

# Parliamentary ESNZ Committee Inquiry

## Response from British Hydropower Association: Tidal Range Alliance

### Introduction

On 17<sup>th</sup> November 2023 the Parliamentary Energy Security and Net Zero Committee launched an inquiry to examine:

*the potential for UK manufacturing to play a greater role in the supply chain for low-carbon energy projects and the Government support available.*

The inquiry will look at where in the sector is the greatest potential for UK manufacturers to make a difference and how growing a more local supply chain could help reach the goal of a secure, decarbonised electricity sector by 2035. The following draft responses are to engage BHA TRA members in agreeing a final version

### Questions and draft responses

#### 1. How can UK plc capture its fair share of the economic potential of emerging or less developed energy technologies?

The UN target for Net Zero carbon emissions by 2050 has led to calls <sup>1</sup> to double global hydropower generating capacity of about 1200 GW that has taken a century to create. Since starting in the UK, hydropower is now identified <sup>2</sup> as:

- the most mature renewable technology;
- an important component of power systems worldwide; and
- largest source of renewable electricity,

Whilst changes and trends in the power sector require the value of hydropower to be acknowledged, its role needs rethinking <sup>3</sup>. Also, policy makers and practitioners need to raise stakeholder awareness about hydropower's perceived challenges and benefits.

The government has committed to "aggressively explore" Tidal Range technology as a source of energy security <sup>4</sup>. Development projects are proposed around the UK coast with an aggregate of 20GW of zero carbon power<sup>5</sup> from resources estimated up to 30GW <sup>6</sup>.

---

<sup>1</sup> World Hydropower Congress, International Hydropower Association, Bali, October 2023

<sup>2</sup> 'Changing Role of Hydropower' International Renewable Energy Agency (IRENA), February 2023

<sup>3</sup> Challenges and Opportunities, IRENA, February 2023

<sup>4</sup> British Energy Security Strategy. UK Government 2022

<sup>5</sup> Flying the Flag for British Hydropower, BHA Manifesto November 2023

<sup>6</sup> UK Government, BEIS, 2013

DESNZ recognises the important role tidal range can play in the UK energy system <sup>7</sup>. This opens a window of opportunity for government to partner BHA TRA to brigade individual UK projects into a world leading Tidal Range development programme

As 10% of the global total, <sup>8</sup> UK tidal range resources provide a robust platform on which to develop multi-£billion manufacturing and export capacity which despite a 2017 call for action <sup>9</sup> has stalled since 2013 <sup>10</sup>.

Lack of Government led support and price stabilisation mechanism incentives have deterred private investment. However, now, grant aid is enabling laboratory testing of a new innovative Very Low Head Tidal Turbine (VLHTT) <sup>11</sup>. Whilst welcome, this presents a challenge to attract further private investment for field demonstration of the emerging technology.

Research indicates Tidal Range technology can compete on price against Nuclear and FLOW energy <sup>12</sup> and deliver more non-price benefits <sup>13</sup> including from use as sea defences to reduce costs of insuring against floods and coastal erosion as sea levels rise and storm surges grow and get more frequent.

UK plc can capture its fair share of the economic potential of global tidal range markets by scaling up its nascent industry to progressively substitute for imported turbines, increase pumped storage and target 8GW of installed generation capacity close to demand centres by 2050 <sup>14</sup>.

Taking lessons from the off-shore wind industry, if UK plc is to capture its fair share of economic potential for bringing forward Tidal Range it needs:

- An Industry/ Government partnership to bring forward this GW opportunity
- A Tidal Range accelerator programme as a backbone for a TR industrial strategy (including test site support and funding)
- An underpinning strategy focused on developing the TR supply chain. Jobs and skills within the UK, unlike off-shore wind, where the supply chain benefits have gone off shore.

---

<sup>7</sup> Tidal range projects: criteria and how to submit a proposal, Notice, DESNZ, 19<sup>th</sup> December 2023

<sup>8</sup> British Hydropower Association Manifesto 2023

<sup>9</sup> Hendy report 2017

<sup>10</sup> Severn Tidal Power Feasibility Study, UK Government

<sup>11</sup> Development of a Very Low Head Turbine, UKRI SMART Grant Project No. 10072702, September 2023.

