



Draft Energy Strategy and Just Transition Plan 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.

Our Vision is to advance the industry and make Hydropower technologies relevant within the current context of climate change and meeting the Government's ambition to decarbonise the grid by 2035.

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Q 1. What are your views on the vision set out for 2030 and 2045? Are there any changes you think should be made?

The BHA welcomes and fully supports the energy system vision and roadmap prepared for a just energy transition. Many of the issues that this vision looks to address and the opportunities captured, align with the hydropower industry view that Scotland can, and should be, a world leader and champion of a new fair and green energy system. Scotland has all the natural resources, skills and infrastructure to lead and support this transition, but it must recognise, manage and invest, to avoid the real risks associated with not delivering on this transition.

1.1.1. Hydropower

The BHA is pleased to see that the Scottish Government wants to see 'increased contributions from solar, Hydro and marine energy to our energy mix' and will be keen to talk to Scottish Government about how this can happen.

- **1GW of untapped Hydropower** can be deployed, as stated in the [recent report](#) by the university of Birmingham) with a long term price signal, such as the CfD, of between £140- £180/MWh
- **Resource adequacy** is a key issue as we move to a higher penetration of intermittent renewables such as wind and solar. Hydropower is the work horse of renewable energy generation and delivers across winter and at times of peak demand. 1GW of Hydropower alleviates the need for 1GW of fossil based thermal generation including expensive peaking plant.
- **Grid Constraint** is a major barrier to our NZ ambitions. New Hydropower can be part of smart localised energy systems and alleviate grid congestion from deployment of electrification of heat and transport. It is estimated that this can save £Bns in avoided costs of grid reinforcements.
- **Storage:** Currently Hydropower with reservoir, offers 900GWhs of storage. With a further 1GW deployed, there will be a further increase in storage, a valuable asset on the future flexible grid that will be needed to balance the planned offshore wind and increases in solar.
- **Incentive mechanisms** currently do not bring forward new hydropower. The capacity market and CfD **must be enabled to encourage technologies that bring system value** which is currently not metered through the basic Levelised Cost of Energy metric.
- **Value for money** assertions should include non-price barriers to be recognised and the BHA is calling for the more advanced metric of 'enhanced LCOE' to become the price point used for evaluation.
- **Proven and long lasting,** Hydropower has been generating for generations. Any hydropower deployed today will deliver well beyond our 2050 NZ targets.
- **Deployable:** with an 80% UK based supply chain and skilled labour in rural areas, 1GW could be delivered within 5-7 years with a low risk of non-delivery.

The BHA is calling on the Scottish Government to ask the UK Government to create a ringfenced Contracts for Difference for Hydropower, with a strike price of between £140-£180/MWh for >1MW schemes (with an allowance to aggregate projects to meet the 1MW target) This ringed CfD will not only provide low carbon electricity, which is the intention of the CfD incentive, but Hydropower, a firm, winter generator, will also meet the needs of the Capacity Market, reducing the need for fossil fuel peaking plant.

According to the Jacobs report* CCGT with CCS peaking plant operating at a load factor of between 20-25% has a cost of £250MWh. This highlights the value for money that hydropower provides, when considered across a wider context than the levelized cost of energy.

Hydropower in 2023 means schemes will still be operating in 2050, without the need for expensive repowering, and therefore should be considered a low risk, no regrets option within the 2050 Net Zero targets.

The BHA call on the Scottish Government:

- to set a target for 800MW Hydropower delivery
- Call on the UK Government for support:
 - for Hydropower via a tweaked CfD mechanism (reduce entry from >5MWs to >1MW, create a ring fence with the ability to aggregate pipelines to meet 1MW threshold)
 - the Capacity Market to review how more Hydropower can be commissioned through the CM.
- To enable new policy to be brought forward that will address the Rural Net Zero transition, including funding for holistic Rural Community Local area energy plans and availability for CfD funding for community scale projects that will enable delivery of NZ solutions and avoidance of expensive grid upgrades.
- Remove the 1GW of coal online and replace with Hydropower.

