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Claire Mack

Chief Executive

Scottish Renewables

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Michael Matheson MSP

Cabinet Secretary for Net Zero, Energy and Transport

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Claire Mack

Chief Executive, Scottish Renewables

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Cabinet Secretary for Net Zero,
Energy and Transport

Hassaan Majid

Chief Financial Officer, EDF Renewables

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Hassaan Majid

Chief Financial Officer

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A time of change – the fundamental shifts in our energy system



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Future shape of the industry in Scotland – an energy system for net-zero

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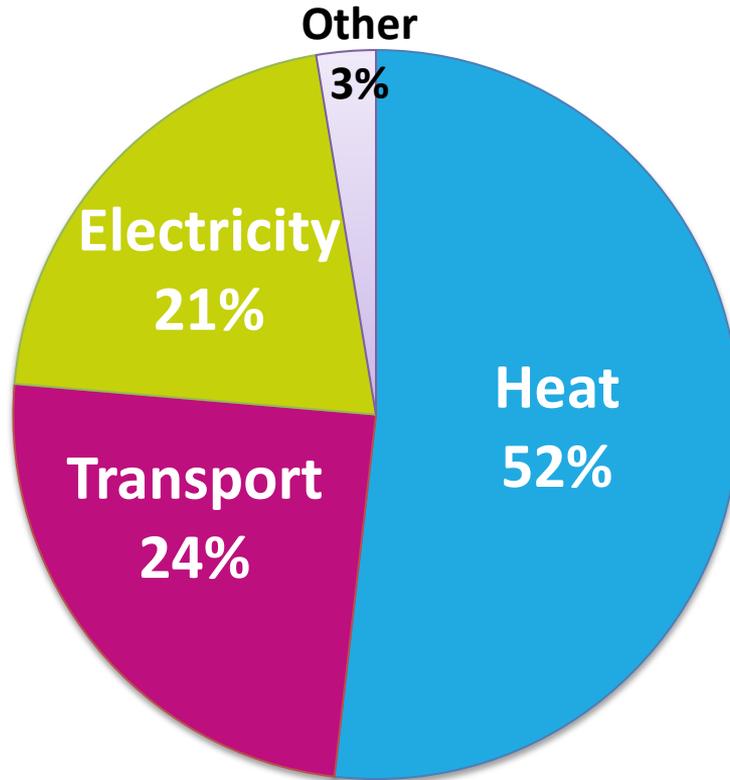


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Morag Watson
Director of Policy
Scottish Renewables

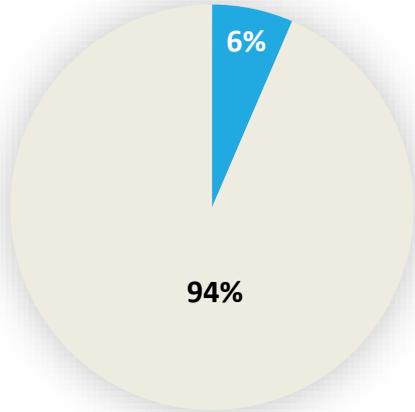
Scotland's energy use



How are we doing?

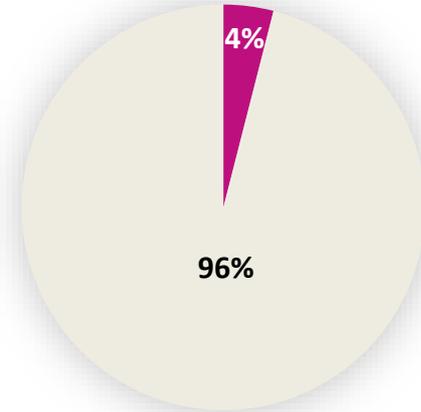


Heat



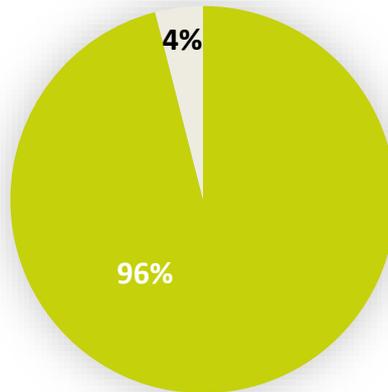
■ Low carbon ■ High carbon

Transport



■ Low carbon ■ High carbon

Electricity



■ Low carbon ■ High carbon

Installed capacity (GW)		
Area	UK - 2021	UK - 2050
Offshore wind	10.5	95
Onshore wind	14	30
Solar PV	13.5	85