<sup>12</sup> Lifetime Cost of Energy, BHA Tidal Range Alliance, Research Report December 2023

<sup>13</sup> Turning the Tide: Unlocking the potential, Briefing Note, Jacobs and SETB, October 2022.

<sup>14</sup> 'Future Energy Scenarios', National Grid

## **2. What more can the Government do to encourage greater domestic supply chain investment in the energy industry by 2035, including through the Contracts for Difference scheme?**

Government grant aid is enabling private investors to undertake the first stage of a programmatic approach to development that requires, next, Field Demonstration of a prototype VLHTT prior to integration in a first of a kind (FOAK) Modular Tidal Bar<sup>15</sup> and a Commercial Pilot project.

Private investors indicate that including Tidal Range in the CfD scheme<sup>16</sup> would engage their interest to partner BHA TRA members and DESNZ in brigading the 20GW of currently separate project proposals, in a programme to help deliver zero carbon electricity by 2035.

8GW of predictable, time tabled energy generation from tidal range energy is possible by 2050<sup>17</sup> as part of a zero-carbon energy system to supply residential, business, industry and transport energy users in the UK and via interconnectors. 1GW is feasible by 2035 in the context of plans for a UK zero-carbon electricity transmission system<sup>18</sup>

A Tidal Range Roadmap could locate Tidal Range energy assets<sup>19</sup> adjacent to coastal elements of the successful Industrial Clusters<sup>20</sup> programme to accelerate expansion of strong, domestic, clean energy supply chains and seize the opportunity to build on the UK's world-leading decarbonisation track record and strong deployment offer<sup>21</sup>.

The UK is the first G20 country to halve its peak carbon emissions<sup>22</sup> whilst a scenario for "leading the way" to NZ2050<sup>23</sup> indicates the feasibility to decarbonise the UK electricity grid by 2035 and early achievement of the statutory net zero target for 2050<sup>24</sup>.

A programme would replace shortfall from any change to the Nuclear Roadmap that drops its 2050 target of 24GW to 16GW installed capacity. This matches 8GW of zero carbon supply<sup>25</sup> deliverable using a Tidal Range Roadmap agreed between government and industry.

Such a Roadmap, targeting 1GW by 2035 and 8GW by 2050, could be developed from a Preliminary Business Case that has been made for harnessing the power of the Severn Estuary tides<sup>26</sup> using HMT Guidance<sup>27</sup>. It would include additional energy storage capacity from UK Tidal Range.

The shallow coastal waters and high tidal range that give the UK 10% of accessible global resources provide unique competitive advantage in the UN Race to NZ for UK manufacturing and construction sectors to supply developers with the turbines and civil engineering for their project pipeline.

Delivery can be achieved with higher Sustainable Industry Rewards per MW than other renewable energy sectors due to the multiple co-benefits associated with Tidal Range such as reduced

---

<sup>15</sup> Turning the Tide, Briefing Note, SETB and Jacobs, October 2022.

<sup>16</sup> CfD Sustainable Industries Reward scheme DESNZ consultation November 2023.

<sup>17</sup> FES Leading the Way S4

<sup>18</sup> Transmission Acceleration Action Plan

<sup>19</sup> a Strategic Spatial Energy Plan

<sup>20</sup> UK could be at forefront of green Industrial Revolution with carbon clusters plan, Sky News, 30 Dec 2023

<sup>21</sup> Green Industries Growth Accelerator (GIGA) programme

<sup>22</sup> Global Carbon Projects report

<sup>23</sup> Future Energy Scenarios (FES) Report, National Grid Energy Systems Operator 2023)

<sup>24</sup> Nationally Determined Contribution (NDC)

<sup>25</sup> NG scenario 4

<sup>26</sup> Severn Estuary Climate Adaptation and Energy Resilience programme, Turning the Tide, October 2022.

