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Morag Watson
Director of Policy
Scottish Renewables

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Peter Diver

Head of Hydro Operations

SSE Renewables

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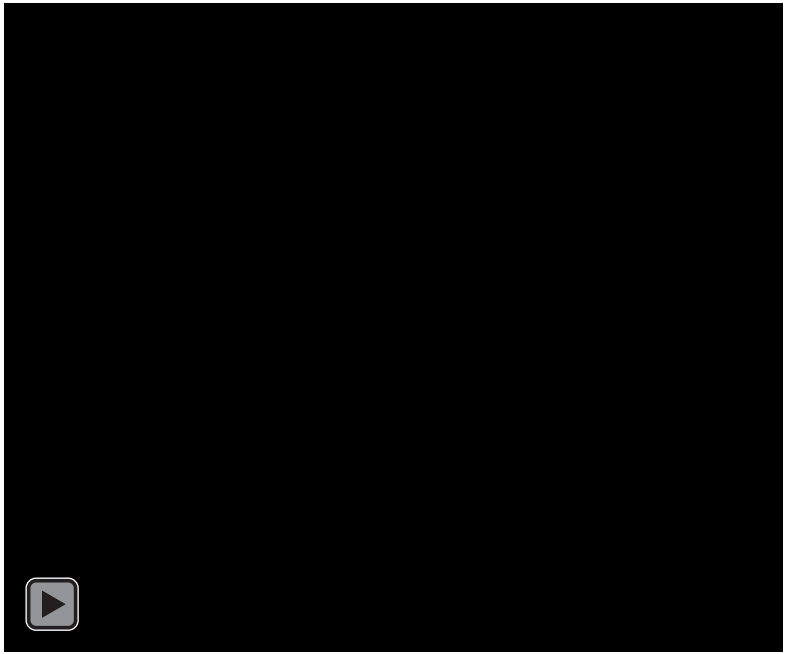
The Future of Hydropower

26th August 2021

HYDRO FEATURES PROMINENTLY IN BRAND CAMPAIGN



- Hydro is an integral part of the SSE Renewables brand campaign which is currently running.
- This video has been running across a range of platforms
- It underlines the importance we attach to our hydro business and its future role.
- Check out this trailer to find out more about what to expect from this four-part series on Britain's Biggest Battery and start the Virtual Hydro Tour here.

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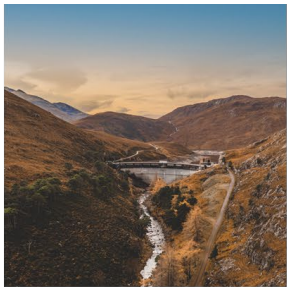
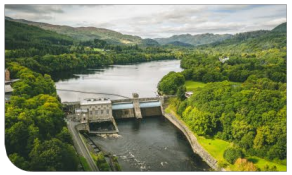
HYDRO – DELIVERING FOR A NET ZERO FUTURE

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TUMMEL INVESTMENT UNDERLINES OUR COMMITMENT TO HYDRO POWER

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A BRIGHT FUTURE FOR HYDRO

- Bright and important future as we move towards a net zero world.
  - Long duration storage
  - Flexible plant for grid support
  - Enabler for large scale wind
  - Social and environmental benefits
- Investment required to enable and sustain these benefits
- Requires policy and regulatory environment that recognises this and supports it.

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Rob Nickerson
Electricity Market Modelling Manager
National Grid ESO

Hydro in the Future Energy Scenarios

Rob Nickerson

nationalgridESO

Aim

To set the scene: to understand the future landscape that hydro will be participating in as we transition to a decarbonised, high renewable economy.

Contents

What is net zero?

- Legislation introduced in 2019, commits the UK to reaching net zero emissions by 2050
- Net zero aims to limit the impact of climate change and means any residual emissions in 2050 have to be **balanced by negative emissions**
- The UK hosts COP26 in Glasgow this year, and as host is tasked with helping other countries reach their decarbonisation targets
- Net zero will require lifestyle changes – early engagement with consumers is critical

Future Energy Scenarios 2021

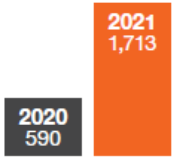
Future Energy Scenarios 2021

Four pathways for the future of energy.

Used by ESO and network owners for planning and operability analysis.

Used by many others to inform investment decisions, support policy decisions and help to understanding the different ways we supply and use energy.

Future Energy Scenarios 2021



Stakeholder Engagement

This year, we have had 3 times more stakeholder engagement than in FES 2020

Analysis & Insight

We use stakeholder engagement and market research to inform our analysis and insights into what the future may look like

Future Energy Scenarios 2021

Four pathways for the future of energy.

