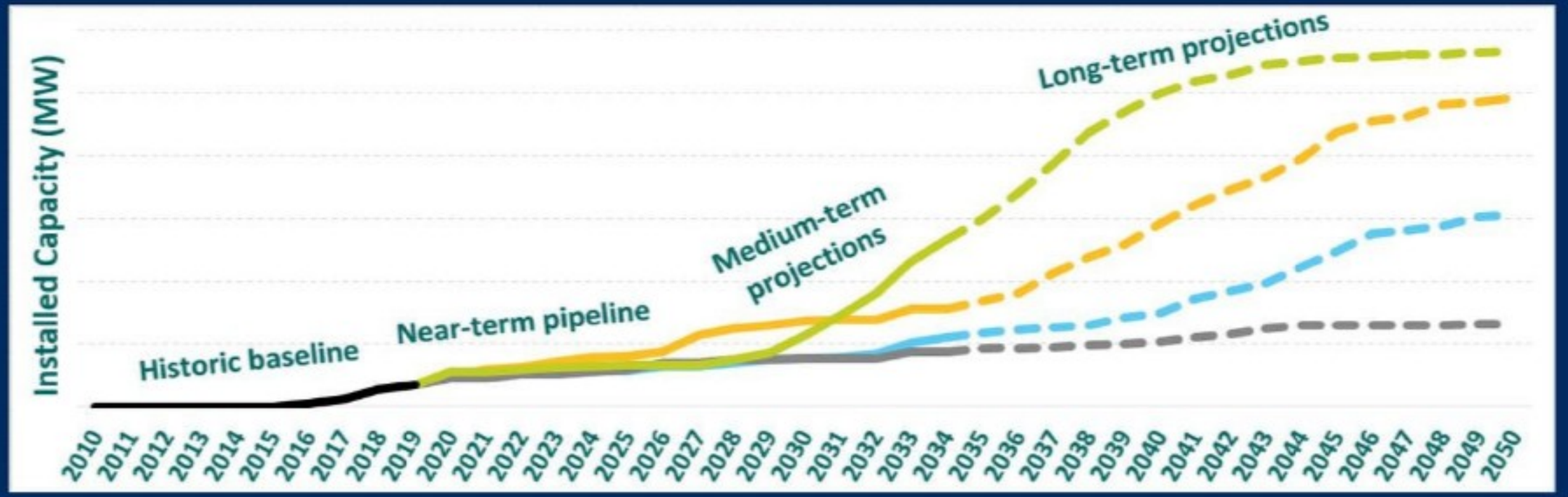
- All major renewable energy generation technologies (wind, solar, hydro, marine)
- All major waste-driven generation technologies (AD, biomass, sewage, ACT)
- Fossil fuel generation technologies (natural gas and diesel)
- Electricity storage technologies (batteries, pumped storage)
- Future disruptive technologies (hydrogen generation, electrolysers)

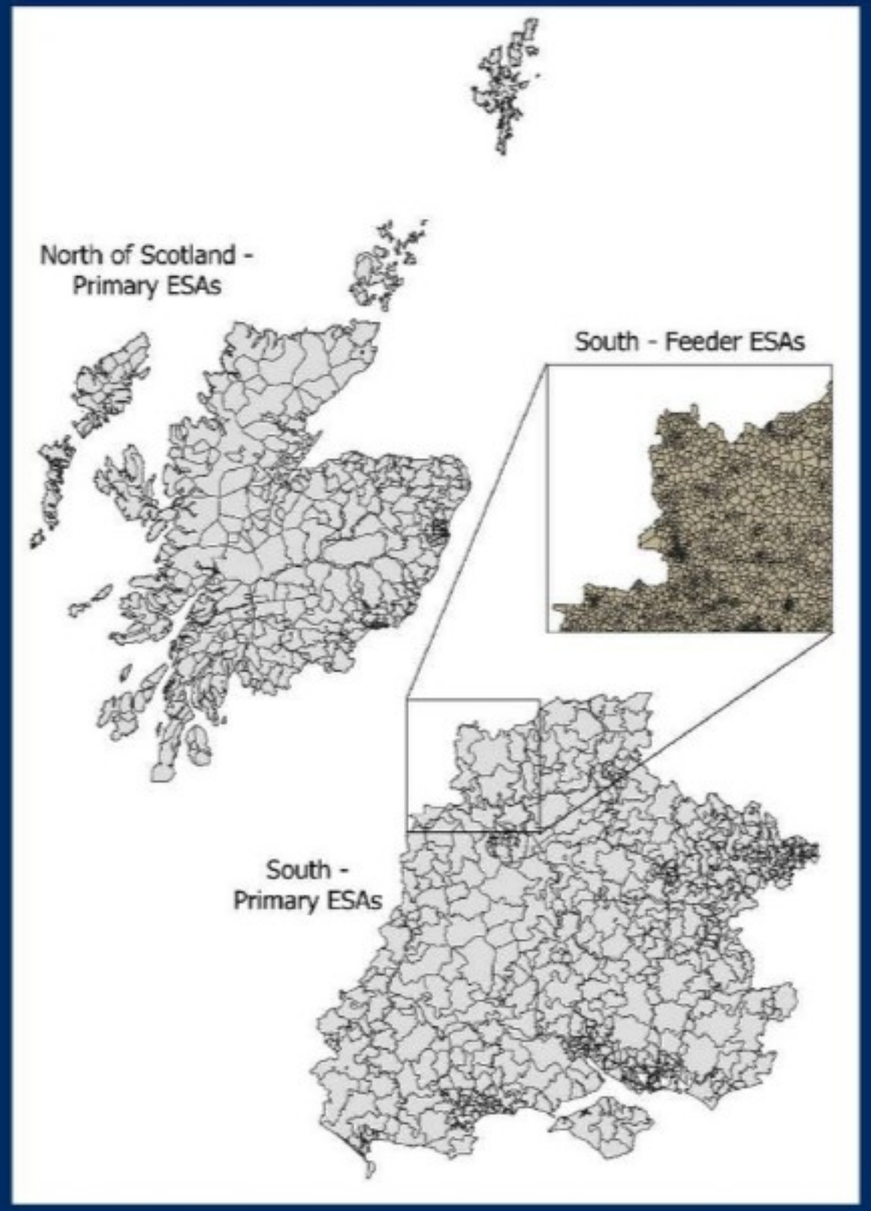
2) Key low carbon technologies that might connect to SSEN's network at lower voltages:

- Electric vehicles (cars, buses, coaches, LGVs, HGVs, motorbikes)
- Electric vehicle chargers (on & off street, workplace, fleet/depot, destination car parks)
- Heating technologies (heat pumps, hybrid heating systems, direct electric heaters)
- Rooftop solar PV

The DFES follows a four-stage process where, for each of the technologies in-scope, it:

1. Determines the existing baseline
2. Assesses the near-term pipeline
3. Develops medium and long term projections out to 2050
4. Geographically distributes these technologies/capacities within the licence areas





The DFES distributes its projections into **Electricity Supply Areas (ESAs)**

Using technology specific geographical factors

Generation & storage projections - 11kV substation level

LCT projections – feeder/secondary substation

A bit more about you...

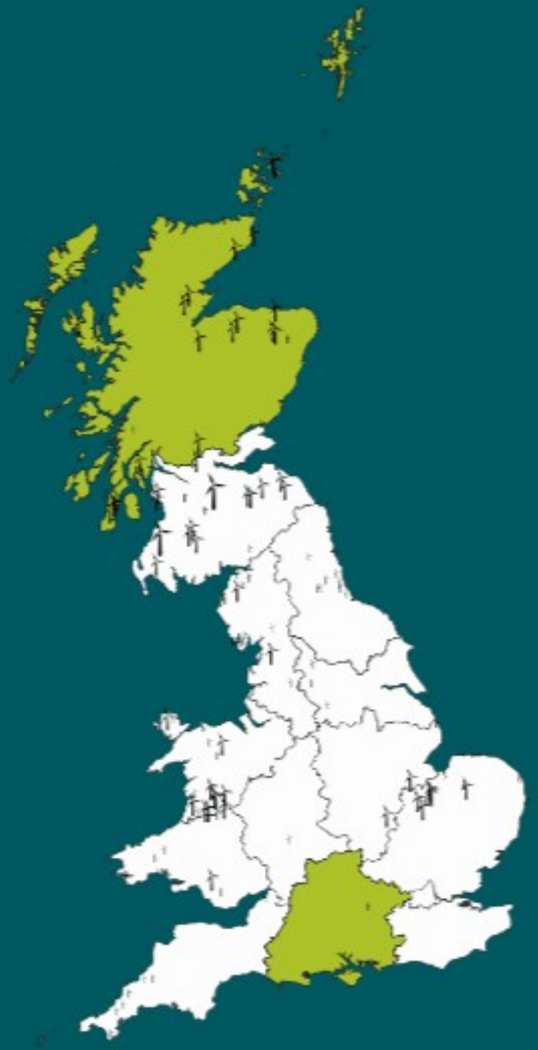
What is your name?

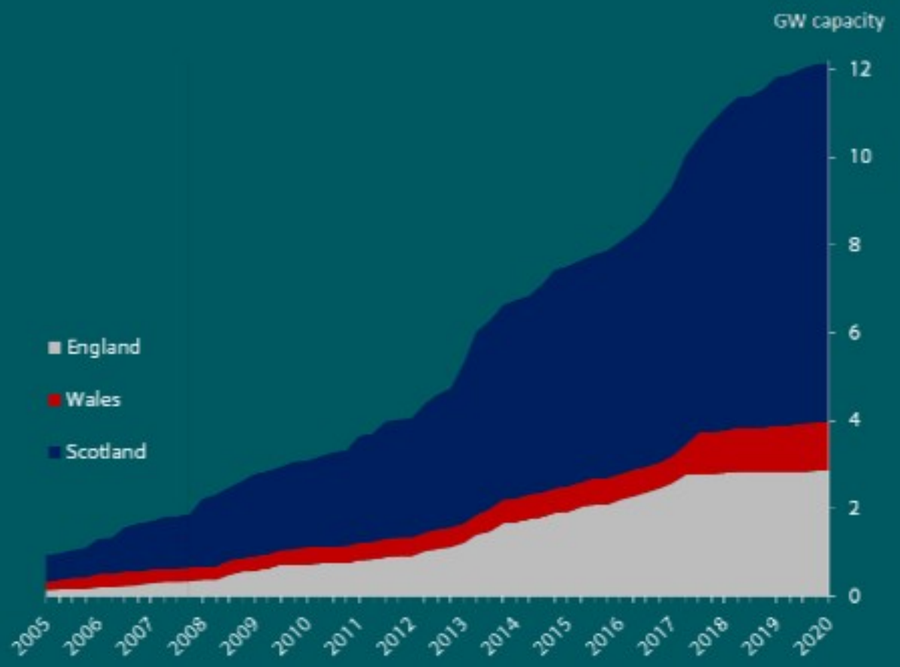
Where do you work?

