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12 January 2017

Dear Sir or Madam

Consultation reference: Plan for a Smart, Flexible Energy System - A call for evidence

Quote relating to the most important part of this submission:

"There is no consideration in the call for evidence for a possible cap and floor mechanism. This has already been established for interconnectors which are seen as a source of flexibility. Interconnectors face very similar challenges of high capital costs and long project lifetimes. Revenue streams over such long timescales are uncertain, and will be strongly influenced by policy decisions. A similar cap and floor mechanism for storage would protect against long term changes in policy, limit risk to investors and therefore reduce the cost of capital, reducing the cost of new projects and ultimately reduce the cost to customers. This would help bring forward storage projects, especially pumped storage hydro."

Eishken Limited is developing a pumped storage hydro (PSH) facility in Eishken Estate on the Western Isles, Scotland. The 300MW facility will have an energy storage capacity of circa 2,400MWh. As there is currently no support for PSH, revenues are proving difficult to assess, especially over the longer term. We expect the development of over 350MW of remote island wind that is consented on the island. The PSH facility could be operated in such a way to maximise the utilisation of the proposed grid connection to the mainland. We have considered the proposed Eishken PSH facility, and the proposed connection to the mainland, as examples to illustrate our answers to relevant consultation questions below:

1. *Have we identified and correctly assessed the main policy and regulatory barriers to the development of storage? Are there any additional barriers faced by industry? Please provide evidence to support your views.*

Storage is not recognised as a discrete activity or asset type under current regulation. It has the capability to both generate when needed, and consume electricity when needed. The controllability of pumped storage hydro serves to complement intermittent renewable generation, such as wind, marine and solar,

and reinforce the networks to which it is connected. Storage provides flexibility, reduces reliability on fossil fuel generation, and maximises the use of renewable generation.

Storage needs to be classed in such a way to recognise that it is an asset that can be controlled. Its unique capability, and the benefits it can bring, must be recognised as a distinct asset class which can deliver benefits to the network, and, ultimately, save money for the consumer.

A number of barriers currently exist, including lack of revenue mechanisms, market access and participation rules, long-term regulation, unpriced services, and clarity of benefits:

- Revenue streams - a principal barrier is the uncertainty of long term revenue streams. Storage can provide multiple services. The various pumped storage revenue streams need to be compatible with each other. Visibility is required over the longer term, and be planned to start at a point in time to allow projects to be constructed.
- Market – storage needs better coordination between regulators, network owners and operators, and energy companies as to the long term role energy storage will play, and the value it can bring.
- Policy and regulation – long term Government policies are unclear, this is a key risk which raises the required financial returns for storage projects. The lack of suitable definitions for storage facilities means that there is currently no standard charging methodology. Charging needs to recognise all the benefits that storage can bring.
- Networks - storage is currently treated as a generation asset and therefore subject to grid reinforcement costs and balancing costs. This fails to recognise that storage can contribute to system security, avoid the need for reinforcement, and reduce the costs of balancing the network.

If storage is not progressed, then opportunities to reduce network operator costs, and therefore consumer costs, will be lost.

2. *Have we identified and correctly assessed the issues regarding network connections for storage? Have we identified the correct areas where more progress is required? Please provide evidence to support your views.*

The Eishken pumped storage development on the Western Isles, together with the wind and wave renewable technologies, will be connected to the transmission network at Beauly on the mainland by a new 600MW HVDC link (the Western Isles Link). The controllability of the PSH facility would complement the renewable generators on the island, minimising curtailment, and maximising the use of the proposed Western Isles link, whilst providing significant balancing capability for the transmission network.

The pumped storage facility at Eishken will be able to be used to:

- provide services to balance the system in northern Scotland, including capacity, frequency response, reserve, voltage support, black start, and will also provide inertia to help with frequency regulation;
- balance the renewables generators on the island, minimising the need for curtailment, and ensuring a greater utilisation factor on the Western Isles Link;
- supply the island at times when the Western Isles Link is not available;

PSH facility on the Western Isles will be enhanced by the HVDC technology proposed for the Western Isles Link. HVDC technology can perform better than traditional AC technology. VSC converter stations (Voltage

Source Converter) enable efficient long distance power transmission, and also provide very controllable reactive compensation capability which will provide system benefits at both Beauly and also on the Western Isles:

- Beauly is a key hub on the system, particularly with the construction of the Beauly-Denny 400kV overhead line. Voltage support is therefore critical at such an important point on the network. The reactive capability of the Western Isles Beauly converter will be used to help maintain system voltage at optimum levels and would have a positive impact on system stability.
- On the Western Isles, the converter will provide the necessary voltage support and dynamic stability for the renewable generators on the island. Overall the network security and quality of supply for the island will be improved following the installation of the Western Isles Link together with the operation of the storage facility.
- The VSC converters, together with the pumped storage facility, would be able to provide sophisticated black start capability, restoring supplies in a black start situation without the need to rely on standby diesel generation.

The Western Isles, therefore, offers an opportunity to connect clean renewable technologies, balanced and controlled by pumped storage hydro, all connected by controllable HVDC directly into an important node on the mainland transmission network. This will be a truly smart part of the network and will offer an excellent opportunity to learn and optimise how such a flexible system can be optimised, and used as the basis of smart networks in the future.

We need this capability to be recognised with appropriate measures put in place to recognise the benefits storage can bring. This should be through a combination of policy, regulation, and market drivers to make sure opportunities like the Western Isles are not lost.

