

Winter Outlook

2022 - 23



mutualenergy 

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working for consumers

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Executive summary

Gas supplies

100% of NI’s natural gas requirements are sourced from the GB National Transmission System (NTS) and associated GB wholesale trading markets. We therefore look to National Grid’s **Winter Outlook**¹ to inform our thoughts on the availability of the base commodity in the National Transmission System at Moffat.

Whilst the supply issues across Europe as a result of the Russian invasion of Ukraine could pose a higher potential than is normally the case for gas supply shortfalls in GB which could in turn impact NI this winter, this still remains an unlikely scenario. GB – and by extension Northern Ireland – has diverse supplies of natural gas from the UK Continental Shelf (UKCS) and Norway, with liquified natural gas (LNG), GB gas storage and interconnection with Europe providing flexibility to meet demand.

The **NGESO Electricity Winter Outlook**² does consider the impact of gas shortfalls in GB on electricity generation. Their worst-case scenario assumes limited gas availability for their combined-cycle gas turbines (CCGTs). Assessing the impact of that on gas supplies at Moffat, we estimate this would equate to a request for us to cutback approximately 15% of our total flow on a typical day. This would only impact a manageable proportion of gas supplies to NI for power generation. The protocols to deal with this (with the electrical system operator SONI and the generators using back up supplies of fuel) are in place and have been tested rigorously. Even so, the expectation is that these protocols are unlikely to be required over the coming winter.

NI gas transmission system capability



To transport our natural gas from GB, we rely upon the NTS, the GNI pipelines and Beattock gas compression facilities in Scotland, and the NI gas transmission network itself, comprising MEL’s Scotland to Northern Ireland pipeline (SNIP) and GNI’s South-North pipeline (SNP) fed from Twynholm and Gormanston respectively.

The outlook for the operation of the Scotland pipelines and compressors is good – pressures this winter are expected to be similar to previous years.

¹ <https://www.nationalgrid.com/gas-transmission/document/140921/download>

² <https://www.nationalgrideso.com/research-publications/winter-outlook>

As such, we expect no issues transporting up to NI's contractual limit of 8.08mscm/day via Moffat and being able to deliver this to the extremities of the NI system at useful operational pressure.

As noted below, and in much more detail in the **2022 NI Gas Capacity Statement**³, a combination of high gas demand for power generation and heat could push the peak daily capacity close to the 8.08mscm/day limit and require the use of NI's second supply point at Gormanston. This would require several extreme scenarios to align, and the analysis takes no account of potential demand suppression due to current high gas prices. However, systems are in place to manage the introduction of commercial gas flow through Gormanston and the SNP if required.

Moyle HVDC operations

High levels of availability and reliability of the Moyle electricity interconnector put downward pressure on electricity prices and provide the electricity system operators with functionality which greatly assists the efficient operation of the electricity systems and provides security of supply. Whilst the technical capability of the interconnector to import and export power is 500MW, the available firm capacity for this winter is 450MW from GB to NI and 400MW from NI to GB. Those constraints applied to ensure stable operation of the wider NI electricity transmission network. SONI are currently considering the possibility of enabling import into NI historically limited to 450MW up to 500MW.

Through 2022 we completely refurbished Moyle's complex control system. We are one of the first interconnectors to have undertaken the refurbishment in parallel with maximising the availability and reliability of the aged system being replaced, an extremely complex undertaking. And whilst we are very proud of the success of the project, now having two months of highly reliable operation under our belt, we remain cautious and will be continuing to monitor the system performance closely throughout the winter, when it becomes increasingly relied upon.

Winter challenges

Our control rooms monitor the conditions of the gas transmission system and Moyle Interconnector 24/7 and we have technicians on standby, attentive to respond to plant issues and emergencies. The response to site can be more challenging in extreme weather conditions but through careful planning we consider ourselves to be as well prepared as we can proportionally invest to be. We expect to maintain our high levels of responsiveness to the interconnectors and the highest levels of availability of these strategic assets for NI throughout whatever challenging weather this winter bestows upon us.