1.1.2. Pumped Storage Hydro

The existing PSH in the UK, 2.8GW installed capacity and ~30GWhs of storage, was built over 40 years ago when the energy system was still nationalised. This plant has performed over many years (and will continue to do so for many more) providing invaluable flexibility and balancing to the Grid. The Grid has a 2% margin before a 'catastrophic' event causes severe disruption within the system. The physics of the grid means it operates as a 'just in time' model, matching generation to demand in real time. The complexity of the physics of the grid, is often overlooked by policy makers, as they strive for the cheapest kWh, which they believe will give 'value for money'.

However, as the energy mix increases penetration of intermittent renewables, we need the ability to be more flexible. It is important that this flexibility is mixed in the form of short, medium and long duration energy storage. PSH is unique, as it offers all 3 forms of storage, alongside other ancillary systems benefits that are crucial for the functioning of a reliable, and stable Grid. PSH also has the benefit of being a proven technology, with a 5GW pipeline of projects awaiting a policy that offers stable long term price signals.

The BHA is keen that a policy framework, that has already seen the successful building of a pipeline of interconnector projects, is replicated for PSH.

The cap and floor mechanism for interconnectors has given the long term price signals required for investors and developers to deliver. This is urgently needed for PSH. With a 5GW pipeline of projects, some consented, but with a build time of at least 5 years, Government policy needs to be firmed up to enable delivery if targets set out in the 'Smart systems and flexibility plan' or the 'Future Energy Scenarios' published annually by the ESO, are to be met.

As highlighted above, the need for PSH should be a no regrets, low risk opportunity that will compensate for the increased amount of Wind curtailment and the associated costs.

The BHA are calling on the Scottish Government to support the House of Commons BEIS committee in their report [Decarbonisation of the power sector \(parliament.uk\)](https://www.parliament.uk/decarbonisation-of-the-power-sector) to urgently bring forward the need for a decision on the Cap and Floor mechanism which would enable the deployment of the pipeline of PSH projects in Scotland.

The BHA are calling on the Scottish Government:

- to set a 5GW target for Pumped Storage Hydropower in Scotland;
- Call on the UK Government for the 'cap and floor' revenue mechanism to give investor certainty.

1.1.3. 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 precedents is very likely to have time slippage). Progress prior to these upgrades is going to have to focus on local flexible solutions, as laid out in the [Call for Input: The Future of Distributed Flexibility | Ofgem](#). 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 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.

3. Chapter 2 – Preparing for a Just Energy Transition

Q 2. What more can be done to deliver benefits from the transition to net zero for households and businesses across Scotland?

Q 3. How can we ensure our approach to supporting community energy is inclusive and that the benefits flow to communities across Scotland?

1.1.4. 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 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 grid is physics and low cost and abundant kWhs don't meet the needs of a 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) 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 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.



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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.

1.1.5. 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)

Another way to improve resilience is to have a patchwork of community based, holistic energy systems through Smart Local energy solutions. This is something that Scotland is already doing in their ambitions for Carbon Neutral Islands. 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 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.

Q 4. What barriers, if any, do you/your organisation experience in accessing finance to deliver net zero compatible investments?

The technologies the BHA represents are all currently unable to access the required revenue support needed to deliver vital MWhs to deliver on the Scottish Government's vision. Hydropower projects have a high upfront capital cost due to the high civils, M&E costs, access, grid and the bespoke nature of each project. However, once operational Hydro/ PSH assets provide vital, predictable electricity during periods of peak demand and have longevity, generating for 100+ years if well maintained.

The current market is geared towards cheap, scalable, yet intermittent renewable projects, which are delivered at a scale that makes them lower cost and lower risk but requires expensive thermal backup generation that is cheap to build but has higher operating/fuel costs, which it recovers based on the lucrative backup contracts.

Hydropower projects are higher cost, but as they generate at times of peak demand with 2/3rds of all generation delivered in winter and with reservoir hydro providing 900GWhs of storage, they are a vital part of any net zero solution. Finding a way to get new hydropower projects delivered represents a low-risk solution and one that will be vital in achieving any net zero vision.