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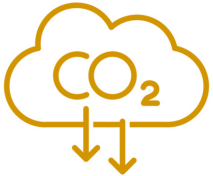
Used by many others to inform investment decisions, support policy decisions and help to understanding the different ways we supply and use energy.

Electricity Supply: Key Insights

Increased peak demands compared to today and previous FES reports means we need more generation and flexible capacity

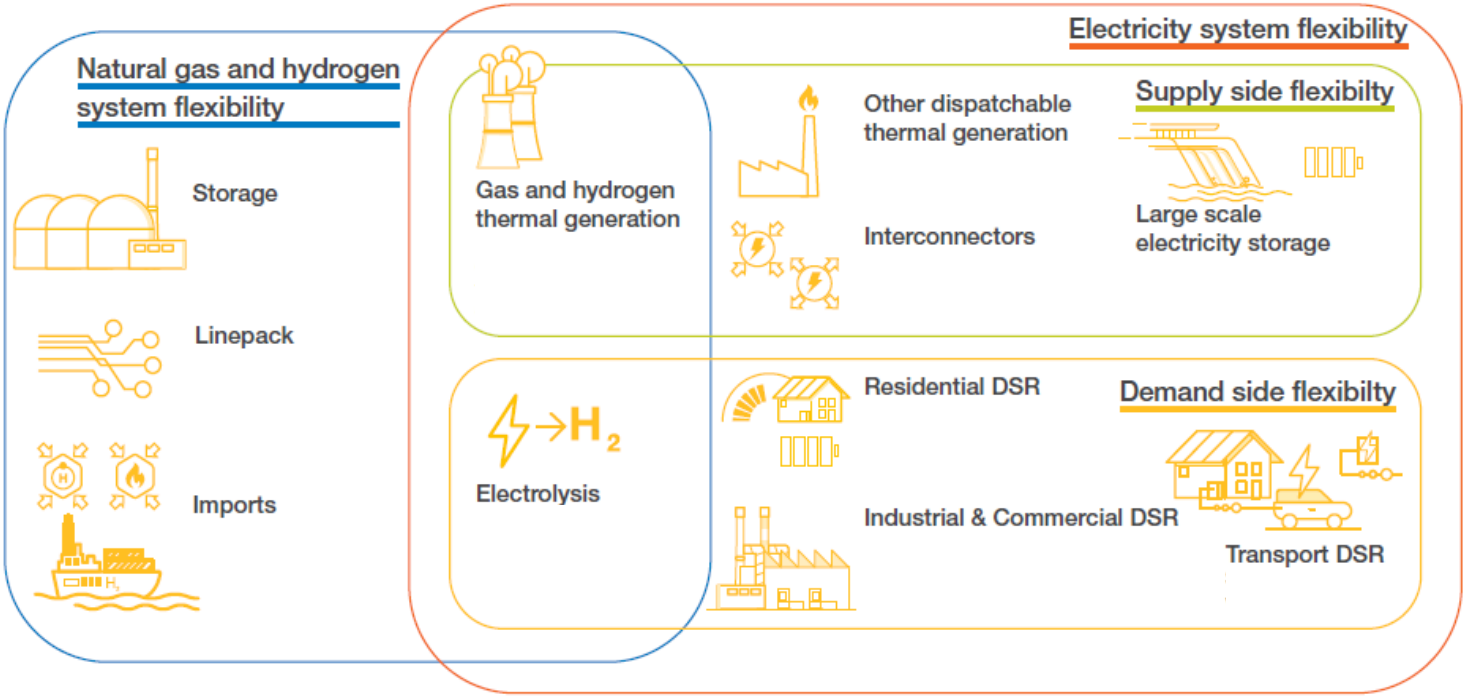
Large growth in wind and solar changes the profile of supply. DSR will play a key role in flexibility and ensure security of supply in a more efficient way



As unabated gas generation is phased out, maintaining security of supply requires accelerated uptake of CCUS and zero carbon technologies

