

Energy Storage: A necessary complement to achieve a low emission electricity sector

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Energy Storage in the UK Market

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Who we are

- UK's largest renewable energy and clean technologies trade association
- 550+ members, sole trader to large utilities
- Only body encompassing renewable electricity, heat and transport as well as energy storage and EV charging

REA

- Formed in 2001, have lead the development of UK Energy Policy

Speaker:

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Frank Gordon

Head of Policy & Renewable Power, Energy Storage lead 5 years experience in energy storage

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Context: The UK Energy Policy Landscape Today



The UK Energy Transition





UK Energy Policy

• Energy policy overhauled in last 5 years

- Investor confidence damaged
- Exacerbated by currency devaluation and policy uncertainty following EU Exit Referendum

However, decarbonisation agenda remains strong:

World's first Net Zero Commitment for 2050

• Coal phase out by 2025

 Government focus moving to decarbonisation of transport and heat

•New Clean Growth Strategy

• Industrial Strategy sees a new focus on innovation and growth, in which renewables must play a key role





UK Renewable Targets

Climate Change Act (2008) - UK

- 80% reduction in carbon emissions from 1990 levels by 2050
- 5th Carbon budget will require 57% reduction by 2032, abatement of 1725 MtCO₂e

Renewable Energy Directive – EU

- 15% of all energy to come from renewables by 2020
- Will require 30% power, 12% heat and 10% Transport demand to come from renewables

Energy Performance of Buildings Directive – EU

- 2020 deadline for all new builds to be nearly zero-energy buildings.

Cop 21 Paris 2015 – UN

- Agreed to aim for no more than 1.5°C warming and renewed commitment to EU targets.



World's first Net Zero GHG Emissions Target

Climate Change Act requires UK to reach 'net zero' emissions by 2050. Goes beyond previous 80% reduction target and a world first.

Government required to set intermediate targets – 'Carbon Budgets'. These emission targets are legally binding on Government. Latest Budget estimates will be December 2020.

Five Carbon Budgets currently in place capping emissions up to 2032 requiring a 57% reduction in emissions compared to a 1990 baseline.

Figure 3: UK carbon budgets and 2050 target³⁵





Figure 1: UK and G7 economic growth and emissions reductions⁸



2010 - 2018

Generation in the UK



Figures courtesy of Carbon Brief

Policies & Environment

- 2010 introduction FiT for small scale renewable generation
- Levy Control Framework:
 - Contract for Differences (CfD)
 - 2017 RO closed
 - 2019 FiT scheme closed

2018 onwards - Bonfire of the Policies





https://interactive.carbonbrief.org/how-uk-transformed-electricity-supply-decade/

<u>2010 - 2018</u>

UK Renewable Energy

& Emissions







Source: BEIS (2019) *Final UK greenhouse gas emissions national statistics 1990-2017*; CCC analysis. LULUCF = land use, land use change and forestry.

2019 & looking forward

UK Policies:

Initially UK Gov believed that 2009 Climate Change Act with 80% reduction GHG from 1990 levels was GOOD ENOUGH

Late 2018 – views began to change....

- Clean Growth Strategy key pillar of;
 - INDUSTRIAL STRATEGY

To meet 1.5 Degrees ambition, UK new ambition was to achieve Net Zero GHG by 2050. So....

- May 2019 Committee on Climate Change report
- <u>June 2019</u> UK Gov. pass laws to end its contribution to global warming by 2050
- Jan 2020 New initiatives Engaging people....Climate Assembly

2050 NET ZERO Greenhouse Gas Emissions





Renewable Power Forecasts for United Kingdom



■Coal

Nuclear

Gas

∎0il

Modeling assumptions



Additions and retirements



Flex

Bloomberg New Energy Finance Study: Tipping Points 2017: sponsored by Eaton and REA

Progress, But... Policy Gap to Deliver

The UK's emissions challenge

Emissions have fallen rapidly, but most of the progress has come from electricity generation.



