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This session begins at 1000

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COP26: stepping up to the challenge of climate change

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Claire Mack

Chief Executive

Scottish Renewables

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San Johal

Chief People Officer

EDF Renewables

Nicola Sturgeon MSP

First Minister of Scotland

Dr Andy Kerr

UK and Ireland lead

EIT Climate-KIC

Solutions for scale of the challenge

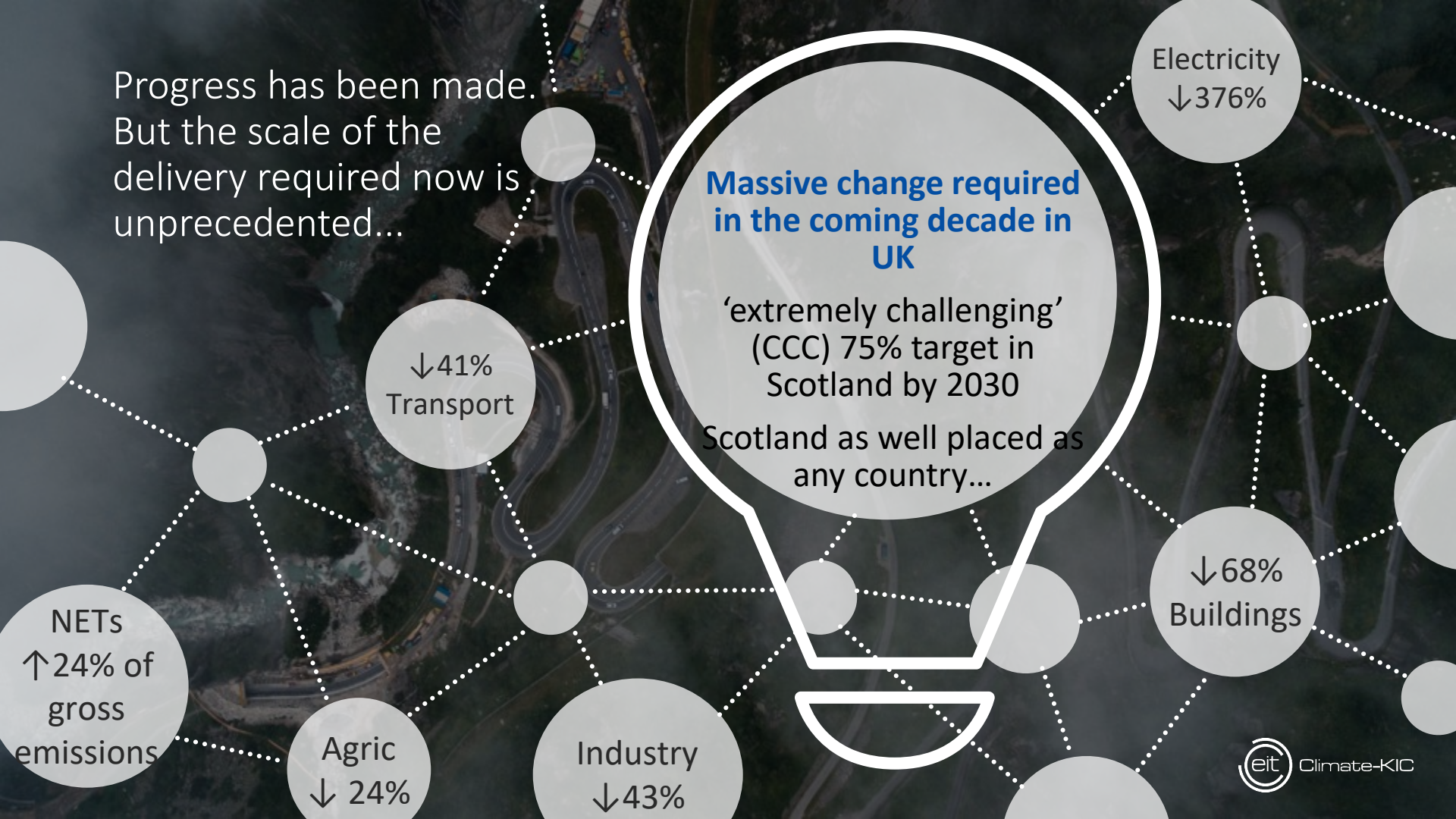
Scottish Renewables Annual Conference – March 2021

Andy Kerr

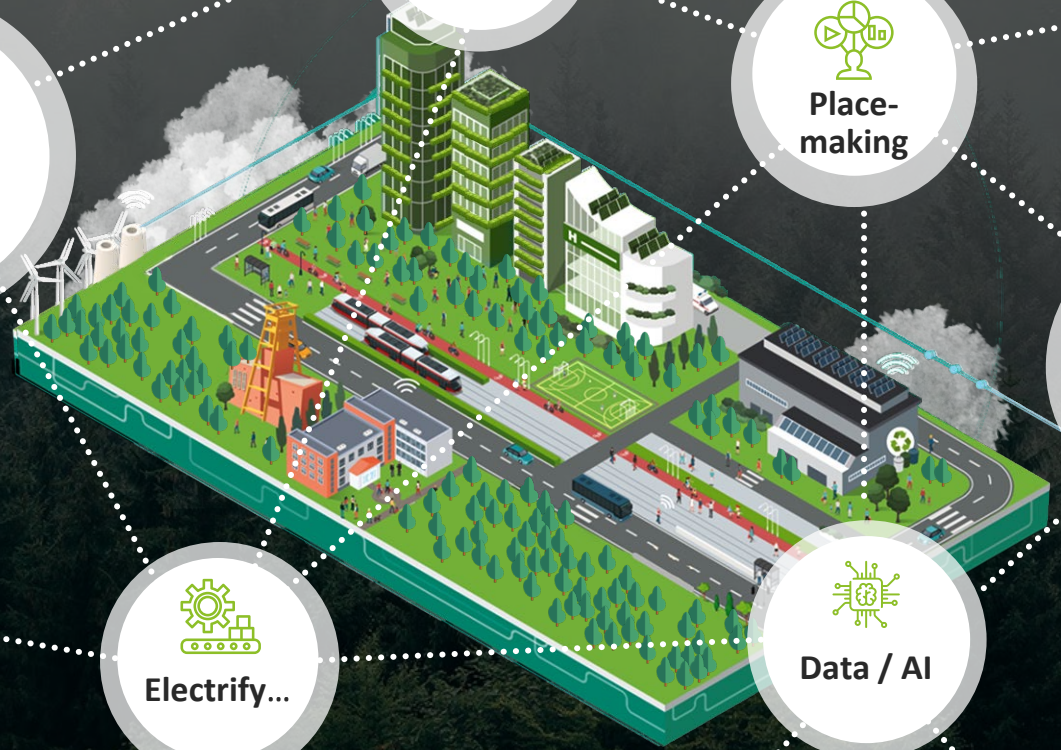
@ClimateKIC

March 2021

EIT Climate-KIC is supported by the EIT, a body of the European Union


Progress has been made. But the scale of the delivery required now is unprecedented...
Massive change required in the coming decade in UK
'extremely challenging' (CCC) 75% target in Scotland by 2030
Scotland as well placed as any country...
Electricity ↓376%
↓41% Transport
↓68% Buildings
NETs ↑24% of gross emissions
Agric ↓ 24%
Industry ↓43%
eit Climate-KIC

How are solutions going to roll out?



Finance & Investment

Green recovery… ‘Build back better’

Place-making

Bioeconomy

Civic legitimacy

Education and skills

Electrify…

Data / AI

Climate-KIC

Our experience has taught us that solutions for the scale of the challenge requires a different approach to delivery…

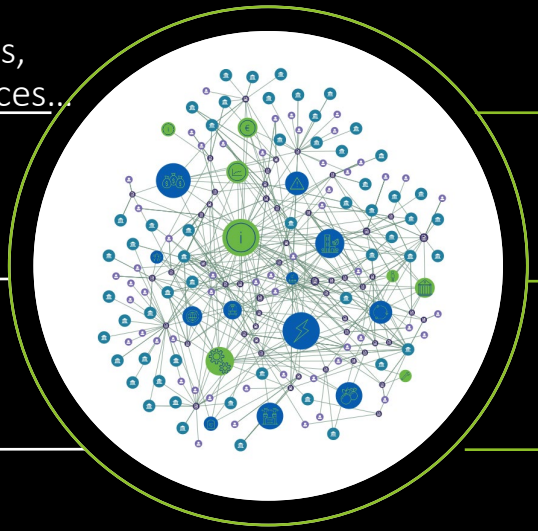
What we need…

Investment mindsets…upfront investment, long term annuity benefits, blending public /private finance, services…

Energy projects which deliver co-benefits of climate action – places, homes, jobs, skills, wellbeing…

Civic legitimacy…shared vision *with communities* for delivering radical change

Whole system innovation



Outcomes

Investment led recovery

Integrated personalized services, capturing spillover benefits

Increased agency & resilience to future economic shocks

Climate-KIC

Climate-KIC

Andy.Kerr@climate-kic.org

www.climate-kic.org

@ClimateKIC

EIT Climate-KIC is supported by the
EIT, a body of the European Union

Climate-KIC

Rachel McEwan

Chief Sustainability Officer

SSE

Just Transition Commission Final Report

"A national mission for a fairer and greener Scotland"

Background

… Provide practical, realistic, affordable recommendations that will support Scottish Ministers take action that will:

1. **Maximise the economic and social opportunities that the move to a net-zero economy by 2045 offers;**
2. **Build on Scotland's existing strengths and assets;**
3. **Understand and mitigate risks that could arise in relation to regional cohesion, equalities, poverty (including fuel poverty), and a sustainable and inclusive labour market.**

What is a Just Transition?

“The imperative of a just transition is that Governments design policies in a way that ensures the benefits of climate change action are shared widely, while the costs do not unfairly burden those least able to pay, or whose livelihoods are directly or indirectly at risk as the economy shifts and changes.”

Just Transition Commission

Four key messages (24 recommendations)

1. Pursue an orderly, managed transition to net-zero that creates benefits and opportunities for people across Scotland. Delivery of this must be a national mission

2. Equip people with the skills and education they need to benefit from the transition

3. Empower and invigorate our communities and strengthen local economies

4. Share benefits widely and ensure burdens are distributed on the basis of ability to pay.

A company Just Transition strategy

SSE'S 20 PRINCIPLES FOR A JUST TRANSITION

TRANSITIONING INTO A NET-ZERO WORLD

SSE'S PRINCIPLES FOR GOOD, GREEN JOBS

1. Guarantee fair and decent work
2. Attract and grow talent
3. Value employee voice
4. Boost inclusion and diversity

SSE'S PRINCIPLES FOR CONSUMER FAIRNESS

5. Co-create with stakeholders
6. Factor-in whole-system costs and benefits
7. Make transparent, evidence-based decisions
8. Advocate for fairness

SSE'S PRINCIPLES FOR BUILDING AND OPERATING NEW ASSETS

9. Support competitive domestic supply chains
10. Set social safeguards
11. Share value with communities
12. Implement responsible developer standards

TRANSITIONING OUT OF A HIGH-CARBON WORLD

SSE'S PRINCIPLES FOR PEOPLE IN HIGH-CARBON JOBS

13. Re-purpose thermal generators for a net-zero world
14. Establish and maintain trust
15. Provide forward notice of change
16. Prioritise retraining and redeployment

SSE'S PRINCIPLES FOR SUPPORTING COMMUNITIES

17. Deliver robust stakeholder consultation
18. Form partnerships across sectors
19. Promote further industrial development
20. Respect and record cultural heritage

Reflections for the renewable sector

1. We’ve got a big job to help deliver a Just Transition for the country;
2. A proud tradition of the renewables sector ‘sharing value’;
3. The importance of the portability of skills;
4. A thriving domestic supply chain is in all our interests: and a competitive Scottish renewables sector is too;
5. Contributing to … a ‘national mission’.

Vicky Dawe

Deputy Director

Renewable Energy Support Schemes

Department for Business, Energy and Industrial Strategy

Powering CB6

The role of renewables

24 March, 2021

Department for Business, Energy & Industrial Strategy

Net zero and a changing landscape

- Since signing net zero into law there has been a drumbeat of major announcements, fundamentally changing the landscape for renewable generation.

Prime Minister's 10 Point Plan

Energy White Paper

40GW offshore wind

1GW floating offshore wind

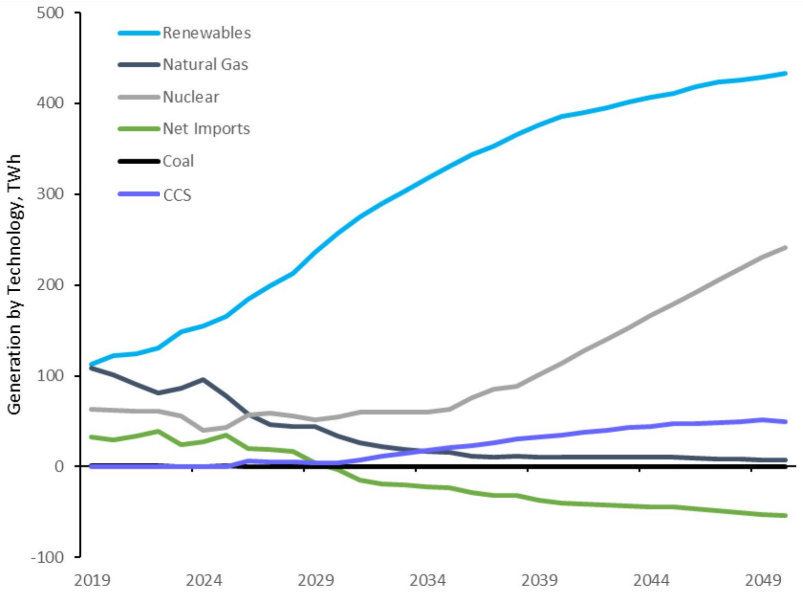
Doubling ambition for AR4

New pot structure for AR4

Delivering our commitments

- There are many different pathways to delivering net zero, but renewables are a key component across all scenarios.
- We have set out ambitious plans for renewables, the 2020s need to be the decade in which that acceleration is delivered.
- We have set up a Ministerial Delivery Group to drive progress and will follow up headline commitments, such as 40GW offshore wind by 2030, with actions such as expanded CfD allocation rounds.

2050 Electricity generation by fuel source in GB, TWh – Net Zero Higher Demand Scenario, balanced mix



Source: BEIS ENERGY AND EMISSIONS PROJECTIONS 2019, ANNEX O

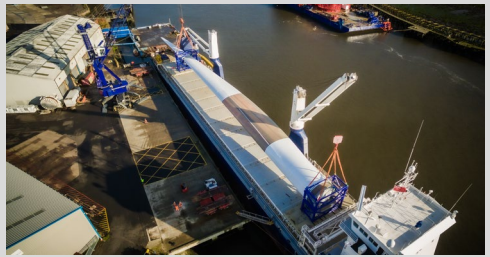
New ports & manufacturing investments

Aberdeen Energy Transition Zone
£27m in Budget

Able Marine Energy Park
~ £450m wind hub
£75m funding

Teesworks
Major port hub development
£20m funding

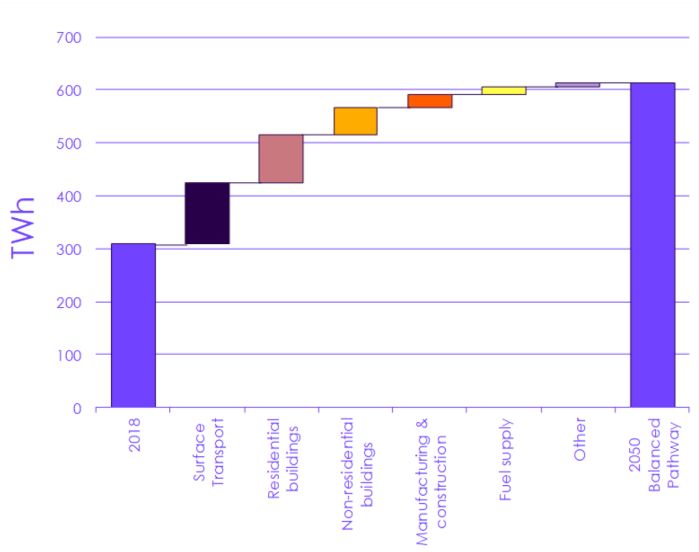
First anchor tenant: GE
107-metre turbine blades
750 direct jobs; opening 2023



CCC Carbon Budget 6 Report

- CB6 will be the first carbon budget to be set since legislating for net zero.
- The CCC recommended a 78% reduction in UK emissions by 2035. If adopted, this would represent a step-change in the pace of decarbonisation.
- For power, the CCC pathways show low carbon generation may need to increase from 50% now to 100% by 2035, at the same time as electricity demand rises by 50%.

Figure M5.5 Contribution by sectors to increased Electricity demand in the Balanced Pathway (2018-50)

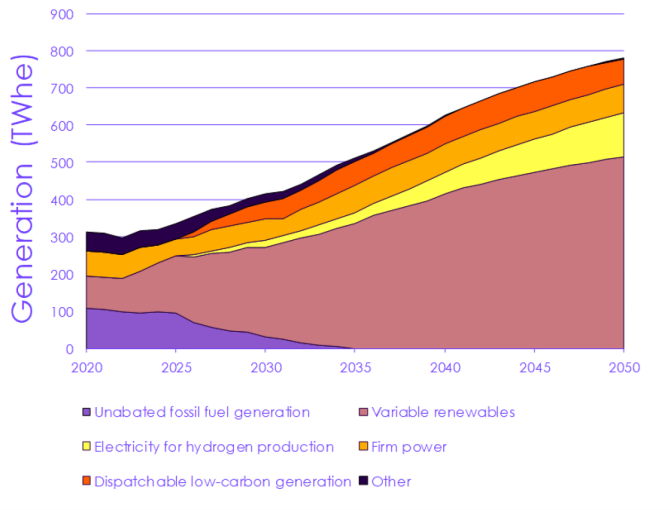


Source: CCC analysis.
Notes: 'Other' category includes agriculture, aviation, direct air capture, shipping and F-gases.