What sector do you work in?

Generation & storage deployment

- Onshore wind
- Battery storage





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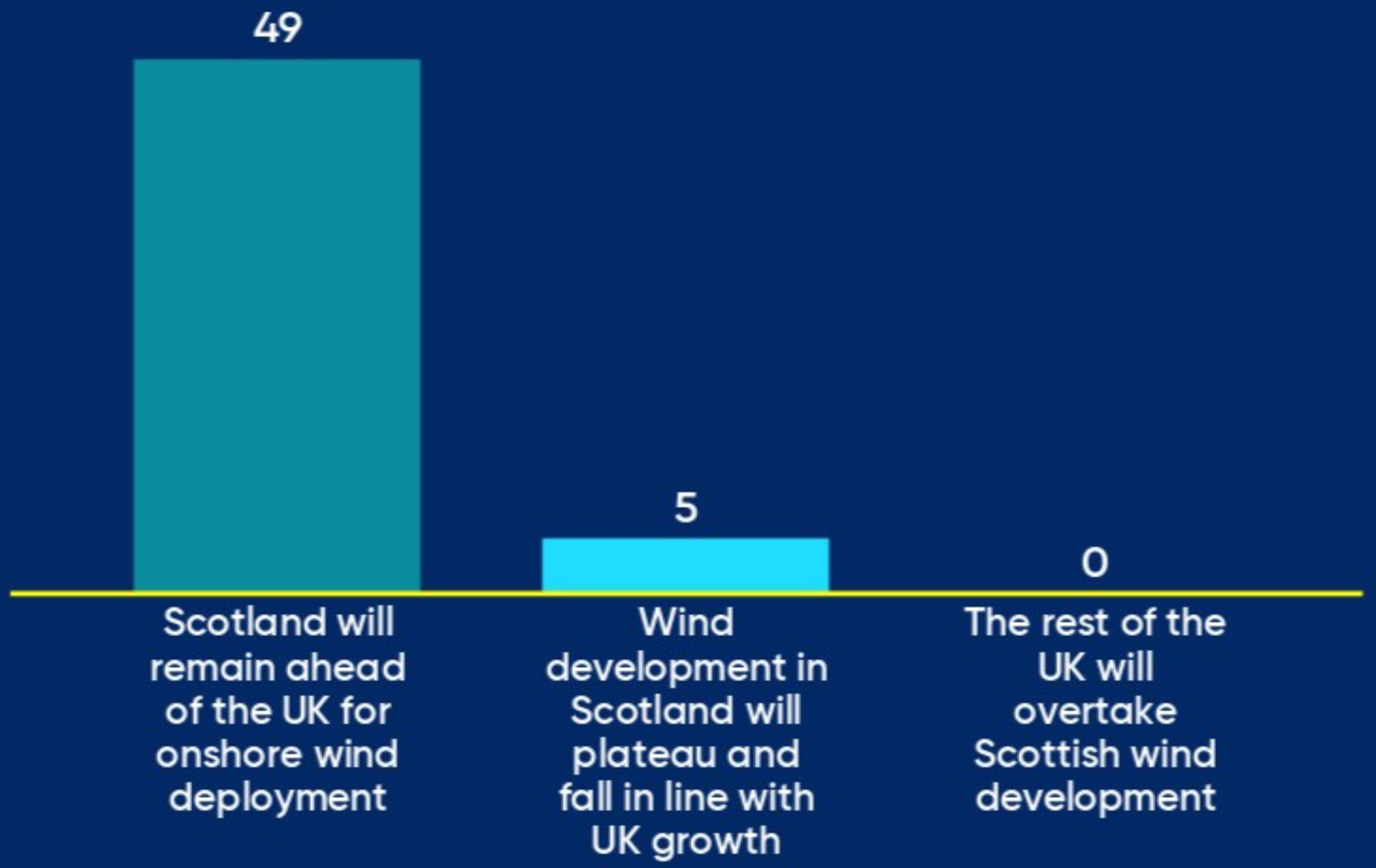
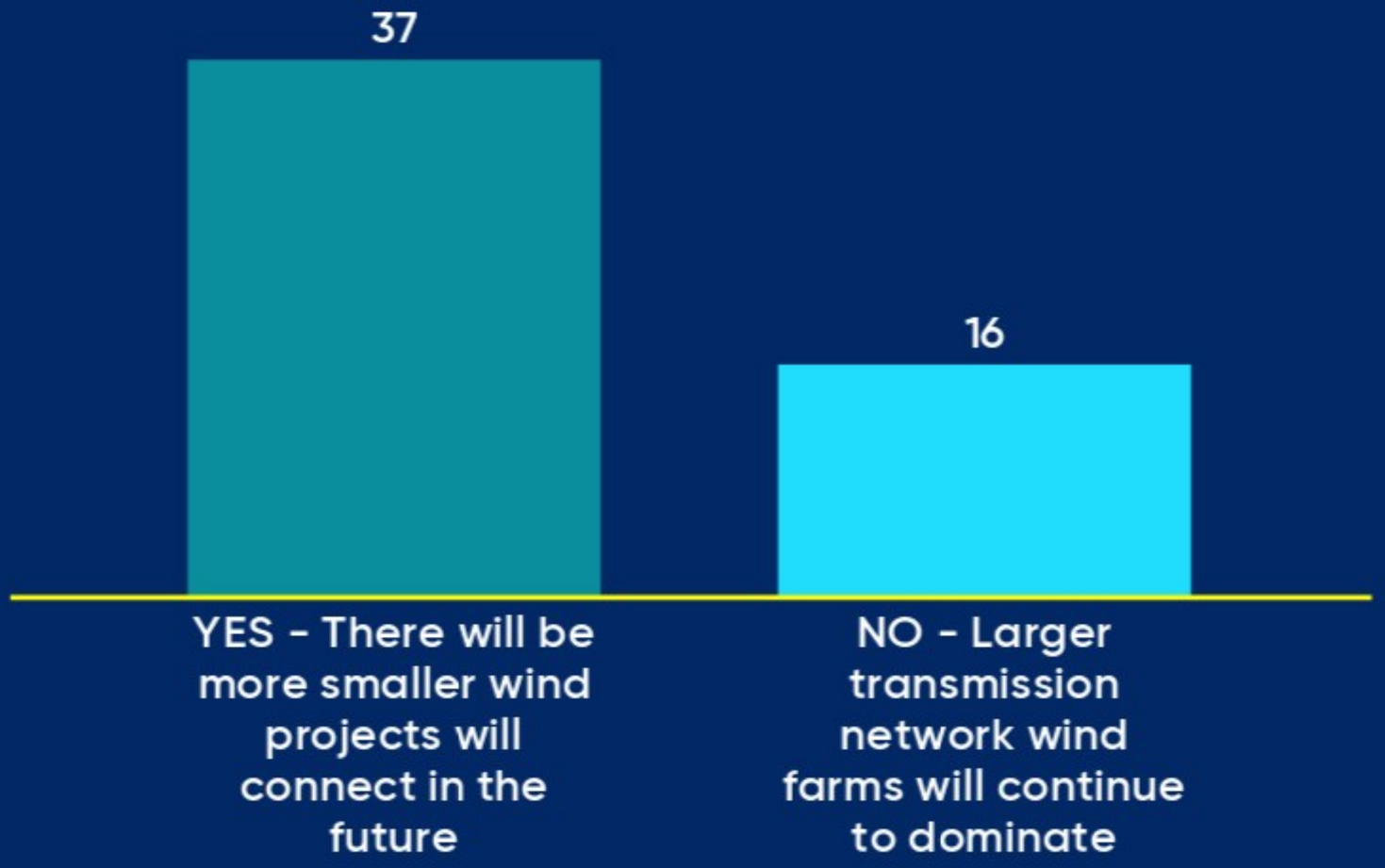
Of the 1.9GW of onshore wind in North Scotland most is transmission connected. c.0.8GW is connected to SSEN's network plus another 1.8GW is contracted

How might onshore wind development in Scotland compare to the rest of UK out to 2050?



...and will Scotland start to see more smaller wind projects connecting to the distribution network?



Electricity storage

- Batteries
- Pumped hydro

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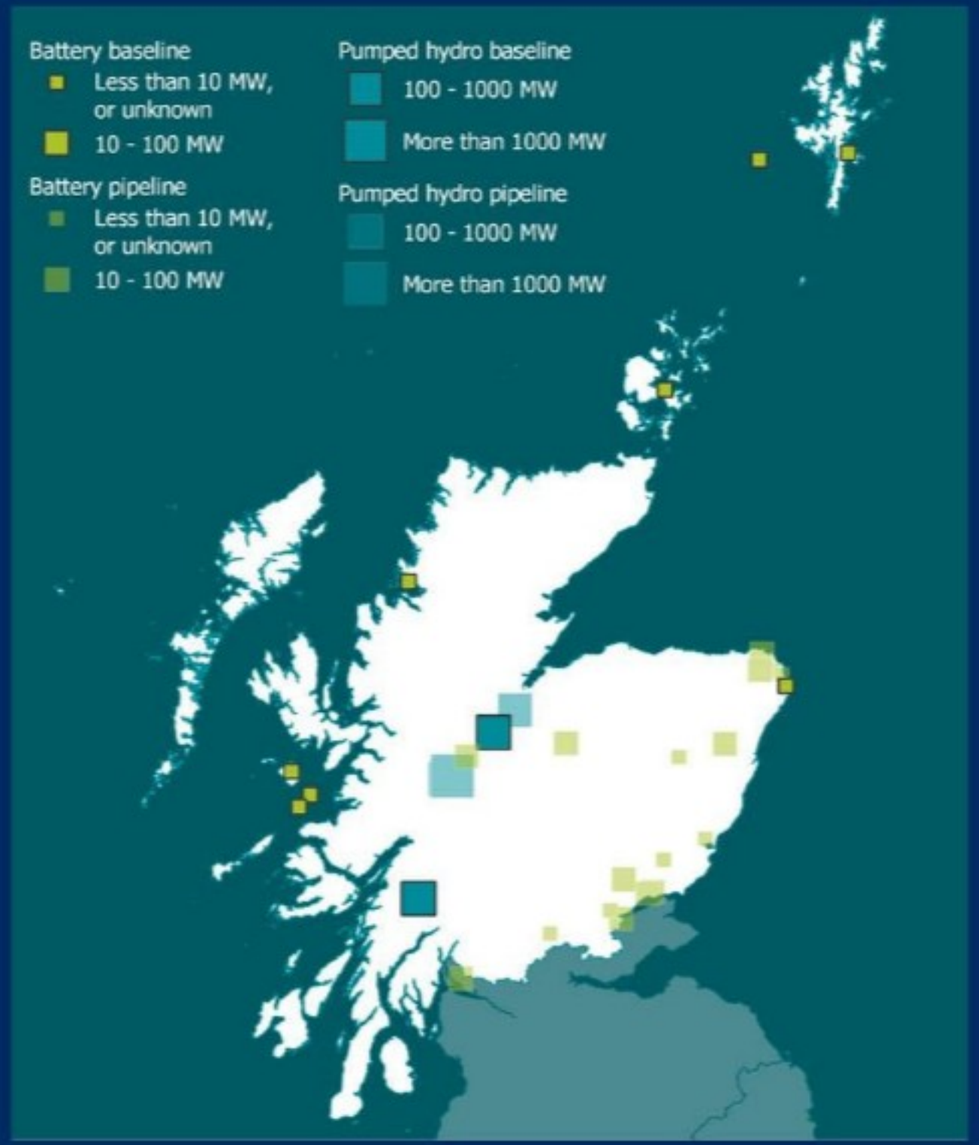
DFES categorises electricity storage projects into 4 key business models:

Storage business model	Description	Typical size / scale	Energy storage duration
Standalone grid services	Dedicated storage projects providing balancing services to the network	Multiple MW (potentially up to 50/100MW)	Between 30mins and 2-4 hours (increasing out to 2050)
Generation co-location	Typically co-located with a solar, wind or potentially gas generation sites	Multiple MW (somewhat linked to generation project size)	Potentially 2-6 hours Varies by generation technology (increasing out to 2050)
Behind-the-meter high energy user	Co-located with a large energy consumer	Hundreds of kW to low MW scale (could be industry specific)	2-4 hours Could vary by industry
Domestic batteries	Home battery units, used with rooftop PV and for back-up	Typically up to 10kW-20kW scale	2-4 hours



Electricity storage – baseline and pipeline

- 8 small batteries currently connected on the Islands/Highland areas totalling 4.2MW
- Strong pipeline of 15 battery projects – mostly standalone – totalling 374MW
- Pumped hydro projects (baseline & pipeline) are all transmission network connected

Which business model do you think will see the most capacity (MW) growth by 2050?

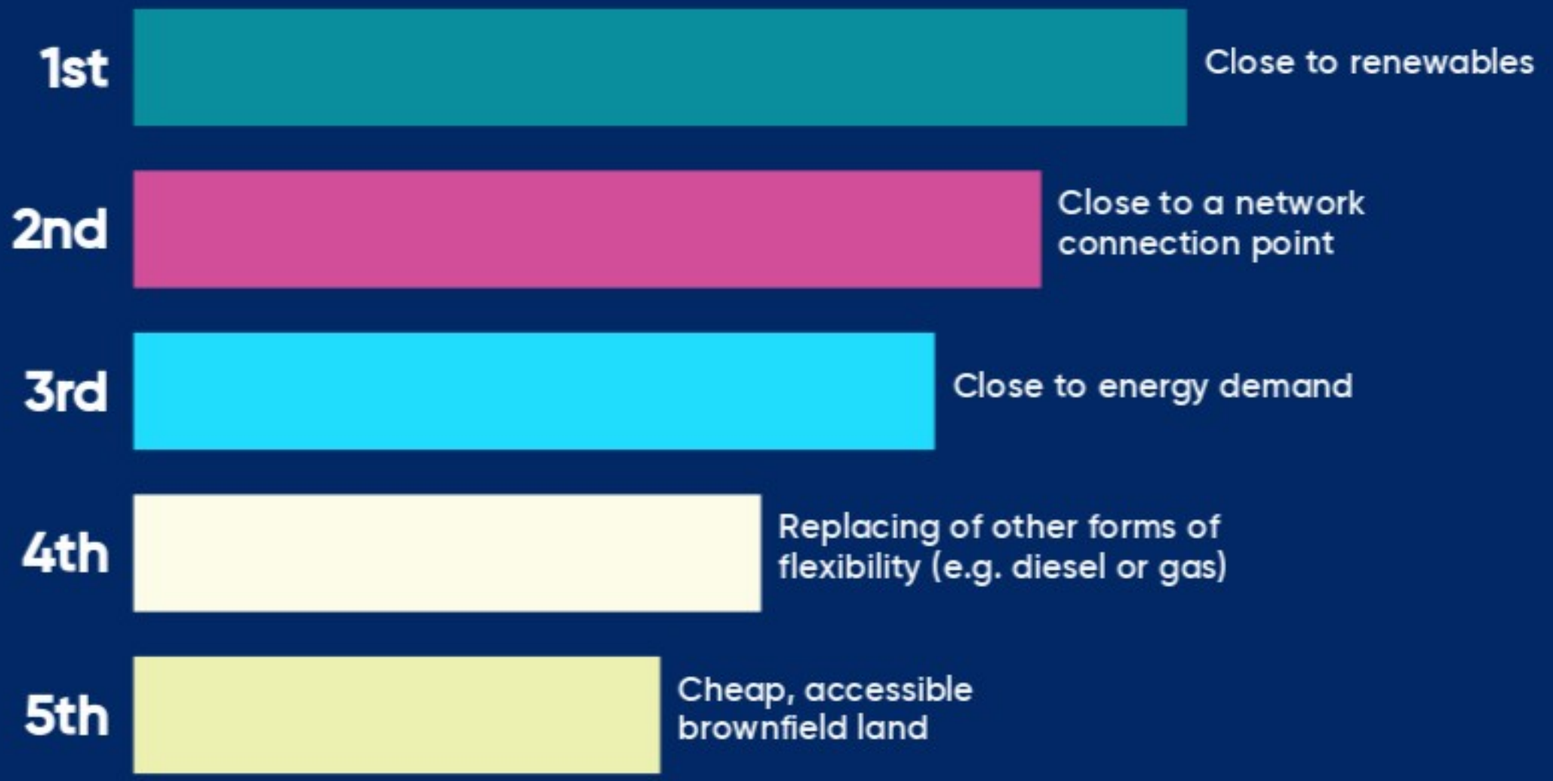
Standalone battery projects

Generation co-location projects

Behind-the-meter large energy users

Domestic batteries

For a battery storage project, how would you rank these factors for where it could be located?



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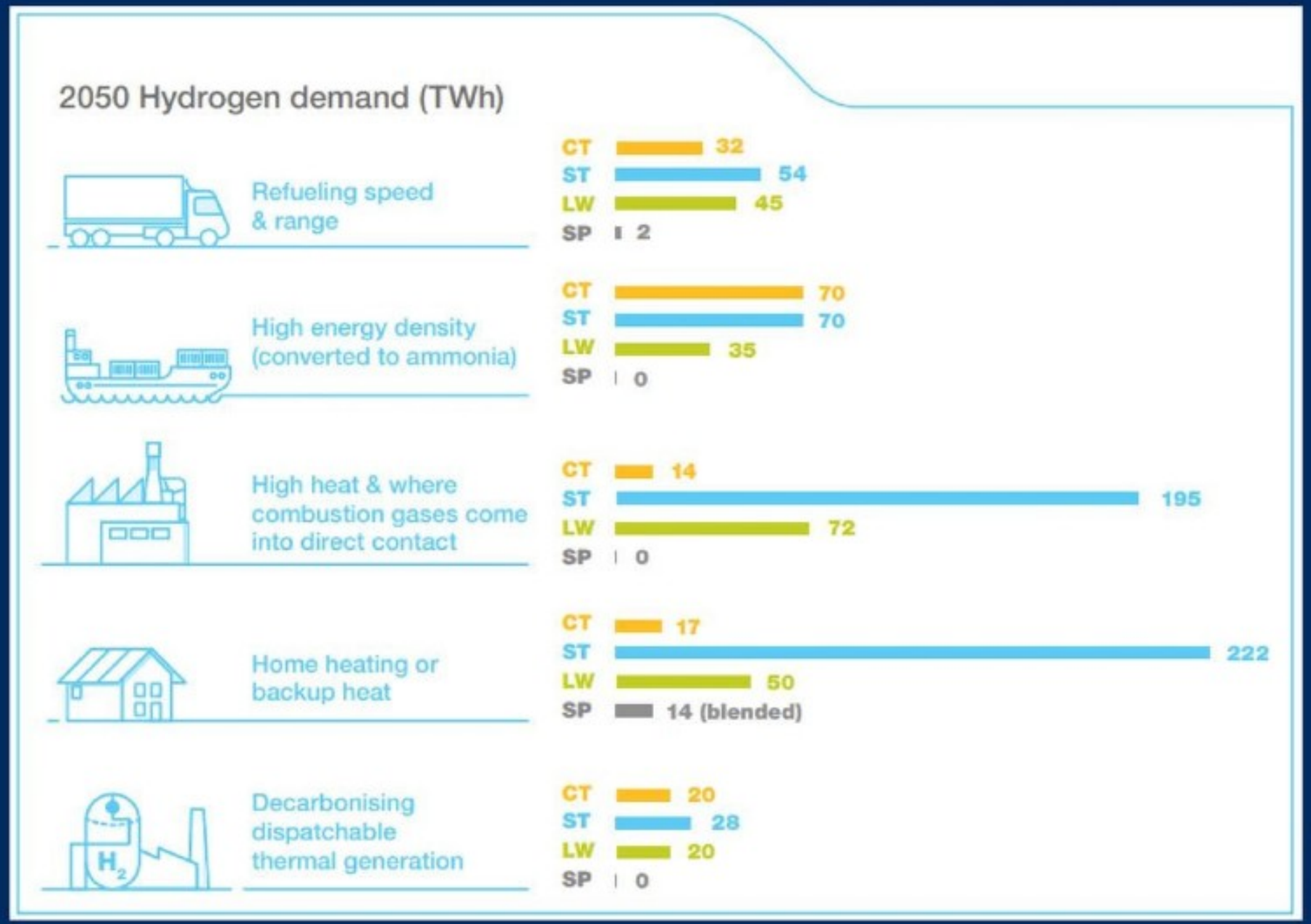
Hydrogen in North Scotland

- Future use cases for hydrogen
- Aberdeen



Significant range in the volume of hydrogen in the UK across the 4 x scenarios by 2050

Source & credit: National Grid ESO, Future Energy Scenarios 2020 document, July 2020

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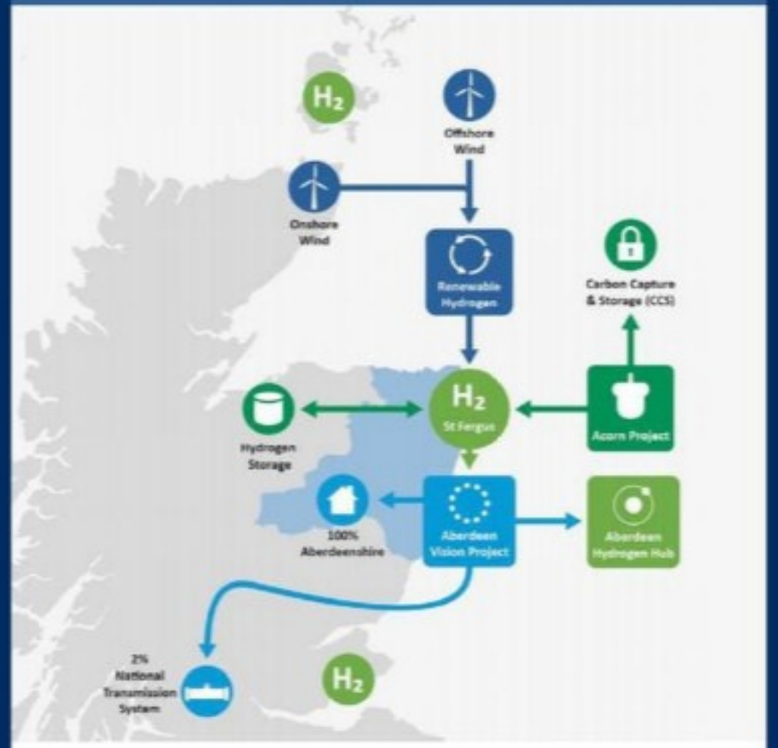
The Hydrogen Coast

A cluster of projects delivering hydrogen innovation and leadership along the East Coast of Scotland to support net-zero carbon emissions targets.