³ <https://gmo-ni.com/assets/documents/NIGCS-2022-23-to-2031-32-FINAL.pdf>

Long-term weather outlook

After a long run of mild winters lasting through much of the 1990s and 2000s, a run of colder winters started in 2008-09 and finished in 2012-13. Since then, they have been mainly mild, although 2020-21 was slightly colder than average across the UK as a whole.

Late February 2018 brought a spell of severe wintry weather dubbed the Beast from the East. Prior to that, December 2010 was the first calendar month since February 1986 to record a sub-zero Central England Temperature (CET).

Most long-term prediction modelling favours this winter being dominated with long periods of relatively mild, wet and windy conditions. Long range forecasting is still quite unreliable, and, as Beast to the East proved, a sudden cold spell can still appear in a relatively mild overall winter. As such we prepare for the worst.

The 'perfect storm' for our simultaneous gas and electricity interconnector operation would be a sudden cold snap with no wind and as a result high use of gas fired power generation in lieu of wind generation. These weather conditions tend to arise during prolonged period of high meteorological pressure over northern Europe bringing low temperatures and low wind. Our gas and electricity interconnectors will both be importing heavily, and their availability and reliability will be paramount.

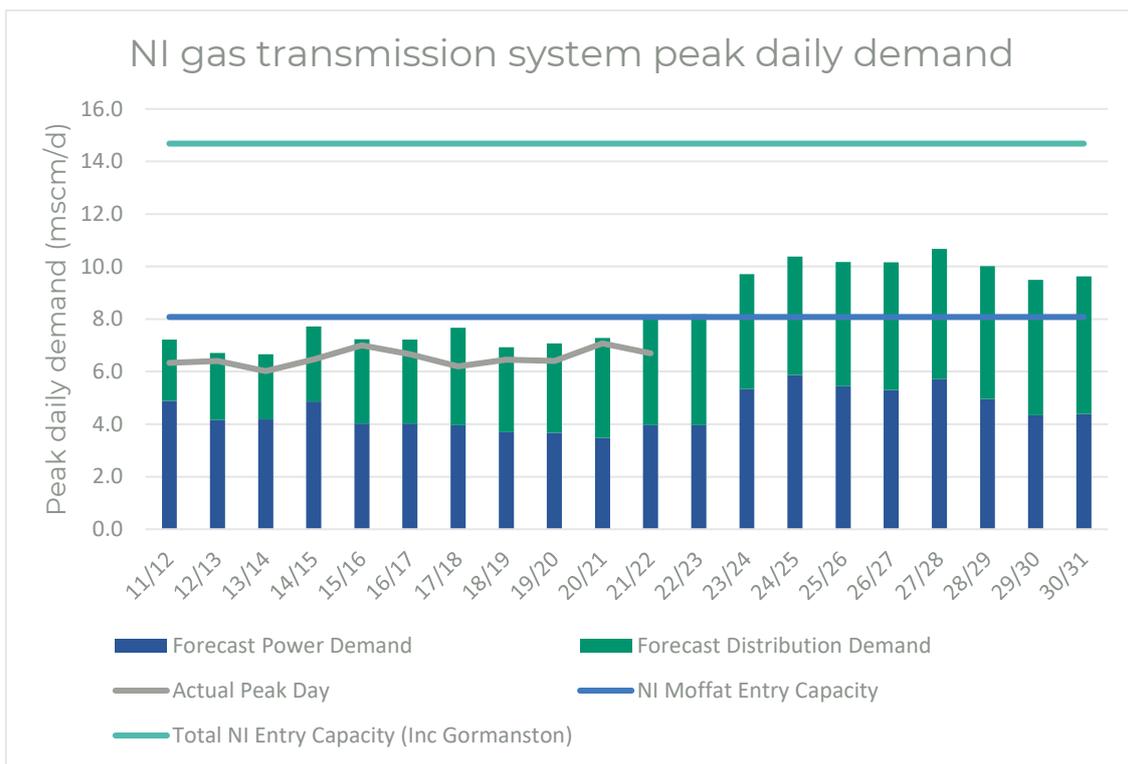
Gas operations

Forecast peak daily demand

Figures from the Northern Ireland Gas Capacity Statement indicate that a severe winter peak day for this winter could be 9.6mscm/d. For this to occur would require all of NI’s gas fired power generation units to be dispatched at peak (4.0mscm/d), coinciding with extremely cold weather conditions which would have all NI gas distribution network operators incur their peak one-in-twenty demand (5.6mscm/d). Whilst possible, such a coincidence of peaks in both sectors is highly unlikely. Looking at the historic actual peak day demands against what was forecasted, graph below, we believe there is a much better correlation between the peak power, as forecast in the NIGCS, and ‘average winter’ peak forecasts for distribution.