Installed capacity (GW)			
Area	Scotland - 2021	Scotland - 2030	Scotland - 2045
Offshore wind	0.9	11	26 - 40
Onshore wind	8.7	20.4	20.4
Solar PV	0.4	4 - 6	6 - 8

STORAGE CAPACITY & PSH

*“FORECASTS FROM AURORA SUGGEST THAT **30GW** OF STORAGE CAPACITY WILL BE NEEDED BY 2050.”*

SCOTLAND CURRENTLY HAS **0.74GW** OF PUMPED STORAGE HYDRO

3GW MORE IS CONSENTED OR IN PLANNING

5GW MORE IS PROPOSED

(ICL ESTIMATE THAT PSH COULD **SAVE CONSUMERS £690M PER YEAR BY 2050**)

SCOTTISH HEAT IN BUILDINGS STRATEGY

“OUR VISION IS THAT BY 2045 OUR HOMES AND BUILDINGS ARE CLEANER, GREENER AND EASY TO HEAT, WITH OUR HOMES AND BUILDINGS NO LONGER CONTRIBUTING TO CLIMATE CHANGE, AS PART OF THE WIDER JUST TRANSITION TO NET ZERO.”

*OUR COMMITMENT (IS) TO **DECARBONISE THE HEATING IN 1 MILLION HOMES BY 2030**”*

(42% OF SCOTLAND'S HOMES)

SCOTTISH HYDROGEN ASSESSMENT

*“ IN THE MOST AMBITIOUS SCENARIO, ESTABLISHING SCOTLAND AS AN EXPORTER OF GREEN ENERGY TO EUROPE COULD RESULT IN A **£25 BN** CONTRIBUTION TO GROSS VALUE ADDED (GVA) WITH **OVER 300,000 JOBS BY 2045**. THIS WOULD BE ACHIEVED BY UNLOCKING SCOTLAND’S VAST OFFSHORE WIND POTENTIAL...”*

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John Lang

Communication Lead

Aspect Communications

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Mary Thorogood

Government Relations, External
Affairs and Communications Director
Net Zero Technology Centre