<sup>27</sup> HMT 5 Case Model Guidance

transmission constraints by being located next to centres of increasing demand, coastal defence enabling environmental management of at risk wetlands and tidal habitats. Necessary investment needs stimulating but the current lack of CfD allocation needs correcting from AR7 in 2025 using GIGA programme funds and those for coastal Enterprise Zones<sup>28</sup>.

Eco-engineering and sustainable construction not only will limit carbon debt but offer prospects for generating carbon and biodiversity credits to support independent funds and eco-services providers via levy payments and sales of electricity.

A scheme to reward communities has been outlined to government<sup>29</sup> and the industry is engaging with further independent research<sup>30</sup> that would benefit from a commercial pilot project encouraged by a change to the CfD Scheme.

### **3. Does the UK have the supply chain capacity to deliver the required energy infrastructure by 2035, including an expanded electricity network?**

The low priority accorded to Tidal Range power, and consequent lack of public policy and funds, have discouraged investment in the manufacturing and construction supply chains that could enable a significant contribution to delivering the UK zero-carbon electricity system.

Also, based on analysis of a large Tidal Range project<sup>31</sup> this low priority has meant that potential local economic growth has not been unlocked. This indicates, if commissioned soon, such projects would demand UK content of around 66% assuming:

- **Civil Engineering:** the cost split for large heavy civils projects is usually 40% labour, 40% materials, 20% construction plant (cranes etc.). Labour should be 100% UK and materials:
  - Concrete: cement - European supply at present with UK aggregates supply.
  - Formwork: mainly a labour cost – 100% UK
  - Rebar: mainly European supply at present. Unlike dams for hydro, Rebar content in marine caissons is high and is about 50% of total materials cost.
  
- **Mechanical & Electrical:** an example split derived from discussion with a major supplier:
  - Turbines: fabrication in the Far East.
  - Generators and cabling: could be substantially UK supply for a large enough order.

In addition, scaling up to a programme would attract investment in UK turbine manufacturing and Off-Site Manufacture of steel and/or concrete caissons which could drive UK content up to 80%. This compares well with Offshore Wind for which the UK content is understood to be well below 50%.

A recent grant from government for industrial research to develop the VLHTT has stirred private investor interest, but inclusion of tidal range in the CfD SIRS is needed to accelerate progress before interest evaporates in the context of opportunities in other countries (for example impact from the US Inflation Reduction Act attracting considerable global finance)

---

<sup>28</sup> Freeports Enterprise Zones

<sup>29</sup> Tidal Energy Environmental Management Scheme TEEMS, DEFRA NEIRF submission, March 2021

<sup>30</sup> Marine Fund Cymru, Research by WCVA. Wales Coastal and Seas Partnership (CaSP Cymru) 2023

<sup>31</sup> West Somerset Tidal Lagoon, Tidal Energy Environmental Services, December 2023

A Tidal Range Roadmap would guide growth of supply chains that, initially, will require the integration of conventional bulb turbines, modified to improve performance, in FOAK tidal bars constructed using concrete and/or steel caissons locally manufactured off-site.

Such turbines will need to be imported in an increasingly competitive global market but progressively substituted with UK manufactured VLHTT technology providing more cost effective and eco-friendly solutions applicable in a wider range of coastal locations and, potentially rivers world-wide.

Manufacturers in competitor nations are working to update technology with a view to exporting high value turbines for inclusion in major civil engineering structures in the UK where the shallow coastal waters provide competitive advantage in terms of the civil engineering required to house turbines.

A major programme of construction will be needed, and government procures around 30% of UK output including from commitments to renew and expand national infrastructure. Construction is a major employer and enabling sector that is critical to achieving climate change targets whilst BIM<sup>32</sup> and 3D printing in OSM will accelerate eco-engineering<sup>33</sup> and sustainable construction<sup>34</sup>. Laboratory testing of the innovative VLHTT technology is a first step to potentially major demand for UK manufacturing and presents an opportunity to move beyond industrial research to engineering design and commercialisation of jointly owned Intellectual Property Rights with a minimum percent ownership in the case of SMEs and exclusive rights for licensing use in development projects.