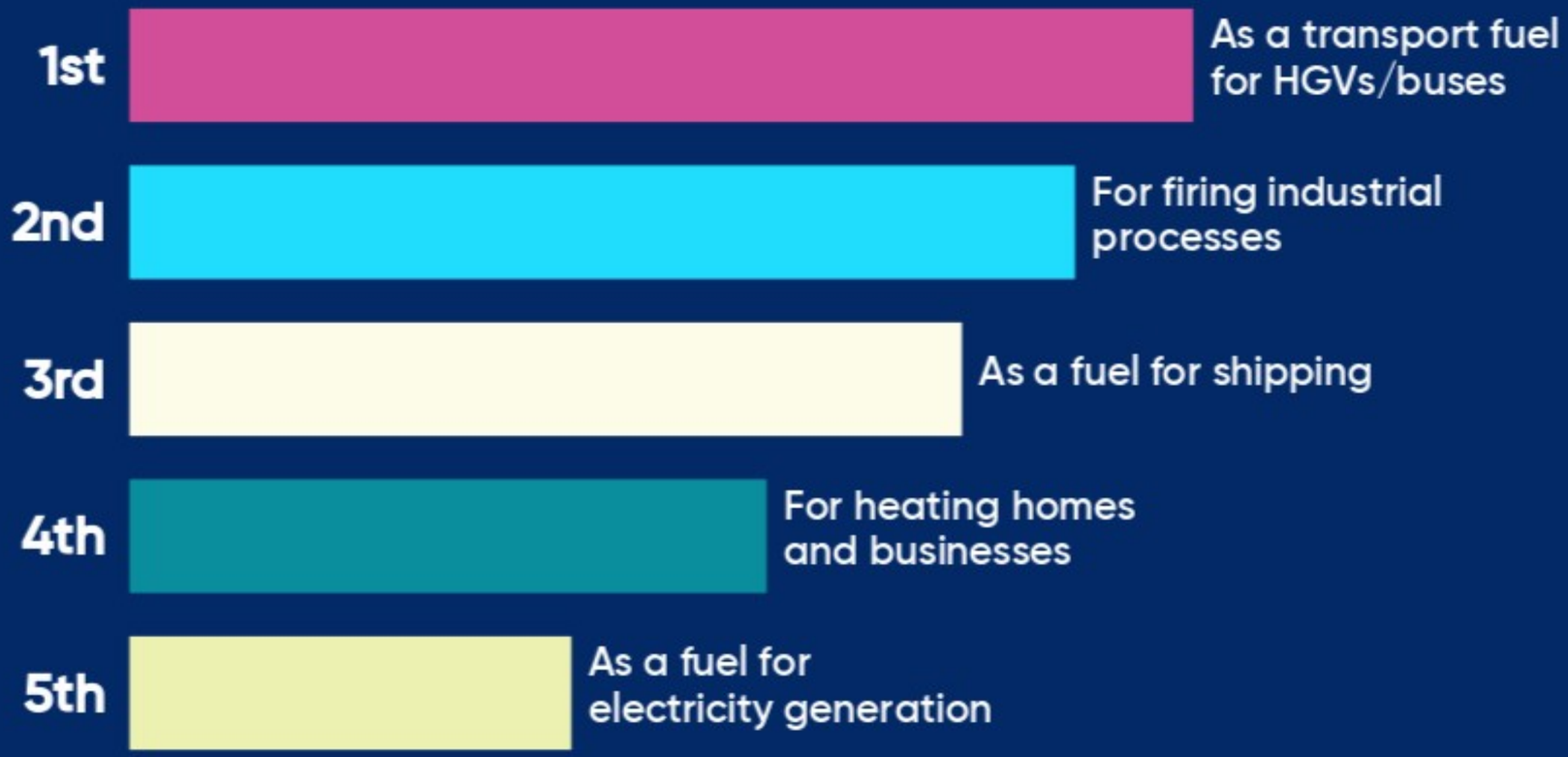
SGN Your gas. Our network.

nationalgrid

Pale Blue Dot.

Hydrogen Coast projects	Project proponents & supporters
Aberdeen Vision Project, Aberdeen	SGN and National Grid with Pale Blue Dot Energy and DNV GL
Acorn Hydrogen, St Fergus	Pale Blue Dot Energy, Department for Business, Energy and Industrial Strategy (BEIS), The Scottish Government
Acorn CCS, St Fergus	Pale Blue Dot Energy, EU Innovation and Networks Executive Agency, BEIS, The Scottish Government and Industry Partners
Aberdeen Hydrogen Bus Project, Aberdeen	Aberdeen City Council, EU High Vlo City and Fuel Cell and Hydrogen Joint Undertaking (FCHJU), Innovate UK, Stage Coach, First Group, The Scottish Government, Scottish Enterprise, Scottish Hydro Electric Power Distribution, SGN
The Hydrogen Hub, Aberdeen	Aberdeen City Council, Scottish Enterprise, Opportunity North East
Surf'n'Turf, Orkney	Orkney Island Council, EMEC Orkney, ITM Power, EU, FCHJU, The Challenge Fund, Scottish Government, Local Energy Scotland, Community Energy Scotland
Dolphyn ERM Project, offshore	ERM, Engie, Tractabel Engie and ODE
H100, Fife	SGN
HyStorPor, offshore	University of Edinburgh
BigHit, Orkney	Orkney Islands Council, EMEC
Flotta Terminal, Orkney	OGTC
HyDIME, Orkney	Ferguson Marine, Orkney Islands Council, EMEC, HSSMI
Methiltoune, Fife	SGN
Dundee Bus Project, Dundee	Dundee City Council

How would you rank these potential uses of hydrogen in North Scotland in the future?



Transport

- EV uptake
- EV charger infrastructure

EV and EV charger uptake in SSEN's licence areas

Region	Public EV chargers per 1,000 households	EVs per 1,000 households	EV chargers per 1,000 EVs in region
SSEN Scotland	1.1 ↑	6 ↓	202 ↑
SSEN South	0.7 –	13 ↑	49 ↓
GB	0.7 –	10 –	70 –

High granularity projections for low carbon technology uptake - electric vehicle, heat pumps and solar PV
SSEN, June 2020

Data sources: SSEN, Regen, DfT, ZapMap, ONS

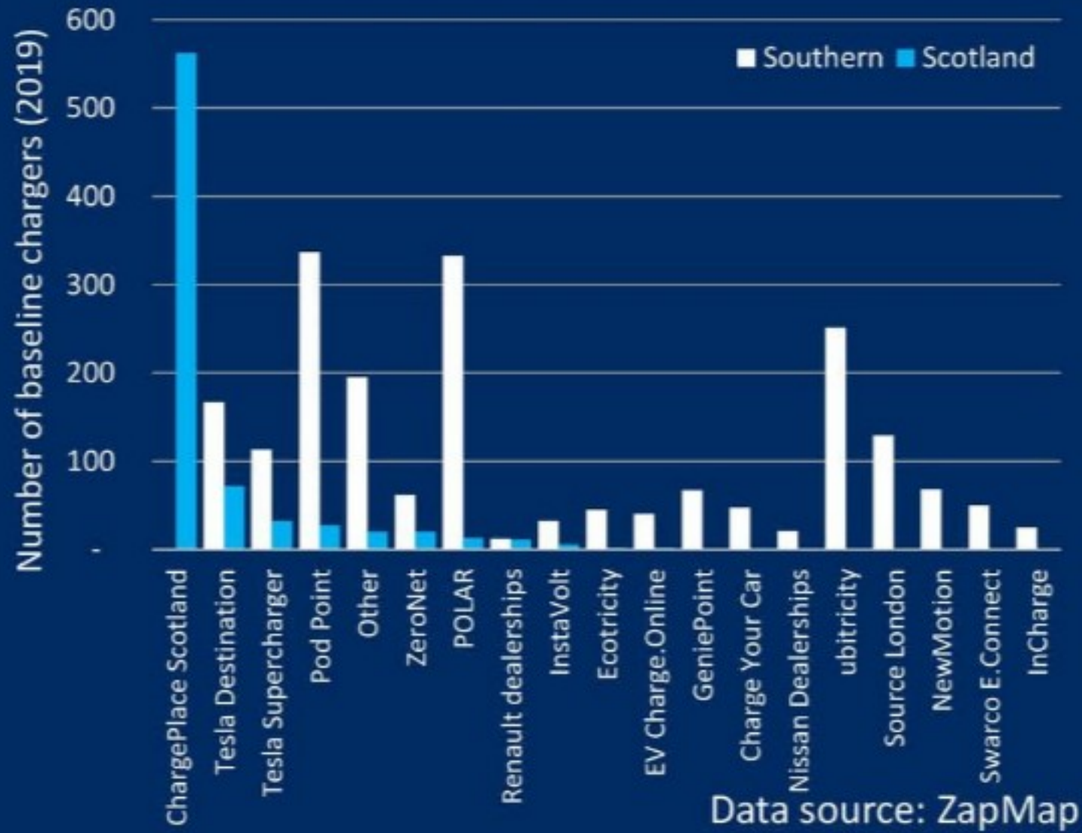
When might Scotland's EV uptake align with the rest of the UK?