**Net Zero
Technology
Centre**

Technology Driving Transition



Strong delivery



£192m

invested with industry

26,500+

industry guests and visitors to the centre

23

commercialised tech



1,450+

technologies screened



33

Startups accelerated



£100m

leveraged from industry partners

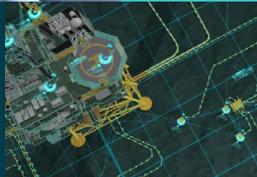


64+

partnerships

£10-15bn

GVA potential



306

projects



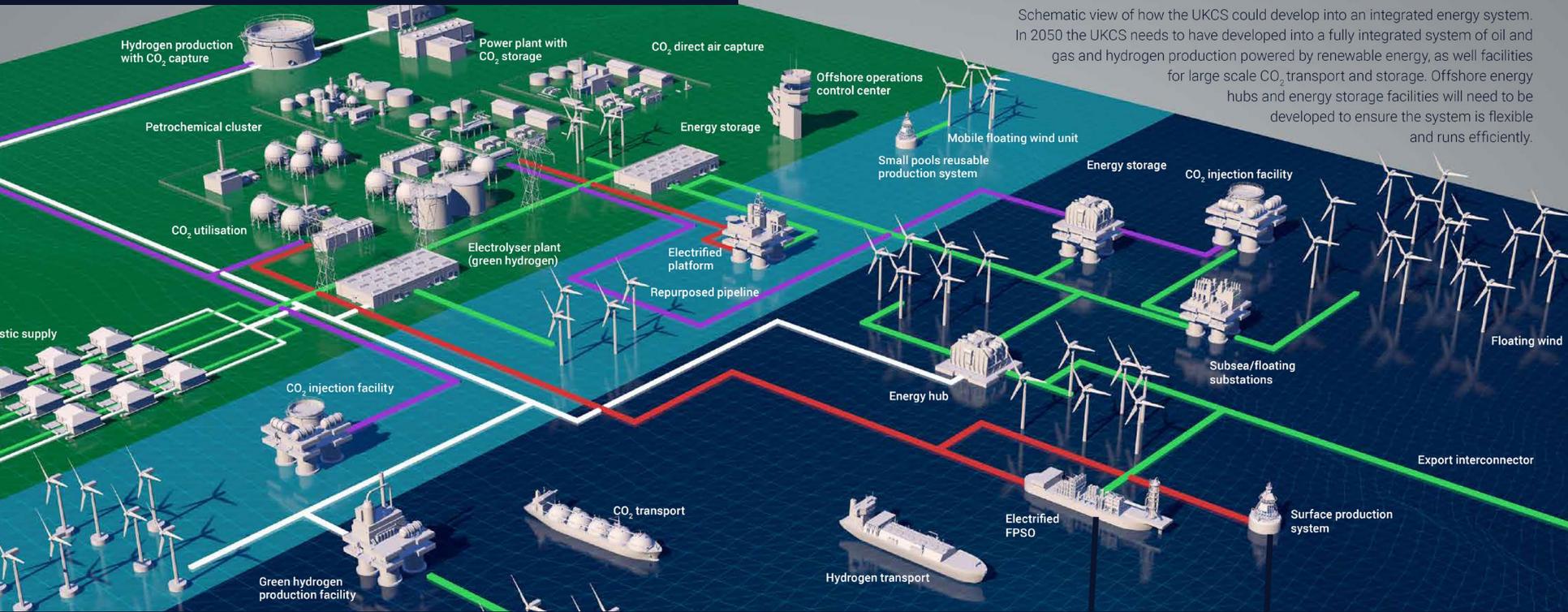
120+

field trials
complete, planned
or underway

Net Zero Technology Centre

UKCS integrated energy vision 2050

Schematic view of how the UKCS could develop into an integrated energy system. In 2050 the UKCS needs to have developed into a fully integrated system of oil and gas and hydrogen production powered by renewable energy, as well as facilities for large scale CO₂ transport and storage. Offshore energy hubs and energy storage facilities will need to be developed to ensure the system is flexible and runs efficiently.



- CO₂ PIPELINE
- OIL/GAS PIPELINE
- HYDROGEN PIPELINE
- POWER CABLE

Up to **£416bn**
investment required
over next **30 years**.

Potentially contribute
£125bn per year to the
UK economy by 2050.

Support more than
230,000 jobs.

REIMAGINING
A NET ZERO
NORTH SEA

AN INTEGRATED
ENERGY VISION
FOR 2050

Closing the Gap
Technology for a
Net Zero North Sea

Horizon Project

2050 Scenarios

At a Glance

- The size of the challenge is surpassed only by the potential rewards of success

	TODAY 2020	EMERGING 2050	PROGRESSIVE 2050	TRANSFORMATIONAL 2050
Summary	<ul style="list-style-type: none"> > Blue and green hydrogen not commercially available > Gas import dependency rising year on year > Floating wind trials in UK waters > CCS under development but not operational 	<ul style="list-style-type: none"> > Blue hydrogen plays a major role > Large reliance on imported gas > Negligible role for floating wind > Significant requirement for CCS 	<ul style="list-style-type: none"> > Blue and green hydrogen play a major role > Moderate reliance on gas imports > Large role for floating offshore wind > Significant requirement for CCS 	<ul style="list-style-type: none"> > Green hydrogen plays a major role > Low reliance on imported gas > Crucial role for floating wind > Moderate requirement for CCS
Economy	£40bn Total Economic Impact	£80bn Total Economic Impact	£100bn Total Economic Impact	£125bn Total Economic Impact
Jobs	140,000 Direct & Indirect	113,000 Direct & Indirect	158,000 Direct & Indirect	232,000 Direct & Indirect
Imports	UKCS Imports ~45%	UKCS Imports ~45%	UKCS Imports ~30%	UKCS Imports ~10%
Investment	£10bn Average historic CAPEX p.a.	£6.5bn Average CAPEX p.a.	£9.4bn Average CAPEX p.a.	£13.4bn Average CAPEX p.a.