In addition to expansion of UK manufacturing and construction suppliers and sea defences, a large tidal range energy infrastructure programme will help protect the environment not only with zero carbon electricity but sustainable eco-services jobs at cost of just above £30k each<sup>35</sup> to aid recovery of natural habitats and delivery of at least 10% Biodiversity Net Gains.

#### **4. To what extent would growing the domestic supply chain bolster UK energy security?**

Energy Security is the uninterrupted availability of energy sources at an affordable price<sup>36</sup> and the government recognises potential for tidal range industry to enhance it<sup>37</sup> whilst any reduced nuclear or FLOW targets create an imperative to accelerate its growth.

UK tides are uninterrupted, predictable, and high, whilst CfD is key to domestic manufacturing and supply chain growth towards energy security from UK businesses with capacity to deliver price competitive, affordable products and services worldwide.

2GW of UK hydropower generation and 0.9GW storage capacity are reliable but the 1.4GW interconnector from Norwegian hydropower already has been disrupted by drought.<sup>38</sup>

There is potential for a further 1 – 3GW hydropower generation and 6.85GW Pumped storage hydro in the UK alongside the 20GW pipeline of Tidal Range power. Viewed as a whole system, the total

---

<sup>32</sup> Building Information Modelling, HM Government BIS 2012

<sup>33</sup> Marine Eco-Engineering Research Unit, Plymouth University

<sup>34</sup> Constructing Excellence and the UK Green Buildings Council

<sup>35</sup> Green Recovery Challenge Fund report DEFRA, Heritage Lottery Fund NHMF, 21 Dec 2023

<sup>36</sup> International Energy Agency

<sup>37</sup> British Energy Security Strategy (BESS), UK Government, 2022

<sup>38</sup> FT 29 December 2023

justifies spatial planning<sup>39</sup> using leading edge geospatial technology<sup>40</sup> including for digital twinning<sup>41</sup>.

This should recognise climate change risks including more frequent and worse flooding in UK river catchments<sup>42</sup> as storm surges and sea level rise, lift spring tides that combine with prolonged heavy rain upstream to overtop defences and threaten security of critical energy infrastructure by 2100<sup>43</sup>.

Tide Locking<sup>44</sup> has implications for planning growth in heavily populated river catchments and port city regions associated with UK maritime history. Dual use of Tidal range projects as sea defences would reduce exposure of asset owners to rising insurance costs set in advance of events using risk models that insurance companies are updating.

The Flood Re scheme end in 2039<sup>45</sup> and growth of the UK tidal range supply chain by then would bolster energy security by providing dual use assets to help manage the risk of flooding and coastal erosion to Industrial Clusters that are decarbonising,<sup>46</sup> and encourage Green Industry Clusters.

Combination with Tidal Range projects would need to accord with statutory Local Development Plans for which the National Planning Policy Framework requires authorities to support transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change.

Manufacturing and construction jobs in Green Industry Clusters harnessing Tidal Range power would level up coastal city regions as Local Development Plan policies press down on costs of development, operation and maintenance using locally sourced and owned technologies and recycled materials in businesses requiring high paid, high skill workforces.

A market route is emerging for a Tidal Range supply chain to bolster UK energy security by reducing costs<sup>47</sup> and offering grid stability and energy storage plus short grid connections to urban energy demand centres as part of a whole UK system with digital management to emulate base load supply as high tides move around the UK coast.

Also, coastal city regions would gain further manufacturing and construction businesses towards levelling up if Green Industry Clusters included large scale electrolyser plants to supply green hydrogen<sup>48</sup>. Industry government partnership is needed to agree the Tidal Range Roadmap.

##### **5. What are the key concerns with respect to the availability of raw materials in the supply chain and how might those be addressed?**

Imported metals are critical to decarbonising the whole UK energy system – typically, steel for zero carbon power projects, aluminium for cabling transmission and distribution grids and copper to wire energy efficient buildings.