Implications for renewable deployment

- The CCC emphasised the role of renewables within their CB6 pathways, including:
  - The importance of reaching 40 GW of offshore wind in 2030, on a pathway to 65-140 GW by 2050.
  - The need for a balanced mix of technologies, including onshore wind, solar, gas CCS and nuclear, and possibly BECCS which could deliver greenhouse gas removals.
  - Estimated deployment rates of 3GW per year of new wind capacity, plus repowering of older sites, and 3GW per year of new solar capacity.
  - The requirement for a major increase in system flexibility – as renewables could contribute ~70% of generation in 2035 and up to 90% by 2050.

Figure A3.4.c Illustrative generation mix for the Balanced Net Zero Pathway (2020-50)



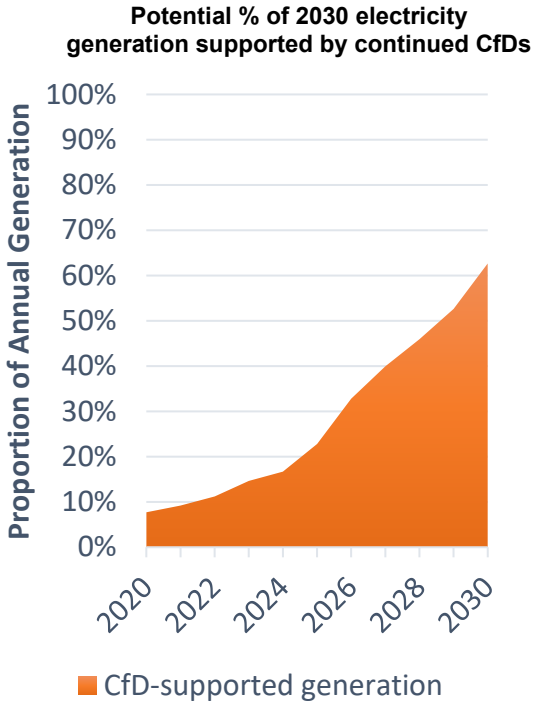
Source: CCC analysis.
Notes: Chart reflects UK electricity generation. Additional capacity is available through interconnection. Unabated fossil fuel generation includes coal and gas. Variable renewables include wind and solar. Firm power includes nuclear. Dispatchable low-carbon generation includes gas CCS, BECCS and hydrogen.

Shaping future market dynamics

- The CCC note the success of CfD in delivering deployment and bringing down costs, and believe long-term contracts remain appropriate given the need for bankable revenue streams.

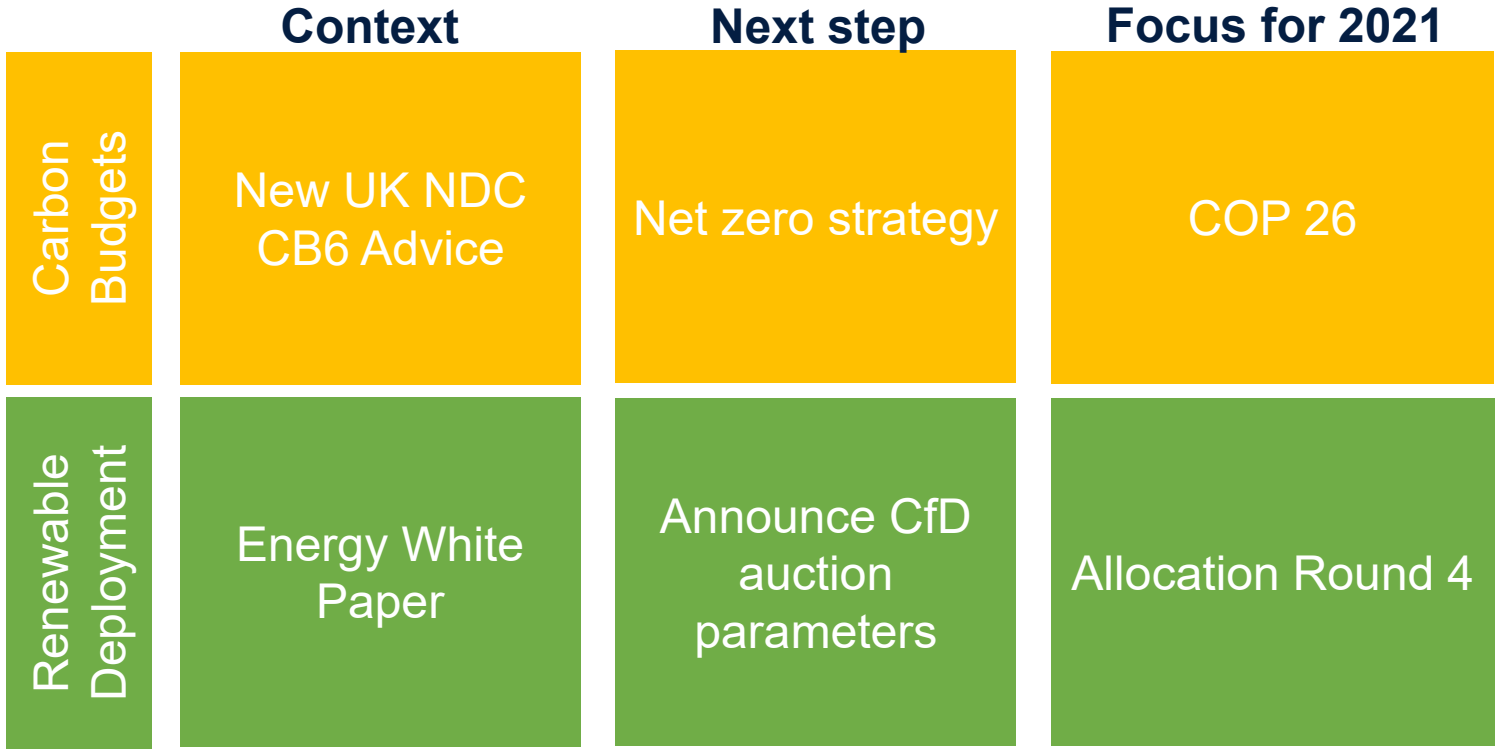
- We need to be cognisant of the impacts on the wider electricity markets. In the CB6 report the CCC recognise this: *“planning should begin immediately for the more fundamental challenges of running a completely decarbonised system”*.

- We are seeking to address these challenges, initially through our recent call for evidence on enabling a highly renewable system.



Source: *BEIS CALL FOR EVIDENCE: ENABLING A HIGH RENEWABLE NET ZERO ELECTRICITY SYSTEM*

Upcoming milestones



This session begins at 1200

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Founder, First Avenue Consulting

Ermenegilda Boccabella
Energy and Climate Adviser, Global Counsel

Emma Pinchbeck
Chief Executive Officer, Energy UK

Melanie Grimmitt
Partner – Global Head of Energy, Pinsent Masons

This session begins at 1445

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Changing customers and the power of market pull

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Dr Warren Bowden
Innovation and Sustainability Director,
Scottish Leather Group

Morag Garden
Head of Sustainability and Innovation,
Scotch Whisky Association

Danielle Kelly
Director of Strategy and Sales Scotland, STV

Aaron Falls
Group Strategy Director, Alexander Dennis

Claire Mack

Chief Executive

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Wednesday Programme

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0930 - **Hydrogen: enough of the talk**

1145 - **Funding the dream**

1400 - **Charging ahead? Grid reform and the battle for low-carbon power**

1530 - **I love it when a plan comes together**

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Hydrogen: enough of the talk

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Chair

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Duncan Clark

Head of Region UK

Ørsted

Clare Lavelle

Associate Director

Energy Consultancy Leader – North

Arup

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SCOTTISH HYDROGEN ASSESSMENT

Scottish Government
Riaghaltas na h-Alba
gov.scot

Scottish Enterprise

HIE

The Scottish Hydrogen Assessment

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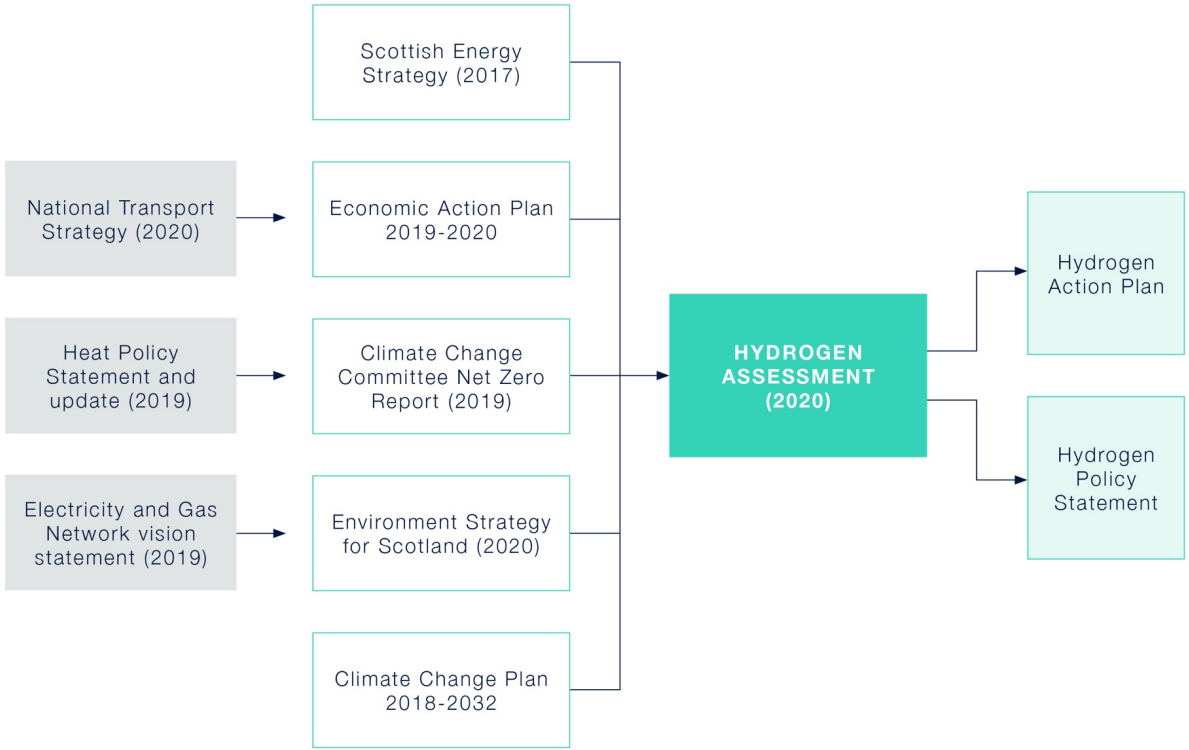

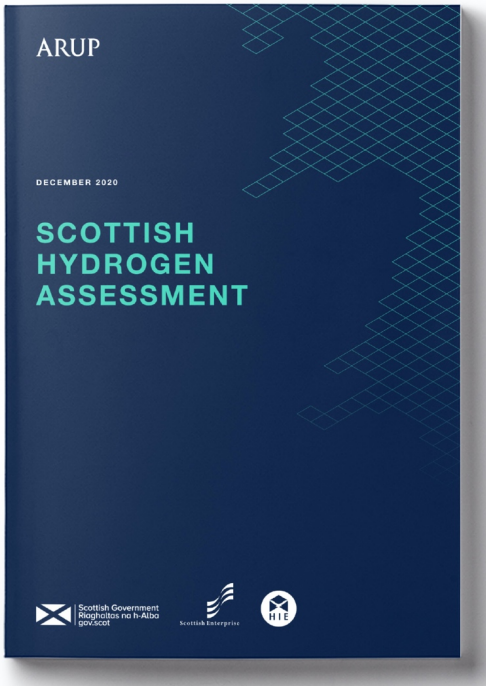


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ON-SITE HYDROGEN
Committee on Climate Change
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Dundee CHANGING FOR THE FUTURE
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ERM
ENERGY TECHNOLOGY CENTRE
eneus energy
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What is Hydrogen?

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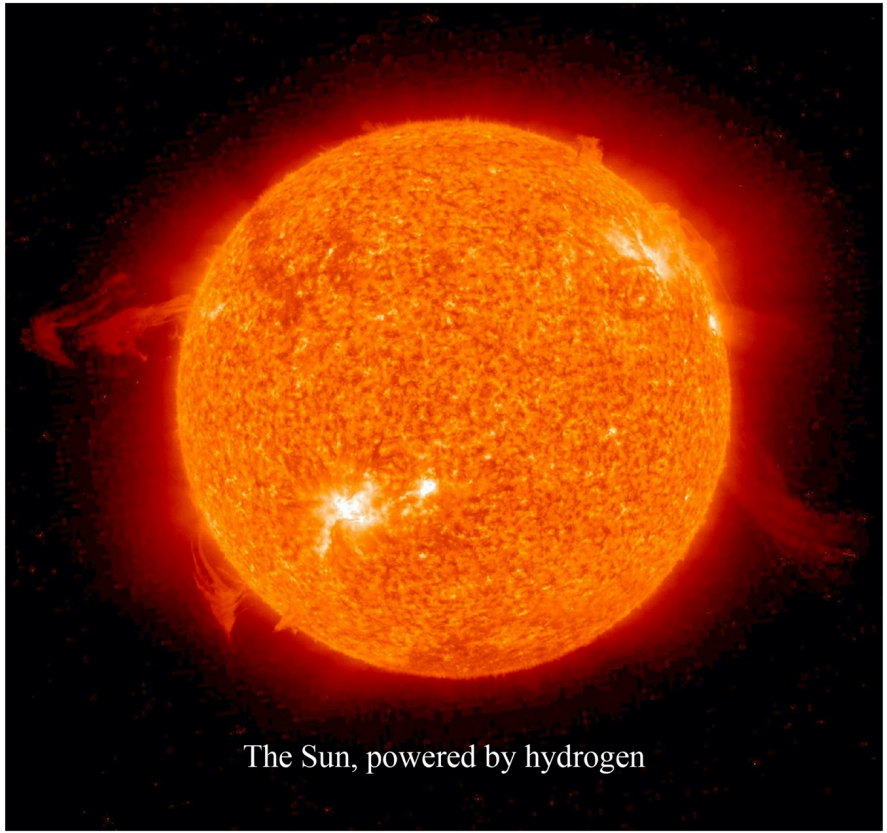

The Sun, powered by hydrogen

New Street Gasworks, Edinburgh

Why Hydrogen?

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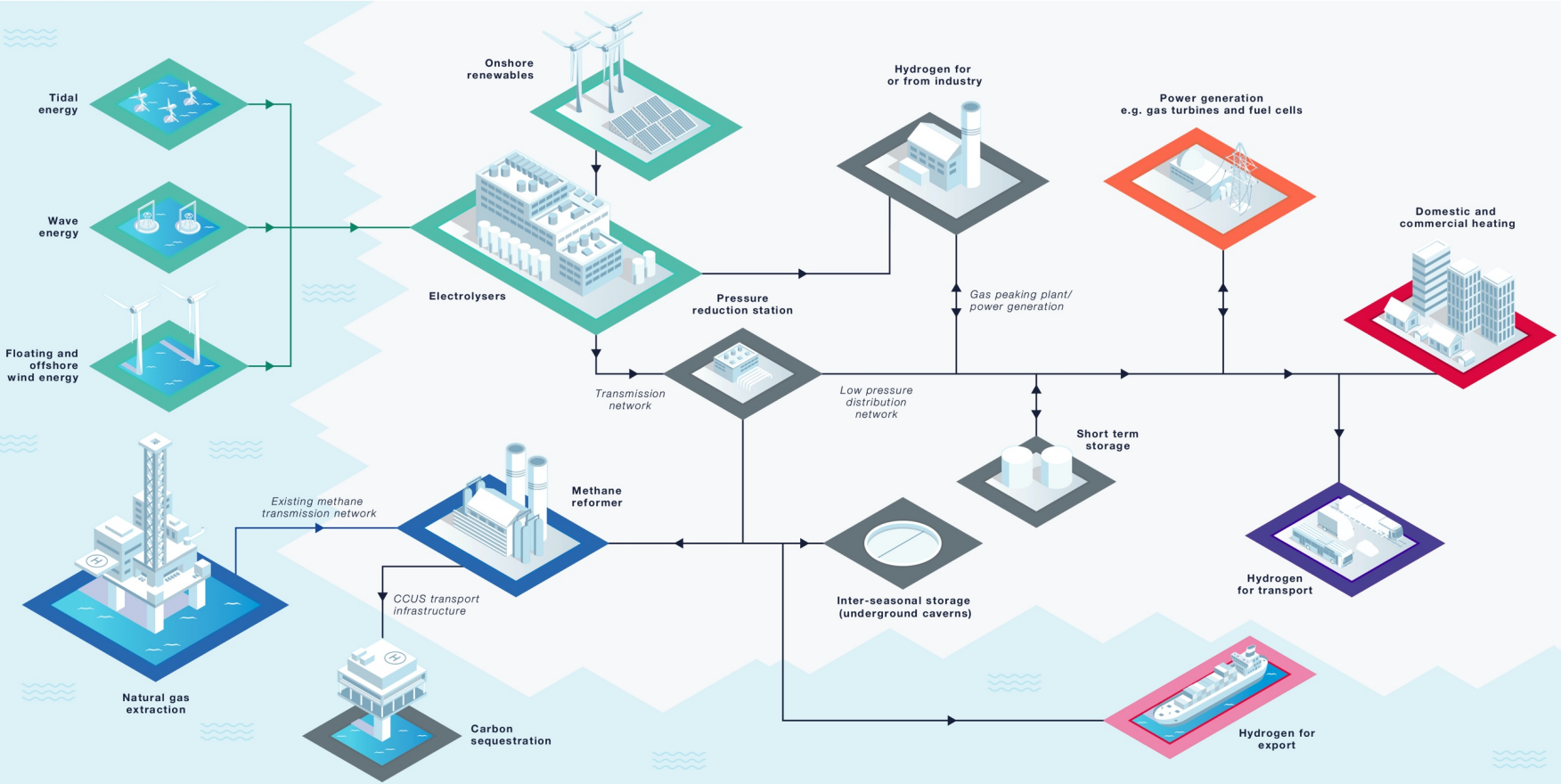