The pipelines of Hydropower projects that are scoped and at various points of consent, could be built within the next 5 years, given the right incentive mechanism:

- A CfD as suggested above, or at a lower price but over 25 years.
- A capacity market (currently unable to enter whilst receiving ROCs, FITs or CfDs and not enough remuneration within the CM to enter without a revenue stack.
- A renewable energy mortgage – could there be low cost finance made available for 40 year loans to give certainty to investors to build out and payback over the long term?

Q 5. What barriers, if any, can you foresee that would prevent you/your business/organisation from making the changes set out in this Strategy?

As set out in previous questions there are a number of barriers to making the needed changes. As the voice of the hydropower industry the following barriers are currently blocking hydropower investment in Scotland and preventing the industry from helping in the just transition set out in the vision.

- **Lack of revenue support** for new MWs – this is fundamental. In order to fund the construction and development costs an investor needs revenue security. Without this, no new investment will enable the delivery of the MWs we know are in developers' pipelines.
- **Grid** – this is a barrier across all energy technologies and represents a significant barrier that is not easily overcome by industry. It needs Government support to provide investment and also look at other barriers to reduce connection times and end this project by project process that ignores the complete landscape shift required to deliver the vision.
- **Business rates** – this is a large disincentive to deliver new hydropower projects and is a huge risk to existing hydropower projects when their current incentive mechanisms finish. In the 1950s, many hydro schemes in Wales were mothballed when the national grid role out suggested that it would deliver cheaper electricity. We don't want another mothballing of schemes that can be there for another 100 years giving local resilience.
- **Investment stability** – this is linked to revenue support, but investors are put off by

changes in support and political instability, which puts project development at risk. A cross party consensus is vital in delivering this stability and investor confidence. The recent USA IRA and EU renewables investment support has added to the global competition for investment into renewables.



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- **Planning** – to invest in a new pipeline of hydropower projects the planning process must be streamlined. Local views and expert scrutiny are critical, but the timelines proposed will never be met with the current planning system.
- **Lack of focus** – with so many barriers a real risk is that the focus is given to either established technologies, where issues aren't as pressing, or unproven technologies that might never deliver. Hydropower is proven and presents a low-regrets solution.

Q 6. Where do you see the greatest market and supply chain opportunities from the energy transition, both domestically and on an international scale, and how can the Scottish Government best support these?

Q 7. What more can be done to support the development of sustainable, high quality and local jobs opportunities across the breadth of Scotland as part of the energy transition?

Hydropower projects have delivered significantly high local supply chain and job creation opportunities. Unlike wind and solar hydropower, projects can deliver c.80% UK content. The UK is one of the oldest manufacturers of hydropower turbines and the opportunities for job creation and investment are therefore significant. Today BHA members are exporting technologies and managing projects around the world, all from hubs throughout the UK, and especially from Scotland. As the investment in hydropower internationally increases, the importance of having a home market increases otherwise the risk of supply chain and job leakage to other countries is real.

The energy market for many years has focused on MW installed and not the broader benefits. Wind and solar are seen as cheap MWhs but most of the supply chain and jobs are not in the UK. Hydropower is the opposite. Much of the work is civil work that goes to local contractors and the UK has turbine manufacturers and suppliers which means a MW of hydropower delivers around 80% UK content.

1.1.6. 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.

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



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- Local supply models
- Community transport solutions – EV charge points, EV car clubs, On demand EV bus services, active travel etc...

1.1.7. 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, Chipping Community Energy and 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 'best value' is. 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.

Targets have been set for Community energy schemes, however, the incentives for these small- mid size schemes are not there to enable the delivery and the deployment. The projects, motivation, business model is all there, however, the development support, both devex and enabling support need to be there to unlock these projects. Community Hydro projects have the ability to unlock the Net Zero transition for many communities. As is [the case for Ynni Oqwen](#), 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



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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.

Q 8. What further advice or support is required to help individuals of all ages and, in particular, individuals who are currently under-represented in the industry enter into or progress in green energy jobs?

The key to deliver the jobs, skills and training for the Net Zero Transition is Certainty. As detailed above, if there are detailed Local Area Energy Plans then planning and mobilisation of the workforce to meet the challenge can be deployed. The BHA members have experienced challenges in attracting people into green jobs, as the industry has shrunk since support has been retracted. Many of the jobs are in rural areas where it is hard to bring and retain young people, who often want to be nearer cities and the activities and entertainment they bring. Retaining people needs good jobs with opportunities for CPD, training and professional career building, this is hard to do when policy is key to delivery.