Source: Committee on Climate Change (CCC)

Progress so far*

More action needed

REA REPORT: Developing flexibility: the new cornerstone of the grid

June 2019



Power system flexibility supports high renewables deployment

Table 10: Summary of scenario outcomes in 2030

Scenario	System cost	Emissions	Fossil capacity as share of peak demand	Renewable share of generation	Zero-carbon share of generation
NEO (base case)	32.8 GBPm/TWh	16.8 MtCO2	49%	74%	88%
Relative change vs NEO					
Low-flex	3%	9%	10%	-1%	-1%
High uptake of EVs	2%	-19%*	0%	1%	0%
High uptake of EVs and flexible charging	0%	-30%*	-7%	2%	1%
High uptake of storage	-2%	-13%	-12%	1%	1%
High uptake of flexible demand	1%	1%	1%	0%	0%
Interconnection to the Nordics	-2%	-25%	-11%	3%	3%

Table 11: Summary of scenario outcomes in 2040

Scenario	System cost	Emissions	Fossil capacity as share of peak demand	Renewable share of generation	Zero-carbon share of generation
NEO (base case)	39.8 GBPm/TWh	11.6 MtCO2	34%	80%	94%
Relative change vs NEO					
Low-flex	13%	36%	45%	-1%	-2%
High uptake of EVs	4%	-88%*	3%	1%	0%
High uptake of EVs and flexible charging	4%	-96%*	0%	1%	0%
High uptake of storage	0%	1%	-1%	0%	0%
High uptake of flexible demand	-5%	2%	-10%	0%	0%
Interconnection to the Nordics	-2%	-24%	-10%	2%	2%

Source: BloombergNEF. Note: Colour scales differ between columns, but in all cases green is desirable. *Emissions for EV scenarios include a negative contribution from emissions displaced in the oil sector.

BNEF analysis indicates that.. *low* grid flexibility => higher carbon system in 2030 & 2040. NOT ACCEPTABLE!



http://electricalsector.eaton.com/en-gb_renewables-energy-transition-section-3?_ga=2.44034789

Energy Storage Policy & Markets in the UK



Storage in the UK's Energy system

Figure 4: Potential locations and applications of electricity storage in the power system





UK's 'Smart' Energy Agenda

National Infrastructure Commission Report

Smart Power report concludes that Energy storage alongside DSR and interconnectors, could save consumers up to **£8 billion a year by 2030,** help the UK meet its 2050 Carbon targets, and secure the UK's energy supply

Upgrading our Energy System: Smart Systems and Flexibility Plan

Government set out plans to realise decentralised energy system.

- Removing Barriers to smart technologies
 - Smart Homes and Businesses
- Promote markets which work for flexibility
 - 40 point plan to deliver this





Operational Storage Technologies in the UK

 Mechanical Energy Storage: pumped hydro in Highlands, compressed air Manchester and flywheel near Oxford

- Electrochemical (battery) Energy Storage: conventional batteries widespread, flow state batteries in Cornwall
- Chemical Energy Storage: Includes hydrogen and synthetic natural gas – not yet used for this purpose
- High Temperature Thermal Energy Storage: Includes liquid air, project in development in Cheshire

 Electromagnetic Energy Storage: capacitors not yet widely used in energy





Energy Storage Support Mechanisms Capacity Market

- Auction mechanism that means generators have a steady, predictable revenue stream in order to ensure security of supply.
- Must be able to deliver energy when needed or face penalties.
- 'Pay as cleared auction' starts at a high price, the price is lowered until the amount of capacity required is reached at the lowest acceptable to bidders.
- One and four year ahead auctions.
- Last full auction cleared at £15.96 per kW per year (T-4 in February 2020).
- Little renewable generation or storage so far.



