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HYDRO CONFERENCE & EXHIBITION

8 MAY 2018 PERTH

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More Than Just Power From the Glens

Claire Mack

Chief Executive, Scottish Renewables

Uzma Khan

Deputy Director, Economic Strategy, Scottish Government

Gordon Watson

Chief Executive, Loch Lomond & The Trossachs National Park

James Greenhalgh

Electricity Customer Connections Manager, National Grid

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Income and Expenditure: Navigating Project Costs and Assessing Revenue Opportunities

Rob Luke

Head of Renewable Origination

SmartestEnergy

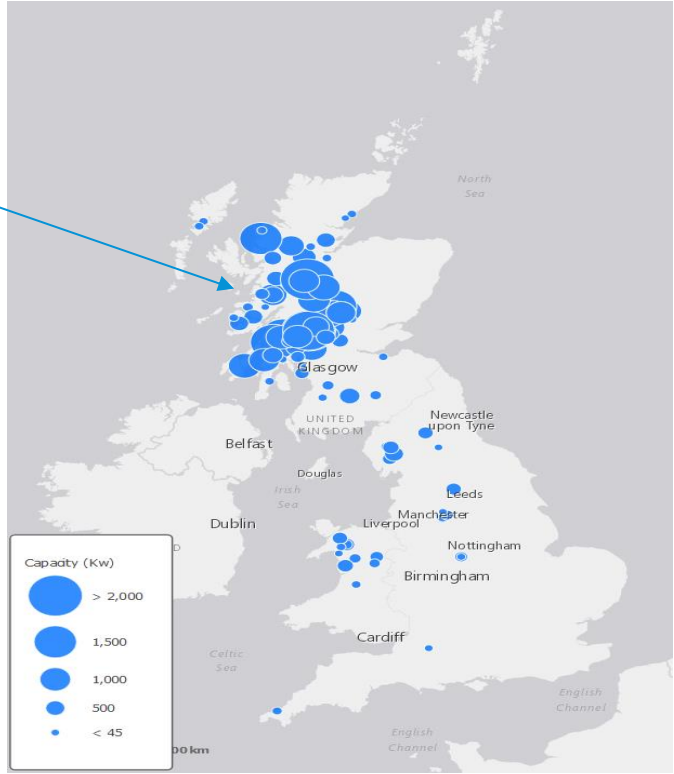
Evolving generator revenue streams in a post-subsidy world

Robert Luke, Head of Renewable Origination

8th May 2018 – Scottish Renewables' Hydro Conference & Exhibition - Perth

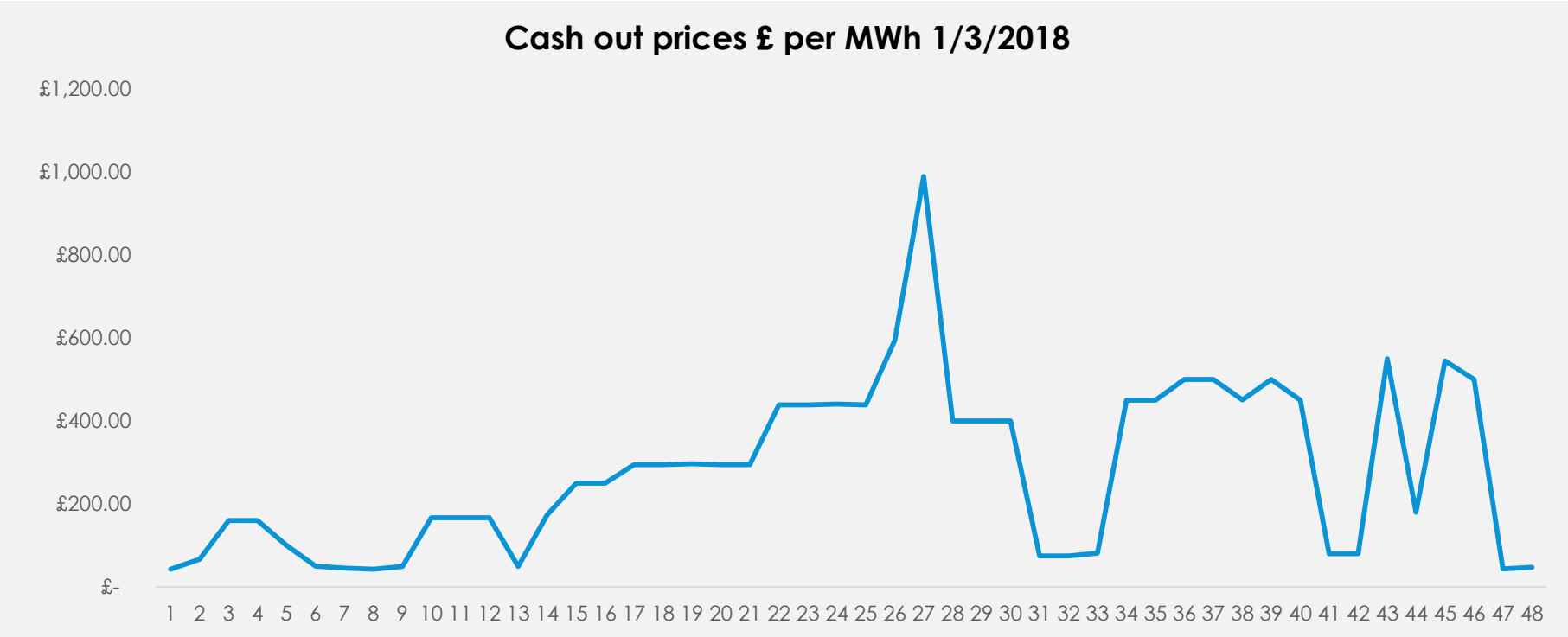
Supporting Scottish Renewables

- British Hydro Association Member
- 50MW Scottish hydro portfolio across 84 sites
- 276MW Scottish Renewables
- Bright Green Hydrogen Limited



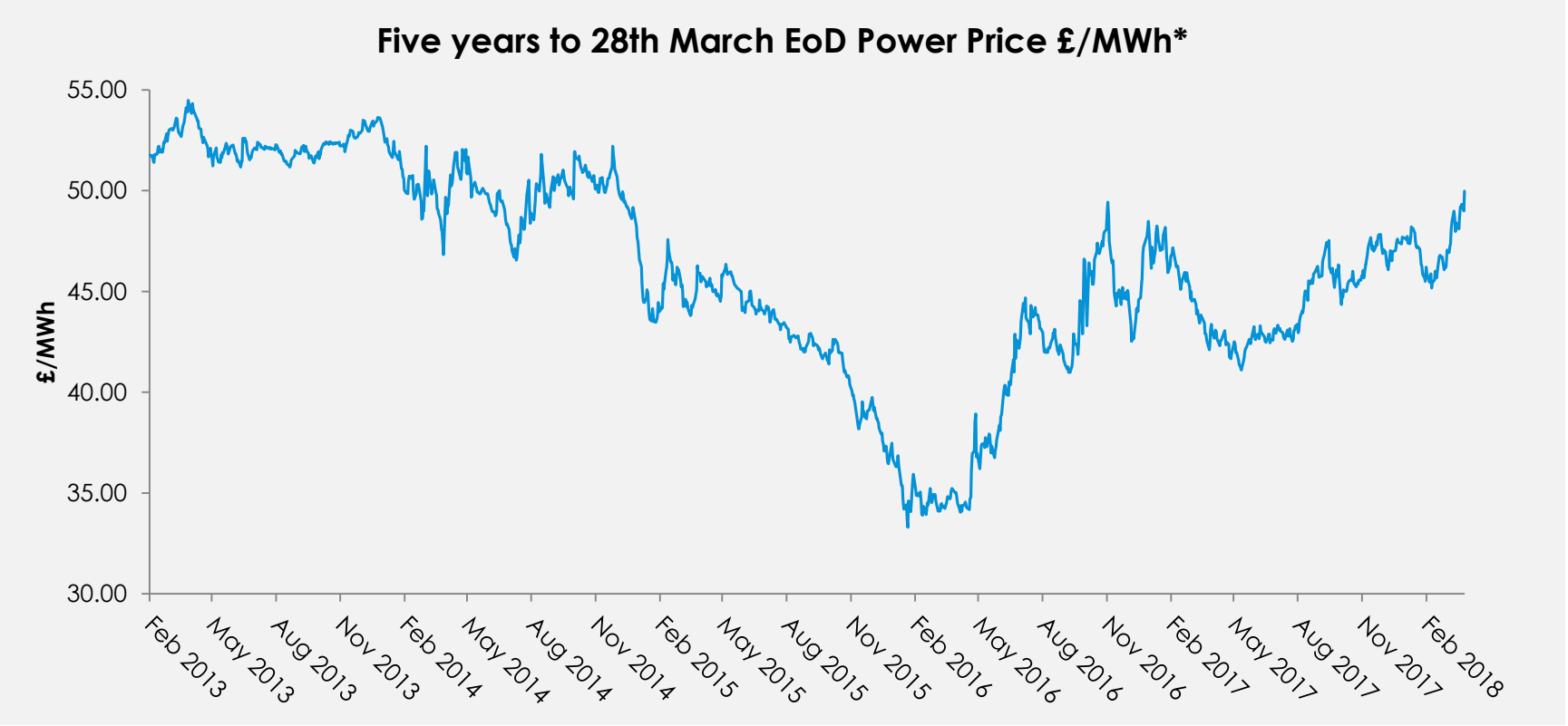
The rapidly evolving market presents new commercial opportunities

