3rd April 2019

Ms Rachel Reeves MP
Chair of the BEIS Strategy Committee

Dear Ms Reeves MP,

1. I am writing to you in your position of Chair of the BEIS Strategy Committee. The British Hydropower Association [BHA] is the leading trade membership association solely representing the interests of the UK hydropower industry [from micro to large scale] and its associated stakeholders in the wider community, both in the UK and overseas. The BHA welcomes the news that the committee has announced an inquiry into Financing Energy Infrastructure and we have set out our evidence as follows.

Summary

2. The BHA agrees with the Committee that the UK energy sector is facing an energy gap by mid-2020 and that change is required to the market framework that will encourage investment in new capacity. The key BHA points are:

   - The rapid growth of renewables requires the associated deployment of flexible generation capacity as significant savings can be made by exploiting storage technologies.
   - Pumped Storage Hydro [PSH] is a proven technology that can deliver flexibility at scale and deliver savings to consumers. At present circa 4GW of new PSH capacity is being developed in the UK.
   - PSH can provide multiple services to electricity markets. PSH does not require subsidies, but it does need a market framework that provides a 'level playing field' allowing PSH to attract investment capital for new-build PSH projects.
   - The BHA recommend that the Committee and Government should act in two areas:
     a) **Firstly, to recognise the value that multiple PSH services provide to deliver a cost effective, secure, and clean electricity system.**
     b) **Second, to define more effective long-term market or regulatory frameworks for PSH that will attract the capital for investment in new-build PSH capacity.**

The need for storage

3. The last decade has seen rapid growth in renewable electricity to meet decarbonisation targets. Over 42GW of renewables are now installed in the UK. Between 2007 and 2015, the total installed capacity of renewables electricity in Scotland alone has more than doubled.

4. Due to its intermittent nature, the rise in renewable generation has resulted in an increased need for reliable flexible capacity to meet peak demands and avoid curtailment of renewable energy at times of low demand.

5. PSH is the most mature large-scale electricity storage technology. Over 120 GW is currently operational worldwide.

   In the UK, there is currently 2.9 GW of operational storage capacity, and there is 4.1GW of new PSH capacity in the UK planning and development pipeline.

6. In 2018, National Grid's future energy scenarios report forecast that up to 9 GW of electrical storage capacity may be required by 2030, and 29 GW of storage capacity may be required by 2050.

7. In 2016, Carbon Trust/Imperial College produced analysis on the benefits of storage to the UK power system. This analysis was also used by the National Infrastructure Commission in their 2016 'Smart Power' report.

   - The Carbon Trust/Imperial report concluded that base savings of up to £2.4 billion per annum could be realised by installing around 6GW of additional storage capacity by 2030.
   - The report identifies that an additional £5billion per annum could be saved by better optimisation of the power system, making a total of some £7.4billion pa. These can be enabled by the availability of storage to help manage the power system, reducing the need for additional generation and network investment.
   - The report estimated that consumers would save around £50 per year if the 6GW was built, based on them only receiving 50% of the available savings.

8. Research by Strathclyde University highlighted the need for Government to consider the wider societal benefits associated with PSH developments[1].

9. This analysis shows PSH can benefit consumers by optimising the future power system, enabling affordable, clean and secure energy supplies, and minimising the need for new gas generation. The BHA suggests that Government should prioritise undertaking its own analysis to satisfy itself of the long-term economic and decarbonisation benefits of PSH to consumers and society.

What are the characteristics of Pumped Storage Hydro?

[1] The Case for Pumped Storage Hydro in the UK's Energy Mix

10. PSH is a way of storing energy by storing electrical energy into stored (or potential) energy and back again to electrical energy. A PSH plant consists of an upper and lower water reservoir with a reversible pump/generator. Electricity is used to pump water to the upper reservoir at times of low system demand and this stored water is used to generate electricity for several hours at times of high demand. The cycle of pumping and generation repeats as required.

11. PSH is valuable to the GB power system due to the wide variety of bulk services that it can provide, including capacity and power system stability and flexibility services. PSH is able to seek revenues from capacity, wholesale, and balancing/system service markets. Current PSH installations provide these services and are operating profitably.

12. As the daily demand profile becomes more volatile in future due to the increased levels of wind and solar, PSH provides back-up capacity and fills in the demand peaks and troughs. This will optimise the available generation capacity and result in lower costs to consumers.

13. The capital cost of new PSH, according to Government's latest cost estimates[2] in 2016, will range from £700k/MW to £1,600k/MW, with a medium value of £1,000k/MW. The pump/generation cycle efficiency is around 80%. Construction times are estimated at c5 years. PSH plants have very long lifetimes, estimated in excess of 70 years.

14. The unique characteristics of PSH include:

- A proven, reliable technology, available at large-scale, with an asset life of 70+ years
- Provides firm capacity for longer periods than batteries or demand response
- Mitigates network constraint costs, and reduce the need for network investment
- Provides the full range of system stability and balancing services, including black start, inertia, frequency response, reserve and reactive, all of which helps to provide system security
- Enables greater penetration of renewable energy, and is a clean energy resource

15. Given the above advantages, new PSH must be considered an economic proposition in future electricity markets and should not require subsidies. However, PSH projects are large capital investments and sufficient certainty will be needed about future markets and revenues so as to attract capital for construction.