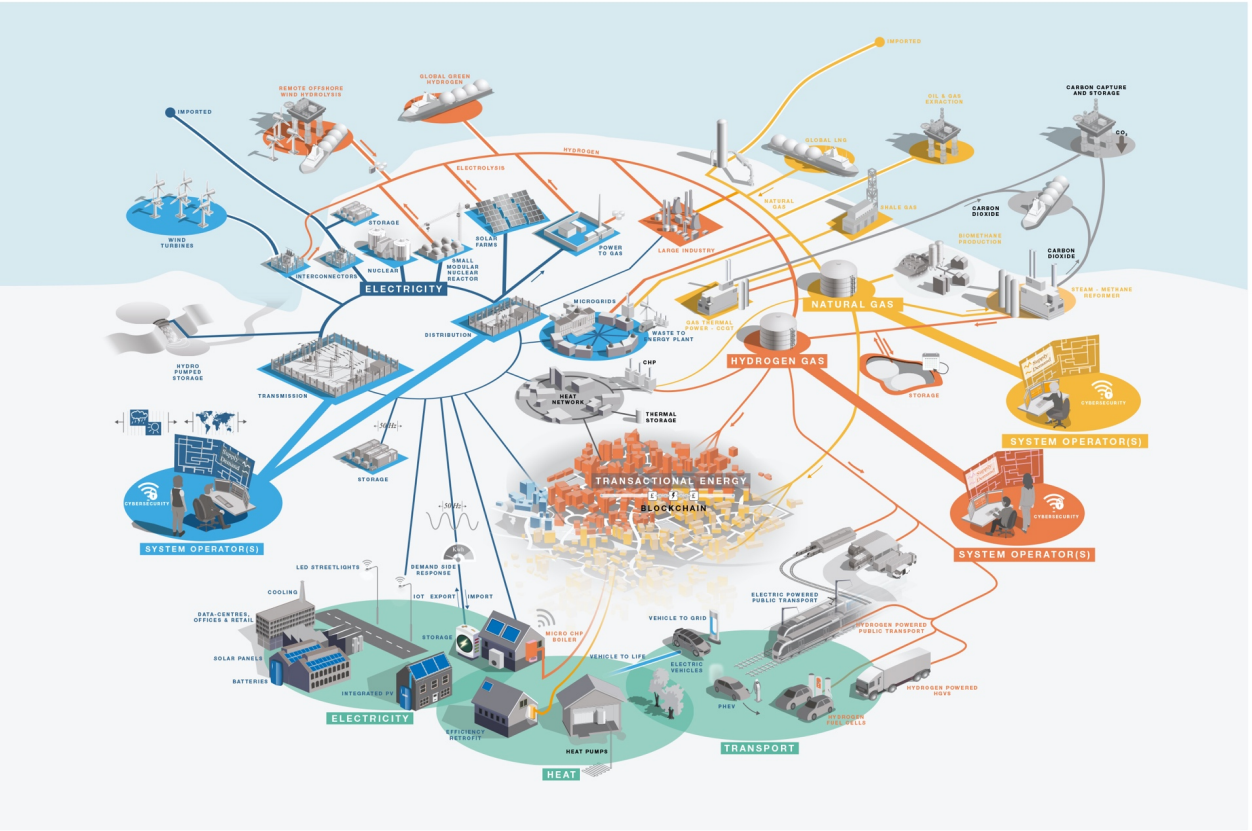

- Technology maturity/risk
- User requirements
- Commercial competitiveness
- Investment case
- Consumer acceptance
- Whole system analysis
- Socio-Economic Benefits
- Geography

Hydrogen Production

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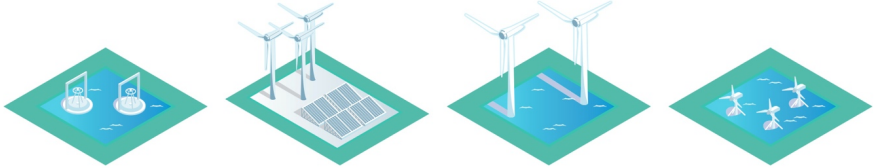
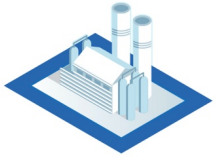
Natural gas



Renewable generation



Methane reformation

Electrolysis

Carbon released into atmosphere

Carbon captured (up to 90-97%)

Grey Hydrogen

Blue Hydrogen

Green Hydrogen

Hydrogen Production

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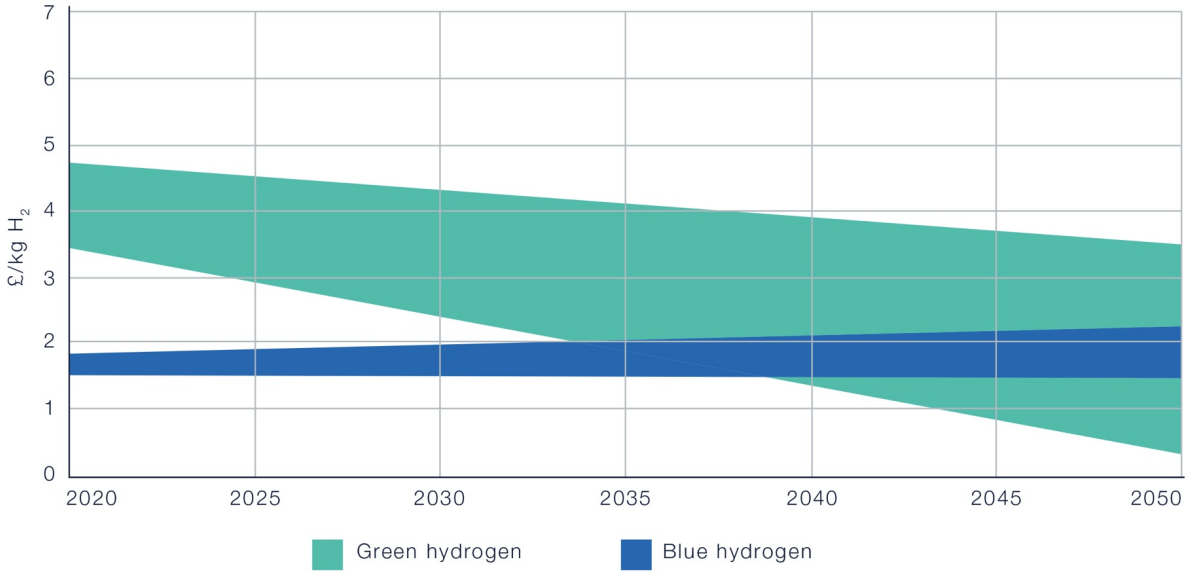
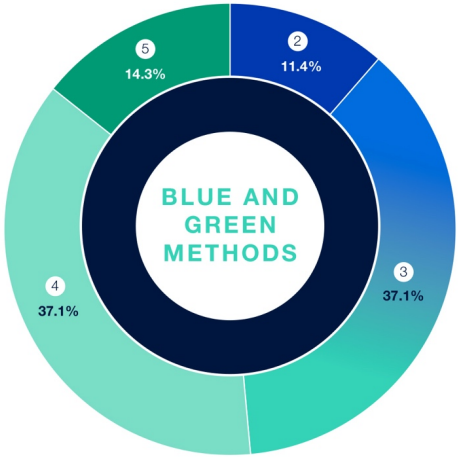




1. Blue only (no stakeholder selected)
2. Mainly blue
3. Mixture of blue and green
4. Mainly green
5. Green only

The Hydrogen Options: Demand

ARUP

LOW REGRETS

Where hydrogen is already used or is highly likely to be used given the lack of alternatives.

Existing H2 uses

Fleet and heavy transport

DECISIONS TO BE MADE

Where it could be used if it is decided that it is the best decarbonisation option but more work is required to understand the appropriate solution for the application considering location specific factors.

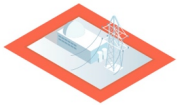
Domestic and commercial heating

Industrial heat

IF HYDROGEN ACHIEVES HIGH SCALE AND/OR LOW COST

Where hydrogen is less likely to be used given the other alternative decarbonisation options and is probably more likely to play a minor role.

Power generation



Personal transport

LEAST LOW CARBON ALTERNATIVES

MOST COMPETITIVE LOW CARBON ALTERNATIVES

Hydrogen for Heat

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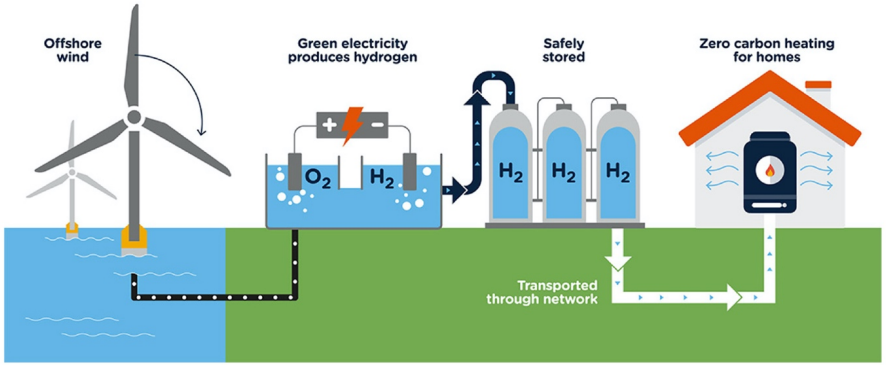

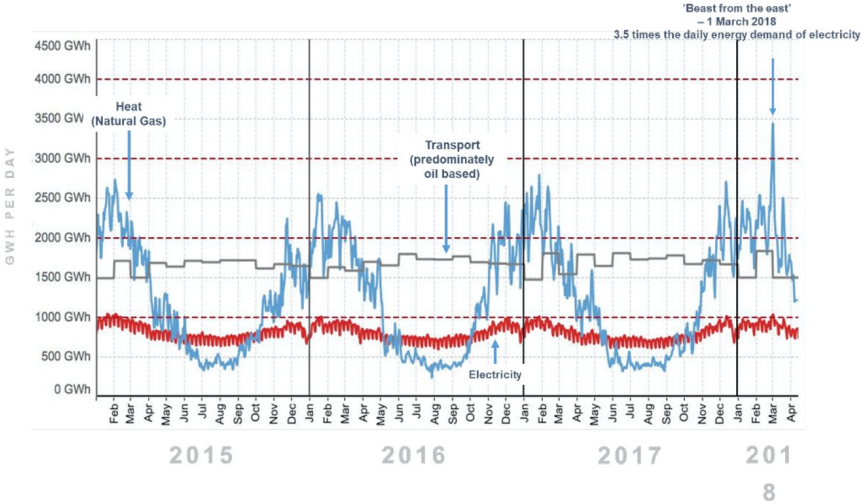

Global Hydrogen Projects

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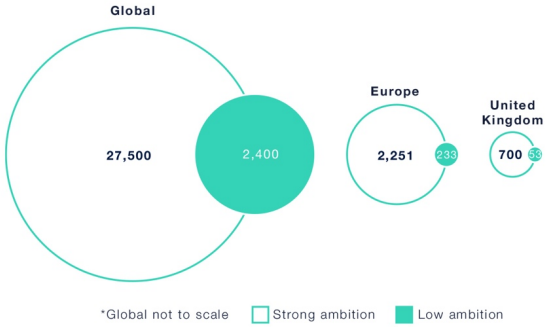

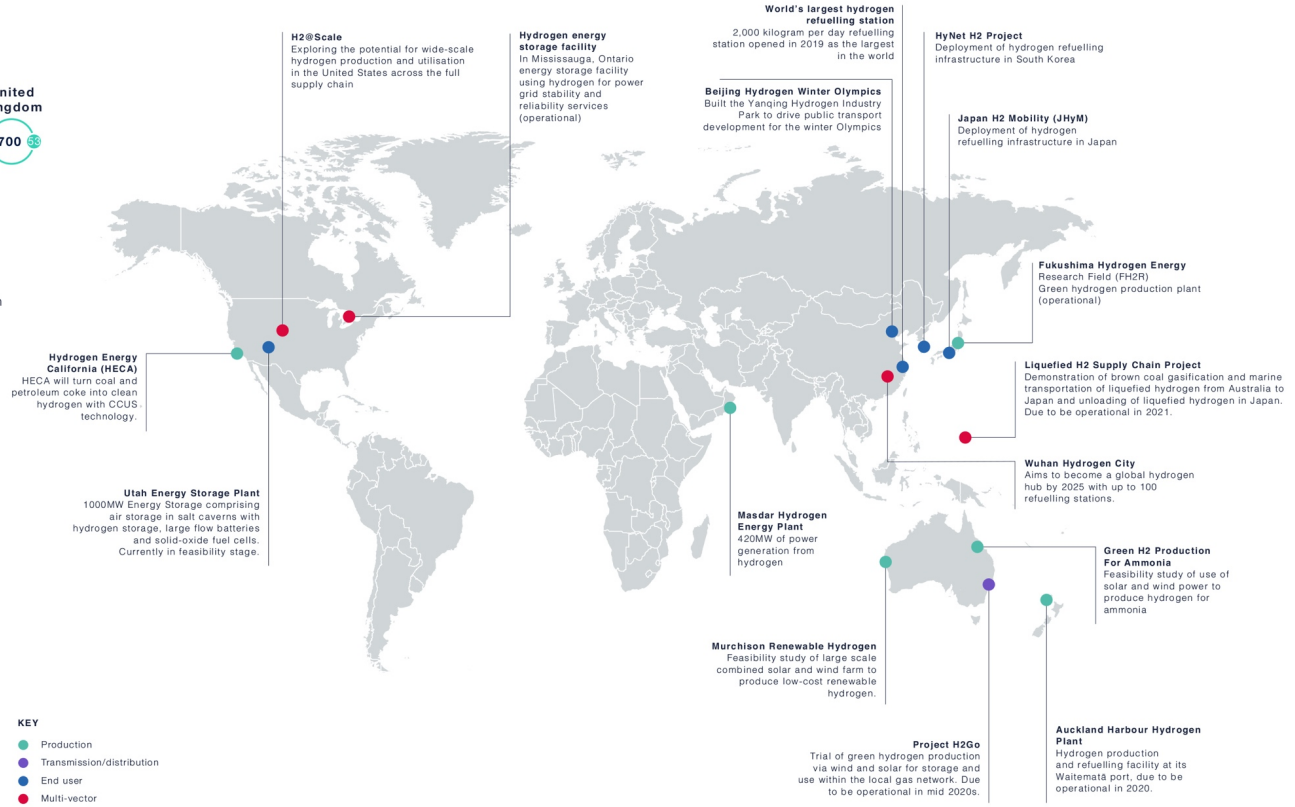


Surf ‘n’ Turf, EMEC, Orkney
BIGHIT
SURF 'N' TURF

Scottish Hydrogen Projects

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01 Project Acorn

02 Hydrogen Offshore Production Project

03 Surf 'n' Turf

04 Dolphyn ERM

05 Caledonian Clean Energy Project

06 Chapelcross

07 Green hydrogen for Scotland

08 H100

09 Grangemouth to Granton future local transmission system

10 Aberdeen Vision

11 Hydrogen Bus Project

12 HySeas I - III

13 HySpirits

14 HyTrEc

15 HyDIME

16 SWIFTH2

17 HyFlyer

18 Stornoway hydrogen refueler

19 Hydrogen refuelling station

20 Glasgow hydrogen transport project

21 TECA fuel cell

22 Glasgow hydrogen bus project

23 HyStorPor

24 BIG HIT

25 Methilltoune

26 REFlex

27 Promoting Unst Renewable Energy

28 The Hydrogen Office

29 Levenmouth Community Energy Project

30 East Neuk Power to Hydrogen

31 Michelin Scotland Innovation Parc

32 Shetland Hub

33 100% Green Hydrogen Hub

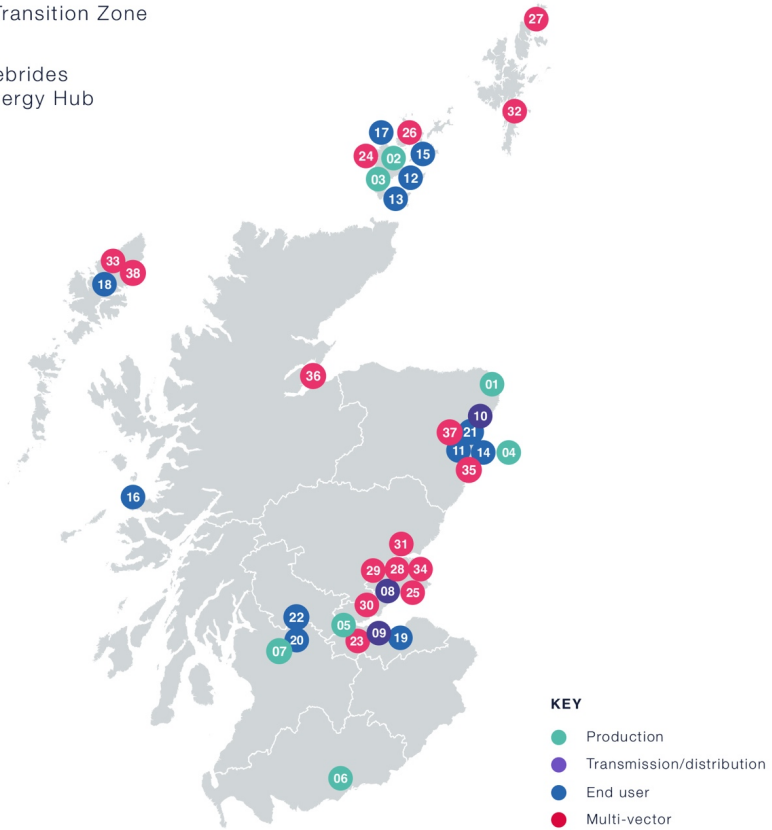
34 Hydrogen Accelerator

35 Aberdeen Hydrogen Hub

36 Cromarty Firth Hydrogen Hub

37 Energy Transition Zone

38 Outer Hebrides Local Energy Hub



THE SCENARIOS ARE:

	HYDROGEN ECONOMY	GREEN EXPORT	FOCUSED HYDROGEN
	Hydrogen is one of the main ways in which Scotland's energy system is decarbonised. A balanced mix of blue and green hydrogen is extensively across all sectors.	Scotland's vast renewable resources, particularly offshore wind, but also wave, tidal and onshore are used to produce green hydrogen. This serves a European export market.	Hydrogen plays a supporting role in decarbonising the energy system in sectors that are hard to decarbonise by other means. Hydrogen is produced near to where it's used.
PRODUCTION			
	46 TWh  39 TWh	126 TWh 	14 TWh  7 TWh
END USE			
 ***TRANSPORT***	 11 TWh	 22 TWh	 7 TWh
 ***DOMESTIC AND COMMERCIAL HEAT***	 35 TWh	-- TWh	 6 TWh
 ***INDUSTRY AND ELECTRICITY***	 19 TWh	 11 TWh	 7 TWh
 ***EXPORT***	 20 TWh	 94 TWh	
 ***GVA***	£16 billion	£25 billion	£5 billion
 ***JOBS***	175,000	310,000	70,000

Key Messages

ARUP

- GOING BEYOND THE PILOT PROJECT STAGE AND INTO COMMERCIAL SCALE PROJECTS
- SPEED OF DEPLOYMENT
- SCOTLAND COULD GROW A STRONG HYDROGEN ECONOMY SUPPORTING JOBS AND GVA GROWTH
- HYDROGEN NEEDS TO BE SEEN WITHIN A WHOLE ENERGY SYSTEM CONTEXT
- CLEAR STRATEGY WITH PROPOSED AMBITIONS
- CO-ORDINATION OF EFFORTS ACROSS INDUSTRY AND GOVERNMENT
- MAINTAINING FLEXIBILITY

Dr Graham Cooley

Chief Executive Officer

ITM Power

ITM Power | Briefing

24th March 2021

Graham Cooley, CEO, ITM Power plc

ITM POWER
Energy Storage | Clean Fuel

Key Achievements in the period:

- Record Backlog: £124m (October 2020: £118m)
- Increasing Tender pipeline of £434.7m (Oct 2020: £324.9m)
- £172m fundraise in Oct 2020 | £30m investment by Snam
- Opened Bessemer Park | world's largest electrolyser factory
- Sale to Linde of 24MW | world's largest PEM electrolyser
- 100MW Humber FEED study in process
- 100MW Refhyne II announced by Shell
- Strategic partnership with Scottish Power
- Strong momentum with Linde in key strategic markets

ITM Power Bessemer Park | 1GW pa Capacity Electrolyser Factory

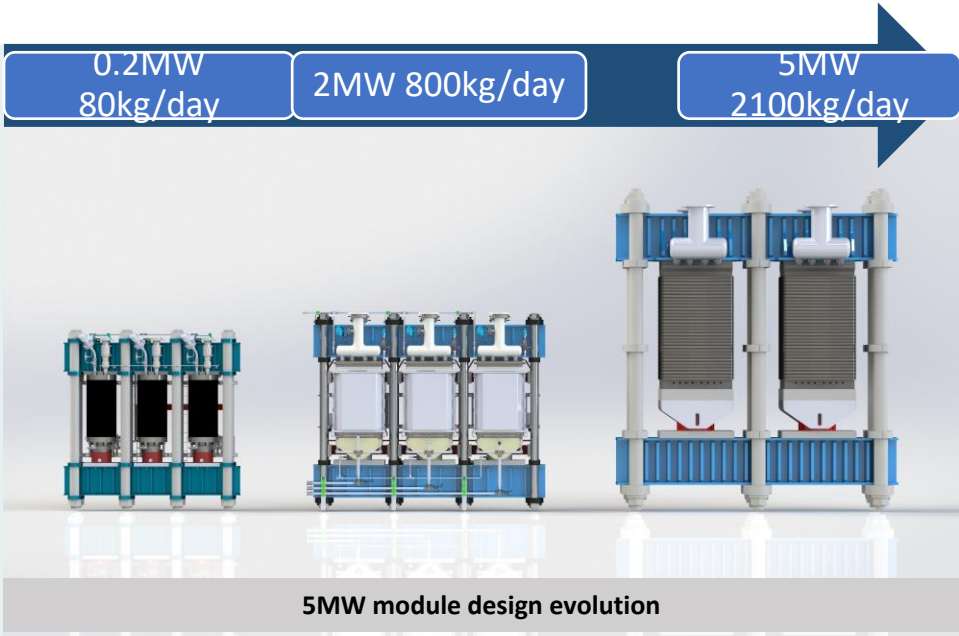
A strong platform for rapid future growth

TECHNOLOGY ACCELERATION
HYDROGEN ENERGY SYSTEMS

ITM POWER
Energy Storage | Clean Fuel

Superior offering for the XL market:

- Acceleration of 5MW stack module underway
- Market leading electrolyser performance
- Responding to the market demand for large scale
- Standardisation and modularity at scale
- Pre-engineer into 20MW packages for rapid deployment
- Exposure to larger projects faster | Minimise on site works



5MW module design evolution

Best in class | available 2 years earlier

Proudly Awarded MADE IN SHEFFIELD

GIGASTACK

TECHNOLOGY ACCELERATION
HYDROGEN ENERGY SYSTEMS

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Energy Storage | Clean Fuel

Superior offering for the XL market:

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- Exposure to larger projects faster | Minimise on site works

100MW design | Part of the Gigastack FEED study

Best in class | available 2 years earlier

Proudly Awarded MADE IN SHEFFIELD

GIGASTACK

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Energy Storage | Clean Fuel

Double Capacity | Half Lead Times:

- Enhance 1GW capacity of Bessemer Park through automation
- Eliminates bottleneck of testing with 5MW power supply
- Use blueprint to set up **new factory** to increase capacity
- New factory in **strategic location** to optimise cost, quality, supply
- Increase minimum stock | Reduce lead times | Project wins
- Market supply capacity to show ability to respond

ITM Power Bessemer Park | 1GW pa Capacity Electrolyser Factory

Double capacity (1 to 2GW/year) | Halve lead time (14 to <8 months)

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Green Hydrogen Cost:

- Assumptions for 2025 deliveries
- Orders placed in 2023
- Capex $500/kW ($0.5m/MW)
- LCOE $50/MWh (5c/kWh)
- 50% Load Factor
- Direct coupling to renewables

Exhibit 14 | Renewable hydrogen from electrolysis production cost scenarios[5], USD/kg hydrogen

Hydrogen Council

Cost of renewable hydrogen with varying LCOE and load factors
USD/kg H_2

< USD 2/kg | USD 2-3/kg | USD 3-4/kg | > USD 4/kg | Viable medium-term (<2030)

LCOE	Capex electrolyser	USD 750/kW					USD 500/kW					USD 250/kW				
UDD 0/MWh		5.7	2.8	1.9	1.4	1.1	4.2	2.1	1.4	1.1	0.9	2.8	1.4	0.9	0.7	0.6
USD 10/MWh		6.1	3.3	2.4	1.9	1.6	4.7	2.6	1.9	1.5	1.3	3.2	1.9	1.4	1.2	1.0
USD 20/MWh		6.6	3.8	2.8	2.4	2.1	5.2	3.0	2.3	2.0	1.8	3.7	2.3	1.9	1.6	1.5
USD 30/MWh		7.1	4.2	3.3	2.8	2.5	5.6	3.5	2.8	2.5	2.2	4.2	2.8	2.3	2.1	2.0
USD 40/MWh		7.5	4.7	3.8	3.3	3.0	6.1	4.0	3.3	2.9	2.7	4.6	3.2	2.8	2.6	2.4
USD 50/MWh		8.0	5.2	4.2	3.7	3.5	6.5	4.4	3.7	3.4	3.2	5.1	3.7	3.2	3.0	2.9
USD 100/MWh		10.3	7.5	6.5	6.1	5.8	8.9	6.7	6.0	5.7	5.5	7.4	6.0	5.6	5.3	5.2
Load factor		10%	20%	30%	40%	50%	10%	20%	30%	40%	50%	10%	20%	30%	40%	50%

SOURCE: McKinsey

Green Hydrogen Cost Dominated by LCOE, Electrolyser Capex and Load Factor

ITM POWER
Energy Storage | Clean Fuel

Green Hydrogen Cost:

- $0.8 to $1.60/kg before 2050
- Equivalent to gas at $6-$12/MMBtu
- Lower cost than NG
- Lower cost than CCS (Blue H_2)
- Broad agreement from BNEF, Platts, Hydrogen Council and Hydrogen Europe

"If electrolyser manufacturing can scale up, and costs continue to fall, then our calculations suggest renewable hydrogen could be produced for $0.8 to $1.60/kg in most parts of the world before 2050. This is equivalent to gas priced at $6-$12/MMBtu, making green hydrogen competitive with current natural gas prices and cheaper than producing hydrogen from natural gas or coal with CCS.“ **BNEF**

Bloomberg NEW ENERGY FINANCE | S&P Global Platts | Hydrogen Council | Hydrogen Europe

Green Hydrogen should be prioritised in the cost down journey because its Net Zero

NO emissions

ITM POWER
Energy Storage | Clean Fuel

Why ITM Power:

- Rapid market growth in the GW scale
- Global technology leadership and manufacturing scale
- Global partners: Shell, Linde, Snam, Orsted and SPR (Iberdrola)
- Transformation of the backlog and pipeline
- Fundraise to accelerate ITM Power
- Capturing the global opportunity

10MW Shell Electrolyser

Capturing the global green hydrogen opportunity

ITM Power | Briefing

24th March 2021

Graham Cooley, CEO, ITM Power plc

Dr Kerry-Ann Adamson

Project Manager

Advisian

This session begins at 1145

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Scottish Renewables conference

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March 2021

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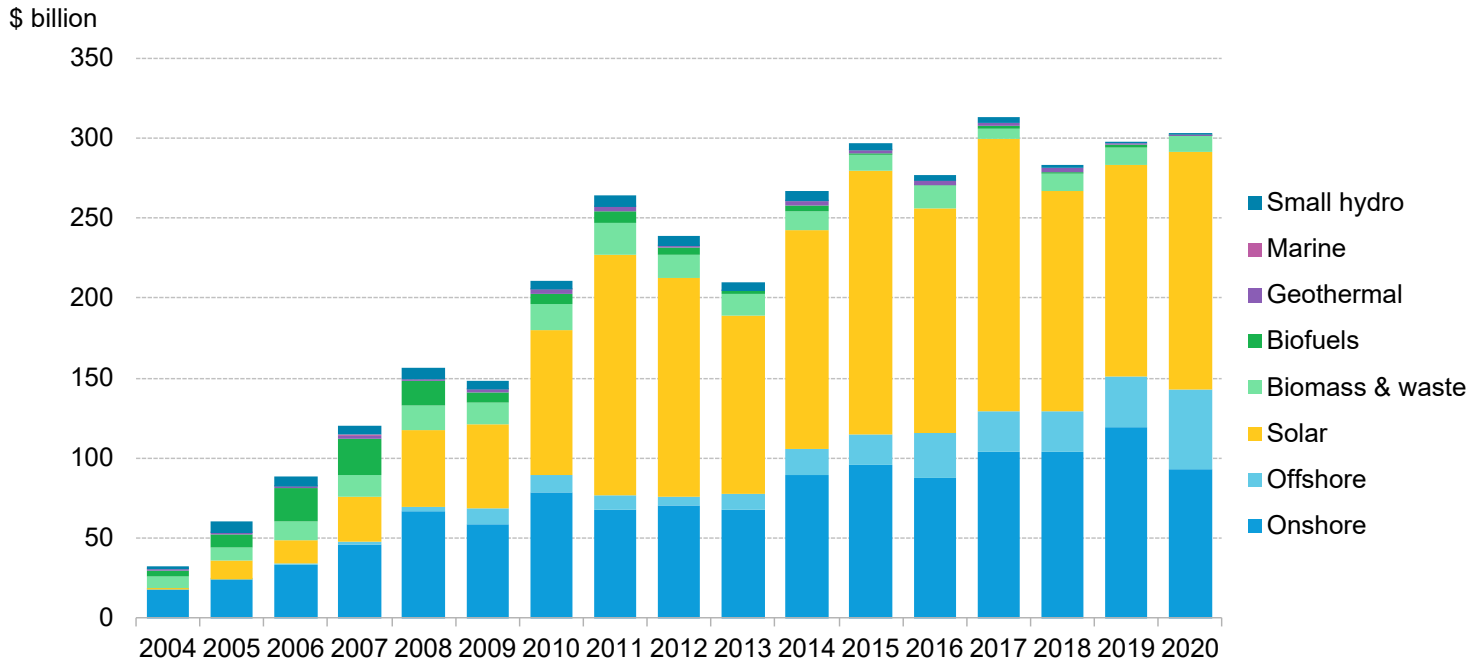
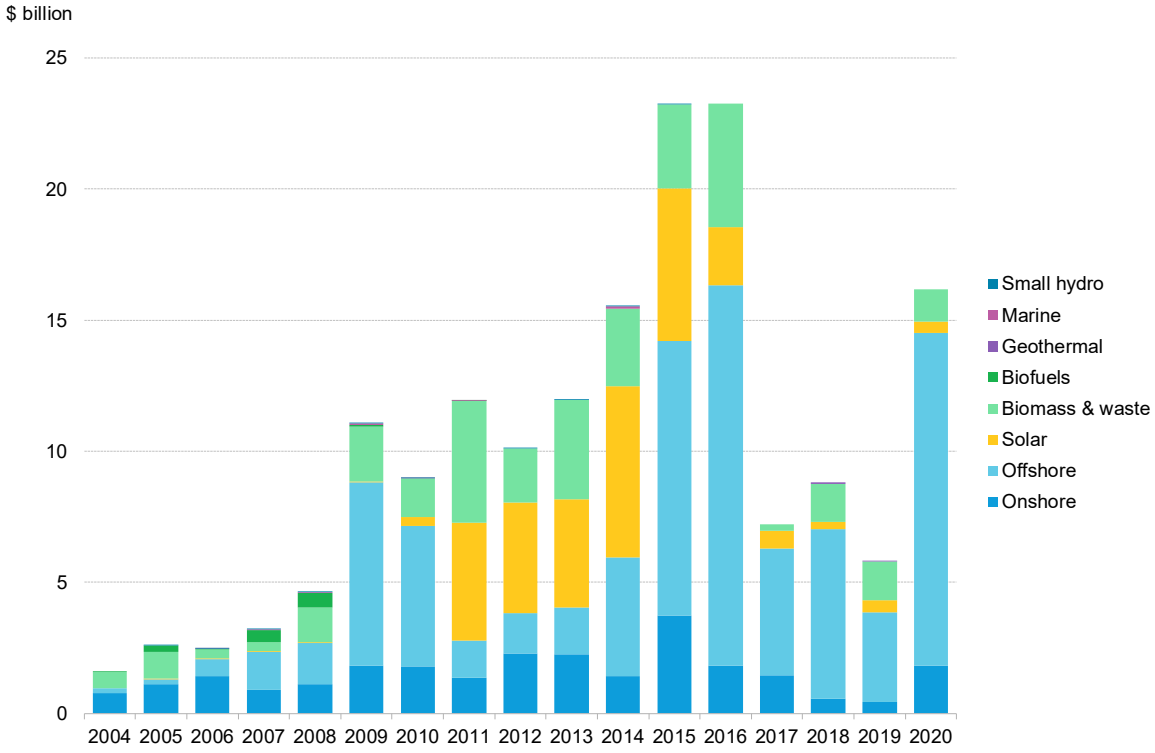
Current trends

Global investment in renewables capacity by sector, and wind sub-sector



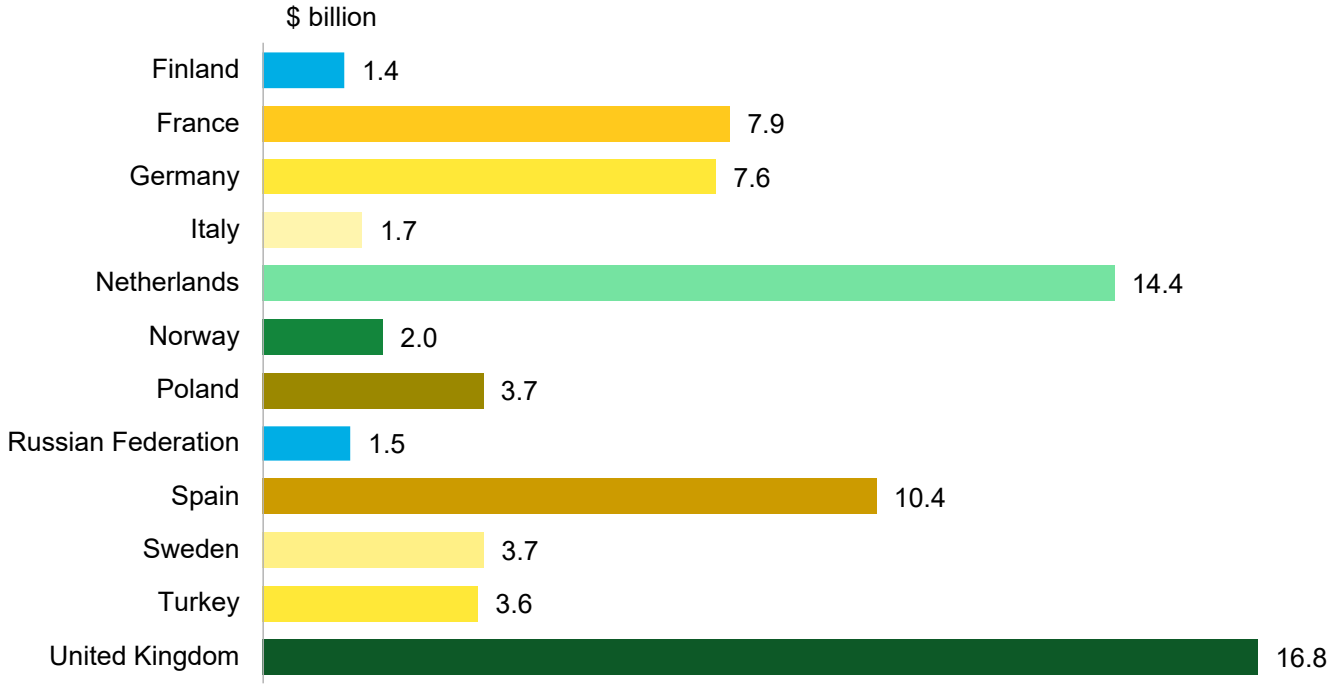
Source: BloombergNEF.