Existing EV charging infrastructure in SSEN's licence areas

EV chargers in the North Scotland SSEN licence area are more centralised

EV chargers in the Southern SSEN licence area are more decentralised

90% of existing chargers in the Scottish SSEN licence area are operated by ChargePlace Scotland



Data source: ZapMap

What is the future of on-street EV charging infrastructure in North Scotland?

Continued focus towards centralised charging infrastructure

Neighbourhood EV charging hubs

Widely distributed residential on-street charging

Heating technologies

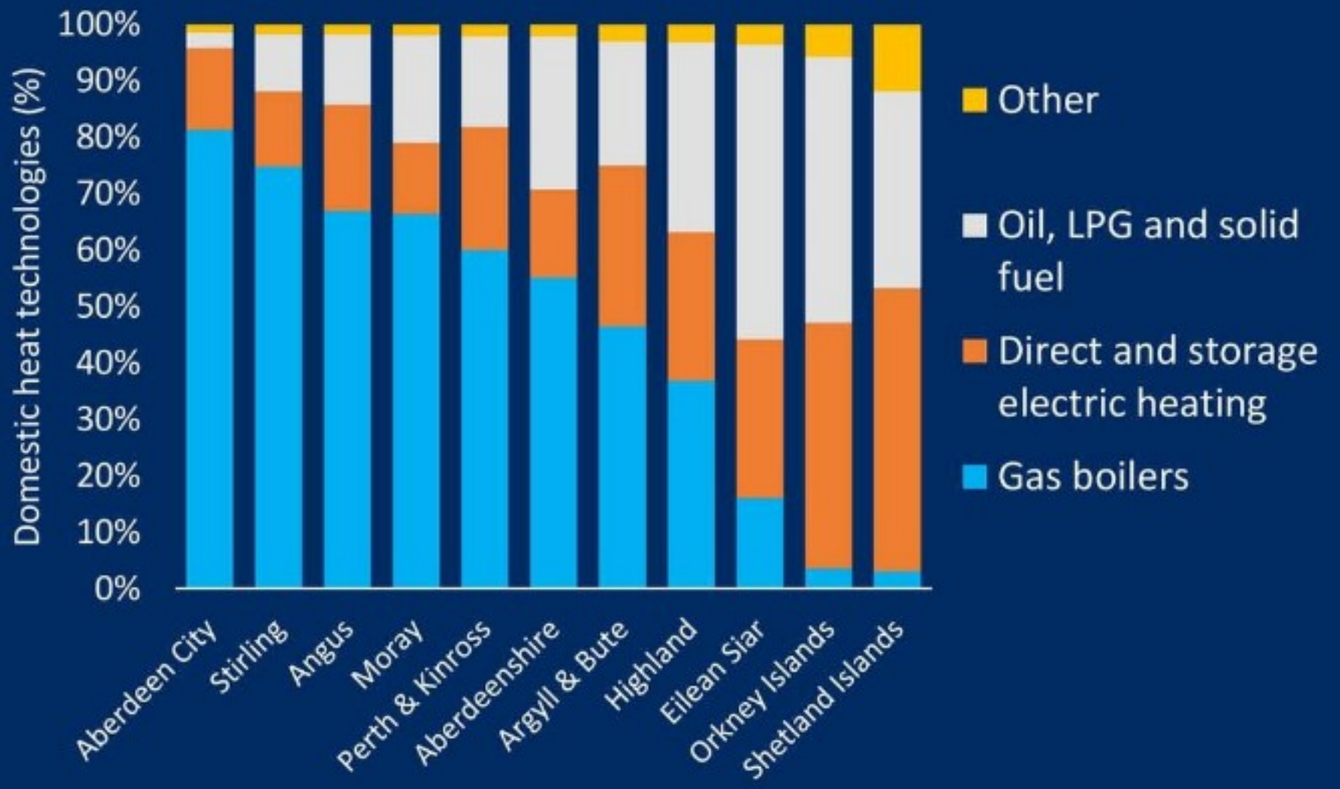
- Current baseline (boilers and electric heaters)
- North Scotland off gas areas
- Heat pump adoption

Domestic heating in North Scotland

North Scotland has approximately triple the number of non-gas heated homes compared to GB

	Gas boilers	Direct and storage electric heating	Oli, LPG and solid fuel	Other	Heat pumps
SSEN Scotland	57%	20%	20%	2%	1%
SSEN South	79%	11%	8%	2%	1%
GB	85%	7%	5%	2%	1%

Gas heating is concentrated in local authorities that are predominantly urban, or in the east or south of the licence area



Data sources: Census, FES 2020, EPC

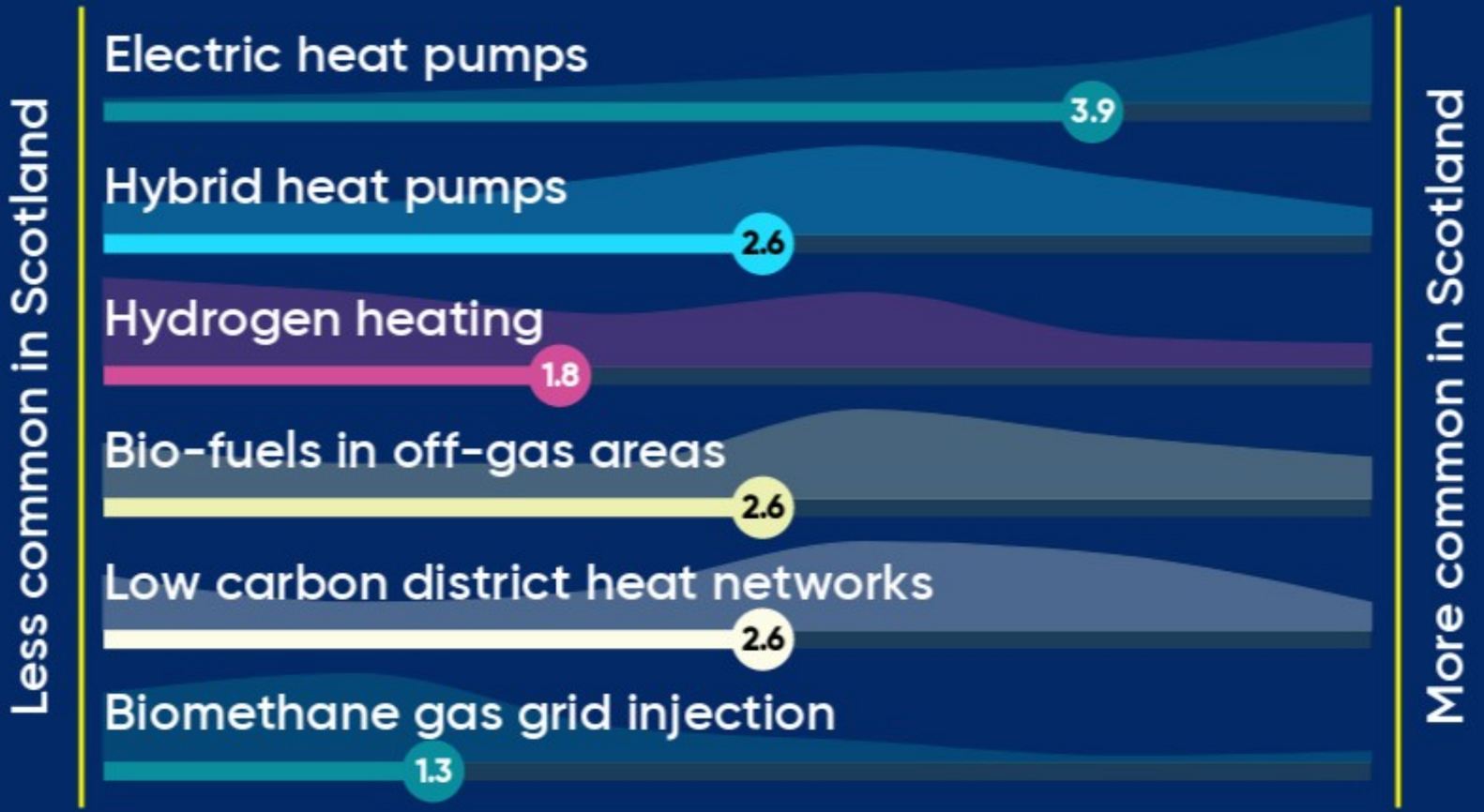
What do you think the future low carbon heating technology will predominantly be for the Scottish islands?

Direct and storage electric heaters

Electric heat pumps

Low carbon gas / fuel

In the North Scotland licence area, how would you rate the opportunity for deployment relative to the rest of the UK?



Distribution Future Energy Scenarios

Ray Arrell - Head of Technical Development, Regen
Joel Venn - Head Analyst, Regen

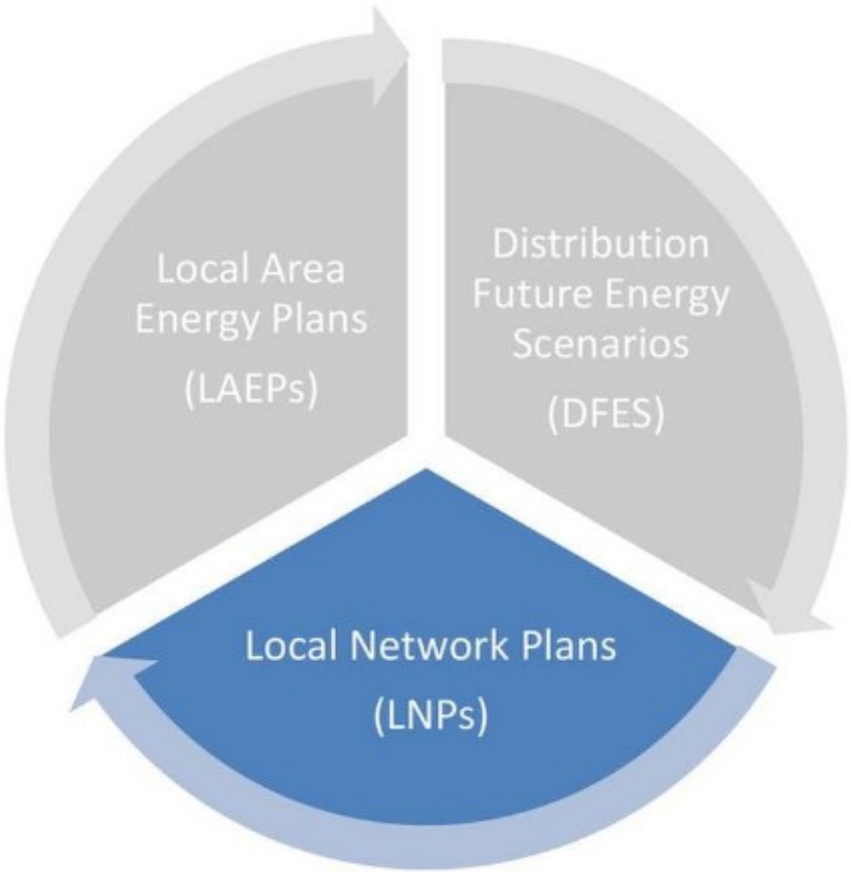
Local Network Plans

→ Trung Tran - ED2 Network Strategy Lead, SSEN

How do the pieces fit together?