Offshore energy mix

Offshore wind	Electricity 32 TWh	Electricity 289 TWh	Electricity 380 TWh Hydrogen 101 TWh	Electricity 380 TWh Hydrogen 340 TWh
Hydrogen	27 TWh	270 TWh	Gas 195 TWh Green 75 TWh	Gas 17 TWh Green 253 TWh
Oil & Gas	~40% IMPORTS 640 TWh Gas 700 TWh	31% IMPORTS 270 TWh Gas 801 TWh	22% IMPORTS 270 TWh Gas 555 TWh	54% IMPORTS 270 TWh Gas 333 TWh
Carbon Capture & Storage (CCS)	0 MTCO ₂ /year	140 MTCO ₂ /year	113 MTCO ₂ /year	81 MTCO ₂ /year

Technology priorities

				Innovation cost savings	
Green Hydrogen	Electrolyser catalyst innovation	Seawater electrolysis	Subsea electrolyser solutions incorporating compression	£55bn	Cost Reduction 61%
Offshore Wind	Reduced cost floating wind foundations	Innovative floating wind mooring systems	Dynamic cabling solutions to reduce downtime	£97bn	Cost Reduction 24%
Blue Hydrogen	Enhanced SMR reactor membranes and catalysts	Alternative production methods eg, plasma pyrolysis	High-capacity sorbents more durable at high temperatures	£6.5bn	Cost Reduction 32%
Carbon Capture & Storage	Modular retrofittable carbon capture solutions	Modelling geological behaviour of CO ₂	Direct air / seawater capture	£1.3bn	Cost Reduction 13%

We have identified a range of critical technologies, which include but are not limited to:



Oil & Gas

Ammonia or other low-carbon fuelled turbines

Marine hydrogen transport solutions

Platform electrification (AC/DC cabling solutions)

Subsea electrification cost reduction



Offshore Wind

UK-specific floating wind foundations

Innovative floating wind mooring systems

Dynamic cabling solutions to reduce wind downtime



Carbon Capture & Storage

Modelling of geological behaviours of CO2

Modular, retrofittable carbon capture solutions

Direct air/seawater capture

CO2-compatible well plug and abandonment techniques

High-capacity sorbents durable at high temperatures



Hydrogen

Seawater electrolysis

Electrolyser catalyst innovation

Subsea electrolyser systems incorporating compression

Improved efficiency of existing SMR and ATR technology

Enhanced SMR reactor membranes and catalysts

Alternative blue hydrogen production methods

Inter-seasonal hydrogen storage

Morag Watson
Director of Policy, Scottish Renewables

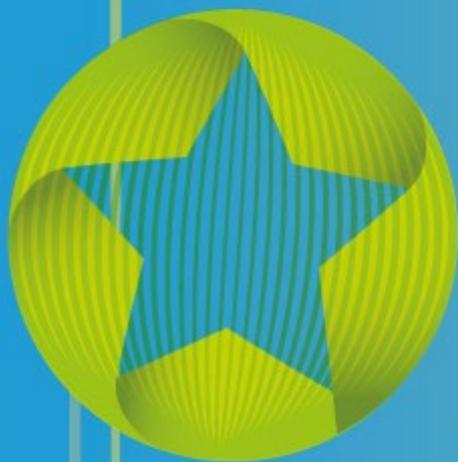
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Getting the financial environment right – CfD auctions and beyond