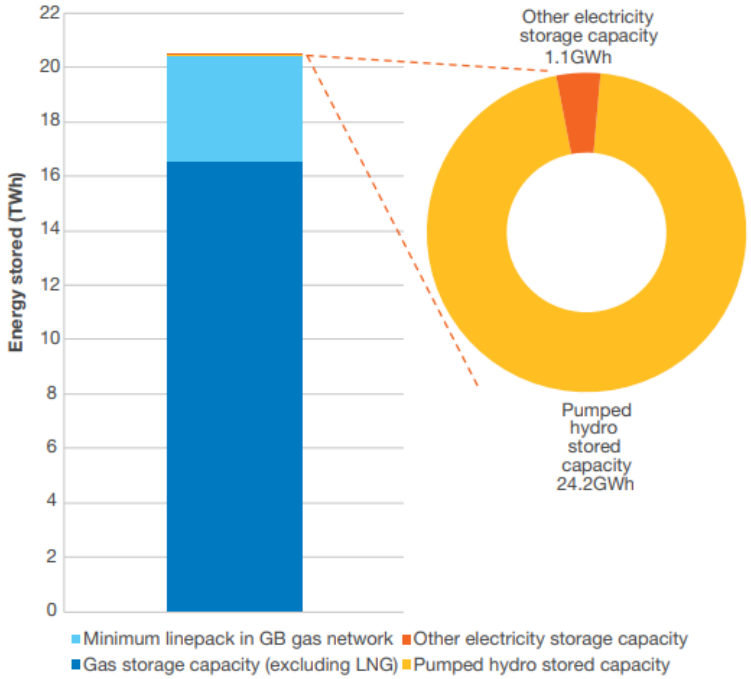
Rapid decarbonisation of electricity supply is essential to meet net zero and enable decarbonisation in other sectors

Flexibility: Overview



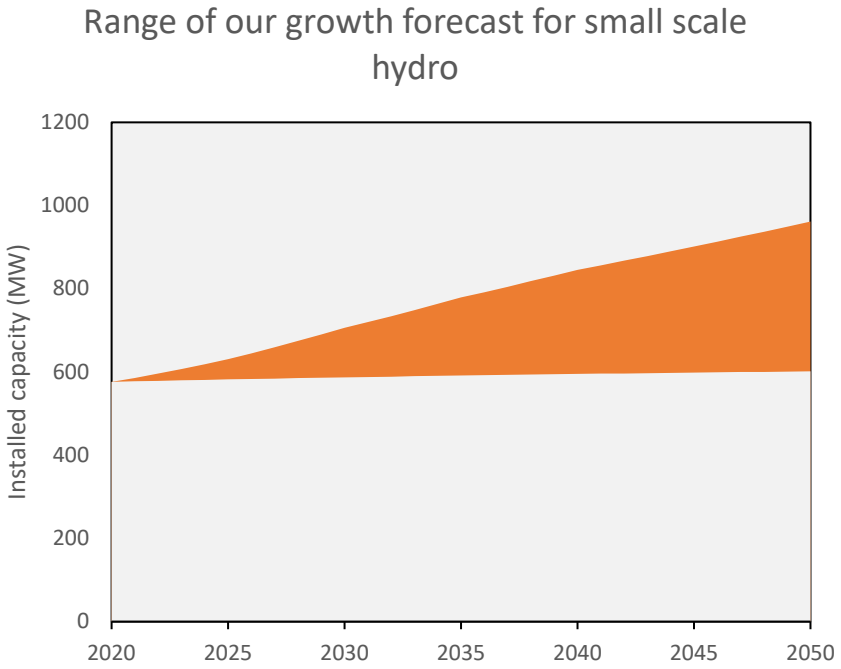
Flexibility: Storage

Figure FL.1: Electricity and gas storage capacity in 2020



At the end of 2020 there was approximately 15,000 GWh of gas in storage, and a minimum 3,800 GWh of linepack in the gas network; there is less than 30 GWh of electricity storage capacity, of which 96% is from pumped hydro storage sites, with around 4% from other forms like batteries.