Market volatility creates opportunities



Increasing revenue opportunities

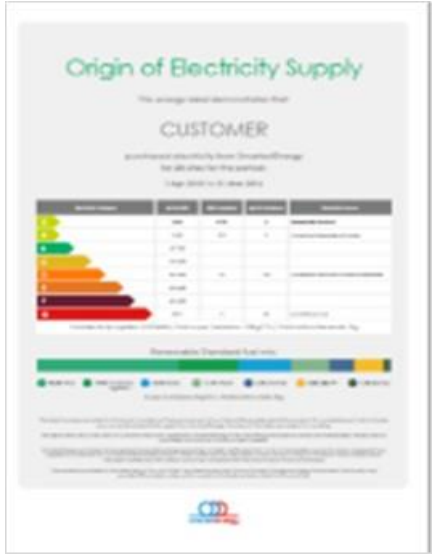
Five year end of day power prices



Scottish Renewables supporting UK Consumers

- Our renewable supply product is certified by sustainability experts **the Carbon Trust** (Greenhouse Gas Protocol Scope 2 compliant)*

- The only UK supplier to be formally recognised by the **CDP**



*100% of the electricity supplied is renewable, backed by certificates of renewable energy guarantees of origin. Emission factors are compliant with the GHG Protocol Scope 2 Guidance and to be used for the 'market-based method'.

Maximising the value of generation assets

Providing value to your supplier

New contract structures

Future proof your asset

Energy Entrepreneurs Report 2018

Visit our stand to pick up your copy

Thank you

Robert Luke, Head of Renewables Origination

Visit us at our stand

www.smartestenergy.com

Jill Cox

Sales Operations Manager

Flexitricity

DSR and Grid balancing services
Hydro and Pumped Hydro

Power markets: GB and EU

What will be influencing change over the next five years?

- Societal pressure: continued consumer drive to green power and local energy
- Environmental choice: need for increased flexibility in generation, to manage the increased penetration of renewables and phase out of coal
- Technology advancement: the speed of innovation of new technologies, such as battery storage
- Data: “big data”, IoT, Blockchain, predictive modelling
- Regulatory changes: development of an integrated European Balancing market, and development of liquid, integrated short-term markets

Flexitricity

GB Market

Unprecedented level of change – industry and regulatory level

- Products and platform changes: SNaPS, PAS
- Export triad benefit
- Capacity Market
  - Unproven DSR delivery assurance needed
  - Strengthening arrangements relating to Satisfactory Performance in-year
- Key Proposals: TERRE, BM Lite
- Flexibility will have greatest value

Demand Side Response

- The participants and technologies in the DSR market are changing
  - Developers leaving diesel, chasing other opportunities, including storage
  - Direct participation from Industrial & Commercial sector decreasing
  - Utilities offering DSR in service propositions to supply clients – commitment?
- Short- to Medium Term
  - Reserve: near term price erosion and flexible rejection inevitable
  - Electrification of heat and transport will impact
  - National Grid's requirement for flexibility will increase
- What role is there for hydro and pumped hydro?

Flexitricity

DSR and hydro generation

Historical Model - Hydro Generation

- Time of day running (red rates) typically taking priority
- Hydro availability for DSR services, particularly reserve has dependency on season, rainfall, volume and other parameters
- Benefit to owner/operators - can be “set and forget”

Hydro generation and Demand Side Response

- Positive (STOR) & negative (demand turn up) reserve services potential
- Value in availability and utilisation, claw-back of revenue for penalties
- Secondary revenue to renewable subsidies

Flexitricity

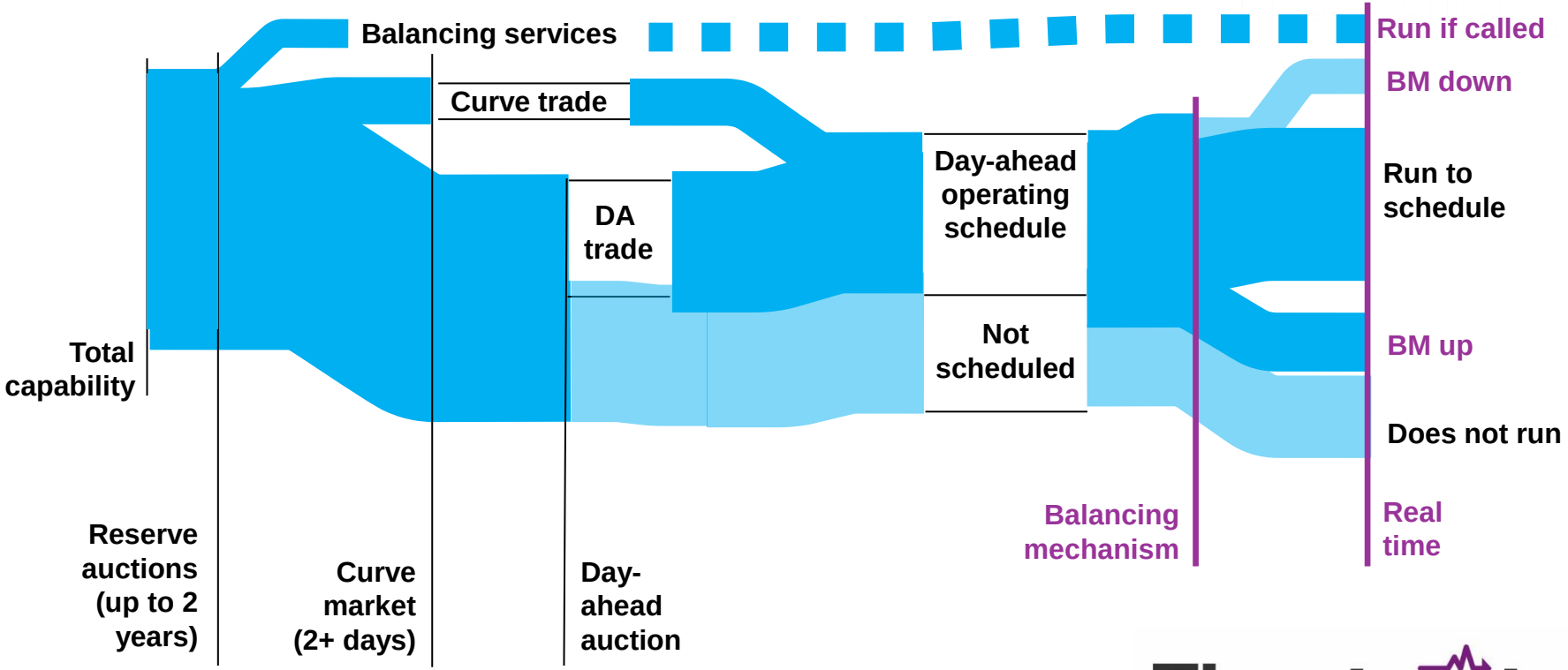
Balancing Mechanism

National Grid:

“As we continually work to balance the system, we can ask generators of all kinds, not just wind farms, to come on or off the grid to help us balance supply and demand, or to manage ‘constraints’ in the network.”