Policy will always be key to renewable energy and the net Zero agenda, as we are constantly competing with the status quo and cheap fossil fuels that do not cost in, or account for the environmental damage they are doing. A carbon tax is always cited as a way to cost in the impact of carbon from combustion of fossil fuels, until this is the new paradigm, the net zero agenda will require Government incentives and policy drivers to carve out the change we need.

4. Chapter 3 – Energy supply - Scaling up renewable energy.

Q 9. Should the Scottish Government set an increased ambition for offshore wind deployment in Scotland by 2030? If so, what level should the ambition be set at? Please explain your views.

Scotland already has a thriving offshore wind industry and deployment pipeline. Offshore wind is and will be a key part of the Net Zero agenda. However, as we deploy more offshore wind, the cost of curtailment, congestion, transmission upgrades and power transfers must be carefully planned.

According to the [UK wind curtailment monitor](#) for the period from January 2021 to January 2023, 6.2TWhs were curtailed, at a cost of £1,608m and 2.6mt of CO2 emitted as a consequence. Hydropower storage and PSH will be key in reducing curtailment and creating a more secure, flexible and economic grid.

Off-shore wind is likely to be coupled with offshore Hydrogen electrolysis and transmission to counter the risk of curtailment. As we increase interconnectors, there is a likelihood that more of the offshore wind will head to Europe as part of a wider super grid. However, 3 week low wind periods have to be accounted for. This can be through increases in Long Duration Energy Storage, which should have pumped storage hydro within the mix and 1GW of Hydropower will mean less pressure on the capacity market (see above)

The BHA fully supports a green mix, where technologies like hydropower and pumped storage can complement wind and create a truly secure and de-risked energy system. Diversity of energy mix means less risk.



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Q 10. Should the Scottish Government set an ambition for offshore wind deployment in Scotland by 2045? If so, what level should the ambition be set at? Please explain your views.

As set out in the answer to Q9, the offshore wind industry in Scotland has delivered real success, the focus needs to be on unlocking the supporting energy projects and infrastructure, like hydropower, which is required to support the scaled deployment of intermittent wind.

Q 11. Should the Scottish Government set an ambition for marine energy and, if so, what would be an appropriate ambition? Please explain your views.

A Government target that depicts ambition can provide confidence to investors and developers and encourage a developing market. The BHA would fully support a public ambition and commitment to delivering Tidal Range, but it is vital that this is accompanied by the details of how these ambitions will be delivered.

An ambition to deploy 1GW of Tidal Range will ensure a diverse portfolio of renewable technologies to mitigate risk against Net Zero ambition and wind drought:

- **Proven:** Tidal Range technology has been demonstrated in France and South Korea for 60 and 10 years respectively.
- **Resource adequacy:** We need non-weather dependent, low carbon energy generation assets that can be relied on when there is wind drought or anomalous weather patterns.
- **Grid Constraints:** Tidal range generation can be developed near demand centres, can load follow and fits well with the future charging of EVs, hot water storage and heat pumps.
- **British Energy:** As an Island nation, Tidal Range offers an extensive indigenous energy supply (at least 13GWs) from which the UK should be capitalising.
- **Intergenerational:** As with reservoirs and aqueducts, these infrastructures are permanent and can be the mainstay of Energy security for 120+ years.
- **Added value:**
 - **'Low cost' V 'Best value':** 'low cost' has been stated repeatedly within the strategy, however, 'best value' or 'enhanced' Levelised Cost of Energy that is inclusive of 'non price barriers' must be considered if we are going to deliver a cost effective, whole system to consumers.
 - **Supply Chain:** Tidal Range has 60-80% of the supply chain within the UK and no reliance on Critical Earth minerals.
 - **Levelling up:** in areas where Tidal Range can offer economic growth opportunities growing localised green skills base.
 - **Flood defence:** Near densely populated areas, where flood defence will be needed.