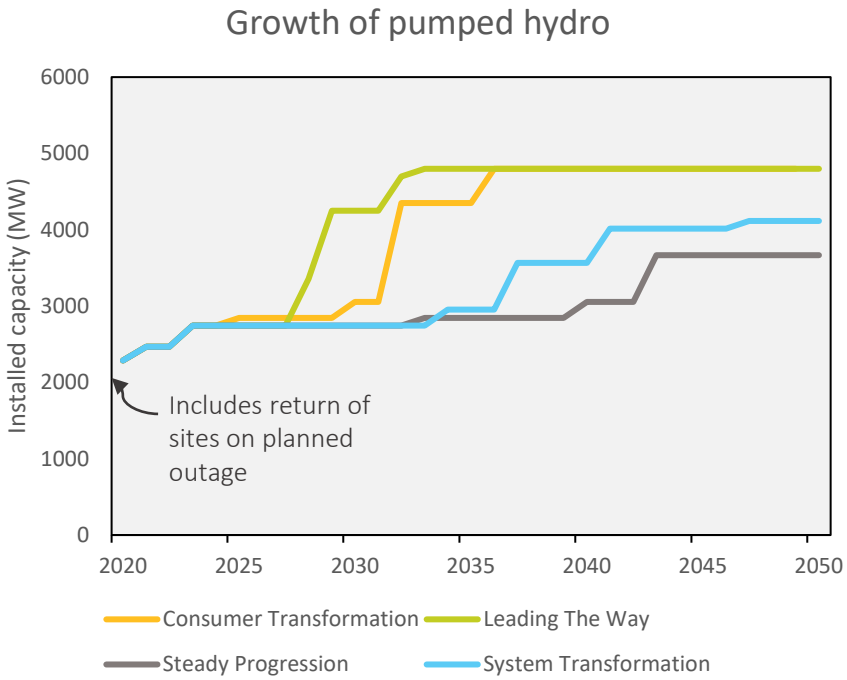
Results: Small scale and reservoir



In addition:

- 63 hydro reservoir generating units (non-pumped) totalling 1300 MW
- Expansions to existing sites could increase this by 60 MW.

Results: Pumped hydro



- Electricity storage will become increasingly important as levels of renewable generation increase.
- Two to four-hour storage typically helps meet short periods of peak demand, absorb excess supply or support grid stability. Longer duration storage can help secure the system over longer periods of high or low renewable generation output. Hydrogen or gas is better suited to very long term or interseasonal storage.
- The policy and regulatory environment for storage will need change to bring forward the levels of energy storage we expect to need on the system.

Sarah-Jane McArthur
Partner
Brodies LLP

THE FUTURE OF HYDROPOWER

Sarah-Jane McArthur, Partner, Brodies LLP

26 August 2021

BRODIES LLP

ENLIGHTENED THINKING

BRODIES LLP

OUTLINE

- Context
- What support is needed?
- How can the case for support be made?
- Final thoughts

THE HYDRO LANDSCAPE

- Covers a wide range of projects at various scales.
- Future deployment relies on making the economic case for projects stack up.
- Without some form of support deployment levels are likely to be low.
- Options to reduce costs/ improve revenues will only work for some schemes in some locations.

WHAT SUPPORT IS NEEDED?

- Hydro is a long-term asset requiring large capital investment with long build times – even for small scale projects.
- To make the investment case developers need access to long-term, secure revenue streams to enable a return on investment over a reasonable pay back period.
- There is limited opportunity for significant cost reduction and so a premium to power sales or access to additional capital or revenue is required to support projects.
- We also need a better long term solution to business rates.

THE CASE FOR SUPPORT

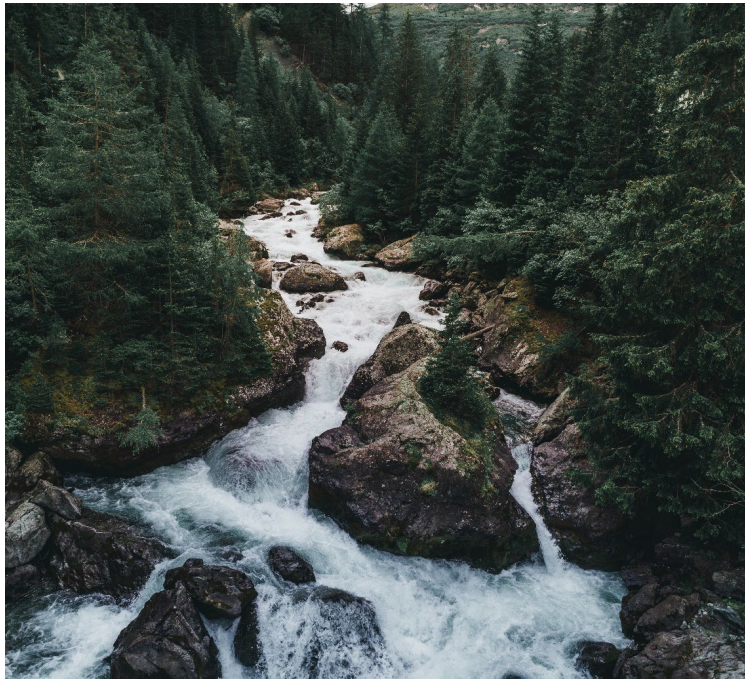
- Green electricity?
  - This case isn't strong enough.
  - Competition with other low carbon technologies.
  - Lifetime carbon content?

- Low carbon flexibility (and long duration storage)
  - This is the case for pumped storage hydro.
  - What about hydro storage capacity?
  - Is there a case at local distribution level?
  - What about smaller scale storage offered on an aggregate basis?
  - Large-Scale and Long-Duration Electricity Storage call for evidence is live – responses by 28 September 2021.