The grey line represents the actual peak day demand, noting the highest ever peak day demand for NI has been 7.1 mscm/d in January 2021.

Taking into account diversity (the fact that it is unlikely that power and distribution sectors will have their absolute peaks on the same day) and the historic trends, we believe the ‘average winter’ peak day of 8.2mscm/d is a more credible peak to prepare for rather than the 9.6mscm/d ‘severe winter’ peak day.



Demand of 8.08mscm/day can be supplied through the Moffat entry point. Demand exceeding 8.08mscm/d will be supplied via the South North entry point.

The figures in the NIGCS were forecast and supplied in Q2 2022. An emerging trend with all gas distribution operators in GB/Ireland is that gas use for heating and industrial and commercial consumers does appear to be lower due to high and volatile gas prices. Some figures suggest distribution demand could be suppressed by as much as 10-20% by comparison to previous October periods, albeit October has been much milder than average. It is therefore difficult to conclude the

proportion of reduction caused by milder conditions or price. It is also difficult to predict whether suppression will have an influence on the extremely cold days such as those where we predict a possible 8.2mscm/day total.

Balancing supply and demand

As a gas transmission system operator (TSO) we operate the NI gas transmission network so as to balance the supply into the system and the demand coming out, on a daily basis, with the target of maintaining an optimum level of stock (known as linepack) to accommodate:

- pressure losses caused by transporting the gas over long distances, and
- the fact that whilst demand varies through the day, typically two peaks in the morning and evening, supply is steady.

In the peak winter days especially, to match supply and demand and maintain a system balance requires:

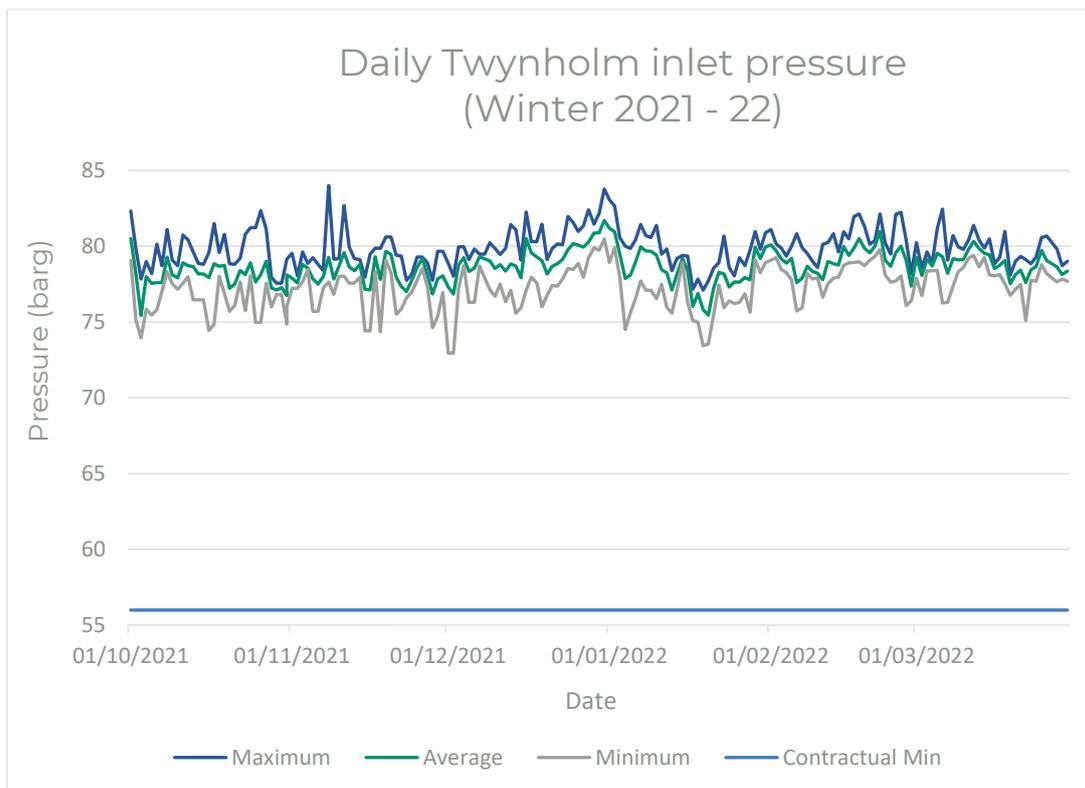
1. Sufficient gas supply to meet demand in the Great Britain National Transmission System,
2. The high availability and reliability of the Southwest Scotland Operating System (SWSOS), the infrastructure NI shares with GNI, to deliver healthy pressures (above 70bar) at the inlet to the NI system at Twynholm, and
3. Network users (Shippers) signalling what supply they require (nominations) in as accurate and timely a manner as is possible as situations change within the day.