U.K. investment in renewables capacity by sector, and wind sub-sector



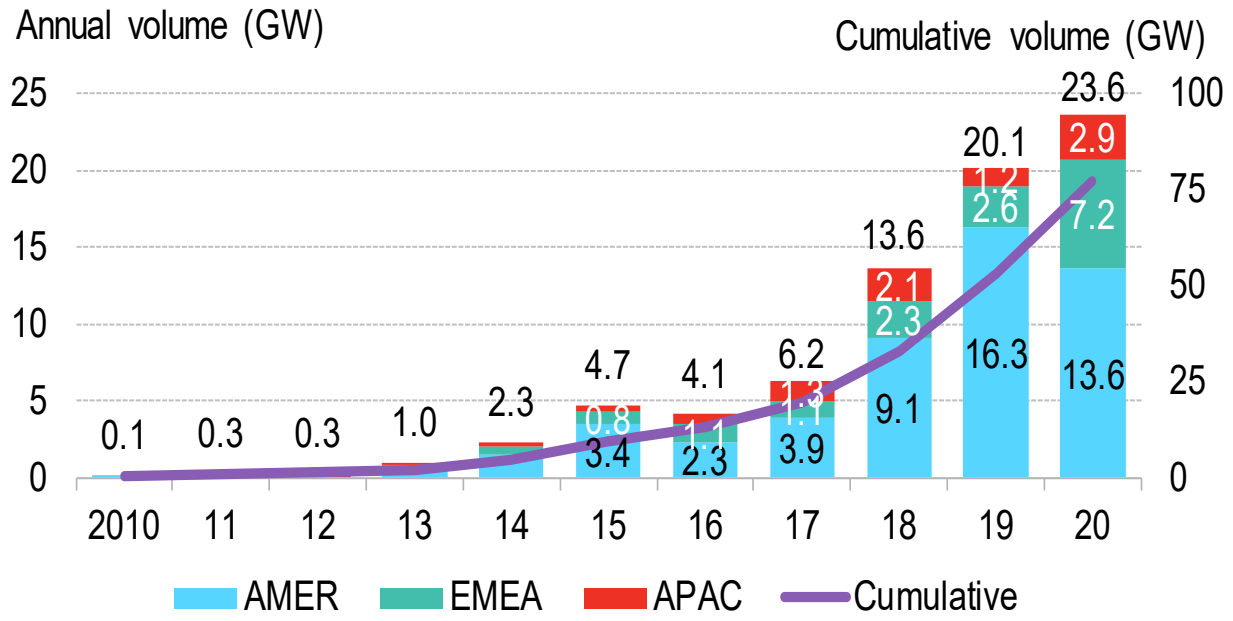
Source: BloombergNEF.

Investment in renewables capacity in 2020, by major European market



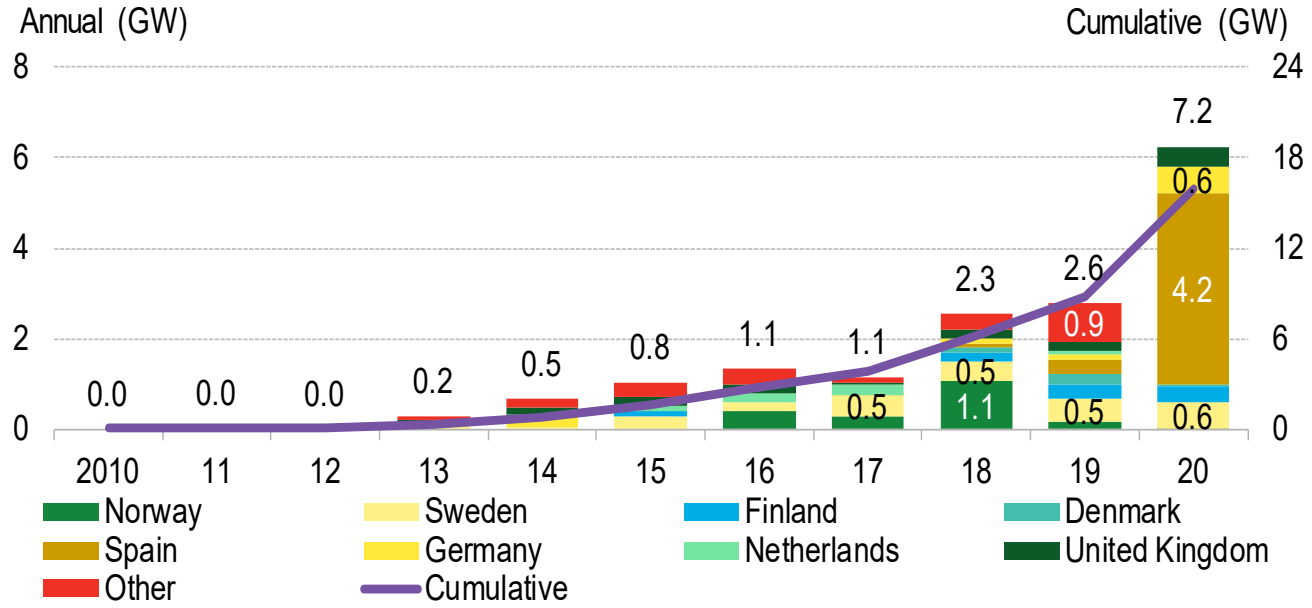
Source: BloombergNEF

Global corporate PPA volumes, by region



Source: BloombergNEF Note: Onsite PPAs excluded. APAC volume is an estimate. Pre-reform PPAs in Mexico and sleeved PPAs in Australia are excluded.

EMEA corporate PPA volumes, by country



Source: BloombergNEF Note: Onsite PPAs not included.

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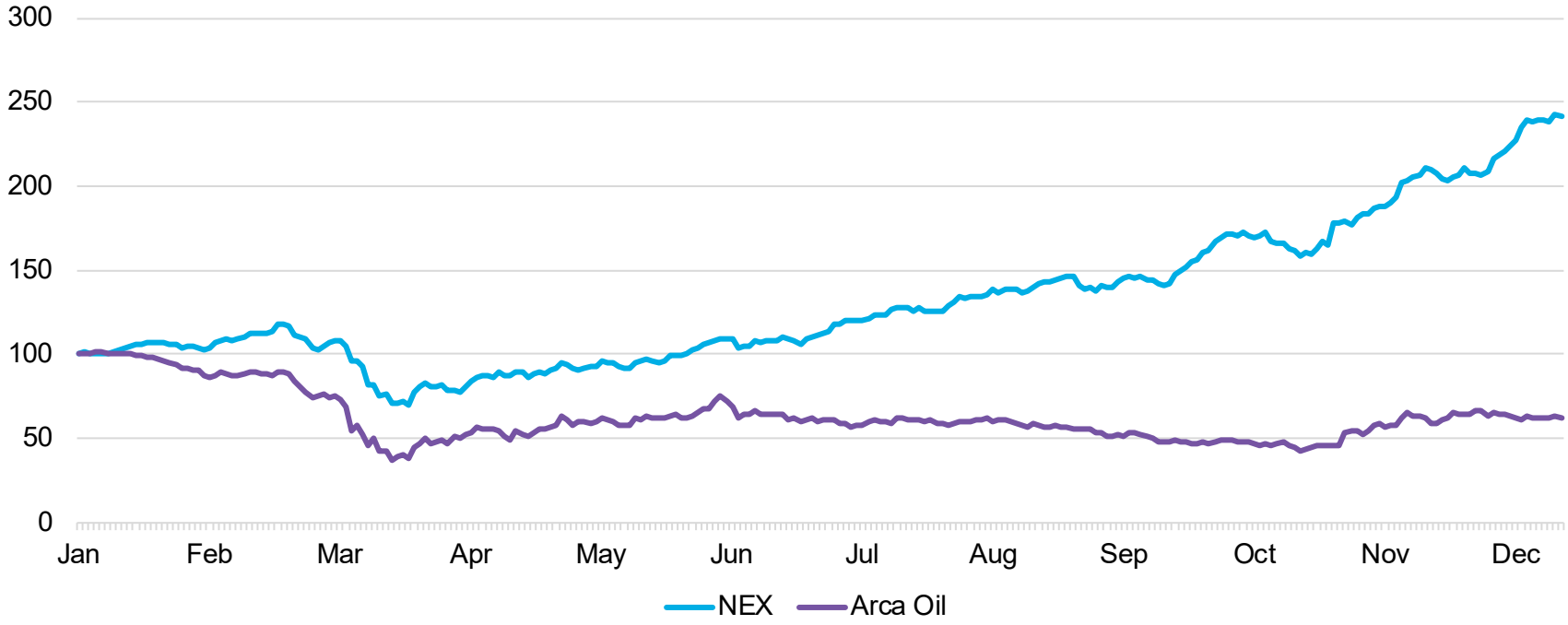
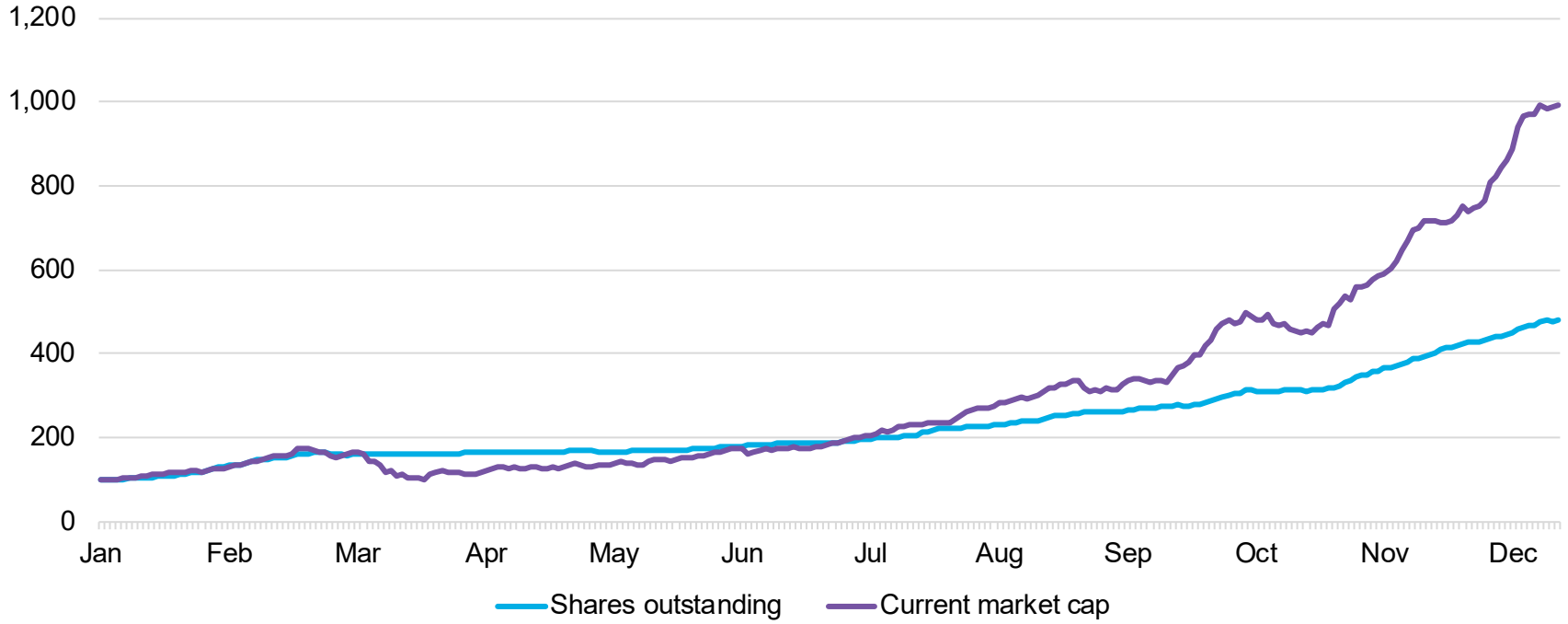
WilderHill New Energy Global Innovation Index (NEX) versus NYSE Arca Oil Index, full year 2020 (rebased)



Source: BloombergNEF. NEX is WilderHill New Energy Global Innovation Index

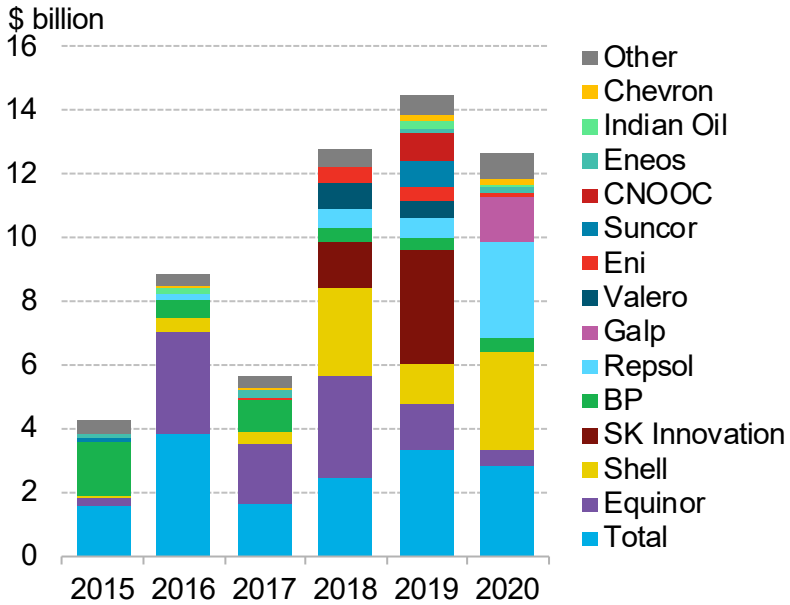
Dollar market cap and number of shares outstanding in nine global clean energy ETFs, full year 2020 (rebased)



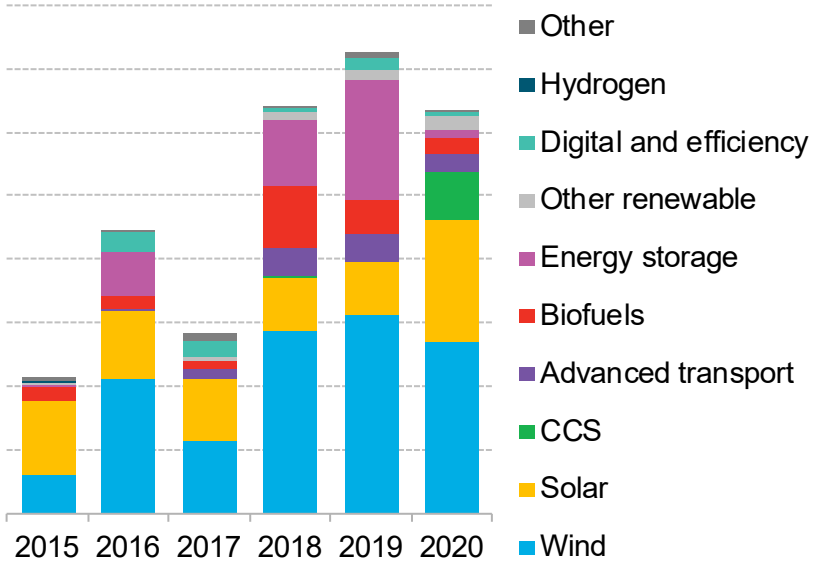
Source: BloombergNEF. Dollar values are indexed to 100 on January 1, 2020

Clean energy investment by oil and gas companies, 2015-2020

By company



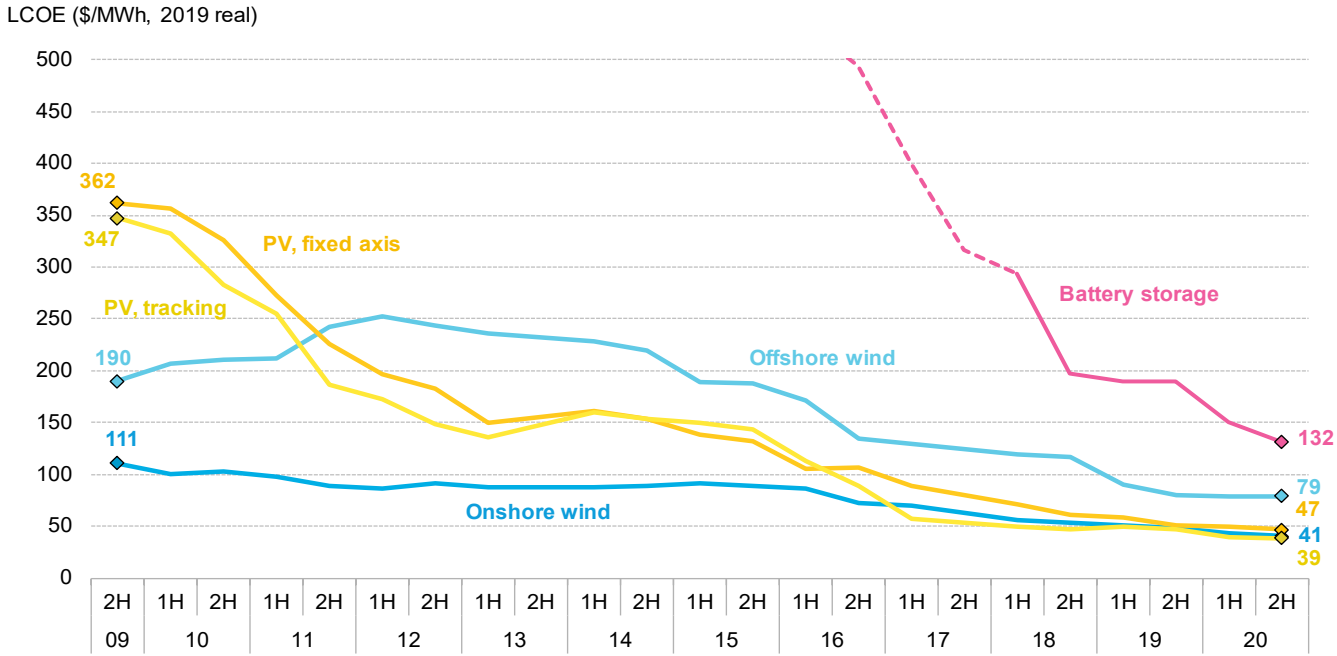
By area



Source: BlooombergNEF, company disclosures. Note: includes completed deals, and estimated values for undisclosed deals. CCS data excludes non-commercial projects that have not disclosed investment values. Asset finance data may overstate investment by each company where project equity shares have not been disclosed.