Q 12. What should be the priority actions for the Scottish Government and its agencies to build on the achievements to date of Scotland's wave and tidal energy sector?

See above for Marine energy.

Q 13. Do you agree the Scottish Government should set an ambition for solar

deployment in Scotland? If so, what form should the ambition take, and what level should it be set at? Please explain your views.

Solar, like wind, has enjoyed significant industrial deployment and the challenges to further roll-out are now more about how to pay for 'backup' power and how do you manage grid constraints and ensure the power is being produced where and when it is needed.



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Q 14. In line with the growth ambitions set out in this Strategy, how can all the renewable energy sectors above maximise the economic and social benefits flowing to local communities?

Hydropower is already one of the leading technologies in delivering local benefits. The industry has an established Scottish and UK based supply chain and many world leading developers, operators and manufacturers are in the UK.

In terms of localised energy solutions, please see questions above.

Q 15. Our ambition for at least 5 GW of hydrogen production by 2030 and 25 GW by 2045 in Scotland demonstrates the potential for this market. Given the rapid evolution of this sector, what steps should be taken to maximise delivery of this ambition?

Hydrogen delivery comes with huge risk and the BHA are concerned that huge amount of political focus, support and investment is being placed on a technology that might not be able to deliver in the timeline or the scale predicted. It also has the challenge of being subject to global market pressures that could impact deployment, price and availability, where generation from hydropower is a de risked alternative, proven to deliver scale, jobs and investment.

Hydrogen will be a key energy vector within a net Zero energy system, but focus must continue to be trained on all technologies that can deliver towards net zero. There is a real risk of not meeting our Net Zero targets. To mitigate risk, 6-month evaluations of progress should be undertaken. All technologies have some facets of risk, a diverse portfolio is the best way to mitigate risk – just as investors would not invest in 2 emerging markets, they would mix with technologies that are proven, reliable and deliverable.

Q 16. What further government action is needed to drive the pace of renewable hydrogen development in Scotland?

Q 17. Do you think there are any actions required from Scottish Government to support or steer the appropriate development of bioenergy?

Q 18. What are the key areas for consideration that the Scottish Government should take into account in the development of a Bioenergy Action Plan?

Q 19. How can we identify and sustainably secure the materials required to build the necessary infrastructure to deliver the energy strategy?

Scotland has a proud history of hydropower and currently has 1.7 GW operational, which accounts for 88% of total UK hydropower capacity. There is an additional pipeline of fully consented and quickly deployable projects totalling 26 MW (excluding pumped hydro storage). Projects vary significantly in size, power output and geography.

Hydropower has the potential to play a significantly greater role in the energy transition – both at a small-scale in cooperation with local communities as part of a diverse resilient energy supply in

remoter parts of Scotland, and at a larger scale, providing flexible services to the grid and helping to ensure a continued resilient and secure electricity supply.

The supply chain for hydropower is 80% within the UK making hydropower one of the most proven, reliable and deliverable technologies within the energy mix.



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5. North Sea Oil and Gas

Q 20. Should a rigorous Climate Compatibility Checkpoint (CCC) test be used as part of the process to determine whether or not to allow new oil and gas production?

Scotland does not need any new oil and gas to deliver on its just energy transition vision. The technologies already exist that can deliver against meeting our climate targets while ensuring economic growth and prosperity. Scotland is a world leader in hydropower and the BHA believes that the urgent deployment of hydropower technologies should be top of the Government's agenda.

Q 21. If you do think a CCC test should be applied to new production, should that test be applied both to exploration and to fields already consented but not yet in production, as proposed in the strategy?

See answer to Q20.

Q 22. If you do not think a CCC test should be applied to new production, is this because your view is that:

See answer to Q20.

Q 23. If there is to be a rigorous CCC test, what criteria would you use within such a test?

See answer to Q20.

Q 24. As part of decisions on any new production, do you think that an assessment should be made on whether a project demonstrates clear economic and social benefit to Scotland? If so, how should economic and social benefit be determined?