“This is something we do many times every day and have done for many years. It is a normal part of our job, and we have a number of well-proven tools to help us do it, including buying generation onto or off the network one or two days ahead of real time, and bids on the balancing mechanism within one or two hours of when the energy is needed.”

Flexitricity



Flexitricity

Balancing Mechanism

- Traditionally an option for utilities only, we believe the Balancing Mechanism should be open to businesses across GB
- Controllable renewable resources, importantly hydro, can benefit
- Close-in trading requires market knowledge and active management
- Prices in the Balancing Mechanism can exceed wholesale markets, ten-fold
- Flexibility and controllability are key

Flexitricity operates the first and most advanced smart grid in the UK. Join us today. Call **0131 221 8100.**

FLEXITRICITY

Mainpoint
102 West Port
Edinburgh

Flexitricity

James Buchan

Energy Systems Specialist

Local Energy Scotland

Income and Expenditure: Navigating Project Costs and Assessing Revenue Opportunities

LOCAL ENERGY SCOTLAND

Scottish Renewables Hydro Conference & Exhibition: Perth Concert Hall, 08 May

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Greener Scotland
Scottish Government

About us

LOCAL ENERGY SCOTLAND

THE SCOTTISH GOVERNMENT'S → COMMUNITY AND RENEWABLE ENERGY SCHEME (CARES) → IS DELIVERED BY: LOCAL ENERGY SCOTLAND

This consortium is between

CHANGEWORKS

energy agency

energy saving trust

SCARF

wisegroup

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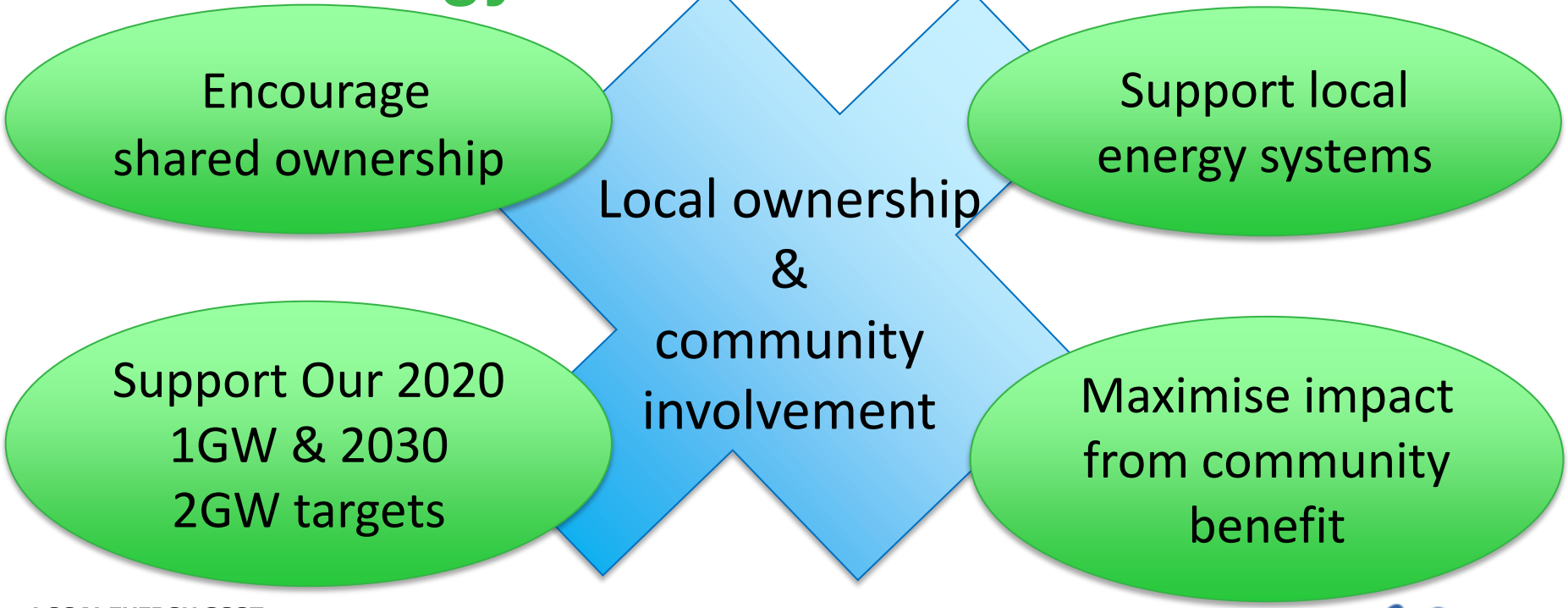
Objectives
Local Energy Scotland aims to



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CARES

Project Types

Capital Projects

Shared Ownership

Capacity building & Innovation

Funding Types

Enablement Grant

Innovation Grant

Development Loan

Bridging Loan

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CARES

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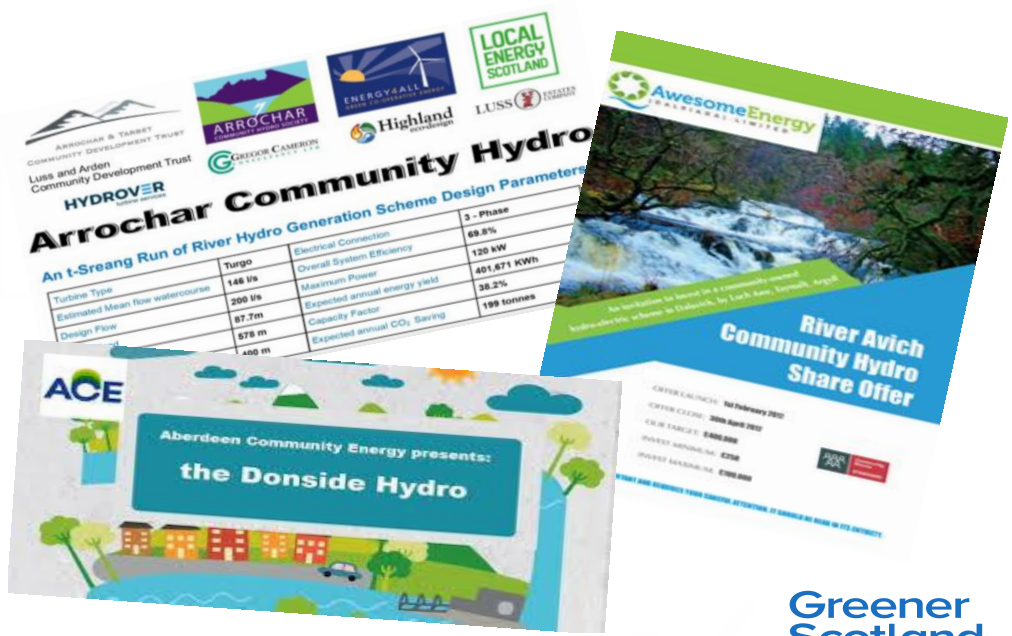
Project Success

We have supported over 100 projects at various stages of development..