Latest Status:

- Next auctions early-2021
- 117.02 MW energy storage awarded contracts early 2020
- REA pushing for reforms to support baseload generation and storage

Energy Storage Support Mechanisms Smart Export Guarantee (SEG)

Available for solar PV, Anaerobic Digestion, hydro, <u>onshore wind (<5MW)</u> and micro-CHP projects up to 5MW in size

Eligible for <u>Energy storage</u> assets below 5MW but up to supplier discretion for individual sites

Payments based on p/kWh 'export tariff' – no set rate

No fixed term for payments

Payments provided are set by individual supply companies over 150,000 customers size threshold

Administered by energy market regulator Ofgem, payments made via supply company based on regular meter readings

Latest status:

- Current SEG rates: Octopus Energy 5.5p/kWh. Tesla Energy 8p/kWh
- 10-15 suppliers





Smart Export Guarantee (SEG) Tariffs, Jan 2020

Energy Supplier	Tariff Name	Price per kWh
Social Energy	Export	5.6p
Octopus Energy	Outgoing Fixed	5.5p
E.On- for new customers with solar installs from 1 Jan	Fix & Export Exclusive V1	5.5p
Bulb	Export Payments	5.38p
ονο	OVO SEG Tariff	4.0p
ScottishPower	Smart Export Variable	4.0p
SSE	Smart Export Tariff	3.5p
EDF	Export + Earn	3.5p
E.On- all other customers, including npower customers	Fix & Export V1	3.0p
Centrica/British Gas	Export and Earn Flex	1.5p
Green Network Energy	SEG Tariff	1.0p
Utility Warehouse	UW Smart Export Guarantee	0.5p



Ancillary & Flexibility Markets

- New mechanisms designed to support fast responding capacity and those providing services to grid network.
- Split into national support schemes ('Ancillary services') and regional markets (very new).
- Expected to play much larger role in future energy markets.
- Power Potential: localised flexibility market in South East England- model for national roll out
- ODFM: payment for demand turn down on distribution networks
- DNO regional tenders: regional markets traded on common platform (Piclo Flex) – but limited capacity, infrequent auctions
- Power Responsive: Balancing Services agenda to increase balancing services from nontraditional sources. Under review.

Flexibility Markets:

- Capacity Market
- Ancillary services: eg Fast
 Frequency Response
 (FFR), Enhanced
 Frequency Response
 (EFR)
- Sub-station specific distribution network markets
- Piclo Flex DNO tenders



Areas identified by Government for further investigation

Delivering existing actions	Facilitating the deployment of	Facilitating the deployment of
and identifying additional	domestic/small scale	large-scale, longer-duration
barriers	storage	storage
Some of the actions set out in the original Smart Systems Plan have not yet been fully implemented, want to understand whether they are on track, how best these can be driven towards implementation and whether there are follow on actions. Areas identified: Planning guidance Definition of storage Connections Innovation Business Rates	 Still a small market. Government have identified some further barriers to the deployment of storage at a domestic/small scale level. Areas identified: Health and Safety and asset registration Smart Export Guarantee Removal of final consumption levies VAT 	Large-scale, longer duration storage may struggle to deploy due to high upfront costs. Want to better understand the role this type of storage will play. Areas identified: Quantified system benefits of this type of storage Quantified system benefits of this type of storage How challenges should be addressed in policy/regulatory Facilitating a level playing field Innovation needs for this type of storage

Summary: Energy Storage in the UK

- 20GW+ of applications on distribution networks (vs c14GW installed solar)
 - Markets: National Ancillary services, Regional Ancillary services
 - National Grid Power Responsive: Balancing Services agenda to increase balancing services from non-traditional sources
 - Eg Black Start capabilities, Power Potential project in south east England – increasing local network resilience
 - Regional DNO Flexibility Tenders
 - Energy Storage co-located projects in renewables schemes now
 largely settled
- Capacity Market reforms allow Solar/Wind + Storage, prices still low
 - Smart Export Guarantee impact unknown
 - Current hiatus in development before new markets confirmed?
 - Grid reforms (TCR SCR, CUSC, EBs) big threat to grid-level storage projects



Thank You!

Questions Welcome

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