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Sarah-Jane McArthur
Partner
Brodies LLP

GETTING THE FINANCIAL ENVIRONMENT RIGHT – CFD AUCTIONS AND BEYOND

SR Net-Zero Energy Conference – 23 March 2022



ENLIGHTENED THINKING

- CfD has been successful in bringing projects to market and driving down costs.
- CfD is likely still to provide a route to market for significant capacity this decade.
- But what projects will it support? Without careful use of minima and maxima, the majority of available capacity will be secured by one or two technologies.
- To achieve net zero we need a diverse renewables mix and we need new technologies and solutions to come forward to address key challenges such as long duration storage.
- Other mechanisms may be necessary to support the solutions required for Net Zero but they could be based on CfD principles.

- Scottish Renewables through the Scottish Marine Energy Industry Group commissioned us to report on options for the Scottish Government to provide small scale, tailored revenue support particularly for emerging technologies.
- Options considered:
 - Variable Revenue Support Grant
 - Dispatchable PPA Model
 - Direct PPA Support
- These would all need to be funded directly from Scottish Government budget.
- We analysed the pros and cons of each option and considered Scottish Government's powers and the subsidy control regime.
- Initial recommendation is to explore the Variable Revenue Support Grant with Scottish Government.

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TRANSMISSION

An energy grid fit for net-zero – re-wiring the system



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Aileen McLeod

Director of Business Planning and Commercial SSEN Transmission

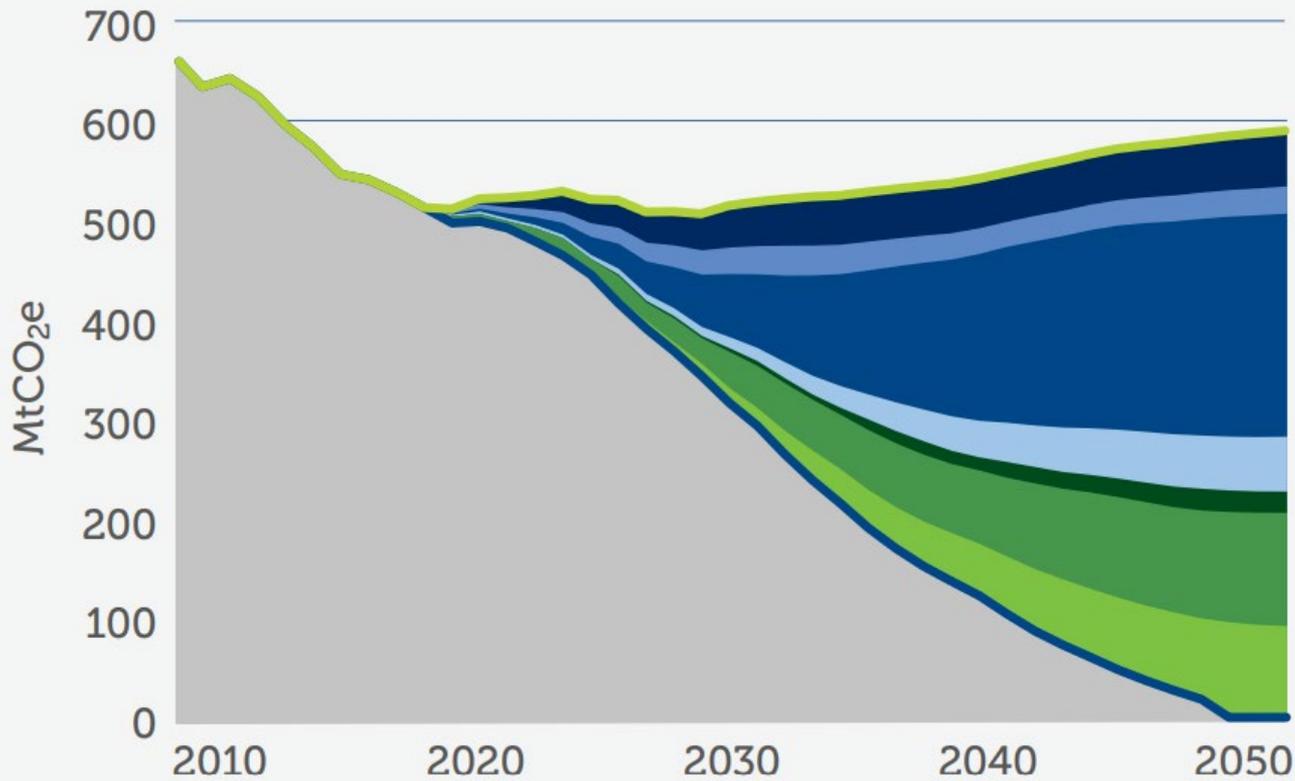


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THE COST OF BEING WRONG IS LESS THAN THE COST OF DOING NOTHING

Aileen McLeod

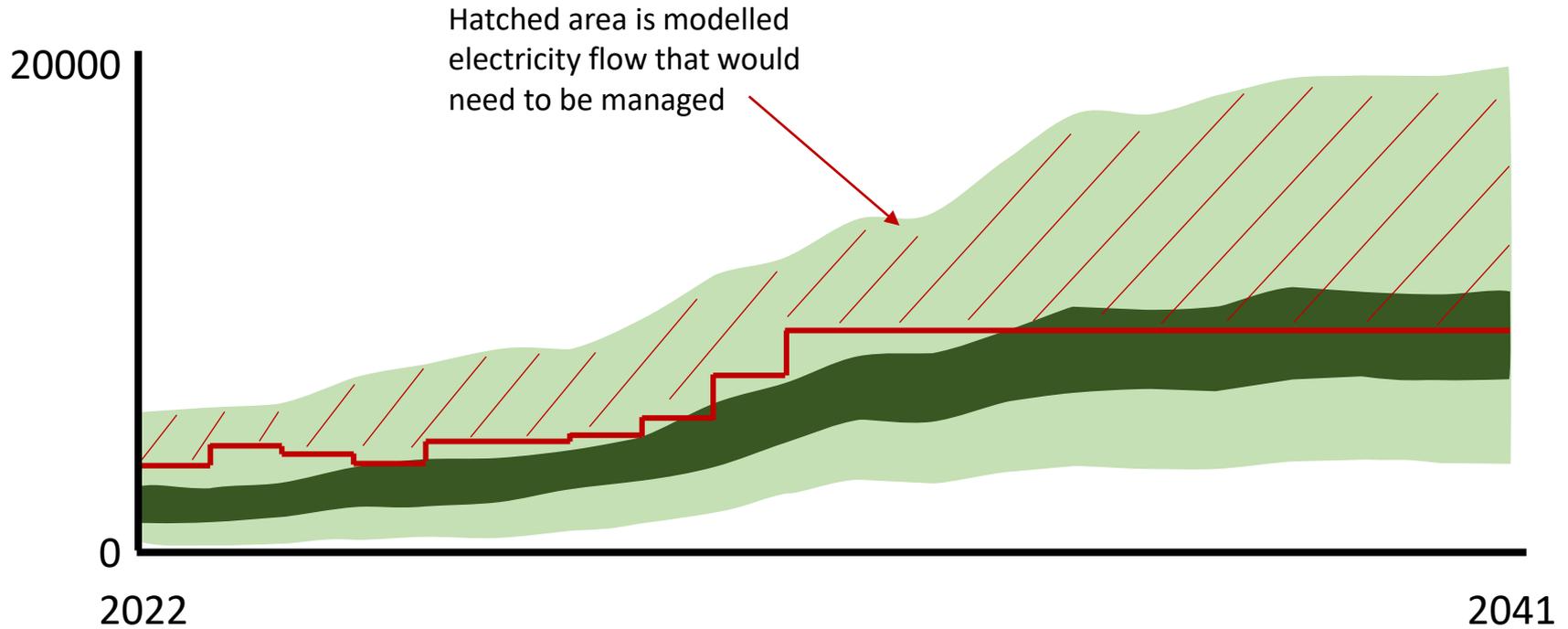
Director of Business Planning and Commercial, SSEN Transmission