CARES Hydro Projects			
Type	Projects	Value Offered (£)	Size (MW)
Loans	45	2,265,000	12.2
Grants	49	1,925,000	
IIF Grants	10	314,000	
TOTAL	104	2,143,795	12.2



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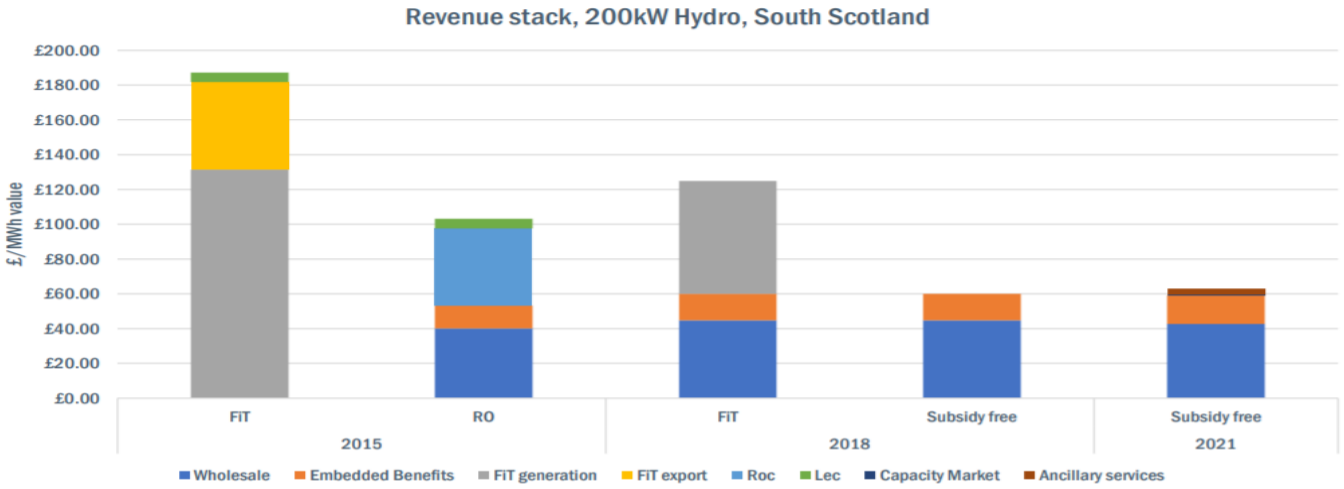
Challenges

Reduction and removal of FIT Scheme subsidies

p/kWh	Tariff Period >>		TP2 2018		TP3 2018		TP4 2018		2019
PlusContingent	**Band**		**Apr-18**	**Cap**	**Jul-18**	**Cap**	**Oct-18**	**Cap**	**Jan-19**
Hydro									
<100kW			8.07		8.06		8.04		8.02
100-500 kW	All one		6.49		6.48		6.47		6.47
500-2000k	deployment		6.49		6.48		6.47		6.47
>2000kW	band		4.73		4.73		4.73		4.73
		Export	5.24		5.24		5.24		5.24



Implications

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Example:

360kW scheme in Argyll

£150k development costs

£1.8M proposed capital cost

Modelled on 10.47p/kWh FIT (inc export)

Scenario Name	Baseline P90 - 80% senior loan @ 6%	10% Lower construction costs, P50	Viable solution - 40% lower construction costs + smaller senior loan	Viable solution - 50% equity	50% senior loan / 50% share offer all at 4%	New Scenario - Scenario 5 with 10% reduced costs	New scenario - 100% equity
Cost per kW (£/kW)	£6,038	£5,496	£3,570	£5,681	£5,878	£5,351	£5,622
Capacity Factor (%)	28.7%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%
Project IRR (%)	3.04%	5.79%	10.02%	4.98%	4.98%	5.79%	4.98%
Total dividends (£)	£0	£1,102,306	£2,095,980	£1,190,800	£775,904	£1,075,818	£2,084,908

Opportunities

- Community pre-accreditation up to 31st March 2019 giving build out time until Sept 2021
- Attractiveness of FIT lock in and 20 year index linked export tariff to investors
- 5MW capacity left in <100kW band
- 25MW capacity left in the >100kW band

Requirements by 31st March 2019:

- Accepted grid offer
- Planning permission
- CAR licence
- (property rights)

Can the above be secured in the next 11 months??

Opportunities

LOCAL ENERGY SCOTLAND

Lower Costs

- Equity funding
- Grant funding
- Cost aggregation
- Cost effective design
- Innovation in materials cost
- Long term finance (40 years)
- Refinancing

Increased Revenue

- Local supply
- Generation aggregation
- Premium PPA’s
- Ancillary services
- DSO services
- Storage / ‘pondage’

CONTACT US

Local Energy Scotland

0808 808 2288
Local Development Officers
contact details on our website

Local Energy Scotland | Energy Saving Trust | Ocean Point 1 | 94 Ocean Drive | Edinburgh | EH6 6JH

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/localenergyscotland

Want to stay up to date with all of our latest news?
Email info@localenergyscotland.org to sign up to our newsletter.

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Scottish Government

Andrew Smith

Managing Director

Deja Blue Consulting

DEJA BLUE CONSULTING

DEJA BLUE CONSULTING

SR Hydro Conference& Exhibition 2018
Perth, 8 May

"…… driven by & passionate about decarbonising through businesses & communities delivering projects……."

MEMBER OF scottish renewables 2017-2018

Deja Blue Consulting

- Strategy & readiness to execute
- Source, structure and close the financing of projects
- Policy
- Signposting of the agencies and background against which projects and business expansion will take place
- We are associates of Greenbackers Investment Capital who are cleantech investment specialists and represent an SEIS/EIS fund
- Non exec and board roles e.g. Our Community Energy Chairman

Project revenue
Risks & Opportunities

RISKS

- Doing nothing, doing something half heartedly doing something you don't want to do, doing the wrong thing, doing something which you don't really understand
- Being "renewables" in the same way Swansea Bay is an energy project
- Policy changes & unintended consequences of changes that shouldn't impact e.g. rates, support mechanisms that are linked to and degrade assuming technology development when you have a mature technology
- The challenges around collaboration
- Undervaluing what you have

Project revenue
Risks & Opportunities

OPPORTUNITIES

- Ancillary services – honest audit, of people & assets, real appraisal of interest and ambition, review of market need, is there a match or can we create one?
- Community schemes – REIF experience – what you need to do – CES, LES, HIE
- Novel financing - REIF (EIF), crowd funding, community share offers, Abundance, Mongoose and others, PPA's and the IPPA, Blockchain, Our Community Energy

Conclusions

- You need your associations conferences and intervention agencies more than ever
- The sector in Scotland has renown and skills and probably scope for more projects if they can be made to stack up financially
- The world needs more hydro schemes
- Hydro schemes are a good fit with energy produced locally being used locally and good for community ownmership
- Collaborate, adapt, innovate in structuring and financing
- Collaborate

DEJA BLUE CONSULTING

MEMBER OF scottish renewables 2017-2018

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Fair and Square: Creating a Level Playing Field

Alex Reading

Development Director

Green Highland Renewables

Green Highland

Unlocking Hydro Energy

SIMEC

How can the Hydro Sector be Treated Fairly?

Alex Reading

A Developer's View

1. The last 10 years
2. The Issues we face
3. Overview of each issue
4. How are we doing?
5. Who is looking after us?

The last 10 years

- Dominated by the
  - Feed in tariff
  - The sub 5MW sector
- In that time the Scottish Hydro sector has:
  - Commissioned = 300+ hydro projects
  - Installed over 170MW of Generation

- Data source = variable pitch website

The Issues we Face

The BIG picture

- Fit Pre-accreditation finishes Mar 19
- No new incentive schemes considered until 2025

1. The Sector Deal

The Here and Now

2. Rates
3. Planning Fees
4. SEPA Charges
5. Grid Outages

1 Sector Deal

What happens next?

- FiT Ends – March 2019
- Initial Line from BEIS – No support until 2015
- Discussions are ongoing

How does hydro be heard above the crowd?

Whats the message we want to send?

……more money and more of the same?

We need to think differently…….