CATAPULT Energy Systems

Network capacity and investment

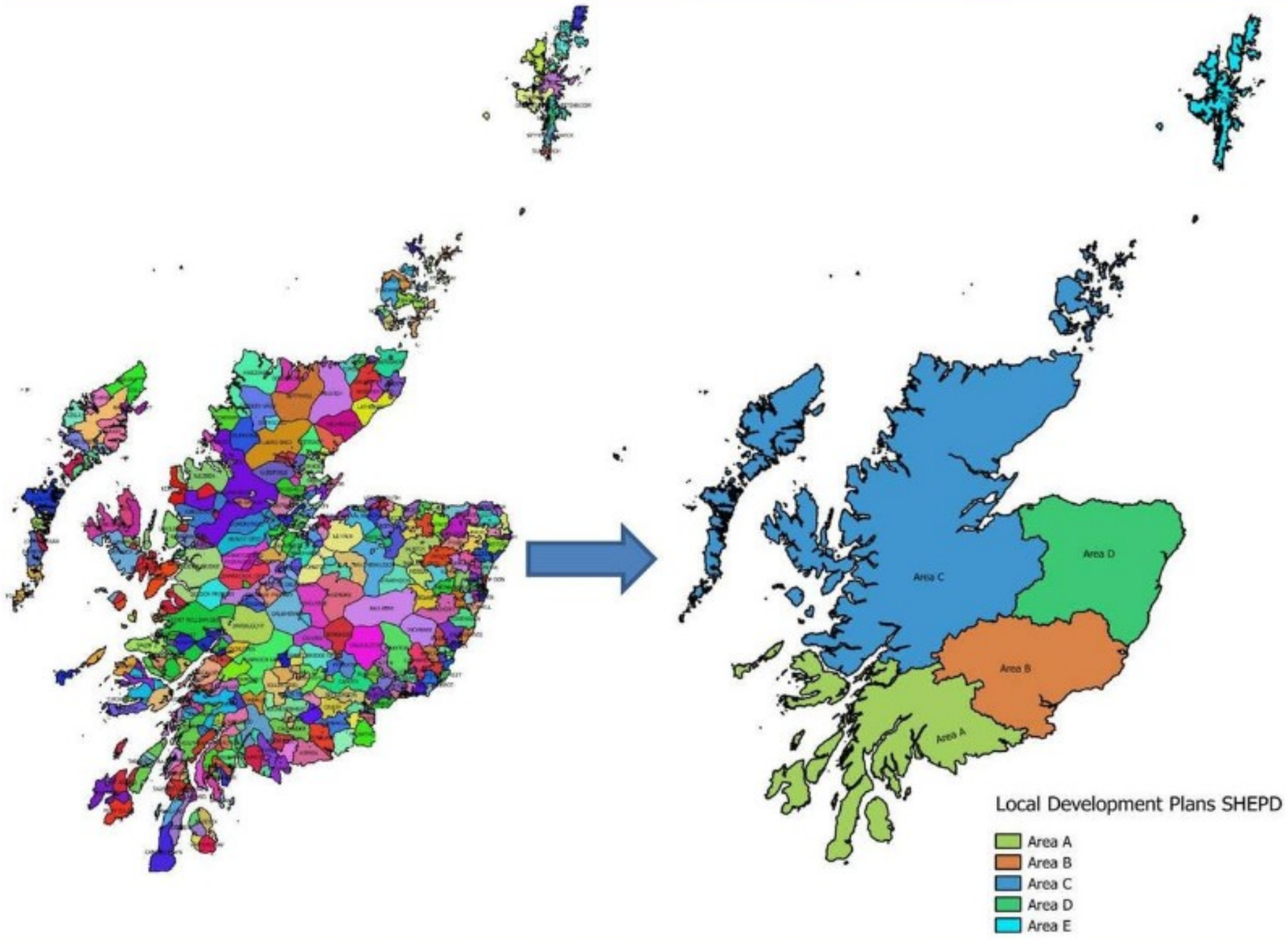


regen transforming energy

Demand and generation forecasts

Scottish & Southern Electricity Networks

Local Network Plans - SHEPD



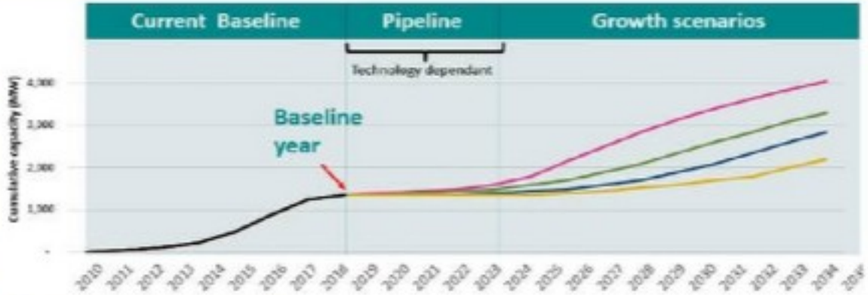
Local Development Plans	Local Authorities
Area A	Argyll and Bute, Clackmannanshire, North Ayrshire, Stirling, West Dunbartonshire
Area B	Angus, Dundee City, Perth and Kinross
Area C	Highland, Na h-Eileanan Siar, Orkney Islands
Area D	Aberdeen City, Aberdeenshire, Moray
Area E	Shetland Islands

Adjacent Local Authorities are grouped in the proposed Areas in the Northern region. The uniqueness in demand, generation and island characteristics has been considered in forming these Areas.

Stakeholder Engagement Process for LNPs

Step 1: takes account of specific local/geographical attributes

Local demand and generation forecasts



Identify network constraints and investments

- High level investment costs
- All four scenarios

Step 2: co-create the baseline investment scenario.

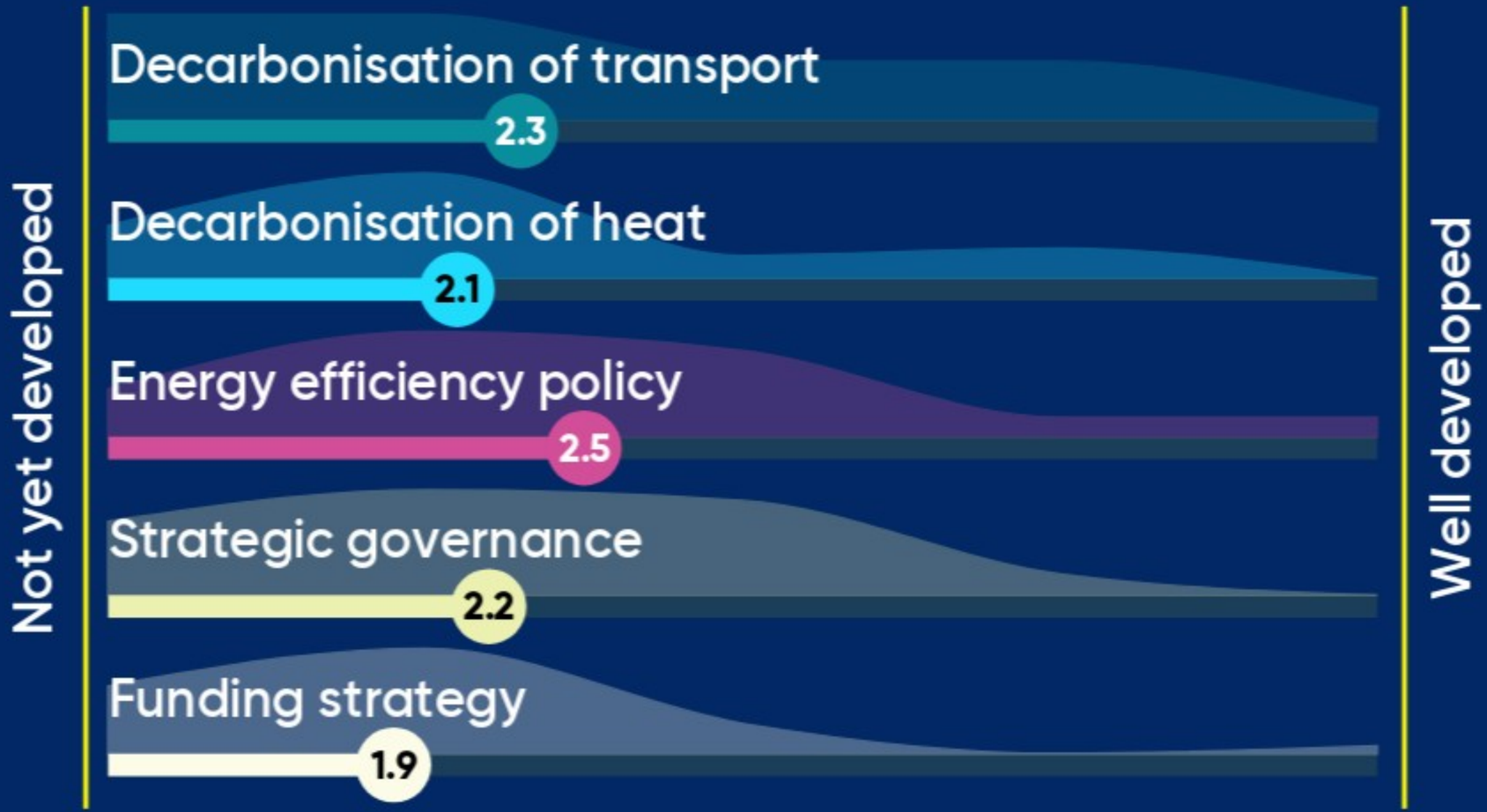
Stakeholder engagement

- Create LNPs for all four scenarios
- Determine the best view investment scenario

