

The Future of Distributed Flexibility

Closing date: 10th May 2023

British Hydropower Association response

The British Hydropower Association (BHA) is the leading trade membership association solely representing the interests of the UK hydropower industry and its associated stakeholders in the wider community.

Our Mission is to drive growth in the sector by engaging, influencing and promoting Hydropower, Tidal Range and Pumped Storage Hydro, as firm, renewable power, providing critical infrastructure for achieving Net Zero and Energy Security.

Table 1 – The BHA 'Asks' to Government

	Hydropower:	Pumped Storage Hydro:	Tidal Range:
Potential deployable capacity	1GW	15GW`	13GW
What is the BHA calling for?	Move to 'Enhanced' Levelised Cost of Energy inc whole systems benefits. Replace 1 GW of coal with 1GW Hydropower. CfD tweak for AR6: <ul style="list-style-type: none"> – Strike price £140/180MWh. – Reduce >5MW to >1MW. – Ring fence and aggregation potential for Capacity Market inclusion 	A cap and floor, to enable delivery of the 15GW called for in this CCC report	Regulated Asset Base, used for Nuclear, to enable delivery of 13GW
What are the main barriers to support?	Hard to raise relevance (see as, too small, can't scale, too expensive)	Geographically constrained, market can deliver batteries	Too expensive (ie, Swansea Bay)

Why are these technologies important?	Resource adequacy, hydropower is cheaper than gas peakers (Reservoir hydro currently provides 900GWhs of storage and load follows)	Storage, reduced curtailment and balancing costs, grid stability/ flexibility (pumps and generates) currently 29GWhs, pipeline 135GWhs	Non-weather dependent, generation near increasing demand centres (circumvents transmission constraints), flood defence, socio economic value.
The counter points:	<p>Longevity: All these technologies are intergenerational assets that will deliver well beyond 2050 – true energy security.</p> <p>Resource adequacy: What’s the answer to 3 week Low wind period in 2035?</p> <p>Energy sovereignty: Gas interruption, interconnector failure, French nuclear fleet refurbishment.</p> <p>Reliability: Hydro/ PSH/ TR are all proven, reliable, long lasting & deliverable</p> <p>Cost: LCOE: cheapest kWhs will not deliver a stable grid. Lowest cost is not always best value. We need to move to 'Enhanced' LCOE and account for Non price factors.</p> <p>Path to net zero:</p> <ul style="list-style-type: none"> • Fraught with delivery risk and time slippage • To mitigate risk, we need diversity. • We need all technologies being progressed rather than a favoured few. <p>Grid: How can we deploy localised energy solutions that will not be hampered by Transmission constraints.</p>		

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1. Section 1

1.1. Q1 What do you think distributed flexibility could contribute to the energy system?

1.1.1. Problem:

- Government has set targets for 50 GW offshore wind and 70GW solar. This will exacerbate the Grid congestion/ constraint issues and does not address resource adequacy (wind drought etc) which is currently reliant on the Capacity market which is delivered mostly by gas (57%).
- Congestion leading to constraints (only going to get worse and more expensive).
- Constraint payments – paying to turn off, paying to ramp up elsewhere, only going to get worse.
- Balancing mechanism – repayments (paying twice for ramping up and ramping down).
- Scale up of electrification of heat and transport will add load to the grid with the need for reinforcement and the costs that will bring.

1.1.2. Government Solutions:

- Holistic Network Design - £54 Bn for transmission upgrades by 2030 – this is likely to slip and in the meantime net zero progression will be massively hampered at transmission and distribution level.
- REMA – Review of the Electricity Market Arrangements looking at how to shift the wholesale market: decouple gas and renewables, locational pricing etc, however this will take a long time and does not resolve the issues of the many projects queued and waiting to get grid connected.
- CfD consultation - consideration of non-price factors. How can we bring new generation online that will help relieve the issue of resource adequacy and not add further congestion/ constraints to the grid.
- Capacity Market consultation how to decarbonise when it is predominately gas (57%). Current Government intention is to move to abated gas with CCuS and to Hydrogen. However, there is large delivery risk with both these options. Both technologies are emerging and need significant additional processes before they can meet the expectation to scale.

Flexibility will be a key component of the decarbonised power grid, not only to compensate for intermittent renewables, but also to reduce the overall cost of grid reinforcement and the additional load from the electrification of heat, transport and industry. Digitalisation will be a key component of flexibility and much flexibility will need to be at local substation levels with smart local energy solutions allowing the automatic load shifting that will be required to balance behind the substation to enable rapid roll out of solutions without the need for expensive upgrades to each substation.