Economic and social benefits can be misleading as those benefits could be met by other technologies if they were given the same state support and decades of subsidisation. It is also worth highlighting that those benefits are only possible as for decades the true impact and cost of oil and gas has not been met. As we are now seeing the impacts of climate change much clearer it has hard to justify the ongoing destruction of our climate because they create a distorted and misleading economic benefit.

Q 25. Should there be a presumption against new exploration for oil and gas?

Access to capital, skills and resources is limited and any activity to explore new oil and gas will only move that much-needed investment away from renewable technologies. Scotland, more than many other countries, is blessed with vast natural resources that will allow it to lead the world in renewable deployment. It is also an area with huge challenges in terms of remote rural locations that will make the decarbonisation of heat and transport and industry very challenging. The BHA believes that the delivery of the Scottish Government's vision is achievable, but it will need absolute focus and the legal, political and resource distractions just exploring the prospect of new oil and gas will only divert

these resources away from where they are needed.

Q 26. If you do think there should be a presumption against new exploration, are there any exceptional circumstances under which you consider that exploration could be permitted?

The only justification for new exploration is energy security but by utilising proven renewable technology like hydropower and pumped storage, Scotland is more than capable and delivering economic growth and opportunity and energy security, without the need for oil and gas.



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6. Chapter 4 Energy demand

Heat in Buildings

Q 27. What further government action is needed to drive energy efficiency and zero emissions heat deployment across Scotland?

- The BHA would challenge the assumption made in the vision that would see a reduced demand across our heat and transport sectors. The delivery of net zero will need to be delivered by existing technologies given the timelines demanded. Therefore, the route to net zero for heat and transport is likely to be through electrification, which will only drive up demand. Hydropower can enable this as it's a proven technology that works well with heat demands, as generation from hydropower is highest in the winter, and transport as the generation from hydropower is predictable. In response to the questions around heat and transport the BHA would strongly urge the Scottish Government to focus efforts on allowing for growth in heat and transport demand by delivering proven and quickly deployable generation, like hydropower.
- The key here is for new demand to match new generation without the issues of grid constraints. Smart localised energy solutions are going to be needed.
- Hydro matches winter demand and the electrification of heat
- The BHA is working with the Low carbon community heat forum to progress holistic solutions for rural areas to decarbonise heat where there is also potential for hydropower. • It is widely accepted that hydrogen for home heating is not economical or practical and should be urgently ruled out before more time and money is wasted on something that is undeliverable as a solution. Electrification of heat, through heat pumps, works well with hydropower as c.70% of hydropower generation takes place during winter months, so the demand curves are very similar.

Energy for transport

Q 28. What changes to the energy system, if any, will be required to decarbonise transport?

- The BHA suggests that Hydropower has a positive impact on strengthening the grid and will be useful as more Electric vehicle charging points are required across the grid. • Hydro co-located next to electric ferries/ battery trains and other larger energy consumers will be key to delivering solutions within tight timeframes and circumventing the issues with the grid.

Q 29. If further investment in the energy system is required to make the changes needed to support decarbonising the transport system in Scotland, how should this be paid for?

As we move to a Smart, flexible grid, the batteries that will be the mainstay of decarbonised transport will also become the backstay of localised energy systems, providing the load shifting and balancing

capabilities required to meet Net Zero at lowest cost for consumers.

Local area energy plans to understand the new load demands and the new generation to meet that demand will be central to any planning.

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Q 30. What can the Scottish Government do to increase the sustainable domestic production and use of low carbon fuels across all modes of transport?

The BHA believes that domestic transport will be electrified, and only heavy haulage will be Hydrogen.

Q 31. What changes, if any, do you think should be made to the current regulations and processes to help make it easier for organisations to install charging Infrastructure and hydrogen/low carbon fuel refuelling infrastructure?

Q 32. What action can the Scottish Government take to ensure that the transition to a net zero transport system supports those least able to pay?

See question response above on localised energy systems and just transition.

Q 33. What role, if any, is there for communities and community energy in contributing to the delivery of the transport transition to net zero and, what action can the Scottish Government take to support this activity?

See above about community based local area energy planning and Just transition.

Q 34. Electric vehicle batteries typically still have around 80% of their capacity when they need replacing and can be used for other applications, for example they can be used as a clean alternative to diesel generators. What, if anything, could be done to increase the reuse of these batteries in the energy system?