2 Rates

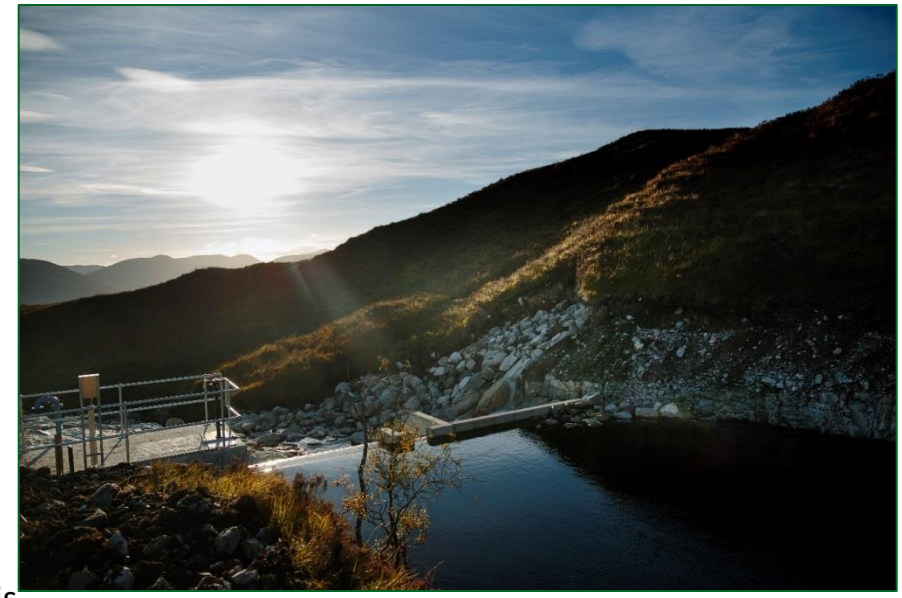
Potted history

- Rates relief lifted
- Followed by Rates review
- Resultant valuations were often exorbitant and generally erratic
- Huge effort by industry to engage with Assessors and Scottish Government

Current Status – Interim relief imposed by Scot Gov and further engagement with assessors, through Tretton Review, will ***hopefully*** lead to a workable solution

KNOCK ON EFFECT – ***Very*** few projects consented through second half of 2016 and all of 2017

3 Planning Fees



Potted history

- Planning fees were originally capped at £2,000
- The cap increased to £20,500
- In Summer 2017 legislation came in that re-classified Hydro projects as “Major” projects. This resulted in the cap being raised to ***£125k***
- Sector engaged with Scot Gov and the Chief Planner.

Current Status – Chief Planner has been very constructive and stated that the change to Major Project classification was unintended. Legislation is being changed and should be corrected by 25th May

KNOCK ON EFFECT – Uncertainty has led to consenting delays

= ***Increased risk of gaining Mar 2019 Pre-accreditation***

4 SEPA Charges

Potted history

- Warning of charges from SEPA - 2015
- Fee Letters issued Sept 2017
- Fees were erratic, greater than anticipated and the wording was inflammatory
- Consultation – Sept - Oct 2017
- Sector engaged with Scot Gov and SEPA

Current Status – SEPA have imposed changes ***but*** have made changes to the charging scheme for sub 500kW projects.

Discussions concerning 500kW to 5MW anticipated to continue

KNOCK ON EFFECT – ***Uncertainty*** - If SEPA can do this, what might happen next…..

5 Grid Outages

Potted history

- DNOs have a network to operate
- Embedded Generators are affected by TNO and DNO works
- Outages - frequent, long and poorly flagged to generators
- Sector engaged with SSE
- SSE's customers:

The Consumer V The Generator

Current Status – Engagement with SSE has led to a better working relationship ***but*** it's the legislation, not the actual DNO. Balance needs to be addressed

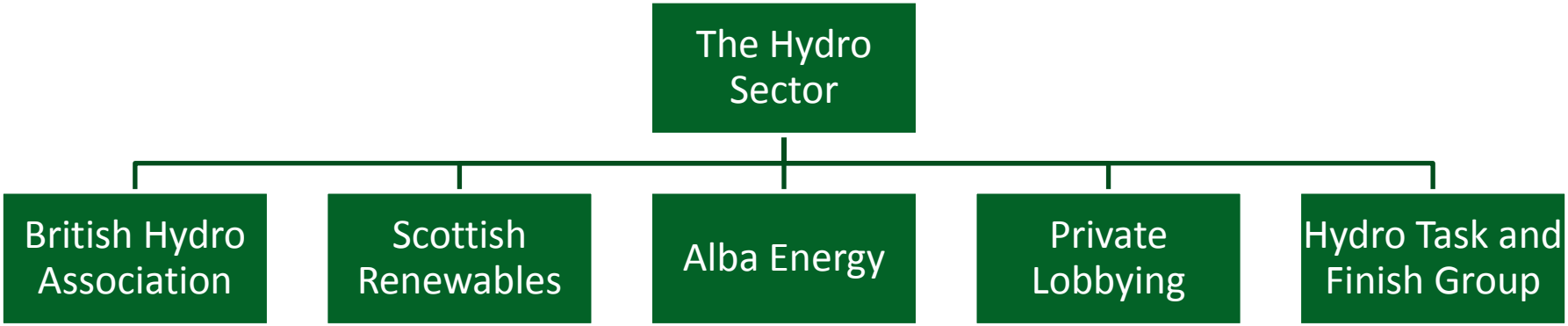
KNOCK ON EFFECT – ***Uncertainty*** – Funders don't like this sort of thing

Report Card - Small Scale Hydro Sector

Date: May 8th 2018

	Issue	Result	Effort	Comment
1	Sector Deal	E	3	*More effort critical* 😳
2	Rates	C	1	*Good result so far, need to concentrate on the next stage. Could be a long one!* 😬
3	Planning Fees	A	1	*Good Result* 😀
4	SEPA Charges	C	2	*Progress has been made but more required…its only half time!* 😬
5	Grid Outages	C	4	*What's been done is OK but need to think differently* 🤔

Who is looking after this?



The End – Thank You

Catherine Falconer

Commercial Manager

Scottish & Southern Electricity Networks

Fair and Square: Creating a Level Playing Field

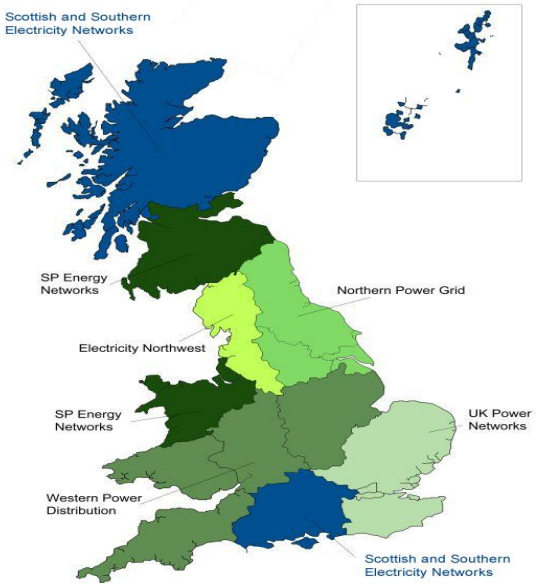
Hydro Conference 2018

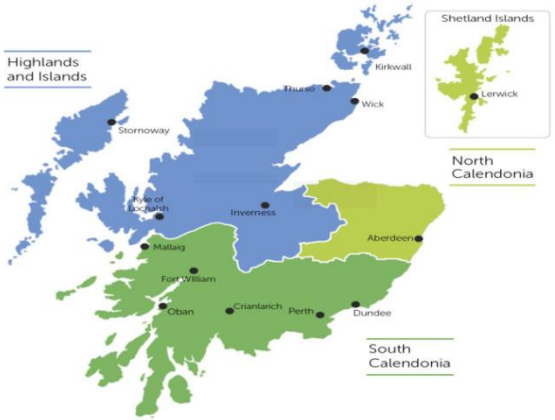
Catherine Falconer
Commercial Contracts and ICE

Scottish & Southern Electricity Networks

Our operating area

- Over 4,000 employees, working from 85 depots and offices in the heart of the community.
- 130,000km of overhead lines and underground cables 106,000 substations
- Over 100 subsea cables, powering island communities
- 3.7m customers served by our networks across central southern England (over 2.9m) and the north of Scotland (740,000)





Open To Choice - Part Funded Reinforcement

You know you “have a choice” to use an Alternative Provider (ICP) to deliver your connection.