The benefits of flexibility for domestic consumers are currently limited to those who can afford assets such as PV/EV and battery. Solutions that are at substation level, will be key for the flow through of the benefits of flexibility to all consumers.

1.2. Q 2 Will a focus on CER flexibility also helps enable other forms of flexibility, especially distributed flexibility?

1.2.1. The Grid & the Rural Net Zero Challenge

Grid constraints pose a major barrier to our Net Zero Transition. The Transmission constraint issues are being worked through via the Holistic Network Design and the £54Bn allocated to deliver both

offshore and onshore reinforcements. This work is targeted to be delivered by 2030 (which is highly ambitious and based on precedent is very likely to have time slippage). Progress prior to these upgrades is going to have to focus on local flexible solutions. This will mean much more support should be focused on what can be delivered in the here and now, rather than in a time when the transmission grid is ready to deliver for Net Zero.

Much can be done at the distribution network level and focus needs to be on the constraints and solutions across the Rural Grid, which is the 'end of the line' in many areas and is classed as 'weak', meaning it may not have capacity for 'additional loads' to be added, i.e., electrification of heat and transport.

The Rural Net Zero transition poses a significant challenge to the Distribution Network Operators. The problem arises as the grid was designed for:

- Centralised generation, distributing electricity one way, with rural areas at the 'end of the line', often with the least demand.
- Rural areas often have lower electrical capacity to match their low demand, this does not make allowance for the **total electrification of heat & transport** required in the future.

Reinforcing the entire rural grid to enable and meet the total demand of electrification of heat and transport will be too expensive, take too long and will not be a priority due to low population density of rural areas.

- There is currently no policy support recognising the specific barriers of the Net Zero transition in Rural areas;
- This policy gap exposes Rural areas to the risk of being left behind and locked out of the Net Zero transition;
- The risk to rural areas unable to capitalise on the benefits Net Zero will bring: boosting the rural economy, jobs, skills, lower energy bills and warmer homes.

NB: Rural Broadband is a prime example of delayed policy that impacted and is still impacting Rural economies. We need proactive policy support to be ahead of the problem.

There must be an aspiration to create and deliver 'smart localised energy systems'.

- local energy consumption needs met through new,
 - small scale local generation,
 - storage and
 - Smart local energy systems,

These local smart solutions will circumvent the need for costly reinforcement, that may be triggered by the increased load of electrification of Heat and Transport. These smart solutions may offer a better 'value for money' solution and will take less time than reinforcing much of the rural grid to meet the additional loads required.

Policy support and funding is needed and could include:

- Local supply models and the local electricity bill.
- A scheme similar to the Rural Broadband project – which provided a Rural GigaBitt voucher scheme. A similar Rural Giga Watt scheme could enable roll out of low carbon heat.
- Provide funding for rural community scale local area energy plans.
- Contracts for Difference for Hydropower and other smaller, placed base generation that will be used to match increased rural demand for electrification of heat and transport.

Smart local energy systems will reduce the socialized cost of grid reinforcement; therefore, the incentive mechanism will pay back via avoided costs.

Community owned, locally owned renewable energy targets should be married up with incentives to deliver placed, based holistic smart local energy systems.

1.2.2. Resource Adequacy and the need for demand side flexibility

The key is not the electricity demand, but the Net demand. As we have a higher penetration of intermittent renewables online, our Net Demand (Demand minus intermittent renewables) will be our biggest issue. This resource adequacy problem is currently met by the Capacity Market, however, 57% of the capacity market comes from unabated gas generation. UK government's main policy is to replace this gas with abated gas with CCuS and with Hydrogen fired thermal generation. Both these are emerging technologies with significant processes that need to be in place before delivery certainty.

As there is an increase in the percentage of generation coming from wind (offshore and onshore) and solar, what is the back up for cold, still winter's evenings?

- Storage – short, medium and long duration (Pumped storage hydro offers all 3)
- Increased low carbon, firm generation – hydropower, Tidal Range and Tidal stream.
- Regular re-evaluation of risk of non-delivery across all technologies required to deploy to meet the NZ targets.
- A concerted effort to deliver flexibility in a strategic regional, supported mechanism.

A Technology agnostic approach is something that the UK Government cites as a necessity to enable the market to deliver the lowest cost solution. However, the BHA would argue that the physics of the grid means that low cost and abundant kWhs don't meet the needs of a stable functioning grid. A more proactive approach, as to what technologies we need generating, where and when must be implemented.

