National Planning Framework 4 Team
Scottish Government
Area 2F South
Victoria Quay
Edinburgh
EH6 6QQ
scotplan@gov.scot

30th April 2020

National Planning Framework (NPF) 4 Call for Ideas

Drax Group plc (Drax) owns and operates a portfolio of flexible, low carbon and renewable electricity generation assets – providing enough power for the equivalent of more than 8.3 million homes across the UK. The assets include the Cruachan pumped-storage hydroelectric power station in Argyll and Bute, which provides 30% of the UK's pumped hydro storage capacity by volume, run-of-river hydro locations at Galloway and Lanark and a biomass-from-waste facility at Daldowie. Through our generation assets we are actively helping to contribute to the country's security of supply though providing balancing and ancillary services which allow the nation's energy system to operate safely and securely.

We welcome the opportunity to provide input to the NPF4 Call for Ideas. We support the Scottish Government's intention as expressed in the 2019 Programme for Government that NPF4 '[should] help to radically accelerate reduction of emissions' as it looks at the critical 30year period ahead of 2050.

Our response focuses on aspects of planning that the Scottish energy system will require over the next 30 years to meet net zero. To support the electricity grid's decarbonisation, NPF4 should provide a view on the new infrastructure needed to meet Scotland's climate targets.

In this context, Cruachan 2, the project aiming to more than double Cruachan Power Station's generation capacity, should retain its status as national development under NPF4[1]. Drax acquired Cruachan Power Station in December 2018 and is currently investing in a series of feasibility studies and surveys to take forward this project. Cruachan is already a key piece of critical infrastructure for Scotland's and the UK's electricity grid but by expanding it, it could play an even greater role in supporting Scotland's decarbonisation and 2045 net zero ambitions. Its strategic importance was recently reconfirmed as it was awarded a six year contract to provide system support services to help maintain secure supplies. This is part of a new and innovative approach by the National Grid ESO to balance and stabilise the grid in order to be able to operate with zero carbon by 2025.

Pumped storage will be critical for the decarbonisation of our grid as it can provide essential services for grid resilience and storage capacity as more intermittent renewables come online. It is the only technology which enables energy storage at scale. The expansion of Cruachan Power Station would help deliver towards this additional capacity. The expansion of Cruachan is also a Project of Common Interest indicating its potential for supporting energy security and decarbonisation at the European level. Despite the above, a policy gap to support the deployment of additional pumped storage hydro at the UK level remains.

The future of the electricity grid in Scotland

In reviewing our pathway to net zero, it becomes clear that greater flexible generation and energy storage are needed, not least due to the greater role which electricity will be called to play in decarbonising different sectors of our economy

[1] NPF3: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2014/06/national-planning-framework-3/documents/00453683-pdf/00453683-pdf/govscot%3Adocument/00453683.pdf

such as transport but also the vast increase in intermittent generation technologies. Increased efforts will be required over the coming years to complete plans for how Scotland can generate the electricity needed to reach net-zero[2].

By 2050, the Committee on Climate Change (CCC) estimates that around 60-70% of generation will come from intermittent renewables with the remaining acting as a gap for other more flexible sources[3].

Today, the CCC advises that 'a challenge across the UK is that, as dependency on electricity grows and the electricity system becomes further decarbonised making increasing use of non-synchronous generation technologies, the stability of the system needs to be maintained and overall resilience ensured'[4]. The CCC has also commented that 'improvements in system flexibility can help accommodate large volumes of variable renewables in the system at low cost'[5].

As acknowledged in the Scottish Government's Network Vision for 2030[6]:

"The ability to operate the electricity system as a whole is becoming more challenging. The closures of large, thermal power stations across Britain, including those in Scotland, means that while discussions about infrastructure often focus on the capacity of networks to move power, a stable electricity system needs other services such as the ability to support voltage, detect faults, and remain resilient to unexpected events".

"We think, based upon our own analysis, informed by the work of the Scottish Energy Advisory Board, that there needs to be a greater strategic focus on regional security of supply. This means considering not only the networks, but also the location and characteristics of resources connected to them".