Prospects

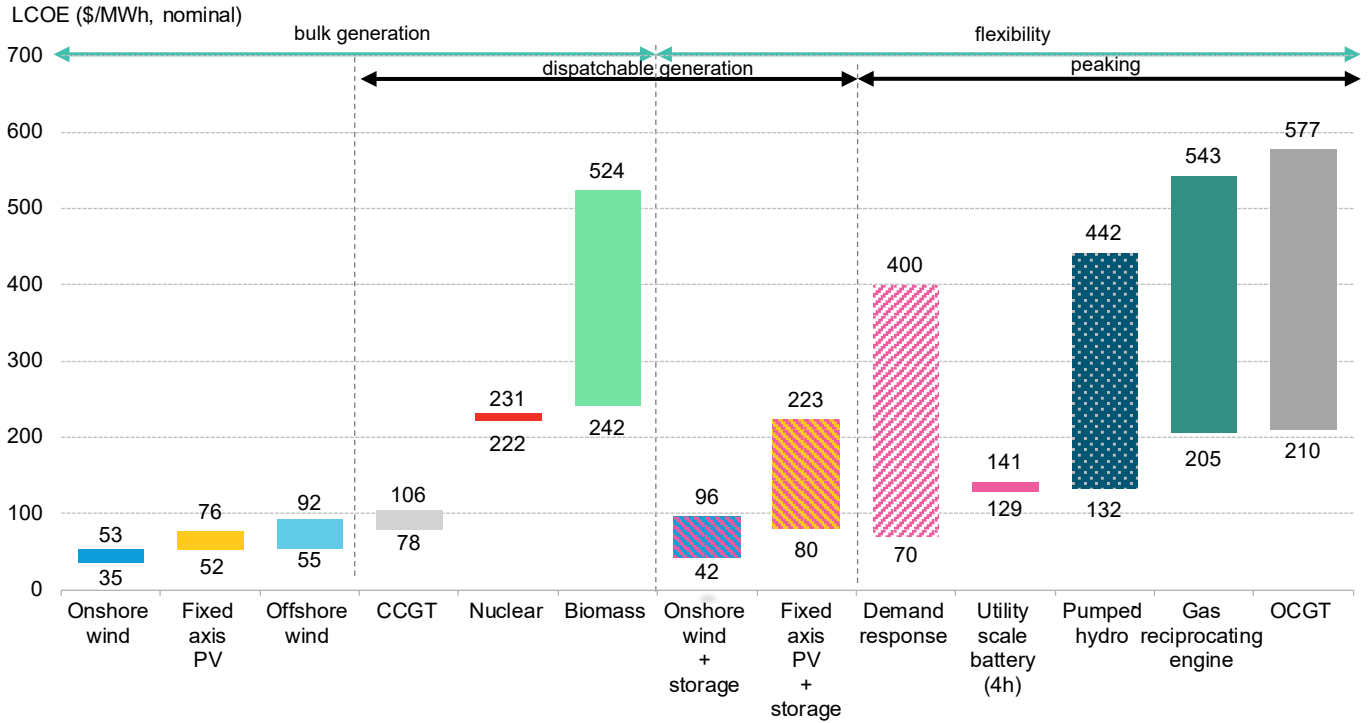
Global benchmarks – PV, wind and batteries



Source: BloombergNEF. Note: The global benchmark is a country weighted-average using the latest annual capacity additions. The storage LCOE is reflective of a utility-scale Li-ion battery storage system with four-hour duration running at a daily cycle and includes charging costs assumed to be 60% of wholesale average power price.

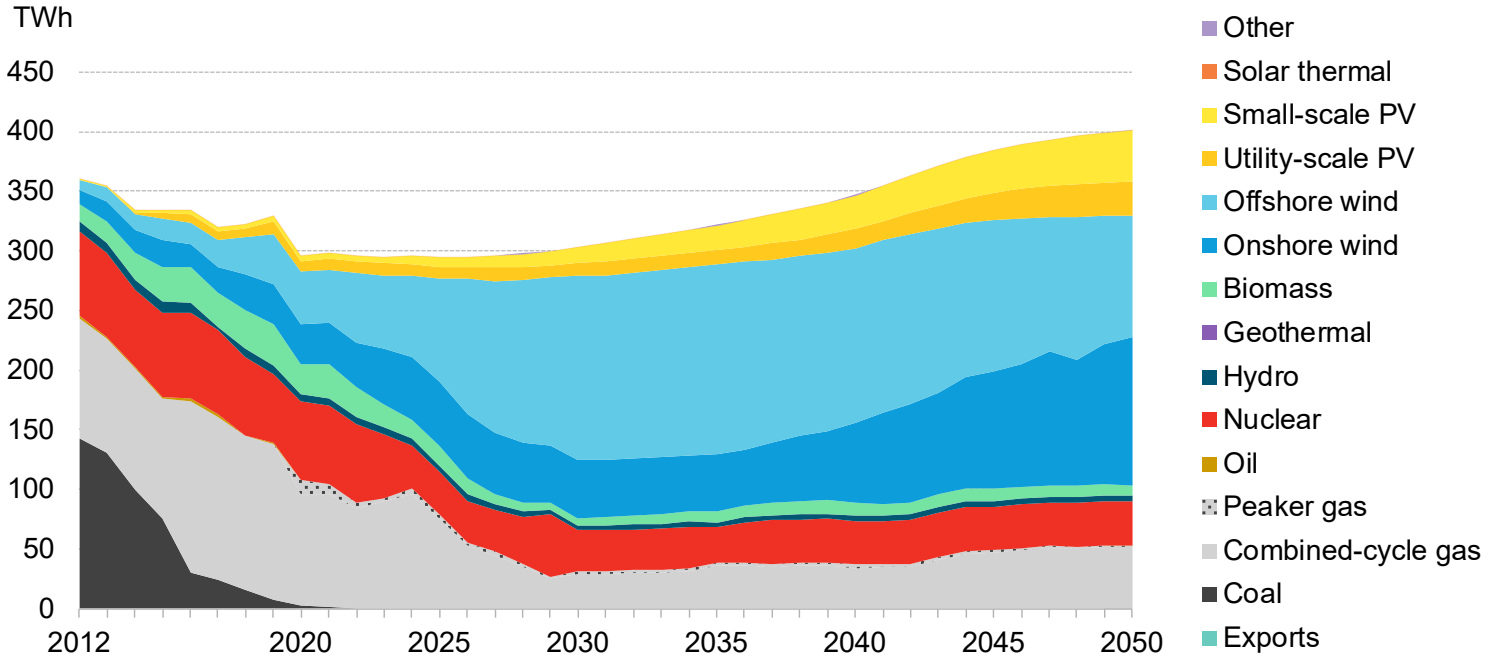
Levelized cost of electricity

All charts and data in this section are available in our *2H 2020 LCOE: Data Viewer* (web | terminal)



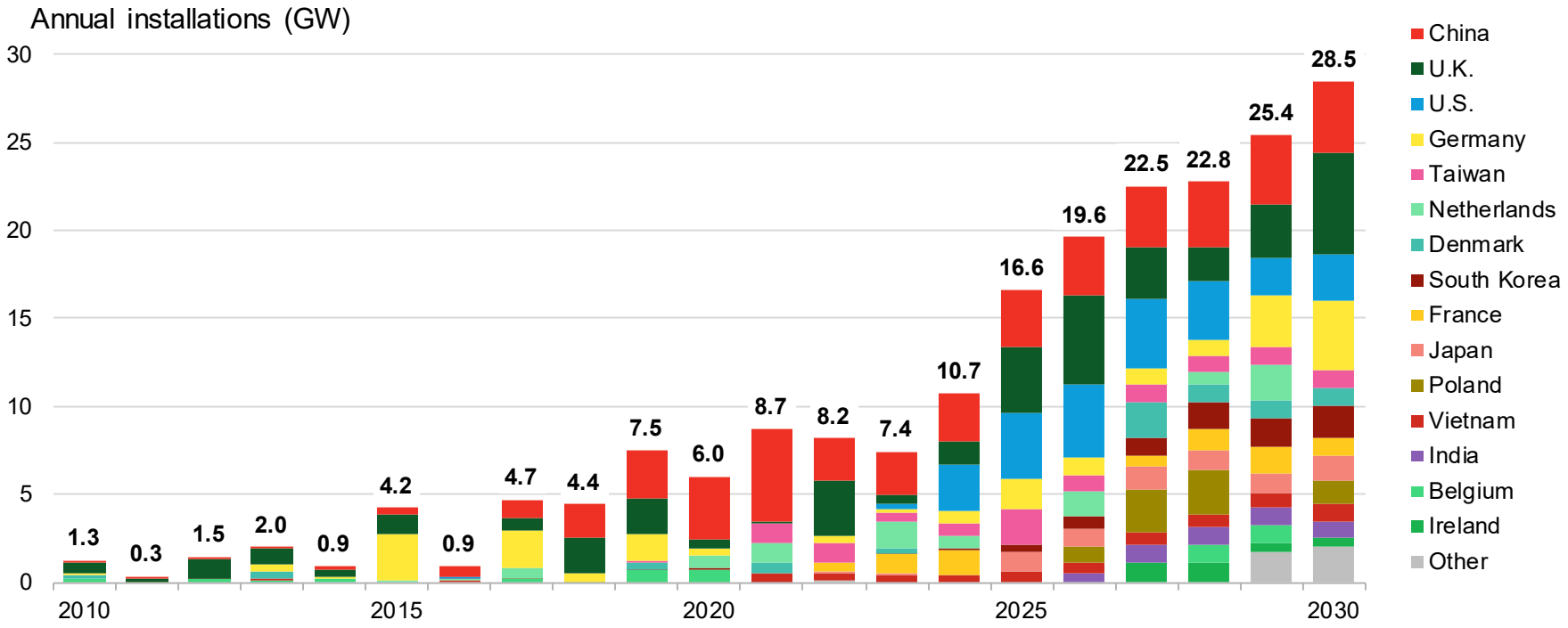
Source: BloombergNEF. Note: All LCOE calculations are unsubsidized and exclude curtailment. The LCOE range represents a range of costs and capacity factors. They include a carbon price for carbon-emitting technologies. Battery storage systems (co-located and stand-alone) presented here have four-hour storage. In the case of solar- and wind-plus-battery systems, the range is a combination of capacity factors and size of the battery relative to the power generating asset (25% to 100% of total installed capacity). Categorization of technologies is based on their primary use case.

U.K. electricity generation by source, 2012 to 2050, on NEO economics-led scenario



Source: BloombergNEF

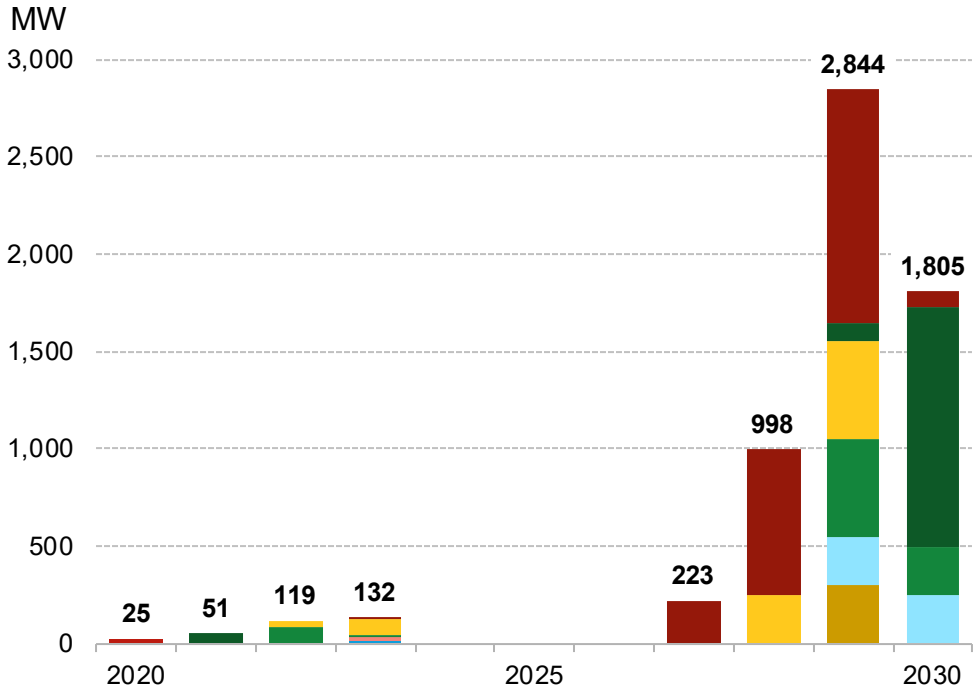
Global annual offshore wind installations, by market

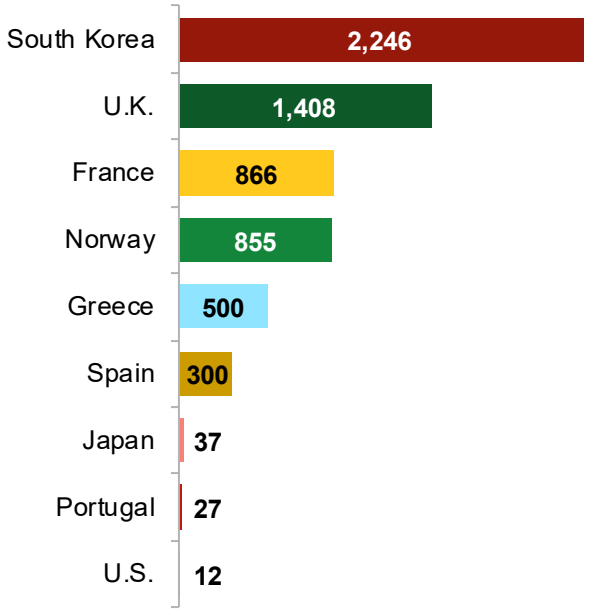


Source: BloombergNEF. Note: 'Other' – Spain, Portugal, Italy, Finland, Sweden, Norway, Greece, Lithuania.

BloombergNEF

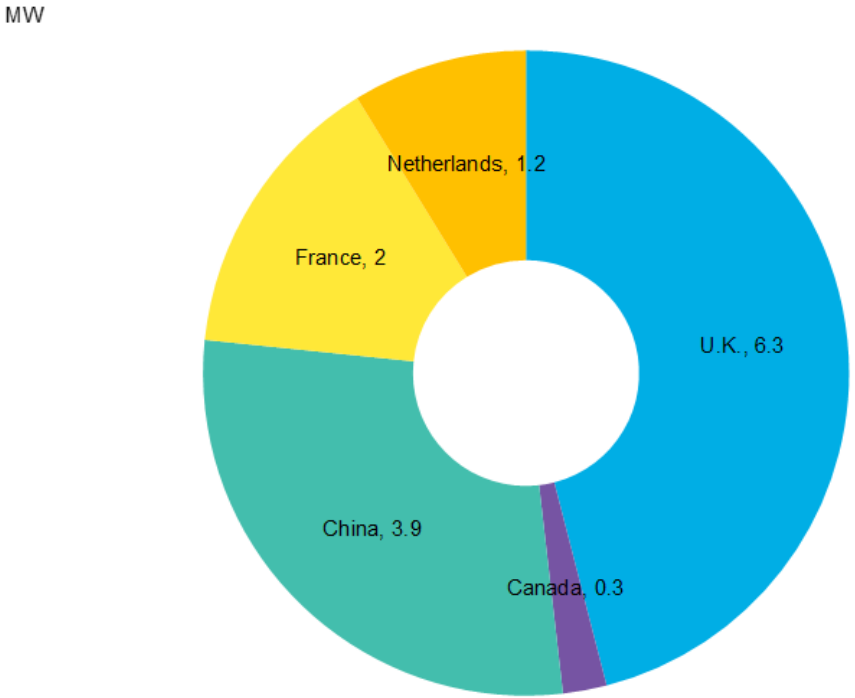
2030 floating wind forecast and market ranking





Source: BloombergNEF

Tidal stream capacity installed as of summer 2020, by country



Source: BloombergNEF.

Issues and milestones ahead

- U.K. CfD auction later in 2021, with three ‘pots’
- U.K. target to reduce emissions by 68% by 2030, relative to 1990 levels
- U.K. offshore wind target for 2030 raised from 30GW to 40GW
- All-in cost of project debt hit record lows in 2020, but could rise as post-Covid recovery gathers steam
- Repowering to become increasingly economic for mature onshore wind and solar projects
- Post-Brexit, policy makers well disposed to supporting hydrogen projects and battery production

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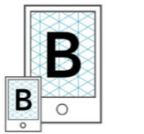

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Senior Regulatory Affairs Manager

RWE Renewables

The role of the regulator in net zero

Nicola Percival
RWE Renewables

A regulated net zero strategy?