Flexibility will be key in meeting our resource adequacy challenge. Household Demand side flexibility is currently something that only early adopters or people who can afford PV/EV and batteries are able to benefit from. There will be a situation where wealthier people are going to be selling energy to less well-off and entrenched energy injustice will be exacerbated. There needs to be more policy drivers to enable community (sub-Station and community wide) flexibility through a drive to smart places and smart local energy solutions.

A recognition of how a future grid can help deliver energy justice needs to be matched with targets and ambition around:

- Community owned renewable generation;
- Reduction of fuel poverty;
- Aspiration for local generation reducing overall cost of energy for communities;
- Tackling grid constraints through local generation and community scale electrification of heat projects;
- Enabling local area energy planning;
- Progressing Smart Local Energy Systems and uptake of community flexibility to provide a more efficient grid and better value for consumers.

The need for community based local area energy planning and a whole systems approach will help avoidance of reinforcement costs, which get socialised on domestic energy bills. UK power Networks have looked at cost savings from place based, whole systems NZ planning and suggest that £6Bn can be saved in their area.

1.2.3. Resilience

Electricity is the mainstay and backbone of society. With increased dependence on electricity for all our systems, the interdependencies of banking, communications, travel, etc mean that we are ever more reliant on a functioning grid and affordable energy.

A resilient electricity system is paramount for the wellbeing of a functioning society.

A resilient system is one that is built on a diverse energy mix, supporting as many technologies as possible in order to spread the risk of non-delivery and also the risk each technology will pose in a decarbonised grid with increasingly disruptive weather patterns.

- Drought – water availability for thermal generation
- High temperatures:
 - Grid capacity reduces as Transmission and distribution cables heat;
 - Nuclear output was restricted last year when the EA prevented discharges into rivers, as the temperatures were already too high;
- Winter Wind drought – we need resource adequacy to cover low wind periods;
- Storm surges – grid infrastructure may be at risk.
- See Climate Change Committee - [Delivering a reliable decarbonised power system - Climate Change Committee \(theccc.org.uk\)](https://www.theccc.org.uk/publication/delivering-a-reliable-decarbonised-power-system/)

Another way to improve resilience is to have a patchwork of community based, holistic energy systems through flexible, Smart Local energy solutions. These types of solutions also fit within the wider context of community owned renewable energy assets, community wealth building, a just transition, affordable, low carbon, energy and the levelling up of areas through street by street infrastructure projects, with planned jobs, skills and opportunities.

£200 Billion is spent on domestic energy each year, much of which will be on fossil fuels and will leave local economies. Creating local energy markets and managing generation and demand at a local level will allow much energy spend to remain within local communities, a key part of the just transition.

A community approach, where no-one is left behind, also allows the benefits of flexibility to be shared equally amongst community members, rather than only those who can afford to install PV, batteries or have an EV.

The BHA Suggest:

- Work is done to build a picture of local, holistic energy solutions where local demand is matched to local generation and flexible smart solutions are embedded. This flexibility will be key when looking at meeting net demand.
- Storage must be considered within this mix.
- A diverse energy mix to counter resource adequacy and resilience.

1.2.4. Place based solutions

Place based solutions will be key to a just and equitable Net Zero transition. This requires Local Area Energy Planning that will look at how to:

- Power down – energy reduction through energy efficiency.
- Power up – opportunities to meet the increased energy demand from electrification of heat, transport and industry with New Renewable energy generation.
- Smart, flexible solutions with community based storage.

Although each local area energy plan will be different for each 'place', the methodology will be the same and a 'patchwork' of solutions can be utilised to streamline and speed up the process. Each plan will need to be dynamic and flexible but will give an overarching framework for delivery.

- A place-based approach ensures that engagement and local considerations are incorporated into local area energy plans.

- For each community place-based transition will be nuanced, however, the methodology framework for developing and delivering the solution can repeat and a 'patch work' of base solutions can be utilised and adapted for each community.
- Local energy solutions will consider new local community owned generation and increased consumption through electrification of heat and transport.
- Community centric, planned approach to the impact on the grid, created through electrification, will be cheaper than non-planned, ad hoc, piece meal non- community centric.