Stakeholder-led LNPs

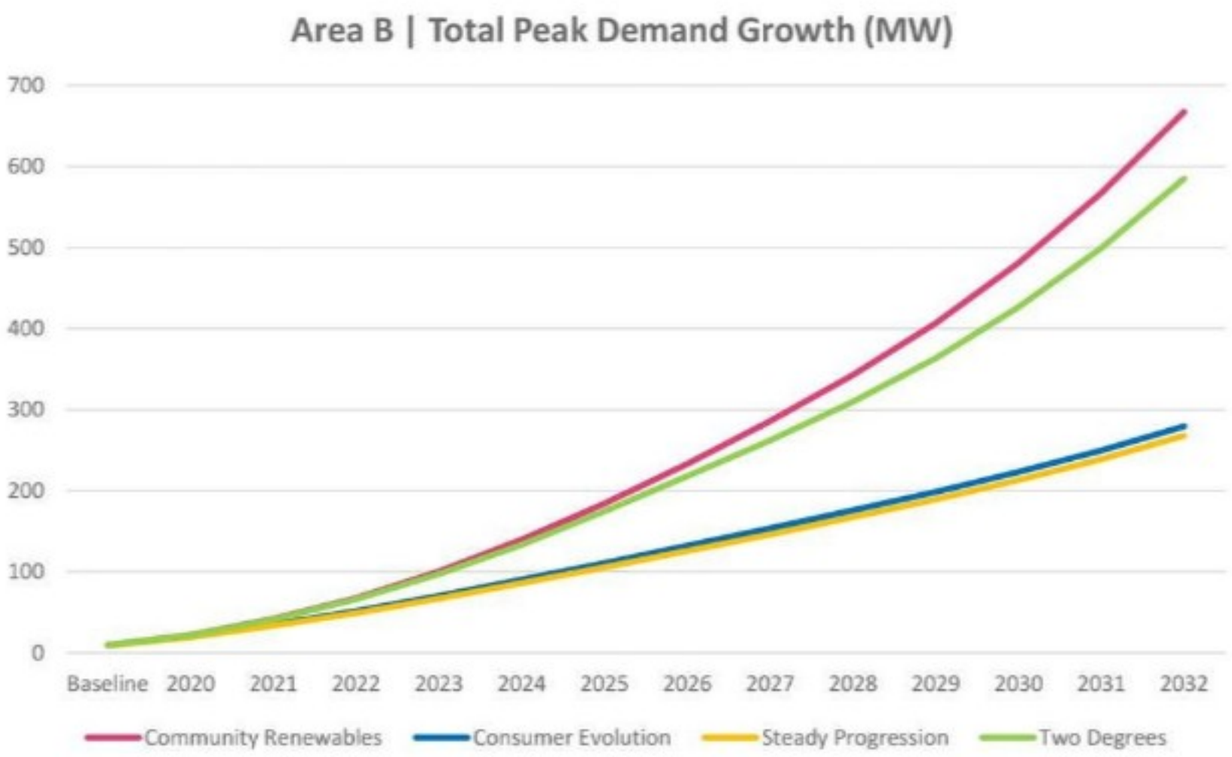
- Best view investment scenario informed by stakeholders