To hit net zero by 2045/2050 we need more renewables.

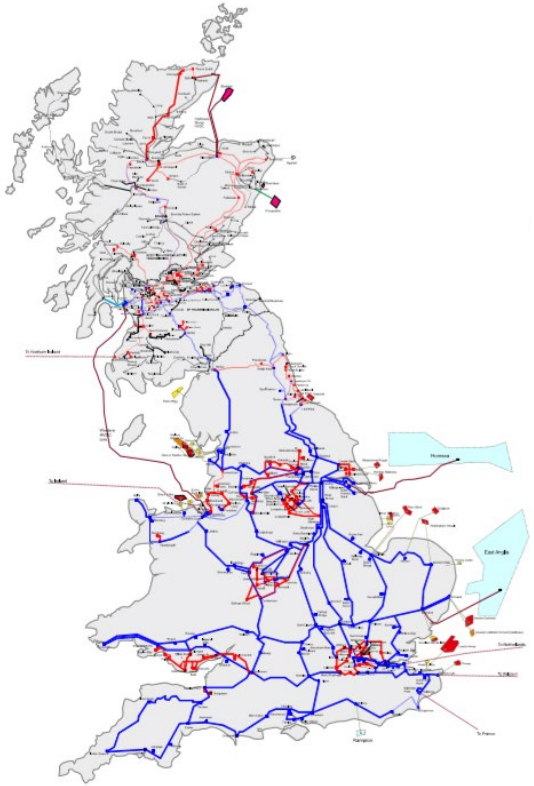
A critical enabler of this is the “re-wire” of GB:

- Long-term, strategic planning of the networks.
- A framework to support anticipatory investment.

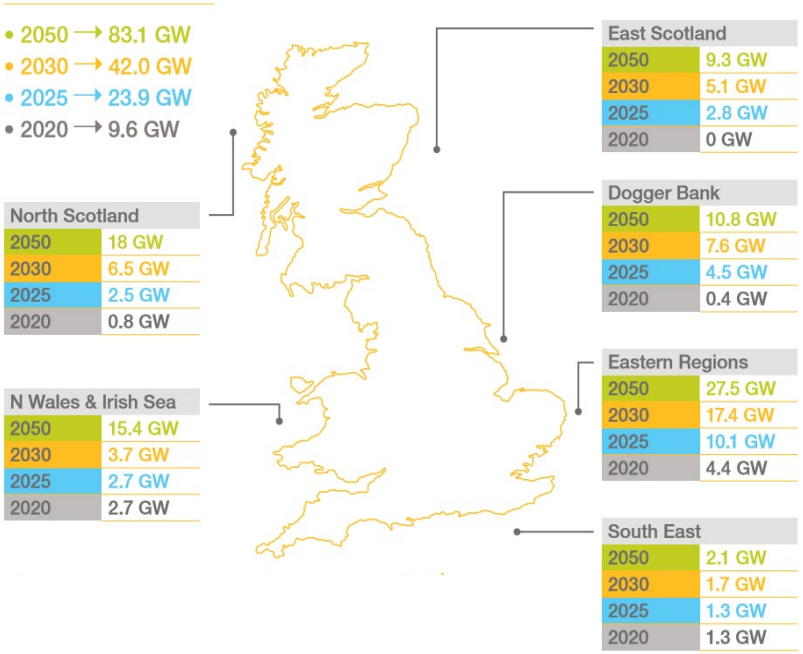
Decarbonising for net zero should be economically efficient and allocate costs fairly between current and future consumers.

This should include consideration of all costs – not just those which Ofgem regulate.

Re-wiring GB for net zero



Source: ETYS 2019/20



Source: FES 2020, “Leading the Way”

Ofgem's duties today

*The Authority's **principal objective is to protect the interests of existing and future consumers** in relation to gas conveyed through pipes and electricity conveyed by distribution or transmission systems.*

*The interests of such consumers are their interests taken as a whole, including their interests in the **reduction of greenhouse gases** in the security of the supply of gas and electricity to them and in the fulfilment by the Authority, when carrying out its functions as the designated regulatory authority for Great Britain, of the objectives set out in Article 40 (a) to (h) of the Gas Directive [3] and Article 36 (a) to (h) of the Electricity Directive.*

It also has duties to competition and must "**have regard to**" Social and Environmental Guidance issued by the Secretary of State.

Giving Ofgem a net zero objective

Energy White Paper, Dec 2020, offers a way forward: a **Strategy & Policy Statement (SPS)**.

Guidance from government to regulator on:

- the strategic priorities,
- The desired policy outcomes,
- the roles and responsibilities of key actors.

Ofgem would then set out its strategy for implementing the SPS, and report on this annually.

Strategy & Policy Statement

- BEIS expected to consult later in 2021,
- It should give a clear direction to Ofgem regarding net zero on the timescales the devolved governments have each legislated for.
- National Infrastructure Commission set out that an SPS could work two ways:
  - Government sets out their policy objectives in SPS,
  - Ofgem can ask Government for their guidance in situations where different consumer groups might be impacted differently by decisions Ofgem take.
  - This would (should!) end the “policy vacuum”.
- Is a primary legislation change needed too?


RWE
Thank you

Ed Birkett

Senior Policy Fellow

Policy Exchange

Powering Net Zero

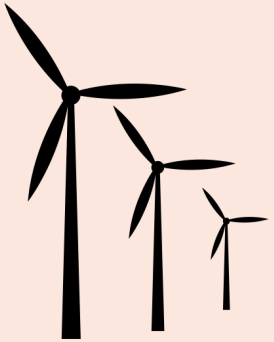
Why local electricity pricing holds the key to a Net Zero energy system

Ed Birkett,
Senior Research Fellow,
Policy Exchange
@ed_birkett

https://policyexchange.org.uk/publication/powering-net-zero/

Summer 2020 exposed flaws in the design of Great Britain's electricity market

Electricity demand fell 15% during the coronavirus lockdown...



…which meant wind's market share was much higher than normal.

This raised system balancing costs by two thirds (+£220m).

Icons created by Icon Lauk, Jacqueline Fernandes, and Corpus Delict. Supplied by the Noun Project.

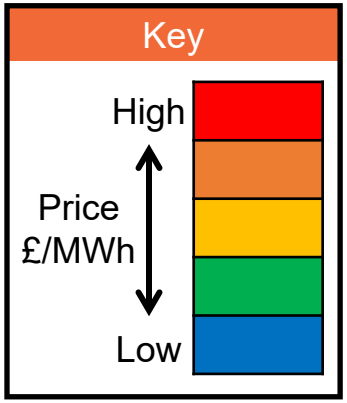
Today, electricity prices are the same across the whole of Great Britain ('national pricing')*

Policy Exchange

Midnight

Midday

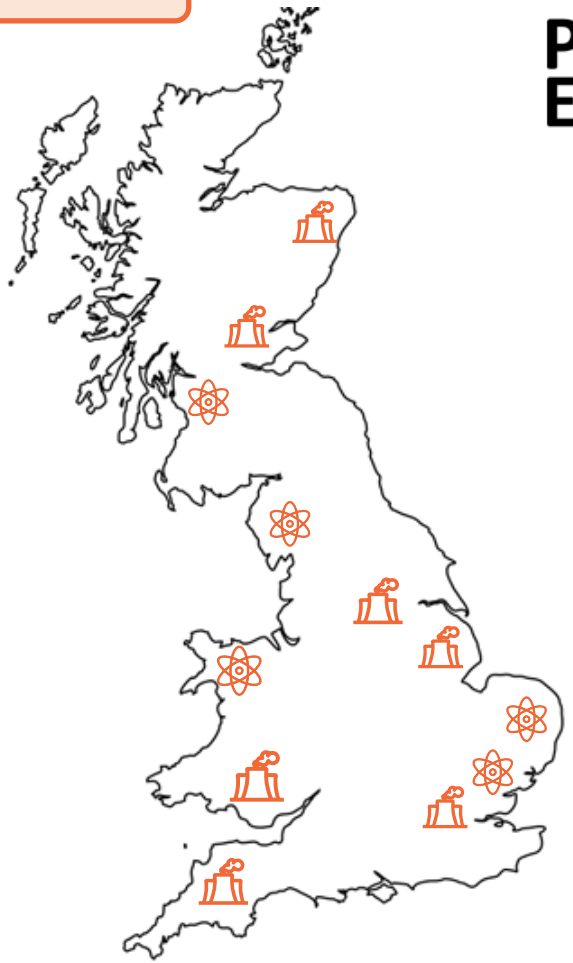
6pm



*in each 30 minute trading period

In the old electricity system, national pricing worked well

2010



- Power stations spread across Great Britain
- Electricity network can transmit electricity across GB
- National pricing ignores physics but there are few constraints, so this doesn't matter

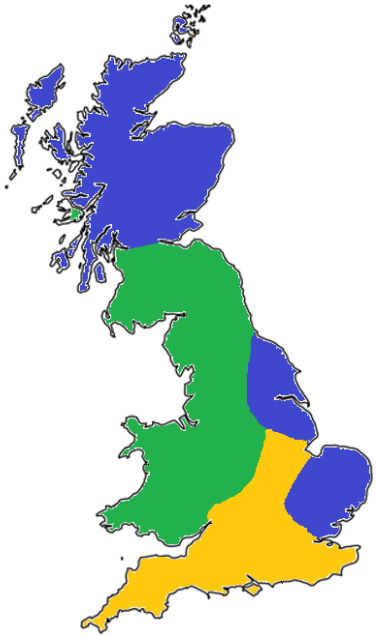
In the new electricity system, location matters

- Wind and solar concentrated in different regions
- Electricity network frequently constrained
- Physics matters, so national pricing lead to higher costs

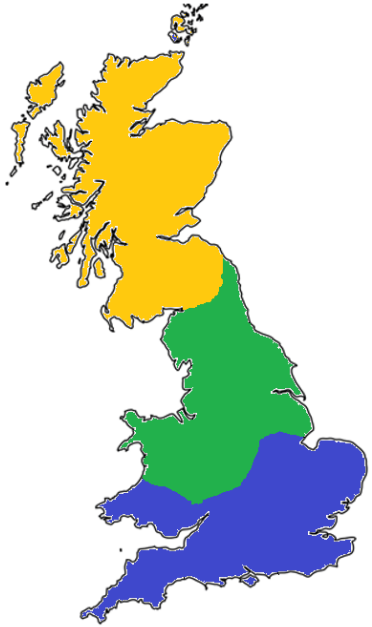
‘Local pricing’ would reflect local supply and demand for electricity

Policy Exchange

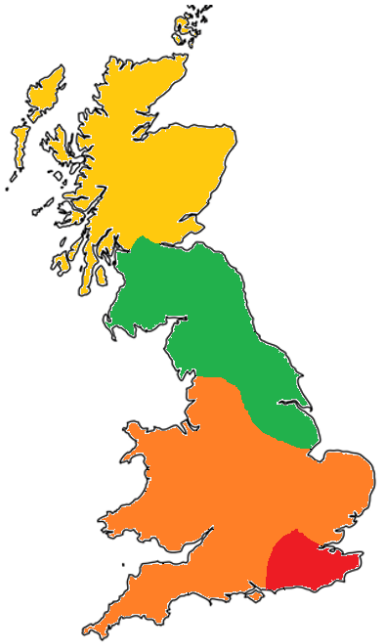
Midnight

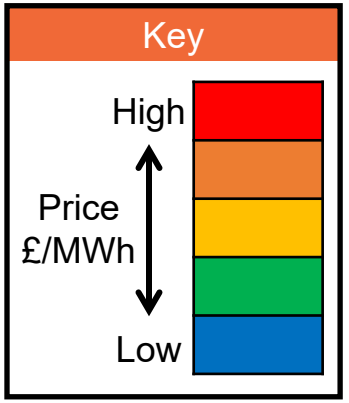


Midday



6pm





Impact of local pricing in Scotland

Short term (to 2025)

Policy Exchange

Impact on:

Renewables	Uncertainty caused by lower and more volatile wholesale prices
Energy Storage	New energy storage projects, encouraged by low prices in some areas
Demand	Industrial users encouraged to shift demand to times of low prices
Networks	Changing operational practices and increased data requirements

Impact of local pricing in Scotland

Medium term (2025+)

Policy Exchange

Impact on:

Renewables	Renewables encouraged in areas that can accommodate them
Energy Storage	Energy storage encouraged as an integral part of Scotland's electricity system
Demand	Cheaper electricity bills for industrial users in Scotland
Networks	Local pricing demonstrates where new power lines add most value

Powering Net Zero

Why local electricity pricing holds the key to a Net Zero energy system

Ed Birkett,
Senior Research Fellow,
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@ed_birkett

https://policyexchange.org.uk/publication/powering-net-zero/

Richard Gow

Policy & Government Relations Manager

Drax

Longer Duration Storage – Scottish Renewables Conference

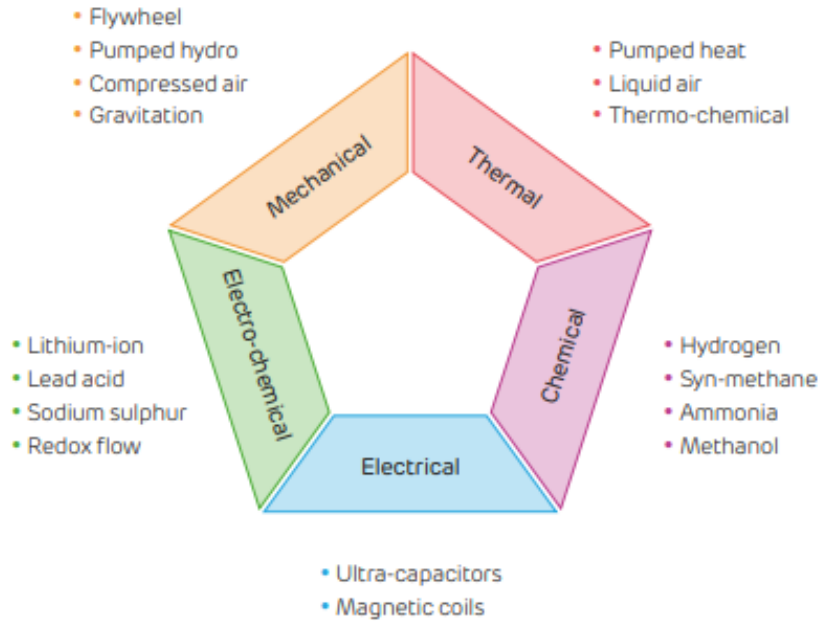
Richard Gow - @RichardGow91

24th March 2021

The need for storage and flexibility

- The rollout of intermittent renewables generation will require increased storage at all scales.
- Long duration storage technologies are a loose definition of technologies with greater than 4 hours storage capability.
- GB currently has ~3.5GW storage installed – FES indicates between 23-40GW required providing up to 200GWh of storage capacity.
- Some storage technologies are able to provide a range of flexibility services, negating the need for high-carbon alternatives.
- Long duration storage technologies face significant investment barriers.

The five key principles of energy storage and the main technologies that employ them



Drax Electric Insights Quarterly Q3 2019

Example – Pumped Storage Hydro (PSH) offers diverse benefits

Reduces the amount of costlier investment in other dispatchable low-carbon capacity, delivering potential cost savings of approx. £10 bn by 2050[1]

Avoids/reduces cost in transmission network reinforcement by providing bulk GWh storage mitigating network constraints

Provides a range of low-carbon ancillary stability services at reduced cost to consumers versus alternatives due to scale

Enables greater utilisation of renewables by reducing the need to curtail wind output in order to manage constraints[2]

Stabilises power prices - reduces peak prices thus lowering the cost to consumers, and supports the system when prices are low, reducing the subsidy cost of CfDs to the consumer

Provides long-term solution with operational life greater than 50 years (compared to 10-15-years for lithium ion battery)

1. Jacobs analysis published in August 2020. Benefits derive from 10 GW of additional PSH capacity displacing alternative more costly low-carbon flexible energy solutions (e.g. Combined Cycle Gas Turbines (CCGTs) fitted with Carbon Capture and Storage (CCS)) which will be required to cover periods of low output from renewable energy resources.
2. LCP analysis estimates that, from 2023 to 2030, 40% of the time renewable generation in Scotland will have to be constrained off and replaced with carbon emitting generation sources south of the boundary.

Cruachan development proposals

Existing Plant – Cruachan I

- The current Cruachan power station consists of 4 x Generator/Pump Units (2x120MW and 2x100MW) providing a total capacity of 440 MW generation and 482 MW pump
- The plant has four modes of operation – pump, generation, spin-pump and spin-gen. In spin mode(s), the turbines spin in air without generating, providing reactive power, inertia, etc. and are able to quickly switch to generation or pumping when required
- The mixture of modes enables Cruachan to provide a range of balancing and stability services to NGESO as well as pumping/ generating in response to low/high prices

Development Option – Cruachan II

- Increase generation output by up to 600MW to complement increasing levels of inflexible renewable generation and mitigate boundary constraints between B6 and B7 (Scotland/England)
- Involves the construction of a new underground power station located to the east of the existing Cruachan station
- Consumer benefits in excess of £360 million

What are the challenges to long duration storage being built on a merchant basis?

Large infrastructure project with high capex investment

Long lead time before revenues start (5-7 years)

Cashflow is volatile creating exposure to debt service cover and increasing financing cost

Current market design and existing support mechanisms do not explicitly reward storage for its full value to the system causing revenue uncertainty

Support mechanism or market change required to enable investment in long duration storage.

thank
you

This session begins at 1530

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‘I love it when a plan comes together’

Darren Cuming

Development and Consents Manager

24th March 2021

EDF Renewables in Scotland

- EDF Renewables is committed to Scotland and has around 500 MW in operation across eight onshore wind farms in Scotland.
- We want to triple this and have another 500 MW of onshore projects already consented plus another 500 MW in development and planning.
- We are currently building the NNG offshore wind farm and have just started constructing the 30 MW West Benhar onshore wind farm in North Lanarkshire.
- We have significant interactions with Scottish Government through private meetings, Scottish Renewables and contributing to consultation exercises in relation to Scottish Policy for the future of renewables.
- We believe their messaging is consistent and encouraging for a positive framework for future renewable proposals and there are clear targets to get to net zero in 2045.