Each community has 'anchors' that can be engaged to enable delivery, ensuring a 'grass roots up' delivery methodology. Community net Zero solutions will all comprise similar solutions:

- Community scale low carbon heat
- Retrofit roll out.
- Local energy generation
- Local supply models
- Community transport solutions – EV charge points, EV car clubs, On demand EV bus services, active travel etc...

1.2.5. Street by street, Low carbon heat

Just transition means better health and wellbeing, less deprivation related mental health issues, better homes and lower bills.

The opportunity for low carbon heat and retrofit has yet to find a delivery model that can scale and bring the benefits of economies of scale, new jobs and skills, better, warmer homes and reduced bills. A community, street by street approach should be adopted that can bring a focal point for delivery and a replicable, scalable, inclusive model.

Examples include the Net Zero Terrace Street (Bacup, Rossendale), Barcombe Communitiheat, Chipping Community Energy and kensa's Stithians (heat the streets) These projects all adopt a whole community, holistic approach considering:

- Technical
 - Low carbon heat
 - Retrofit
 - Local energy generation
- Inclusive
 - Financial
 - No upfront capital cost.
 - Standing charge methodology – ideally situated on council tax bill.
 - Engagement
 - Local supply models

The impacts are already being felt with current energy crisis hitting those who are most vulnerable. The above holistic solution must be considered as a foundation for the Just Net Zero transition.

Incentive mechanisms, both current and past, have been designed to bring forward low cost energy. If we are to realise energy security, we need to review how and why we are incentivising and distorting the market. **'Low cost' does not mean 'best value'.**

The Levelised Cost of Energy has been used as the metric to determine what is the lowest cost of energy, we now need to move to a metric that is more nuanced that will allow us to understand what

is 'best value'. The BHA are calling on the UK Government to use 'Enhanced' Levelised Cost of Energy as a metric that is more likely to show the 'actual' value of energy that takes into account multiple other factors that are going to deliver energy security and a just transition.

Community Hydro projects have the ability to unlock the Net Zero transition for many communities. As is [the case for Ynni Ogwen](#), which is now looking at a Smart Local Energy System scheme. This project started as a community hydro scheme and is key in understanding how schemes bring local benefits, create collaboration and participation, lead to future Net Zero projects and engagement that enable proliferation of well-being and added value. This scheme was developed when the Feed in Tariff was available, there are currently no incentive mechanisms that can enable new schemes. [Energy local](#) is a local supply model that allows the community to buy energy generated from the hydro when it is generating. However, this is a complex regulatory issue and is hard to replicate. The BHA is supporting the [Local Electricity Bill](#) which would allow local supply models to flourish (as they do in Europe) and keep the benefits of local projects within the local community having a big impact on reducing fuel poverty and the switch to electrifying heat.

2. Section 2

1.3. Q 3 Is there a 'case for change' and a need for a common vision for distributed flexibility?

Coordinating, speeding up & maximising system benefit has to be front and central to a common vision. Flexibility benefits must be delivered to enable a reduction in fuel poverty and the uptake of affordable, low carbon heat. The Shared ground loop projects at Stithians will be key to enabling load shifting and bringing forward embedded community flexibility. A whole system placed based solution approach must be the vision and the pathway if a coordinated and least cost solution is to be delivered.

1.4. Q 4. What is your vision for how to accelerate the delivery of accessible, coordinated and trusted markets for distributed flexibility?

Community based local area energy plans will need to be at the core of distributed flexibility. Markets must be delivered with societal need ahead of monopolistic profits. As the grid undergoes systemic change of delivery model, fuel poverty must be at the heart of the delivery of digitalisation, smart systems and flexibility.

1.5. Q 5. Will certainty of an end vision help accelerate enabling work and make it cohesive?

Demand shifting through consumer tariffs could have considerable unintended consequences if a vision and pathway towards that end goal are not set out and the market is left to organically grow. The certainty of a whole systems approach that looks at net Zero holistically, with the objective of affordable, low carbon energy will create a cohesive framework for delivery.

1.6. Q 6. When should a common digital energy infrastructure be in place? And therefore, when should development begin?

As soon as possible this should begin to be rolled out with demonstration projects. For example, [Net Zero Terrace SIF \(enwl.co.uk\)](https://enwl.co.uk)

A Whole systems approach that undertakes a review of how each community will reach Net Zero and the new business models that can create a coordinated scaling up -eg, Case studies like Ynni Ogwen, Chipping Community Energy & Net Zero Terrace Street. The objective and methodology for a whole system, holistic approach must be defined at the earliest opportunity and a strategic plan for implementation delivered.