THE CASE FOR SUPPORT

- Social and Economic Outcomes
  - Support linked to delivery of outcomes.
  - Rural economy – skills and jobs
  - Supporting local infrastructure
  - Community ownership – diversification

- Innovation
  - Integration with other energy vectors - heat and transport?
  - Off grid solutions.
  - Can schemes be optimised or revolutionised?
  - Can small schemes go bigger – extensions?



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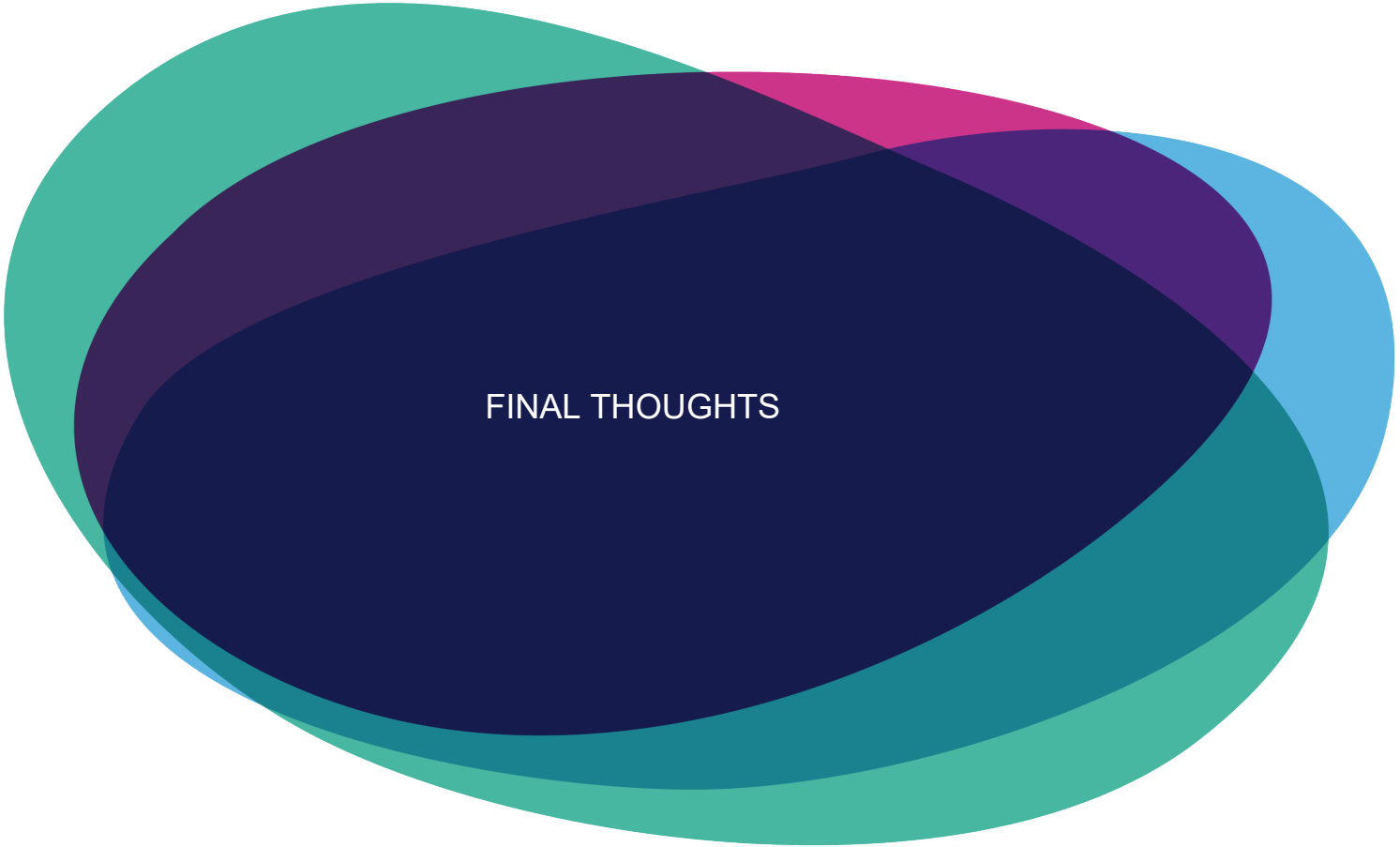

THE FUTURE OF HYDROPOWER

Sarah-Jane McArthur, Partner, Brodies LLP

25 August 2021

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Pump it up: unleashing pumped hydro's potential

Chaired by **Morag Watson, Director of Policy, Scottish Renewables**

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