The Planning System

Positive sounds coming from Scottish Government in NPF 4 Position Statement.

The planning system hasn't changed radically since when renewables were first commercially developed as in plan led, material considerations and consultation as key aspects of the determination process.

It s unclear what a fresh approach would look like other than a complete overhaul of the planning system.

But what we need is:

- **Consistency**
- **Certainty**
- **Timescales**
- **Material considerations and presumptions**
- **Variations and revisions**

As an industry we still need to ensure our projects are well justified and not see any planning changes as a reason to promote less robust proposals.

Our experience

EDF Renewables is developing a number of onshore wind projects in Scotland and have had a mixed response since the declaration of the climate emergency.

- **Fallago Rig Extension (s36)**
  - 12 turbine (41MW) extension to operational 144MW wind farm
  - Officer recommendation supportive, Committee objection
  - PLI in June 2017 and refusal from SG in March 2020.
- **Stranoch (s36)**
  - Consent originally granted in 2016 following PLI
  - Optimisation for 20 turbines with tip heights between 140m to 175m (100MW)
  - Submitted October 2018, final no objection from D&G February 2021
- **Stornoway (s36)**
  - Original consent 2012, a number of variations
  - Increase in tip heights to 180m
  - Submitted May 2019, no objection from CNES February 2021

Conclusion

Is a radical overhaul of the planning system likely? No.

But what is clear is that we need:

- Clear Scottish Government support for more renewables
- A change of mindset required - the climate emergency is upon us
- Views of communities is changing, no longer arguments over need and subsidy
- Grass roots of decision making needs to grasp the climate emergency and swift action is needed
- Recognition that renewables can unlock and contribute to other objectives in the Position Statement including making resilient communities and a wellbeing economy


Thank you

Kristian Henningsen

Head of Public Affairs Nordics, UK & Ireland

Vestas

Vestas

Wind. It means the world to us.™

Nordic countries and drivers of the energy transition

Kristian Henningsen

Head of Public Affairs UK, Ireland and Nordics

Vestas Wind System A/S

Vestas in numbers in the United Kingdom

1500

Vestas employs 1500 people in the UK across our blade production, sales function and service personal

2 GW

2 GW of onshore wind installed and under contract. 7 projects under construction

£1 billion

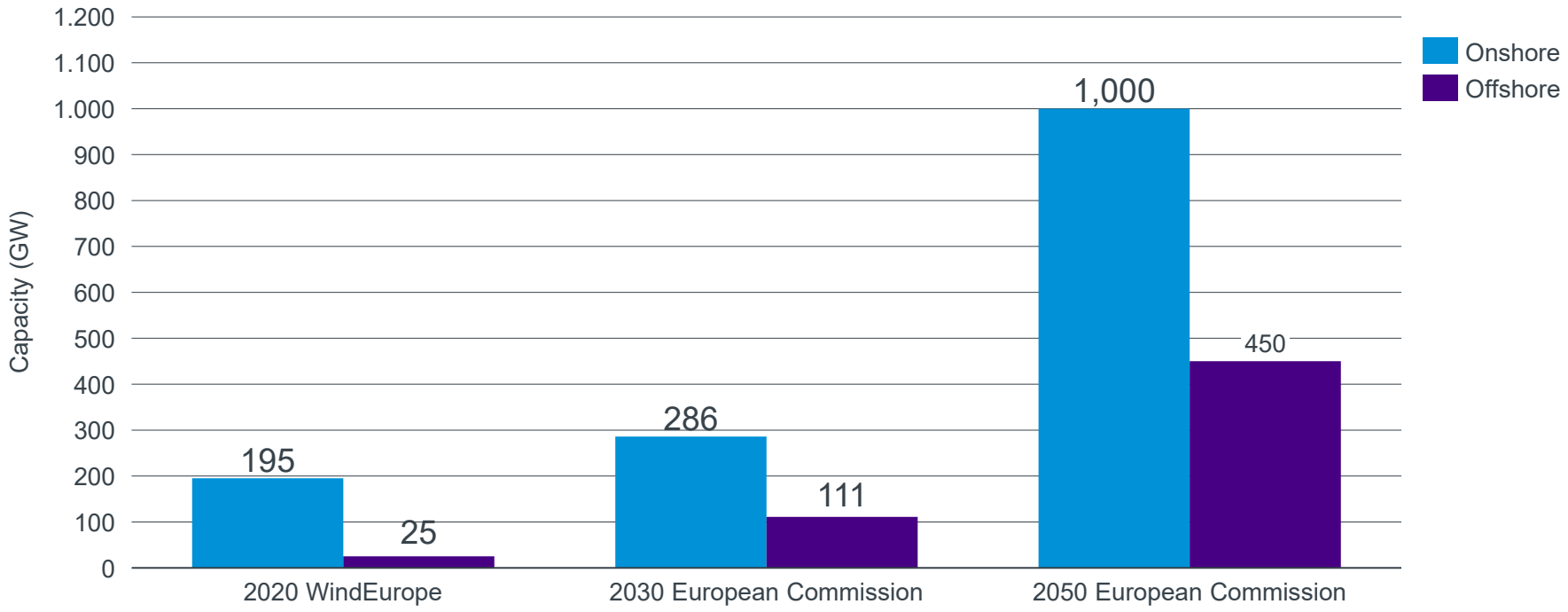
Nearly £1 billion invested in the United Kingdom since 2007

€ 14.8bn

Vestas' revenue in 2020 was EUR 14.8bn

Vestas

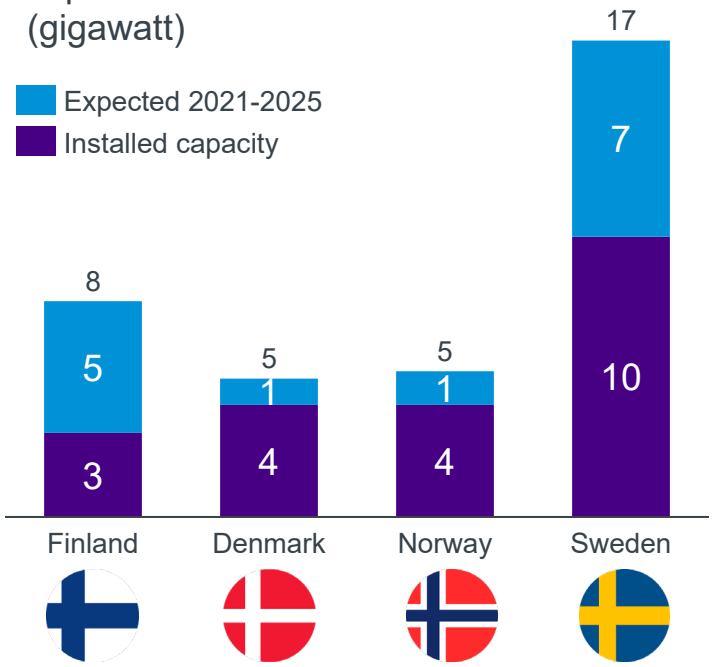
Planning policy will be key across Europe towards 2050



Source: Wind Europe

Drivers behind renewable energy in the Nordics

Total onshore installations by 2020 and expected installations 2021-2025 (gigawatt)



- Strong wind resources
- Stable political will
- Well functioning energy system
- Corporate PPA's
- Strong investor appetite
- Permitting supports scale
- Willingness to give exemptions

Source: WindEurope

Lessons learned and recommendations

Lessons from the Nordics

- Timelines are important and has effect on local acceptance
- Community benefit is key for both political stability and local acceptance
- Grid development timelines must not be underestimated

Recommendations for Scotland (and United Kingdom)

- Set a target for onshore wind by 2030
- Get National Planning Framework 4 right
- Onshore wind as part of future CFD auctions

What is at stake for Scotland

1

Route to 2030

With a pipeline of 4,3 GW of projects consented and 4,1 in planning onshore wind is a fast and cost-efficient way for Scotland to add new electricity capacity.

2

Green economic recovery

Every GW of renewable power installed in Scotland creates 1,500 jobs and adds £133 million of GVA to the economy.

3

Just transition

Local communities in Scotland will benefit directly as Scotland holds the biggest onshore pipeline in the UK and an estimated 37 pct. of the total project spend is estimated to remain locally.

Source: RenewableUK and Scottish Renewables

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Thank you

Sarah-Jane McArthur
Partner
Brodies LLP

PLANNING AND THE CFD

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ENLIGHTENED THINKING

OUTLINE

- CfD Application Process
  - Generally
  - Planning Consents

- CfD Contract Compliance
  - Milestone Requirements and Delivery
  - Planning conditions, planning challenge and project change

NB: This assumes a base knowledge of CfDs and the CfD regime.

APPLICATION PROCESS

- National Grid ESO is the EMR Delivery Body
- NGESO will determine application qualification against eligibility requirements
- Eligibility Requirements contained in:
  - The Contracts for Difference (Definition of Eligible Generator) Regulations 2014
  - Contracts for Difference (Allocation) Regulations 2014
  - The Allocation Framework published for each allocation round.
- Broadly the Eligibility Requirements are:
  - Applicable planning consents
  - Grid connection agreements
  - Supply chain plans (projects over 300MW)
  - Non-receipt of funds under other government support schemes.
  - Proof of company address and incorporation.
  - May be some additional technology specific requirements.
- The regulations contain a process for review and appeal.

ELIGIBILITY – PLANNING CONSENTS

- **Planning consent for the relevant works to enable:**
  - CfD Unit to be ‘established or altered’
  - electricity generated from the CfD Unit to be exported to the grid
- **Therefore planning consent required for:**
  - generating equipment (turbines/ panels), cables and substation (definitely)
  - site access (probably) and delivery route modifications (possibly)
- **Defined list of consents to choose from:**
  - Planning permission, s36 consent, marine licence, development order, TWA order
- **What about conditionality?**
  - do planning conditions need to be satisfied?
  - do planning agreements need to be entered into?

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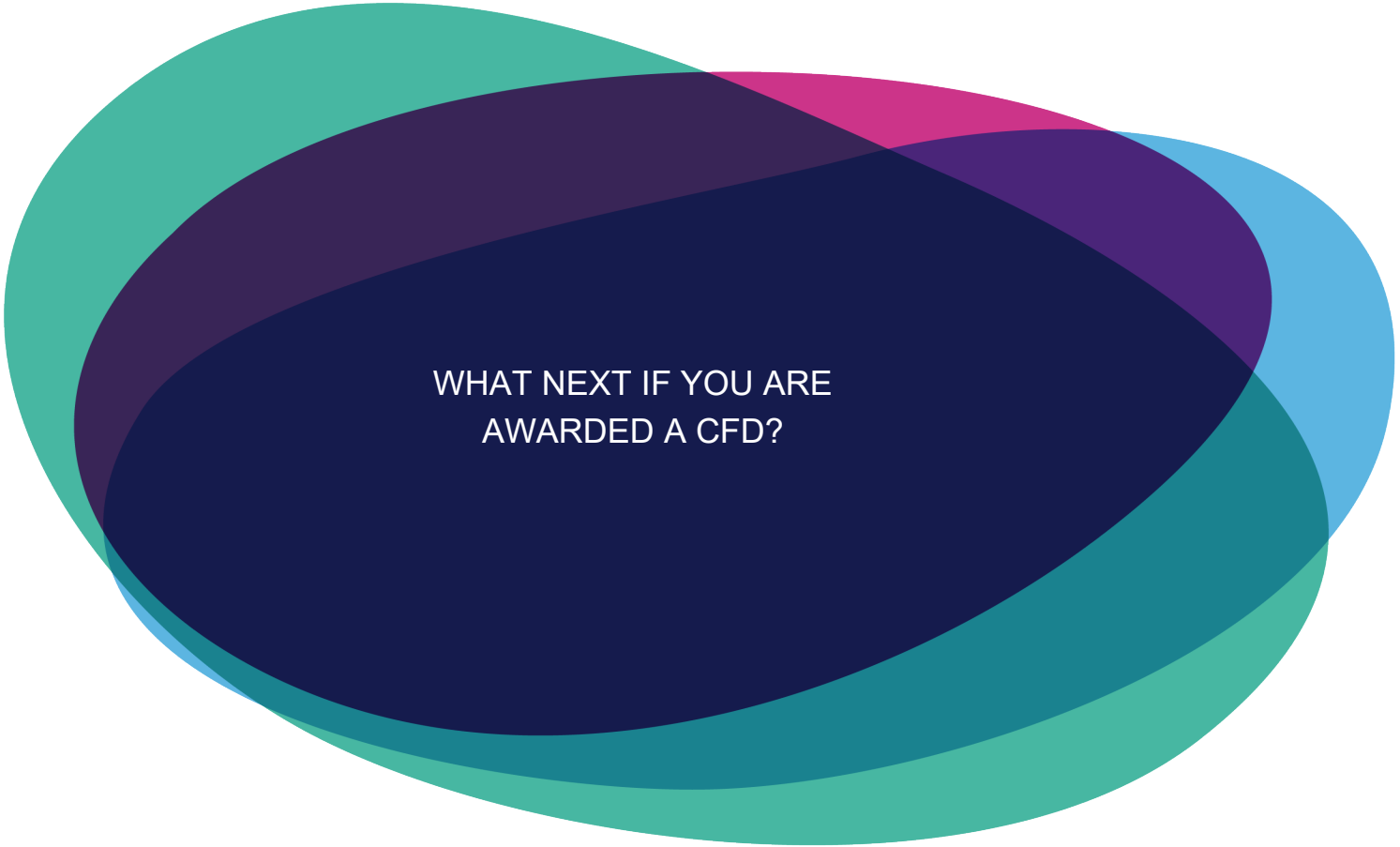


CFD CONTRACT COMPLIANCE

Meeting the Milestone Requirement

Milestone Delivery Date

18* months after you sign the contract

OR

"Spend"
10% of (£ per MW Capacity)

Four requirements:
- Cash paid – commitment to spend not enough
- Must have no right to repayment
- Must be spent by generator or 'direct shareholder'
- Must be spent on project or grid

Enter into "Project Commitments"

Project commitments is a highly involved test including
- evidence "will have" financial resources
- entry into legally binding equipment supply contract

In practice means FID

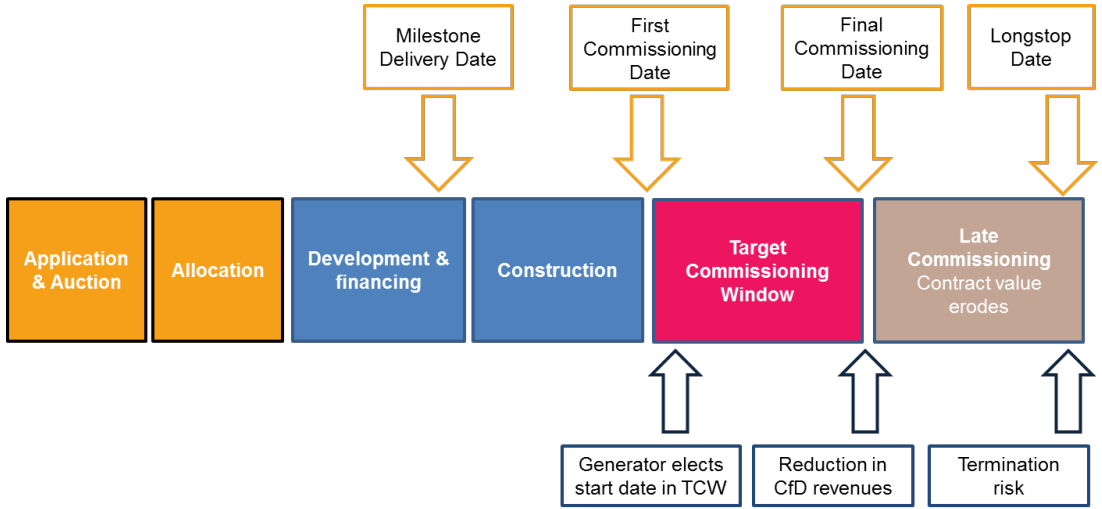
10% spend test appears to be preferred route to satisfy test for most developers

Project Commitments test requires a strategy for obtaining any additional consents / permissions and a credible plan for discharging any consent conditions

CFD CONTRACT COMPLIANCE

Delivery Timeframes

- The CfD has a target commissioning window (bid by applicants).
  - To get a full 15 years of support you must commission your project within the TCW.
  - Commission late and you will get less than 15 years.
  - Commission past the Longstop Date (1-2 years) and you can lose the CfD.



CFD CONTRACT COMPLIANCE

Planning Implications

- **Planning Conditions/ Delay**
  - At MDD there must be a plan in place to satisfy conditions
  - Can Longstop or TCW be extended if satisfaction of planning conditions is delayed?
  - Only if the delay qualifies as Force Majeure and provided not aware or reasonably aware before applying for the CfD

- **Planning Challenge**
  - Foreseeable Change in Law includes Judicial Review of planning consents (within the relevant time limits)
  - Force Majeure expressly excludes Foreseeable Changes in Law.

- **Project Change**
  - Planning consent must enable you to build out the Initial Capacity Estimate
  - ICE can be adjusted up to the Milestone Delivery Date but downwards only thereafter need to deliver 95% of capacity
  - No express rights to amend the description of the Facility – LCCC has discretion.
  - Consent variations may re-introduce the risk of planning challenge

KEY MESSAGES

- Planning eligibility requirements are relatively straightforward for most projects.
- Eligibility is only part of the picture.
- Project planning consents must enable you to deliver the project you have bid for under the terms of the CfD – including meeting milestone requirements and delivering in the TCW.
- Make sure you have a credible plan to discharge conditions timeously.
- Ideally, ensure that planning permissions are obtained in good time before CfD application to ensure that challenge periods have passed.

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