SSEN is trialling the option for them to ALSO deliver any reinforcement

- Reinforcement is the rebuilding of assets on the existing Distribution Network.
- Part Funded reinforcement is when you and SSEN receives a benefit.
- SSEN contributes to the cost of the works .
- Historically, Part Funded Reinforcement was something only SSEN could do

More choice and control for you. Larger more attractive projects for ICPs.

Scottish & Southern Electricity Networks

Working Together - Grudie Bridge

Grudie Bridge is a Grid Supply Point (GSP) 30 miles to the North West of Inverness. The network in the area was “full” for generation.

To accommodate further generation SHEPD required to install a new 33kV switchboard, the significant re-build the 33kV network including a new 33kV cable. SHE-T also required to install new Grid Transformers and upgrade the transmission network.

Working with a number of predominantly Hydro generators a Consortia was formed to spread the cost, risk and learning.

26.6MW of additional Hydro generation was connected across 34 projects. This equated to 70% of the hydro capacity connected in Scotland in 2016/17

Scottish & Southern Electricity Networks

Options - Flexible Connections

Initial Trial has connected 85 Generators/153MW "Early"

- Standard Application – from 16th April 2018
- Options for Flexible Connections
  - Full ANM, 3rd Party ANM
  - Export Limiting and Timed Export Limiting
  - Short Term or Permanent

- Visit our website: https://www.ssen.co.uk/AlternativeGenerationConnections/
- Contact the Active Solutions Team at FlexibleConnections@sse.com

Scottish & Southern Electricity Networks

A Real Example: Mull ACCESS for CES

400kW

DSM comms link

50kW
('firm')

350kW
('non-firm')

Measurement Point
(50kW max export)

Intertrip comms link

Network Constraint

0-350kW
New
Controllable
Heat
Demand

Scottish & Southern Electricity Networks

Constraint Management –
Developing a Collaborative Approach

A new approach to keeping you informed.

A balance between accuracy, obligations and efficiency

- Indicative outage information at year ahead stage
- Specific information to individual customers 3 months out
  - Timescales may still vary
  - Committed to keeping you informed*
- Minimised impact through co-ordinated planning and discussion with customers
- 50kW curtailment, facilitated negotiation between customers

* Your views. What should the rules be?

Scottish & Southern Electricity Networks

Our Proposed 2018/19 ICE Commitments

Provides a high level overview of our list of commitments for 2018/19.

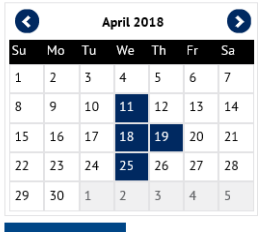
Prioritises improvements or offers greater clarity in the following areas:

- Information provision
- Application and Quotation processes
- Delivery
- Competition in Connections
- Collaboration and Engagement

20 commitments for the coming year

Scottish & Southern Electricity Networks

Other Useful Links and Contacts



SSEN Events Page:

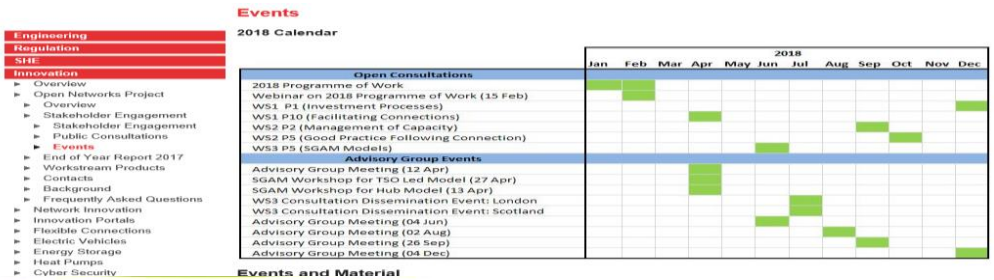
- https://www.ssepd.co.uk/stakeholderevent/basicsearch/

Requirements for Generators (RfG) / EREC G98 and G99 briefing sessions (Replacement to G83 and G59):

- https://www.regonline.com/eucodeslon for London and https://www.regonline.com/eucodesglas for Glasgow

ENA Open Networks Project:

http://www.energynetworks.org/electricity/futures/open-networks-project/



Scottish & Southern Electricity Networks

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Electricity Networks

Sean Kelly

Project Manager – Generation Development

SSE

Coire Glas

Hydro Pumped Storage

1500 MW 30 GWh

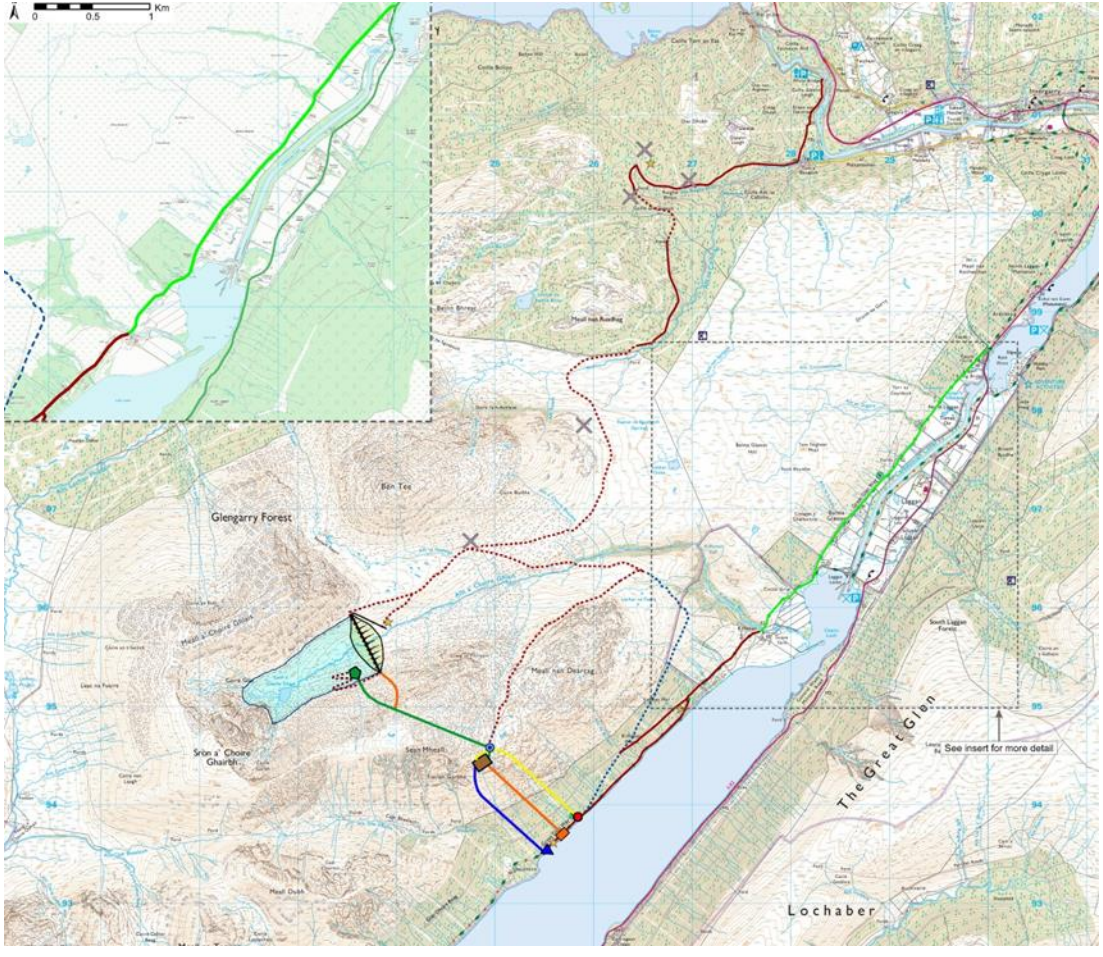
Coire Glas Hydro Pumped Storage: 2013

- Original consented configuration
- Up to 600 MW capacity: Up to 30 GWh storage
- Application made to Scottish Government September 2012
- Planning Consent granted December 2013
- Investment case stalled - SSE unable to progress a positive investment case for this configuration

