

## **Written evidence submitted by Powys Hydropower (REW0005)**

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This submission is put forward in response to the Committee's request for submissions on a number of questions:

- How can the UK Government best support the deployment of renewable generators in Wales?
- How should the UK and Welsh Governments work together to support the development of renewable energy projects in Wales?
- What mechanisms can ensure that subsidies for renewable generators are good value for money?
- What opportunities are there for renewable generators in Wales of greater interconnection with other electricity markets?
- How can the UK Government facilitate Welsh contributions to COP26?
- What implications is COP26 expected to have for Wales?
- Has the COP26 Year of Climate Action had any significant implications for Wales?
- What opportunities are there for renewable energy to aid Wales post-COVID-19 economic recovery?

The following paper describes my response to the questions asked and my recommendations.

**In summary I recommend that a very systematic professional approach is taken to the technical and financial evaluation of potential developments in renewables in Wales.**

The reports on renewables in Wales which I have reviewed have tended to be based on rhetoric rather than on quantified engineering and financial analysis. In some cases critically important parts of the analyses have been wrong. As result some completely erroneous conclusions have been reached.

**David Gayther**

**Director Powys Hydropower.**

**Q1 How can the UK Government best support the deployment of renewable generators in Wales?**

**Q2 How should the UK and Welsh Governments work together to support the development of renewable energy projects in Wales?**

The overwhelmingly obvious characteristic of renewable energy policy in Wales is the lack of reasoned and rational technical & financial analysis of development opportunities. As a result a number of spurious conclusions have been reached. The most notable of these was the Welsh Government decision to support the Swansea Tidal Lagoon. The following are examples of unsupportable conclusions which are widely stated and believed at present:

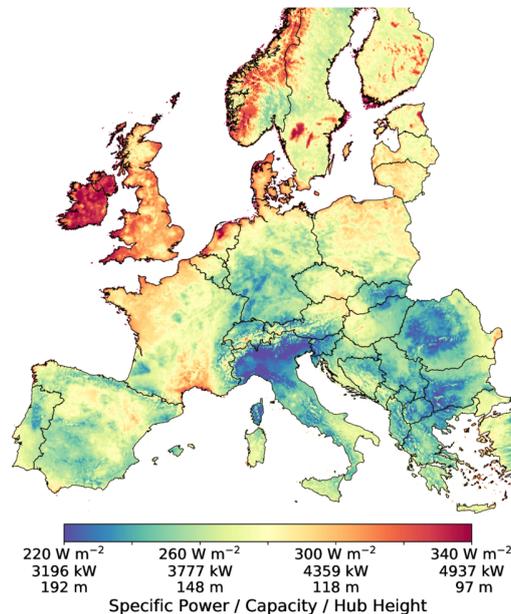
**1. WALES IS AN ECONOMICALLY ATTRACTIVE LOCATION FOR WIND TURBINES.**

In fact Wales is probably not a competitive location for wind turbines when the full cost of transmission to market is taken into account. This point was made in the Welsh government publication. *Energy Generation in Wales 2019* which states that:

***“With a supportive planning environment and strong wind resources, Wales has significant potential for further onshore wind development. The major barrier continues to be the geographical disparity between developable areas and suitable network infrastructure”***

The above statement is slightly self contradictory and can be restated as follows:

***Despite having relatively high average wind speeds relative to other parts of Western Europe (see below) the lack of grid capacity means that the delivered cost of wind power from Welsh wind farms is probably uncompetitive with other areas of UK***



Nonetheless, politicians continue to say that Wales has major opportunities in wind power. However, on the good news side, Wales is likely to be a competitive location for wind/hydro combinations which are wind turbines coupled with pumped storage. This opportunity has not been properly assessed, probably because the prevailing mindset is that there are no opportunities in hydropower (see below).

The belief that Wales is a competitive location for wind turbines is widely held as shown by the following statements:

- **Stephen Crabb Chair Welsh Affairs Committee**  
*“Wales is uniquely placed to benefit from the energy transition, particularly in wind power and marine renewables.”*
- **Adam Price leader of Plaid Cymru**  
*“Wales has vast potential to be a renewable energy powerhouse. Currently, however, our natural resources are largely untapped – or where they are, as in off shore and onshore wind – it is the taxpayers of other European countries that reap the benefit. Even the much-vaunted tidal lagoon project was led by a company from Gloucestershire”*
- **Mid Wales Growth Deal committee**  
*“Mid Wales is well placed to deliver on Wales’ ambition to capture the opportunities associated with the low carbon economy and clean growth. Grid capacity in Mid Wales is a significant constraint to future growth”*

## **2. MARINE ENERGY IS A SIGNIFICANT OPPORTUNITY**

There are very few examples of marine energy having been successfully exploited anywhere in the world despite its theoretical attractiveness as a reliable source of clean energy. The exceptions to this may be the Rance Tidal Power Station near St Malo in France and the yet unproven Morlais tidal stream project off Ynys Mon in North Wales

There seems to be a sustained belief in Welsh political circles that it is a major viable source of renewable energy for Wales. However, simple international comparison indicates that this is unlikely to be the case.

## **3. THERE ARE NO FURTHER OPPORTUNITIES IN HYDROPOWER**

To quote from a letter received from an official in the Wales Energy Service:

*“Although we have many streams and rivers, evidence based assessment of new opportunities for hydropower indicates the opportunities in Wales to meet a large proportion of electricity use from hydropower are limited by the size and type of waterways. Where streams and rivers are suitable for hydro developments, in cases where the electricity can’t be used on site, the cost of development and exporting the power is often greater than its value.”*

The above statement is simply a reflection of the prevailing mindset within the Welsh Govt bureaucracy. In fact there have been no credible ‘**evidence based assessments**’ of the hydropower potential in Wales. There have been several studies but careful examination of the results and data demonstrates unambiguously that these studies have produced completely inaccurate and/or totally spurious conclusions.