Historically, synchronous thermal generators such as coal or gas fired power stations have provided these services as they can increase or decrease electrical output in response to the demands of the transmissions system. As more intermittent renewables come online, there is a risk that underinvestment in these services jeopardises the resilience of the network[7].

Further, given the requirement for new and additional infrastructure to assist with stability within the National Transmission System in Scotland as recognised by the recent Stability Pathfinder Project, we would support the requirement for NPF4 to recognise the need for Grid Forming Capability technologies, that provide key Grid services (inertia, voltage control, system stability, etc) in Scotland.

With an increasing need to manage the intermittency of renewable technologies, there will be a need to promote more flexible technologies. This is a particular consideration for Scotland which continues to increase its wind generation capabilities and where the need for sufficient energy storage will become even more vital[8]. At the GB level, a recent report suggests that ten times more energy storage will be needed to reach net zero[9], an expansion from 3GW of storage today to over 30GW in the coming decades.

This is significant from a consumer point of view too. There are considerable savings to be made through early investment in flexible technologies, estimated at £17-40 billion by 2050 and £8 billion/year up to 2030[10]. The CCC considers that a 'slow start' scenario leading to constrained deployment of flexibility in 2020-2025 would cost around

[2] Completing plans for generating the renewable electricity needed to reach net-zero climate emissions was one of the 12 key recommendations by the Scottish Climate Emergency Response Group: https://www.energysavingtrust.org.uk/about-us/news/twelve-point-plan-tackle-scotlands-climate-emergency#targetText=On%20Monday%2026%20August%202019,around%20the%20world%20%5B2%5D.
[3] https://www.theccc.org.uk/publication/net-zero-technical-report/
[4] https://www.theccc.org.uk/wp-content/uploads/2019/12/Reducing-emissions-in-Scotland-2019-Progress-Report-to-Parliament-CCC.pdf
[5] https://www.theccc.org.uk/publication/net-zero-technical-report/
[6] https://www.gov.scot/publications/vision-scotlands-electricity-gas-networks-2030/
[7] More information on ancillary services can be found here: https://www.drax.com/energy-policy/maintaining-electricity-grid-stability-during-rapid-decarbonisation/
[8] https://www.nationalgrideso.com/document/133836/download
[9] https://electricinsights.co.uk/#/reports/report-2019-q3/detail/what-next?&_k=bpo44m
[10] Imperial College and NERA. Value of flexibility in a decarbonised grid and system externalities of low-carbon generation technologies.

£9bn by 2050[11]. Similarly, investment in energy storage could lead to cost savings of up to £7 billion/year by 2030[12]. Given that deployment of intermittent renewables is particularly high in Scotland it can be assumed that a significant level of these savings could be made on the Scottish power system through sufficient storage deployment.

Pumped storage stands out as a key technology that can deliver storage at scale as well as a host of ancillary services which the grid requires to operate in a safe and effective way. The deployment of this technology is of particular interest to Scotland as its geography allows for considerable potential for deployment.

The case for pumped storage

As highlighted by the Scottish Government, 'electricity storage is [an] important source of flexibility as it will allow us to maximise the amount of renewable electricity we generate and deploy it when it is most needed'[13]. In December 2019, Scotland has 764 MW of storage available, the vast majority of this from pumped hydro plants including Cruachan which alone provides 440 MW.

As a proven large-scale flexible technology, pumped storage hydro can provide large amounts of highly flexible capacity that can improve the reliability of power systems at the least cost to consumers. Pumped storage provides a number of important benefits:

1. **Provision of grid support services**: pumped storage performs just as well as traditional thermal sources when it comes to the provision of critical ancillary services[14]. In recognition of the value of these services, National Grid ESO awarded Cruachan Pumped Storage Hydro Power Station a six year contract to help maintain secure supplies.
2. **Energy storage at scale**: pumped storage is the only technology currently available that can provide storage at scale. It dominates the UK and global storage stock[15]. Scotland is particularly well placed for the deployment of pumped storage hydro[16].There are therefore distinct advantages to maximising opportunities for the deployment of this technology, particularly for rural areas.
3. **Reduced costs for consumers:** the deployment of storage, including pumped storage, will reduce the need for the System Operator to curtail wind generation as it is able to provide both significant storage capacity and a range of system support services. This will allow the continued rollout of intermittent renewable generation in Scotland whilst reducing the costs of such a rollout for consumers[17]. At the moment, in order to compensate for lost revenue, the System Operator provides wind generators with constraint payments, which are ultimately funded through consumer energy bills.

UK and Scottish government support will be required for Scotland to realise the UK-wide decarbonization and economic benefits of pumped storage[18] but there remains a significant policy gap preventing their construction. NPF4 is an important opportunity to identify pumped storage development as a key ingredient for Scotland's pathway to net zero.

Cruachan 2: a Second Cruachan Pumped Storage Hydro Station

Cruachan Power Station in Argyll is one of the UK's four pumped storage hydro facilities. Located within Ben Cruachan, the power station can produce enough power for close to 900,000 households at times of peak demand – going from

[11] https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-Technical-Annex-Integrating-variable-renewables.pdf
[12] https://prod-drupal-files.storage.googleapis.com/documents/resource/public/Energy%20Storage%20Report%20-%20Can%20Storage%20Help%20Reduce%20The%20Cost%20Of%20A%20Future%20UK%20Electricity%20System%20-%20REPORT.pdf
[13] https://www.gov.scot/publications/scottish-energy-statistics-hub-index/
[14] More information on ancillary services can be found here: https://www.drax.com/energy-policy/maintaining-electricity-grid-stability-during-rapid-decarbonisation/
[15] Energising Britain, 2018: https://www.drax.com/wp-content/uploads/2018/12/Energising-Britain-Drax-Imperial-E4Tech-Full-Report-Nov-2018.pdf
[16] https://www.scottishrenewables.com/publications/benefits-pumped-storage-hydro-uk/
[17] https://www.telegraph.co.uk/news/2018/01/08/wind-farms-paid-100m-switch-power/; https://www.nationalgrideso.com/document/121151/download
[18] UK Government support is required to ensure that the right investment framework is in place to support flexibility and storage. In February 2020, EnergyUK recommended that to avoid the cost to consumers and to develop markets in the early 2020s, appropriate, clear, and stable market mechanisms need to be established now to enable the investment case to develop (https://www.energy-uk.org.uk/files/docs/Research%20and%20reports/DeliveringthepotentialofFlexibility.pdf).

rest to full load in as little as two minutes, whereas gas or nuclear stations would take many tens of minutes or hours to reach such capacity. It provides significant system support and storage services to the GB power system as well as a wealth of benefits to the local rural community.

We are in the process of exploring the possibility of developing a second pumped storage asset at the Cruachan site (Cruachan 2). Cruachan 2 would provide further storage and system support services allowing for greater penetration of intermittent renewables at the least cost to the end consumer and it would help reduce reliance on fossil fuelled generation at times of low wind or solar generation. There would be a need to employ local workers during the construction phase and as the project transitions into the operational phase additional high-quality full-time jobs would be created at the site. It is envisaged that an additional 600 jobs would be created during the peak of construction activities. Based on preliminary estimates, project investment is placed at around £400 million.

NPF3 identified Cruachan 2 as a nationally important infrastructure development for Scotland. It would be in line with Scotland's net zero commitments to retain Cruachan 2 as national development in NPF4. The construction of a pumped storage power station is a highly capital-intensive investment, heavy infrastructure project which requires long build times and needs extended periods of revenue recovery. Despite the importance of large-scale storage, current policy frameworks make investing in these assets challenging as the value of storage is not well articulated or recognised[19]. An explicit reference to Cruachan 2 in NPF4 would provide certainty around the Scottish Government's support for the project.

[19] http://www.ili-energy.com/case-for-psh/discussion-paper/?page=1