Coire Glas Hydro Pumped Storage: 2018

- SSE have reviewed the options
- Revised configuration:
- Up to 1500 MW Capacity
- New Planning Application submitted to Scottish Government March 2018
- Decision anticipated April-June 2019

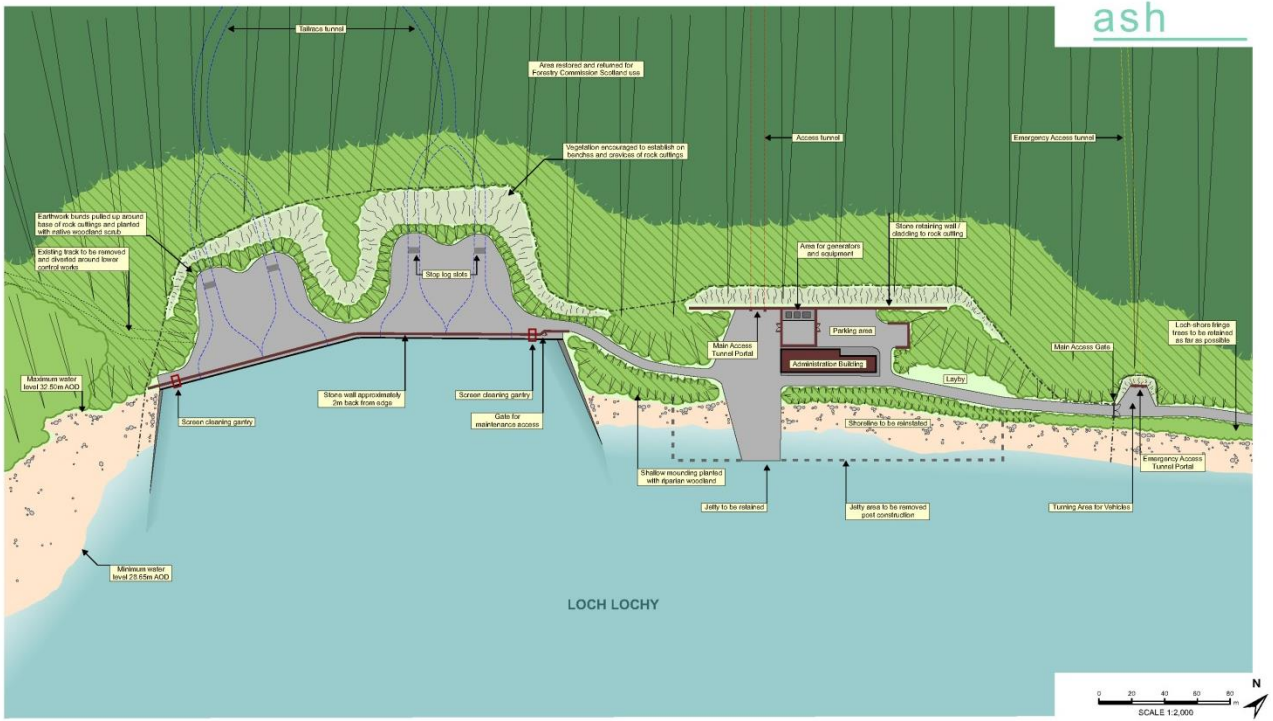
Coire Glas Scheme overview



Coire Glas :- Indicative Layout of Lower Reservoir Works

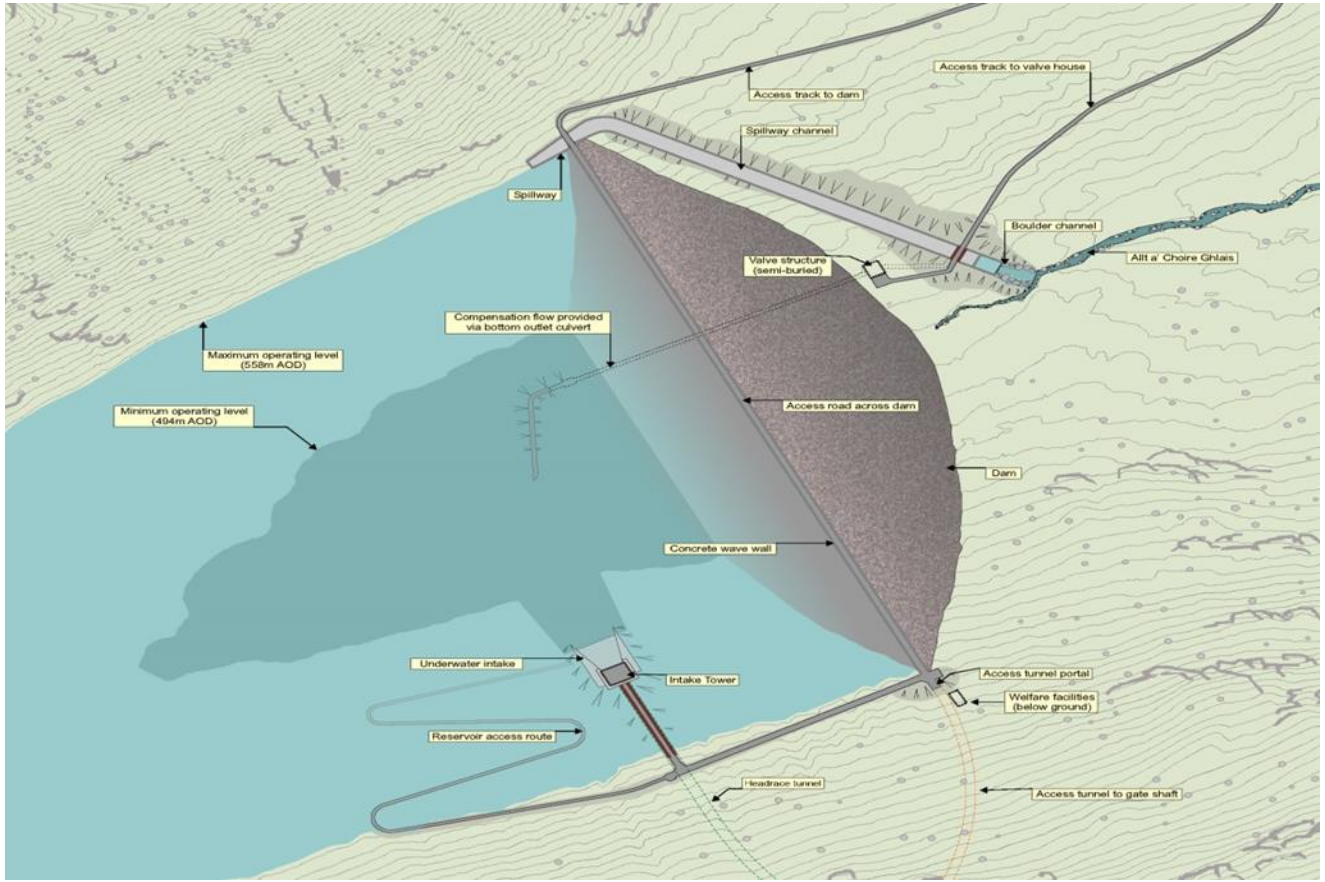
The lower reservoir works at Loch Lochy comprise:

- Administration building;
- Jetty;
- Main and Emergency Access Tunnel Portals; and
- Lower Control Works.