To quote again from the Welsh govt publication *Energy Generation in Wales 2019* .

**“Hydropower is a mature and proven technology that can provide a predictable source of energy. However, the relatively high upfront cost and a lack of cost reduction potential is likely to limit future**

## **growth without support”**

No evidence or analysis was provided to justify the conclusion that **“the relatively high upfront cost and a lack of cost reduction potential is likely to limit future growth without support”** The simple truth is that when the delivered cost to consumers is calculated hydropower is a very competitive generation option for the widely spread population of users which exists in rural Wales and other parts of UK.

The reality is that the capital cost per KWHr for hydropower is lower than the capital cost per KWHr of Wind turbines, when the different potential load factors are taken into account, as shown below:

### Wind turbines

Total investment (as per IRENA) = \$1,600 per KW  
Expected load factor = 27%  
Expected annual production = 2,365 KWHrs  
Capital cost per KWHr =  $\$1,600/2,365 = 67\text{c per KWHr}$

### Hydropower

Total Investment (as per IRENA) = \$4,000 per KW  
Potential load factor = 90%  
Expected annual production = 7,900 KWHrs  
Capital cost per KWHr =  $\$4,000/7,900 = 50\text{c per KWHr}$

**Recommendation It is recommended that both UK and Welsh governments ensure that sufficient engineering/economic expertise is applied to renewable energy policies to enable robust and valid conclusions to be drawn for the future direction of renewable energy in Wales.**

## **WHAT, THEN ARE THE REALISTIC OPPORTUNITIES FOR RENEWABLES IN WALES ?**

Wales probably has two major opportunities on which further research is justified, these are:

### A. Distributed Generation

Wales is very well placed to become a leading region in the development of ‘Distributed Generation’ In this system local generators supply power to local users (either domestic or industrial), so avoiding the very high operating and environmental costs of the central generation system which presently prevails in UK.

### B. Pumped Storage in existing dams

Wales has a major opportunity to utilise its existing dams to store and recover electrical energy. Such storage and recovery would:

- Achieve 100%(or above) storage efficiency (i.e. % power recovered from the power input)
- Use existing well proven technology
- Be very economically attractive compared with battery storage.

However, the issue needs to be taken seriously and professional research is required to decide whether it is worth pursuing or not.

**Q4 What opportunities are there for renewable generators in Wales of greater interconnection with other electricity markets?**

My full answer is as follows:

The major constraint preventing renewable generators in Wales from connecting to the grid is the high cost of grid connection. One of the ways that this could be overcome is to use of existing dams for pumped storage in Mid Wales. The potential economic benefits of this are as follows:

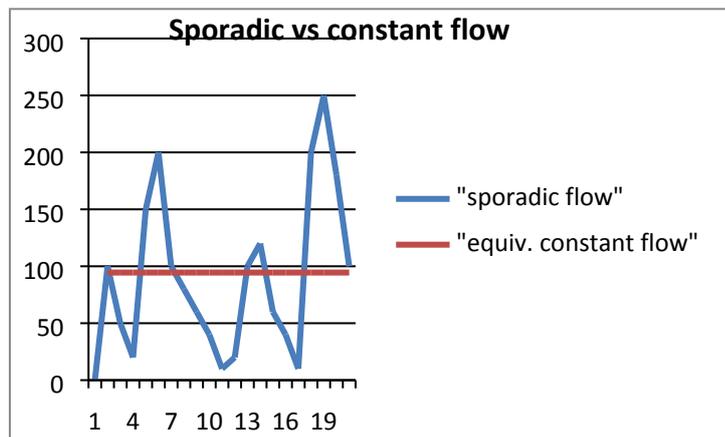
**1. Peak power supply**

The cost of the additional grid connections may become economically viable when pumped storage is used for 'peak lopping' on the grid. The value per KW Hr for peak power is so much higher than for baseload power.

**2. Active management of existing line capacity.**

Hydropower can be switched on or off very quickly to meet external conditions. One of the external conditions is the load on the transmission network resulting from other generation sources. This characteristic allows for Active Management of the transmission capacity in existing networks. The key question is whether this would free up sufficient line capacity to influence the capital cost of transmission.

**3. Transmission cost of sporadic intermittent flow vs steady flow.** The following chart shows the typical relationship between a sporadic flow of power (from say a wind turbine) and a constant flow of the same amount of energy from recovered hydropower. The key question to be assessed is whether there is a worthwhile saving by transmitting a steady flow vs a sporadic flow of energy.



**Recommendation** I believe that investigation of each of the above issues warrants a full feasibility study by a competent agency or organisation.

**Q5 How can the UK Government facilitate Welsh contributions to COP26?**

The renewables situation in Wales is marked by:

1. A fragmented approach

Responsibility for renewables in Mid Wales seems to be divided between

- Wales Energy Service who were apparently supposed to be producing a Mid Wales Energy Strategy by Autumn 2020. This document has not yet been sighted.
- Mid Wales Growth Deal (MWG) The MWG has undertaken to produce investment proposals by March 2021. Since renewable energy is one of the target sectors it is expected that investment proposals in renewables will be published very soon.

2. An excess of political rhetoric.

Various 'strategic reports' have been produced including the following examples

Strategic priorities for the Mid Wales region a report by AECOM.:

Strategic Economic Plan & Growth Deal Roadmap, by Growing Mid Wales.May 2020

However, despite there being a number of strategic reports there seem to be very few actual investment proposals.

**The UK government can facilitate Welsh contributions by ensuring that there is sufficient engineering and financial expertise being applied to bring forward viable projects in renewables in Wales.**

*February 2021*