Containerised recycled batteries are already being used for battery storage. This is a market that will develop over time, especially as community batteries will be incorporated in community local energy solutions. Awareness raising and support for localised energy solutions, what they are and what Net Zero will look like within communities will be key to developing these new markets.

Energy for agriculture

Q 35. What are the key actions you would like to see the Scottish Government take in the next 5 years to support the agricultural sector to decarbonise energy use?

Renewable energy should be considered a key harvest for landowners and farmers. Support should be offered to encourage and promote diversification on farms. A whole system approach that includes Bioenergy, Anaerobic Digestion, wind, hydro, solar, hydrogen hubs should be developed and an understanding of the potential for net zero transformation for farms. Land management, nature recovery, peatland restoration, tree planting and other carbon sequestration activities will be important factors in the Net Zero ambition. Sustainable food production that can be complemented with excess renewable energy, such as hydroponics should be explored. Farming will undergo a shift

if we are to meet our Net Zero targets, and farmers will need considerable support to process and progress these changes.

Energy for Industry

Q 36. What are the key actions you would like to see the Scottish Government take in the next 5 years to support the development of CCUS in Scotland?



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CCuS is going to be an expensive technology that will be phased out as we stop using gas and move industry away from combustion of fossil fuels. Scotland has an excess of renewable energy and should focus budget and minds on efficient ways of utilising this excess energy and a grid that can enable the transfer of that excess power to where it's needed. CCuS should not be a necessity in Scotland and alternative solutions should be the focus of policy.

Q 37. How can the Scottish Government and industry best work together to remove emissions from industry in Scotland?

The Co-location of renewable energy and industry has some historic examples in Scotland. Alvalde's Aluminium smelter was sited in Fort William so it could make use of the 60MWs of hydro that was opened in 1929 and is still operating today.

The potential for a hydro, with storage reservoir, to power a new electric ferry in the Highlands is a great example of what we should be delivering. However, this project is struggling to reach development due to Grid Constraints and the funding for the ferry. Innovative thinking and a move to individual, bespoke solutions must become more prevalent if we are to decarbonise these harder sectors.

Q 38. What are the opportunities and challenges to CCUS deployment in Scotland?

As stated above, CCuS is very expensive and will only ever be a transient technology that will be phased out along with fossil fuels. Consideration should be given to how this infrastructure will not be 'stranded' within in 20 years.

Q 39. Given Scotland's key CCUS resources, Scotland has the potential to work towards being at the centre of a European hub for the importation and storage of CO₂ from Europe. What are your views on this?

Scotland is in a great position to be a Hydrogen hub and should focus on this longer-term energy vector being a key component of the net zero transition within the world economy. CCuS is only likely to be 90% effective and there will be large amounts of embedded carbon within the process, including in any shipping to transport CO₂ to redundant oil fields off the Scottish Coast. CCuS should only be a transitional process, a necessity and not a new emerging market that should receive subsidy and support. Carbon taxing would be a more effective and cheaper way to remove carbon from our energy system.

Chapter 5: Creating the conditions for a net zero energy system.

1.1. Q . What additional action could the Scottish Government or UK Government take to support security of supply in a net zero energy system?

Hydropower, Pumped Storage Hydro and Tidal Range are all technologies that the BHA support and can all add significant value to the energy transition while reducing costs to the consumer and helping

communities and industries to access renewable power.

The BHA is urging the UK Government to provide appropriate market mechanisms for hydropower, PSH and Tidal Range are brought forward, so the potential of these indigenous energy supplies are deployed and the full potential of this sector is realised.

Specifically, the BHA is asking that the UK Government:

- Support the development of pumped hydro storage through an appropriate market mechanism such as the Cap and Floor and bring forward this decision to 2023.



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- Support a new wave of hydropower development by allowing a ring-fenced CfD for the technology and a strike price that reflects the true cost and wider benefits hydropower provides.
- Set a target for Tidal Range deployment, review the Regulated Asset Base mechanism as a way to promote and deliver tidal range, set up a Tidal Range Task force and provide funding for a pilot scheme.
- Look at a whole systems approach to local net zero planning that includes long term demand, generation, flexibility and grid requirements.