---

<sup>39</sup> Government response to the NIC, DLUHC and HMT, 22 November 2023

<sup>40</sup> The UK Geospatial Strategy 2030, DSIT June 2023

<sup>41</sup> National Digital Twin Programme (NDTP) , UK Government, DBT, October 2023.

<sup>42</sup> Challenges and Opportunities, River Severn Partnership, December 2023

<sup>43</sup> UK Climate Change Risk Assessment, HM Government, January 2022

<sup>44</sup> Tidal surge to cause potential flooding on The Broads: Environment Agency press release 21 Dec 2023

<sup>45</sup> Flood Re, Annual Reports, UK Government DEFRA.

<sup>46</sup> Local Industrial Decarbonisation Plans, DESNZ 2023

<sup>47</sup> Tidal Range Cost Study, BHA 2024

<sup>48</sup> Hydrogen Production Delivery Roadmap, DESNZ December 2023

Russia is a major source of aluminium used in transmission and distribution cables and cheaper than alternative copper, as mining companies face growing opposition to extraction operations<sup>49</sup>. UK steel has been in long term decline<sup>50</sup>. Without government support it faces eclipse and closure of the largest production facility at Port Talbot – the UK's single biggest source of carbon emissions.

Supply chain disruption is expected to continue beyond 2024 whilst increasing global competition for other metals and limited scope for UK extraction strengthens the case to accelerate the recycling of waste metals already embedded in the UK economy.

The imperative is for recycling to higher value and critical purposes such as development of the tidal range industry where steel is essential for growth and recycling will accelerate progress whilst lower demand for cabling will mitigate risk of aluminium and copper supply disruptions<sup>51</sup> and price rises.

Initial growth of the UK Tidal Range industry will require importation of bulb turbines against global hydropower market competition and supply chain disruptions. Scaling up manufacture of VLHTTs is essential and will be facilitated by accelerating access to recycled metals embedded in the UK.

This will enable progressive substitution of imported turbines with UK VLHTT technology in more cost effective and eco-friendly concrete and/or steel caissons locally manufactured off-site in a wider range of coastal locations and rivers.

As UK demand for zero carbon electricity grows there will be rising value for money from the lower cable lengths required to connect each per MW of Tidal Range Energy. This will establish a premium for installing generation capacity from projects near centres of demand such as Port Talbot steel works. Concern about its future has given rise to a plan<sup>52</sup> for alternative expansion through investment in Electric Arc Furnaces that will need large scale sustainable zero carbon electricity supplies at a price comparable to those available in competitor nations.

In addition to the manufacture of renewable technology, hydrogen and chemicals, the plan identifies scope for public backing of locally installed tidal range electricity capacity based on supply of locally manufactured turbines as well as solar panels and battery components.

The plan is for thousands of well-paid new jobs and boost to the local economy. This would be in the context of Freeport status and creation of Investment Zone<sup>53</sup> whilst City Deal and other funds are referenced and could sit well with plans for a Green Industry Cluster at Aberthaw.

There are opportunities for other areas, such as the Mersey, to be integrated as part of a GIGA programme over the next 5 years whilst, development of ports for OSW and FLOW offer prospect for economy by extending use to meet growing demand for Tidal Range products. Whilst resilience of the growing UK cable manufacturing capacity would be assured by recycling using EAF technology it would enable complementary production of emission free cement from recycled concrete.

Alongside development of UK technology and supply chains to reduce costs and improve environmental performance there is an opportunity to grow recycling and substitute for expensive imports of copper and scrap metal exports<sup>54</sup>

---

<sup>49</sup> Panama has voided the 20-year Cobre Panama mining concession disrupting 1.5% of world copper supply.

<sup>50</sup> Revitalising Mature Industries, OECD Observer No.213, 1998)

<sup>51</sup> Protesters vs critical materials, Panama copper fiasco, FT 18 Dec 2023.

<sup>52</sup> A workers' plan for Port Talbot, Unite the Union, Nov 2023

<sup>53</sup> Freeports Delivery Roadmap, UK Government, DLUHC, December 2023

<sup>54</sup> UN COMTRADE database