- Reduce demand
- Improve efficiency
- Low carbon solutions: electrification
- Low carbon solutions: hydrogen and other low carbon technology
- Low carbon solutions: CO₂ capture from fossil fuels and industry
- Produce low carbon energy
- Offset emissions using land and greenhouse gas removals
- Outturn and baseline
- Balanced Net Zero Pathway



Source Getting to Net Zero: the critical contribution from electricity generated in the north of Scotland, SSEN Transmission, November 2021



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Paul Wheelhouse

Net Zero Lead on Energy Transition

South of Scotland Enterprise



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An Energy Grid fit for a Net-Zero South of Scotland?

Paul Wheelhouse

**Net Zero Lead
(Energy Transition)**

South of Scotland Enterprise



**SOUTH of
SCOTLAND
ENTERPRISE**

About SOSE...

- **South of Scotland Enterprise**, SOSE for short
- A dedicated economic development agency for the South
- A public body – **FOR the South, BY the South, IN the South**
- Established in April 2020 in response to the unique economic opportunities and challenges facing the South
- Covering D&G and Scottish Borders Council areas
- A Team Player – working with and bringing others together
- Led by a Board with a broad range of interests and brimming with enthusiasm and passion



Net Zero Progress

Until now, South's Energy story is one that has largely gone untold, but....

...by 2020, the South was already a Renewable Energy Powerhouse...

....offering a competitive advantage in the race to Net Zero.

- **South of Scotland is a powerhouse**: generating equivalent to **37.5 MWh** of renewable electricity for every household in our area in 2020 - vs **11.9 MWh** for Scotland and just **5.0 MWh** for the UK)

Remember, as at 2020 the South of Scotland had:

- **4.6% of the UK's landmass (14.3% of Scotland's)**
- just **0.47% of UK households (5.2% of Scotland's)**
- **However, we generate 16% of all Scotland's renewables, including:**
 - **9.6% of UK's Onshore Wind output (17% of Sco)**
 - **7.4% of UK's Hydropower output (8.1% of Sco)**
 - just **1.6% of UK Offshore wind output (56.9% of Sco)**
 - just **0.24% of UK solar PV output (8.5% of Sco)**

Source: BEIS (Sep, 2021) local authority data, adapted from original by SOSE

Net Zero Strategy

Net Zero Region by when?



- **Just Transition to Net Zero embedded at the heart of our three-year SOSE Action Plan**, and annual **Operating Plan**
- Develop the concept for a South of Scotland **Just Transition to Net Zero Route Map ...**
 - Establish baseline and **translate Scotland's interim targets into meaningful regional milestones**
 - ... developing our region's **Investment Prospectus**
 - ... supported by regional Just Transition Plans for each sector, starting with a regional **Energy Transition Plan** led by repurposed **Energy Transition Group** with **targeted workstreams, including on grid**
 - **Working with partners (You, perhaps?)** to plan for and implement our transition

Recognise that for Scotland to achieve Net Zero by 2045, the South of Scotland probably needs to be **Carbon Positive**

Contact us

www.southofscotlandenterprise.com/netzero

0300 304 8888

Enquiries to netzero@sose.scot

Keep up to date



@sosenterprise



South of Scotland Enterprise



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Also see:

<http://www.netzeronation.scot/>



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Pinsent Masons



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An energy grid fit for net-zero – rewiring the system

Euan McVicar,
Senior Climate Adviser

A purpose-led professional services
business with law at the core

An energy grid fit for net-zero – rewiring the system

- Costs
 - Cost Uncertainty & Anticipatory Investment
 - Opportunity Cost
- Strategy
 - Policy
 - Planning and the Role of the SO
 - Integrated consenting
- Price Control Framework
- Reform or Navigate the Regulatory Framework

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Grid Manager

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FLOATING OFFSHORE WIND
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