Coire Glas:-Indicative Layout of the Dam

The dam would be a rock-fill embankment with an upstream concrete face, with a maximum crest length of approx. 700m and an estimated height above ground level of approx. 92m.



Why are the revisions to the configuration needed?

- An assumed major driver for the original configuration was the potential of price arbitrage using the bulk energy storage potential of the site
- 30 GWh of stored energy is more than twice the existing UK PS energy capacity (24 GWh) from the existing 4 PS stations
- However wholesale energy prices over the past number of years have had a flatter 24 hour profile. Energy arbitrage on the general traded wholesale price alone is not enough to make the investment case work.
- So SSE looked at adding more flexibility to the project and to make best use of the Great Glen location.

Coire Glas: Up to 1500 MW configuration

- This retains the bulk energy storage capacity at 30 GWH but increases the generation/pumping flexibility
- By increasing the installed capacity this lowers the construction cost for £/MW installed making the services provided more competitive on a per MW basis
- Ensures that the station can maximise its contribution to UK installed capacity
- Provides more flexibility and options to support National grid in providing ancillary services.

Future Grid Ancillary services

- National grid identified in the SNAPS review 5 key services or which they will need to increase the volume and they way they are procured:
- Inertia and RoCoF
- Frequency reserve
- Reserve
- Reactive Power
- Black Start
- **Pumped storage can supply all of these services**

Pumped storage: part of the solution in the 21st century

‘Storage can open up many possibilities, helping to integrate low carbon generation, reduce the costs of operating the system, and help avoid or defer costly reinforcements to the network. But it needs a level playing field to compete.’

Upgrading Our Energy System: Smart Systems and Flexibility Plan, July 2017

HM Government and Ofgem

Thank You

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Future-Proofing the Sector

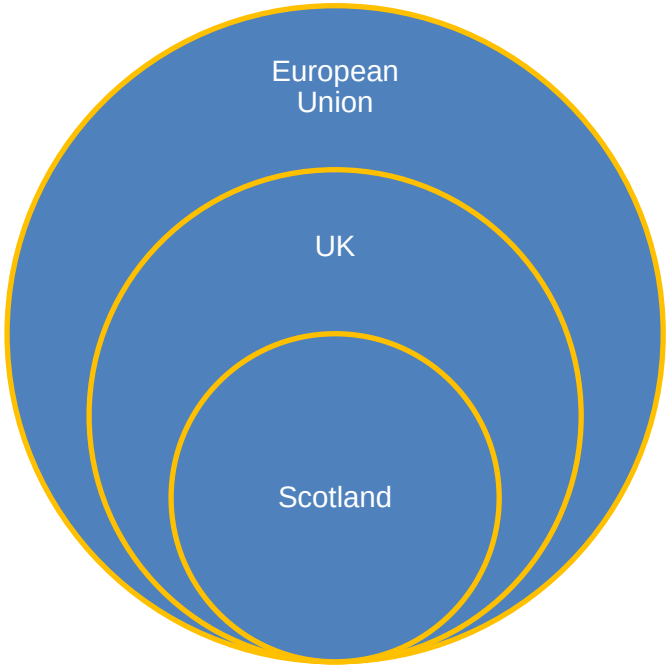
Kirsty Macpherson

Partner

Brodies LLP


BRODIES LLP
Brexit – how it affects Energy
Understanding the current and post Brexit position

Energy policies, programmes and responsibility frameworks



Division of competences Scotland - UK

- Scotland Act 1998

- Scotland Act 2016

Reserved competences (UK Government)

- **Scotland Act 1998, Schedule 5, Part I – General Reservations**

- **Scotland Act 1998, Schedule 5, Part II – Specific Reservations**

Devolved (i.e. non-reserved) matters

Scotland Act 1998

- Wide planning competences
- Promotion of renewable energy and energy efficiency
- Consenting of electricity generation and transmission developments

Scotland Act 2016

- Power over design and implementation of energy efficiency programmes

EU competences – energy related (1/3)

Legal basis: Article 194 of the Treaty of the Functioning of the EU (TFEU)
Art. 194 (2) TFEU:

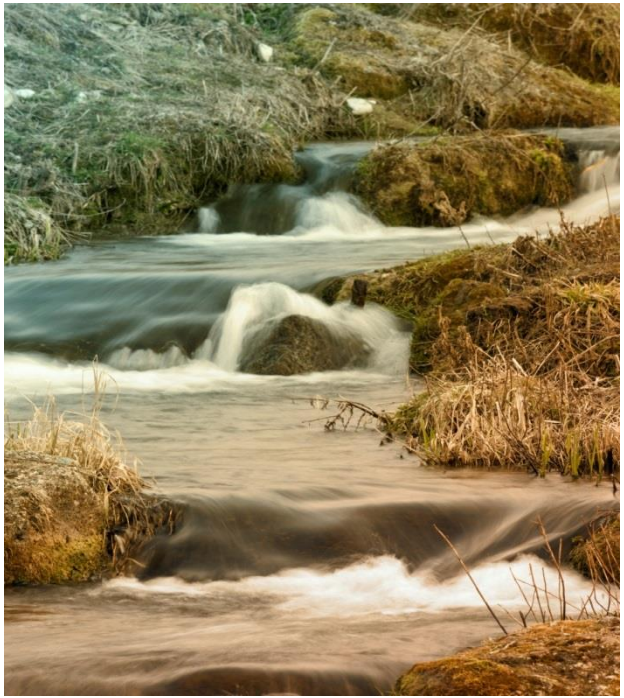
“Such measures shall not affect a Member State's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply”

→ Member states retain competence to determine own energy mix and structure of energy supply

EU competences – energy related (2/3)

Specific provisions, e.g:

- Security of energy supply, Art. 122 TFEU
- Energy networks, Art. 170-172 TFEU
- Internal energy market, Art. 114, 194 TFEU
- External energy market, Art. 216-218 TFEU
- Renewable energy / Energy efficiency, Art. 191-193 TFEU



EU competences – energy related (3/3)

Directives that enforce EU targets, e.g.

- **Industrial Emissions Directive (2010/75/EU)**

- **Renewable Energy Directive (2009/28/EC)**

- **Energy Performance of Buildings Directive (2010/31/EU)**
  → legal provisions on reducing energy performance of buildings

- **Energy Efficiency Directive (2012/27/EU)**
  → e.g. provisions on energy performance of buildings, heat metering and billing information, high energy cogeneration

BREXIT

29 March 2019 (or 31 December 2020?)

Summary of position

- Pre Brexit and during transitional period:
  - EU laws
  - Withdrawal bill

- Post Brexit:
  - Withdrawal bill
  - UK laws

Transitional period - Energy

- Single energy Market

- Network codes and market coupling

Transition Exit Day

- ACER
- EU Trade Agreements
- EU Funding

Is there anything positive to say?

- International Treaty
- UK a signatory

Relationship with EU

- “Deep and special”
- Documentation silent re: energy
- But impacts on Energy

Single Energy Market

Analyse the facts

- Part of single market since 1993
- The EU single energy market is not operating yet
- It has been a goal for more than a decade
- Integrating has been a painstaking process

Post Brexit – what occurs

- Gas and electric – goods?
- Tariff Free trading
- Level playing field rules

Brexit - Energy

What does this mean for Energy, potential affects?

- Cfd and capacity markets, FIT regime
- Environmental regulation and
- Planning requirements

Summary

- Nothing is agreed until everything is agreed
- Devolution aspects are more concrete since they do not entirely depend on Brexit negotiations outcome
- Power grabbing debate is obstacle to a smooth repatriation of EU competences to UK and Scotland
- Brexit is a challenge for UK and Scottish Energy Strategy

Finally

- Paris Treaty
- UK existing law
- UK/Scottish Energy Strategies

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