Q 41. What other actions should the Scottish Government (or others) undertake to ensure our energy system is resilient to the impacts of climate change?

Resilience will be key, not only as we will face more extreme weather patterns including extreme heat, flooding, drought, wind drought which will all impact on our energy system, but also as our systems are all so interdependent and energy is the main stay of so many of the systems that support society in its day to day functioning, ie, communications, banking, food systems.

Localised systems will be key to increased resilience. A broad energy mix will also be key to increased resilience.

- Drought can lead to water shortages which will have an impact on water availability for thermal generation and for nuclear cooling.
- Higher temperatures mean that the capacity on transmission lines is lowered reducing their availability to deliver electricity.
- Wind drought (longer periods of low wind – typically 3 weeks) is a concern within a grid with increased intermittent renewable energy.
- Interconnectors – geopolitics will influence their capacity to be available when we need them, both through sabotage, an ageing French nuclear fleet, or expense.
- Rare earth minerals and world-wide shortages could impact on our supply chains for solar, lithium ion batteries.

The Net Zero journey is fraught with risk and the best way to mitigate risk is to diversify, appreciate that we need to plan for the unexpected and deliver technologies that are proven, reliable and deliverable within a known timescale.

Q 42. Are there any changes you would make to the approach set out in this route map?

Institutions that are within the state have enormous energy demand, including Government, local Government, NHS, Schools etc. Their ability to deliver Net Zero and move the market is immense. Corporate PPAs that could support and deliver new energy generation, could be a key driver for more renewable energy being deployed. Scottish Water have a target to deliver 10% of their energy consumption from their own assets by 2030. This is leading to innovation and new thinking about their role and responsibility within the net zero transition. Devolving carbon budgets to Local Authorities will shift responsibility and help foster new thinking on how this can be delivered.

Q 43. What, if any, additional action could be taken to deliver the vision and ensure Scotland captures maximum social, economic and environmental benefits from the transition?

As stated in many questions, delivery of local plans that look at what Net Zero will need to be within each community:



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- Power down – energy efficiency
- Power up – what local generation
- Increased demand – what will electrification of heat and transport look like • Local flexibility and the grid, what needs to happen and how can consumers get best value.

Impact assessment questions

Q 44. Could any of the proposals set out in this strategy unfairly discriminate against any person in Scotland who shares a protected characteristic? These include age, disability, sex, gender reassignment, pregnancy and maternity, race, sexual orientation, religion or belief.

Q 45. Could any of the proposals set out in this strategy have an adverse impact on children's rights and wellbeing?

Q 46. Is there any further action that we, or other organisations (please specify), can take to protect those on lower incomes or at risk of fuel poverty from any negative cost impact as a result of the net zero transition?

Q 47. Is there further action we can take to ensure the strategy best supports the development of more opportunities for young people?

Just Transition energy outcomes

Q 48. What are your views on the approach we have set out to monitor and evaluate the Strategy and Plan?

Q 49. What are your views on the draft Just Transition outcomes for the Energy Strategy and Just Transition Plan?

Q 50. Do you have any views on appropriate indicators and relevant data sources to measure progress towards, and success of, these outcomes?

A just transition requires the delivery of affordable, low carbon energy for all. As with the social clause within the Northern Scotland Hydro-electric board commission, electricity must be delivered for people's need, rather than solely for a market to deliver profit. The system can deliver both and profit and market shouldn't be prioritised over need. Planning local energy systems, working street by street, community by community are the most likely to deliver equitably, but will also produce a balanced system looking at demand, generation, storage and flexibility and the lowest costs in terms of grid reinforcement.

Community based local area energy plans, working with local energy governance structures (as being consulted on by Ofgem) will be key within this delivery. This model of delivery will ensure no one is left behind in the energy transition. Scotland has a strong record on delivering community based projects that are set up to benefit the communities they serve; this includes the carbon neutral islands aspiration and community wind farms and other community energy projects. The BHA would like to continue to work with Scottish Government to look at how the hydropower industry can continue to deliver projects for the benefit of the net zero transition, communities and the Scottish government.

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