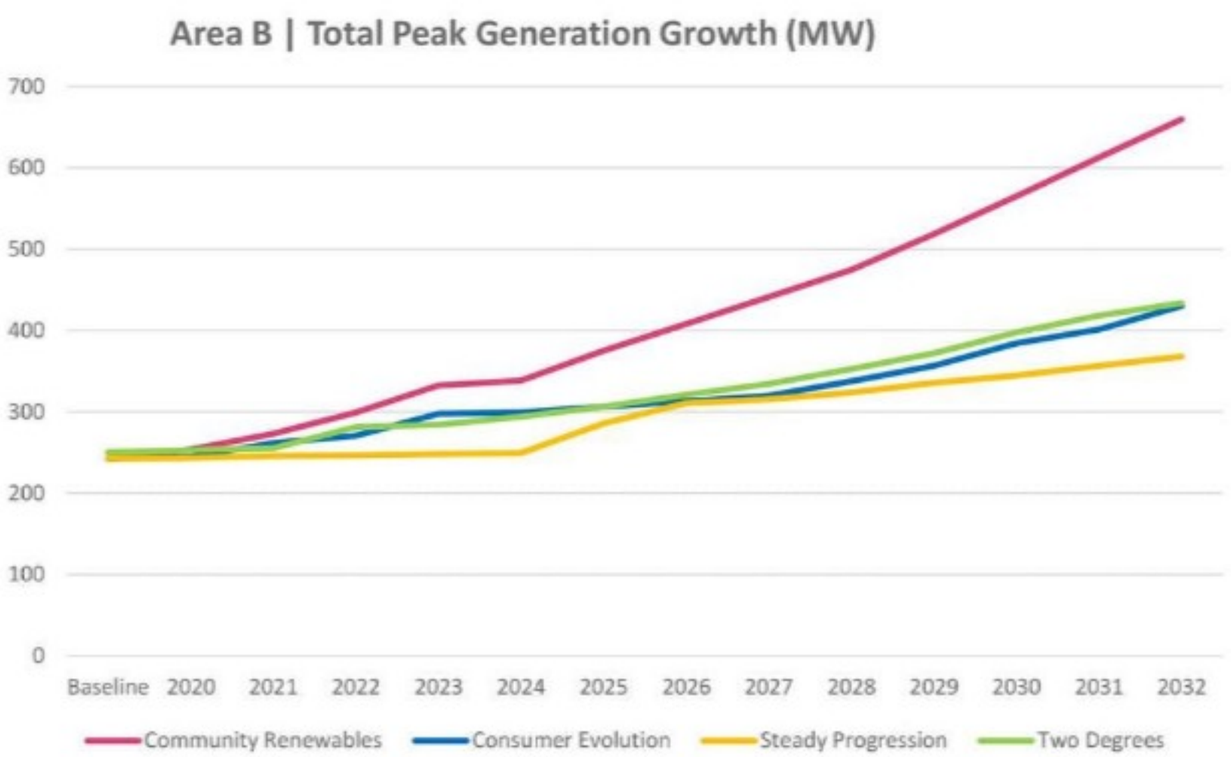
Local energy - future strategies



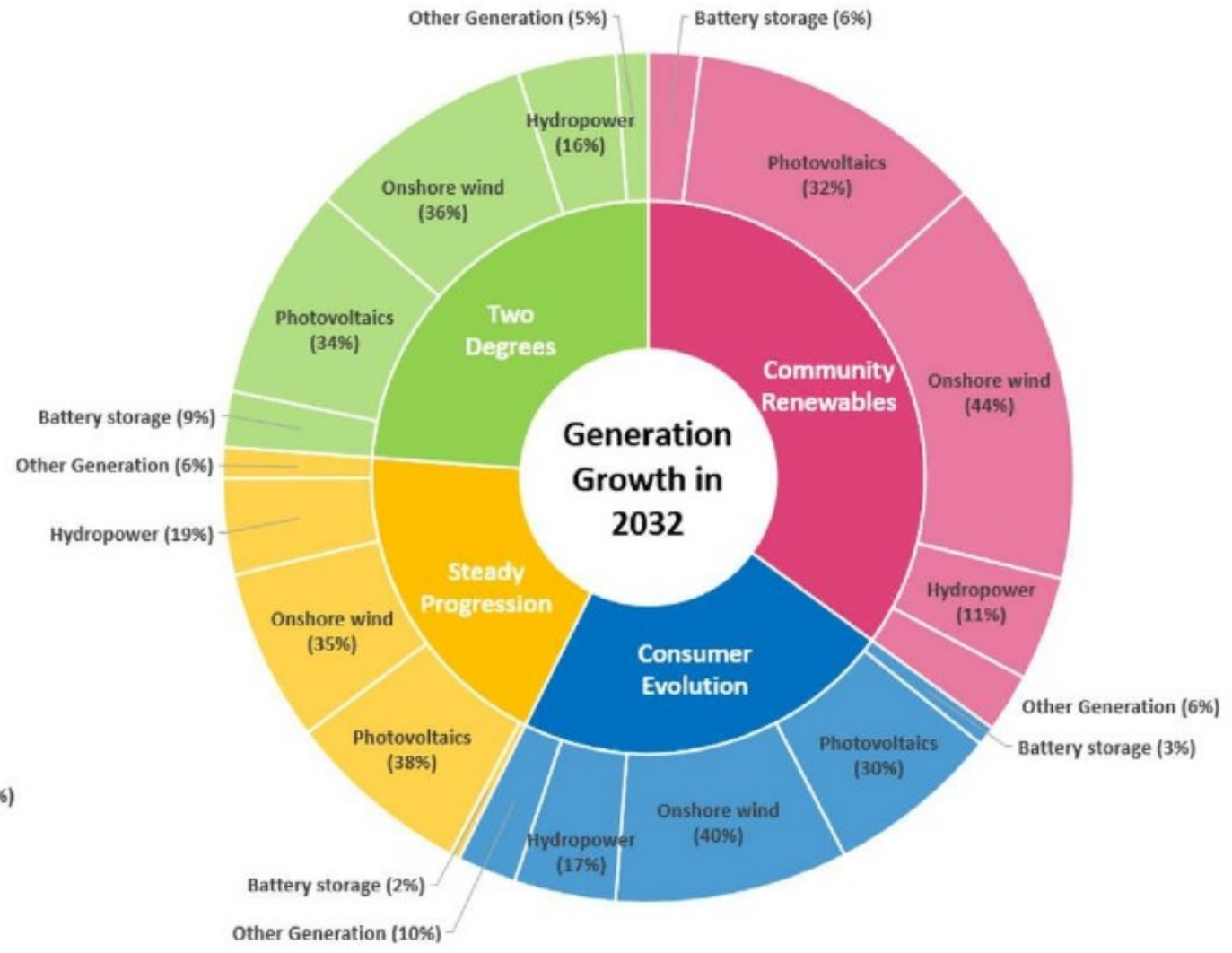
Net zero target year

Demand and Generation Forecast for Tayside



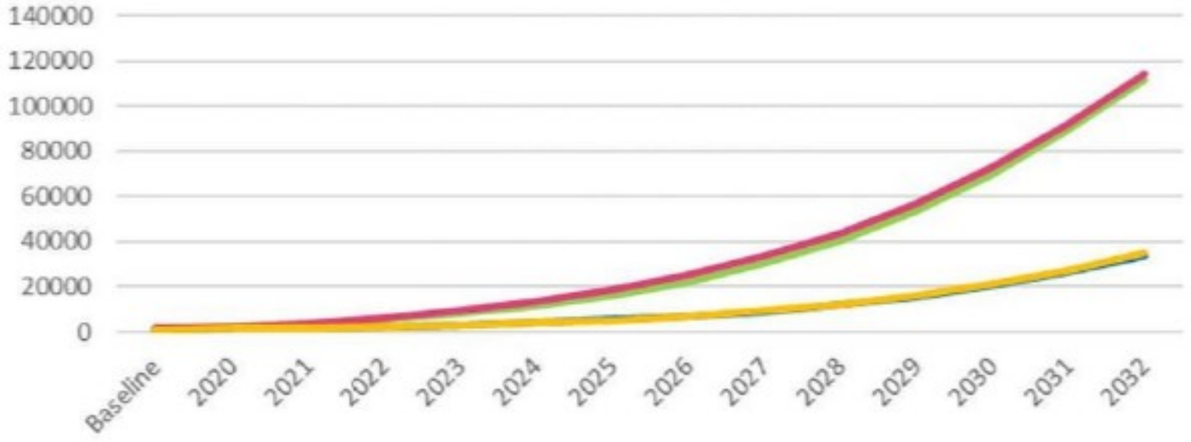


Tayside Demand and Generation Forecast Breakdown

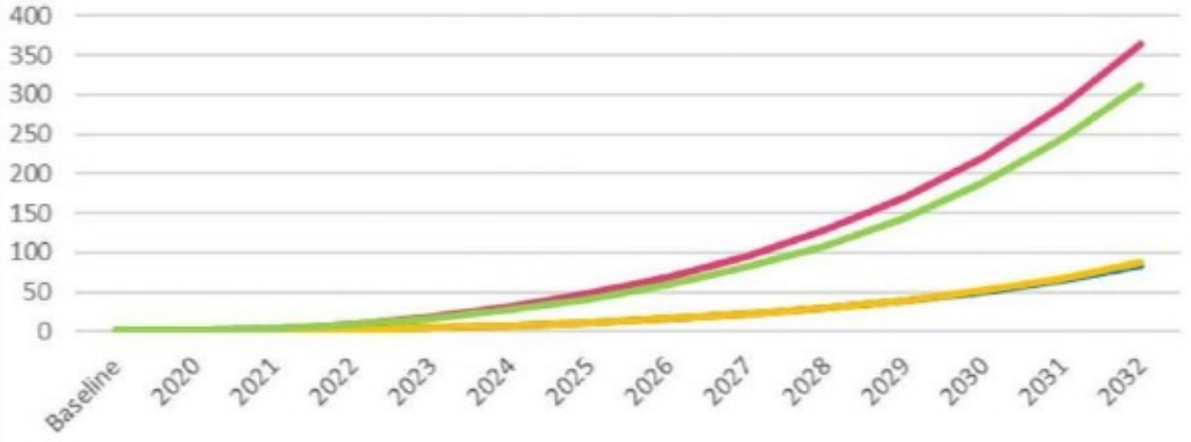


Low Carbon Technologies Forecast

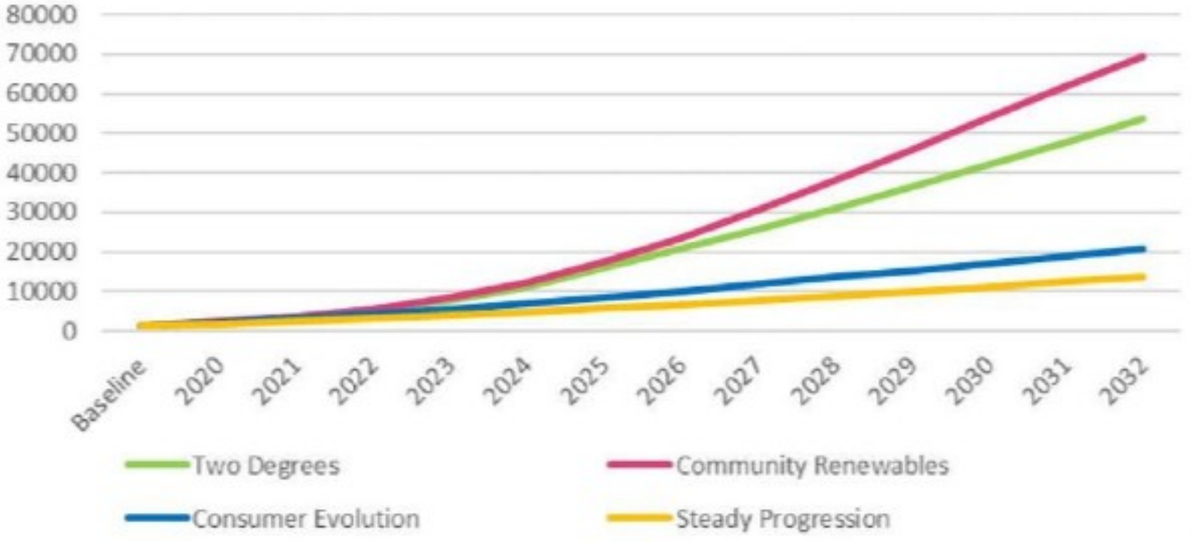
Area B | Electric Vehicles (Number)



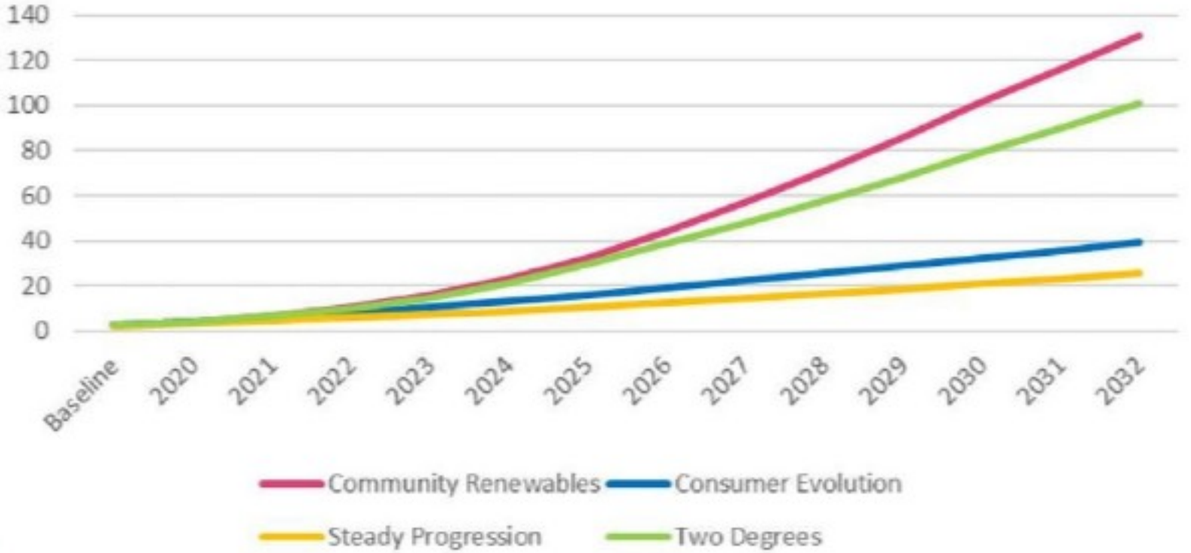
Area B | Peak EV Demand Growth (MW)



Area B | Heat Pumps (Number)

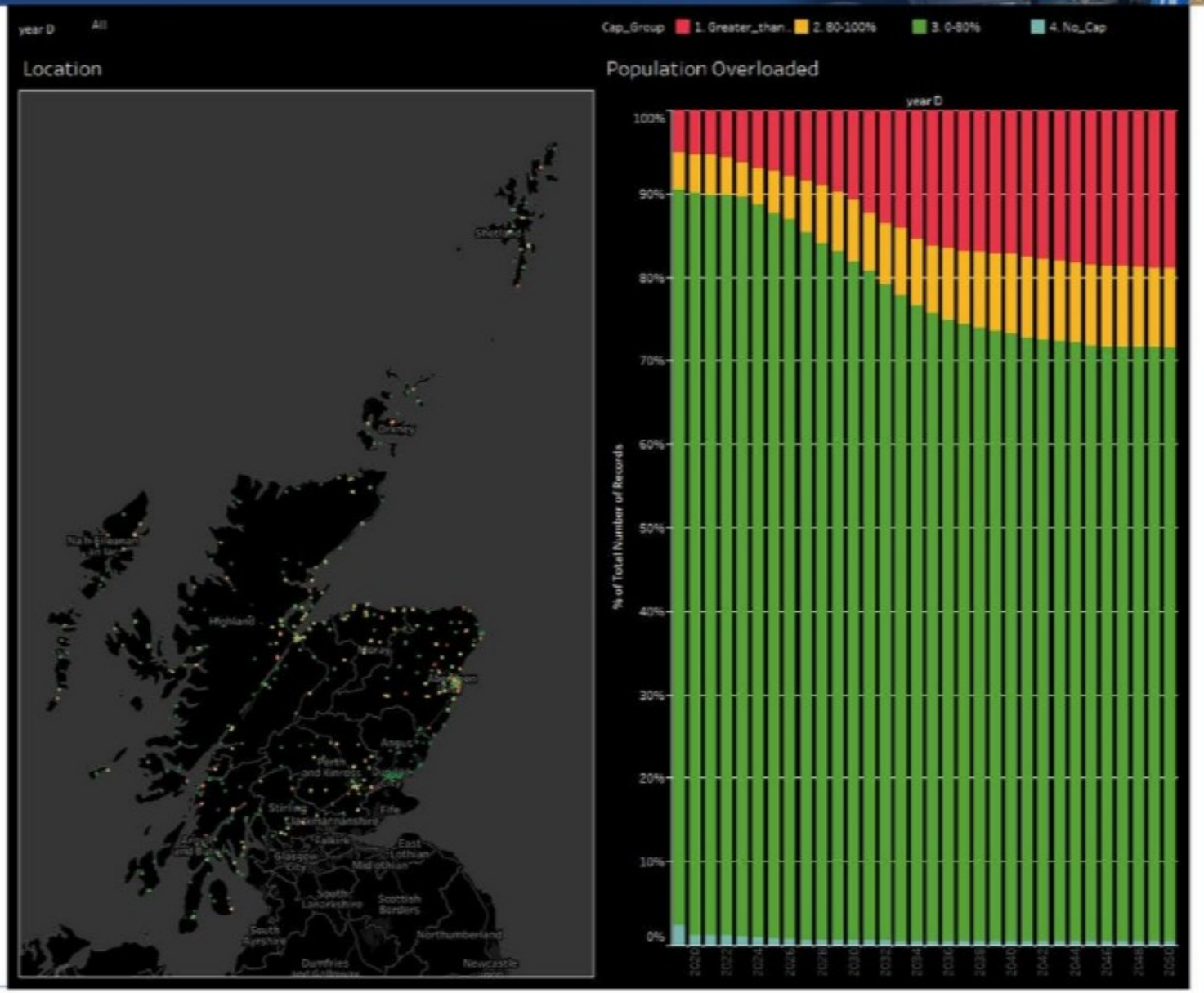


Area B | Peak Heat Pumps Demand Growth (MW)



Low Carbon Technology Hotspots

https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=19141



Summary

- Local Network Plans (LNPs) is our way of communicating the distribution network information for your developing of LAEPs.
- Understanding your Net Zero ambitions/strategies/plans is key to building the baseline of our RIIO-ED2 strategic investment.
- Follow-up ‘bilateral’ sessions with the Local Areas in October 2020 will help us drill down the detail.
- In these sessions, we would like to hear from you how best to share data.

Q&A panel session

Graeme Keddie - Director of Corporate Affairs, Regulation & Stakeholder Engagement

Thank you for joining us today