16. This certainty is not currently available – new PSH projects are faced with seeking revenues from several different electricity markets, some of which are uncertain or of a very short term nature. The ability of PSH to provide multiple market services is effectively being penalised.

What market structures does PSH need?

17. This Inquiry into financing energy infrastructure is considering what more the government must do to attract greater investment into financing future energy capacity, including renewables.

18. At present the PSH regime is reliant on a variety of different electricity markets for its revenue. These have many distortions and uncertainties and do not offer long term

[2] https://www.gov.uk/government/publications/beis-electricity-generation-costs-november-2016

commitments. This will make it difficult to secure long-term low-cost investment finance without some changes to these markets.

19. A substantial intermittency challenge is expected to emerge in GB in the 2020's with increased levels of wind and solar, and reduced coal and nuclear. In order to compete on a level playing field with other potential solutions to the intermittency challenge - interconnectors, battery technology etc, PSH requires equivalent market conditions that value the benefits that PSH offers.

20. There would appear to be 2 main options for improving PSH financing arrangements, namely market framework design and regulated solutions.

Market framework design

21. This could take the form of a market mechanism which would recognise the long-term value that PSH bring across a combination of system services, including:

- Capacity for several hours at daily times of peak demand
- Capacity for system services such as frequency response, reserve, voltage support, inertia, demand turn up, and black start.
- Capacity available to avoid the need for major transmission network investments.
- The ability to combine intermittent renewables with PSH to provide 'firm' power.

22. The BHA suggests that government and Ofgem review their policies in 2 key areas to allow PSH developments to compete fairly in energy markets. These are:

    - Reform of the Capacity Market to provide appropriate long-term investment signals to enable PSH construction and operation.
    - Continued reform of associated policy, regulatory and wholesale/balancing market measures to ensure that PSH can compete fairly against other technologies across capacity, wholesale and balancing markets.

23. Reform of the Capacity Market will be one key factor in allowing new pumped storage to come to market. PSH represents a significant capital investment – and confidence over future revenues will be critical to make the business case and secure this investment. The current Capacity Market structure restricts the way new PSH can compete alongside other technologies. Extending the lead-in time of contracts to reflect the length of time to build new plant would be an important first step to unlocking investment.

Regulated solutions

24. The challenge of developing large capital cost assets for the GB energy system has led to a number of regulated models being developed which use the advantages of regulatory support for construction risk and returns on investment to attract low-cost finance.

    This has led to a number of investments and projects taking place which would not otherwise have been realised. Amongst these examples are:

    - GB interconnectors, where Ofgem's cap and floor regime has provided revenue guarantees so that investors are able to secure a return on investment. This has led to several interconnectors being developed, whereas previously they had been unable to obtain finance as merchant projects.

- Thames Tideway in the water sector, where the project was developed under a separate regulatory framework, attracting bidders to provide low-cost finance.
- The proposed RAB scheme for nuclear power stations where revenue guarantees would be provided so as to attract low cost finance.

25. Such models could potentially be developed for PSH projects, potentially in a similar way to the Ofgem interconnector approach where a tranche of projects are qualified against certain criteria before being considered for the grant of a cap and floor regime.

    This approach could accelerate the construction of PSH while also reducing financing costs.

BHA conclusion

26. The UK is in the midst of an energy revolution. As with any fundamental change, there are risks as well as opportunities. However, the underlying principle remains the same: we need to move away from our previous reliance on burning fossil fuels in a timely manner, whilst maintaining security of supply at a cost affordable to consumers.

27. The rapid deployment of offshore wind has been a great success story with substantial reduction on costs. Before this, government support for onshore wind and solar allowed these technologies to mature quickly. All three are now either at, or are very close to being at, a subsidy free tipping point. If the necessary government policies are in place, we believe these technologies can take a significantly larger share than current policy predicts. The key facilitator of this will be underpinning it with the necessary flexibility and storage. The main proven, grid scale solution to this, which can be deployed by 2030, is PSH.

28. While Interconnectors will play their part in providing flexibility, European energy markets are going through similar transitions and the flexible power we need may simply not be there. A new generation of gas plants will have an important role to play in the energy mix, although the simple fact remains that this is still the burning of a fossil fuel. Developing indigenous PSH solutions promotes UK skill sets and improves security of supply.

29. Policy and strategy documents have been published in recent times by the UK Government (The Clean Growth Strategy), Scottish Government (Scottish Energy Strategy, A Vision for Scotland's Electricity and Gas Networks) and National Grid (Future Energy Scenarios), along with numerous independent papers. The key point they all recognise is the requirement for a significant increase in the amount of storage in the future UK energy system.

30. If the correct frameworks and policies are put in place to level the playing field and as well recognise the full range of benefits and services PSH can provide, the BHA believes this sends the necessary signals to the market and will unlock future investment.

31. As a proven technology, with a current pipeline of over 4GW of proposed projects, if policy makers and system operators (who have all individually recognised the value that new pumped storage will bring) can come together and put the necessary policies in place, the BHA believes a new fleet of PSH, combined with offshore and onshore

renewables, will not only fill the gap left by coal and nuclear, but will do so in a sustainable, cost effective and cleaner way.

Yours sincerely,

Simon Hamlyn

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