3. *Have we identified and correctly assessed the issues regarding storage and network charging? Do you agree that flexible connection agreements could help to address issues regarding storage and network charging? Please provide evidence to support your views, in particular on the impact of network charging on the competitiveness of storage compared to other providers of flexibility.*

We believe that the issues around network charging have been addressed in the call for evidence document. Where storage can play an active role in the reinforcement of a network, then this benefit has to be reflected in the charges levied on the storage provider.

At present the Western Isles is supplied via a 132kV transmission line connected to the mainland transmission network at Fort Augustus via the Isle of Skye. This circuit is connected to an aging 33kV, 22MW subsea cable to the Western Isles. Currently the maximum island demand is circa 27MW, the shortfall in the connection capacity being met by diesel generators on the island. This infrastructure is in need of reinforcement and replacement, and the remote nature of the Western Isles means that any replacement infrastructure will be expensive.

The pumped storage facility on the Western Isles could also be used to help manage the requirements on the island, and could, therefore reduce the level of required network reinforcement. The pumped storage facility could be factored into the design of any new connection to be installed, reducing the network reinforcement and replacement requirements and saving costs.

The implementation of the Western Isles Link would connect the new generation of the island, it would also provide additional capacity to supply the existing demand on the island, and the security of supply would be improved, providing an additional cable link.

The pumped storage, together with the Western Isles Link, will provide significant benefits to the transmission network. They will also serve to benefit the Western Isles themselves, improving the quality and security of supplies in these remote areas, providing capacity to facilitate island demand growth, and relieving reliance on local carbon standby generation. The new arrangements will relieve the heavily congested circuit to Skye, with demand being transferred to the new link.

However, the current transmission charging arrangements would see all the costs of the new connection infrastructure passed to the island generators. The TNUoS charging methodology adopted by Ofgem for island connections (WACM2 selected from the Code Modification Proposal CMP213) treats island generators in the same way as an offshore generator. The full cost of Western Isles Link passed to the island generators, who would therefore be paying not only for their own connection, but also wider benefits to the network, including reinforcing the existing demand on the island.

Where the storage facility, including the network infrastructure required to connects the storage facility, is used to benefit the network and offset the need for system reinforcement, then the avoided costs of the reinforcement could be removed from the costs of the connection levied on the storage project (distribution), or excluded from the calculation of the TNUoS tariff (transmission).

4. *Do you agree with our assessment that network operators could use storage to support their networks? Are there sufficient existing safeguards to enable the development of a competitive market for storage? Are there any circumstances in which network companies should own storage? Please provide evidence to support your views.*

Yes, storage can certainly be used to support networks. We are aware that this is already being done as an alternative to distribution network reinforcement. As alternative to installing additional network capacity, some DNOs are using battery storage, alongside demand side response and distributed generation, to provide post fault capacity to maintain security of supplies (Constrained Managed Zones). This should be repeatable on the transmission network, where that greater scale of pumped storage can be used to provide transmission level capacity to secure networks. Again, the proposed storage facility on the Western Isles would be ideally located to support island demand, reducing the need for expensive network reinforcement in such a remote location where even low capacity circuits would be expensive to install.

The scale of pumped storage could be used as an alternative means to support transmission networks. The pumped storage facility on the Western Isles could be used to help manage requirements on the island, and the transmission network in the area, therefore reducing the level of required network reinforcement.

However, we don't believe that there are safeguards currently in place to enable the development of a competitive market for large scale storage. Whilst storage can offer many services to benefit the network, and therefore the consumer, service contract length is usually short. Many balancing services are only contracted over 1 or 2 years, this means that any contract successfully awarded will have terminated before a pumped storage facility could be built. The 2016 capacity auction has seen 15 year contracts awarded for new build plant coming on line in 2020/21. The timing and duration are helpful, however pumped

storage assets can operate for 50 years or longer. A deferred start, and longer timescales need to be reflected in all agreements for the services storage can provide.

Where storage can provide a cost effective alternative to traditional reinforcement of a network we would not see a problem in network operators owning the storage asset. Alternatively, should the storage asset be developed and owned by a third party, then the investment saved by the network operator in avoiding, or deferring, reinforcement should be passed to the storage provide under appropriate contract arrangements.

5. *Do you agree with our assessment of the regulatory approaches available to provide greater clarity for storage? Please provide evidence to support your views, including any alternative regulatory approaches that you believe we should consider, and your views on how the capacity of a storage installation should be assessed for planning purposes.*

Currently long term forecasting of revenues is impossible. Mechanisms are required to reflect the value that pumped storage brings to the system. A 'cap and floor' mechanism, as already successfully used for interconnectors, would create a bankable long term minimum revenue stream, and would be important to unlocking the benefits that large scale pumped storage hydro can bring to the system.

There is no consideration in the call for evidence for a possible cap and floor mechanism. This has already been established for interconnectors which are seen as a source of flexibility. Interconnectors face very similar challenges of high capital costs and long project lifetimes. Revenue streams over such long timescales are uncertain, and will be strongly influenced by policy decisions. A similar cap and floor mechanism for storage would protect against long term changes in policy, limit risk to investors and therefore reduce the cost of capital, reducing the cost of new projects and ultimately reduce the cost to customers. This would help bring forward storage projects, especially pumped storage hydro.

6. *Do you agree with any of the proposed definitions of storage? If applicable, how would you amend any of these definitions? Please provide evidence to support your views.*

The definition of storage under the regulations is unclear. The technical characteristics of storage mean it can operate as a generation asset and end user demand asset. The definition needs to reflect this controllability and the benefit to the network, including its ability to generate when required or consume electricity as required. Storage should not be classed as generation only.

Yours faithfully

Nick Kay
On behalf of Eishken Limited