GB National Transmission System

National Grid UK predict sufficient gas availability from a variety of supply sources to meet GB winter 2022/23 demand. Supplies from the UK Continental Shelf and from Norway are expected to be high. National Grid do not anticipate any disruption to gas supplies at the Moffat Entry Point.

GNI(UK) and operation of SWSOS

We note commentary within the 2022 NI Gas Capacity Statement referring to the historic pressure at Twynholm through winter 2020/21. The daily minimum average hourly Twynholm inlet pressure through the winter months of 2021/22 ranged from 72.9 – 80.4 barg, with the average being 77.1 barg.



These pressures could reduce in future years as a combination of increased peak day demand on the SWSOS system (growth in use of gas for power generation on the Island of Ireland and decline in use of indigenous supply to RoI from Corrib) and environmental operational reasons. However, similar pressures as to winter 21/22 above are expected this winter, and would be adequate, albeit we understand that such pressure is always susceptible to reliable operation of Beattock compressor station and higher flows in the Scottish pipeline system.

Network code and operational procedures

The **NI Network Transmission Code** is the commercial framework that encourages all network users to put sufficient gas supplies into the NI Transmission system at Moffat to match the demand they are taking out in NI and maintain system balance.

We have operational procedures (**NI Joint Balancing Procedures**) to buy or sell gas if the NI gas transmission system gets out of balance. This winter, because it is more efficient to do so, balancing gas purchases by the TSO's will be enacted at Moffat first. If balancing gas cannot be supplied via Moffat, either because the daily capacity of 8.08mscm/d at Moffat has been broached, or if system pressures at Twynholm are unfavourable, balancing gas can then be supplied by the South North entry point. These secondary arrangements have been available for several winters and the TSO's see them as a positive fallback position.



If we cannot maintain system balance utilising the balancing arrangements, a tertiary operational safeguard, demand side response, could be enacted. Capacity Shortfall (or Flip-Flop) arrangements exist within the NI Network Gas Transmission Code which enable the operators to request SONI to instruct power generation units using natural gas to switch to alternative fuels.

Primary balancing is enacted routinely, all year round. To date, secondary balancing and capacity shortfall arrangements have never been required, but they are routinely tested.

In summary, peak gas demand is approaching the contractual limits of the Moffat entry point. For it to exceed the 8.08mscm/d would take several different scenarios to align.

High demand days bring challenges in operating the system, however the transmission system assets and the systems set up around it are robust for the demands expected through the winter.

Interconnector operations

The Moyle Interconnector links the electricity grids of Northern Ireland and Great Britain through two HVDC undersea cables.

The electricity interconnector flows are determined by the wholesale markets on a half-hourly basis, broadly flowing from the lower price market to the higher priced. The greater the price difference between the two markets and the more capacity available to enable electricity transfer, the greater the effect that the interconnector has providing downward pressure on prices for consumers.

The total installed capacity of Moyle is 500 MW but the transfer capability is constrained by **network limitations** on both sides. The available capacity for winter 2022/23 is expected to be 450 MW from GB to Northern Ireland (import) and 400MW from Northern Ireland to GB (export). SONI are currently considering the possibility of enabling import into NI historically limited to 450MW up to 500MW.

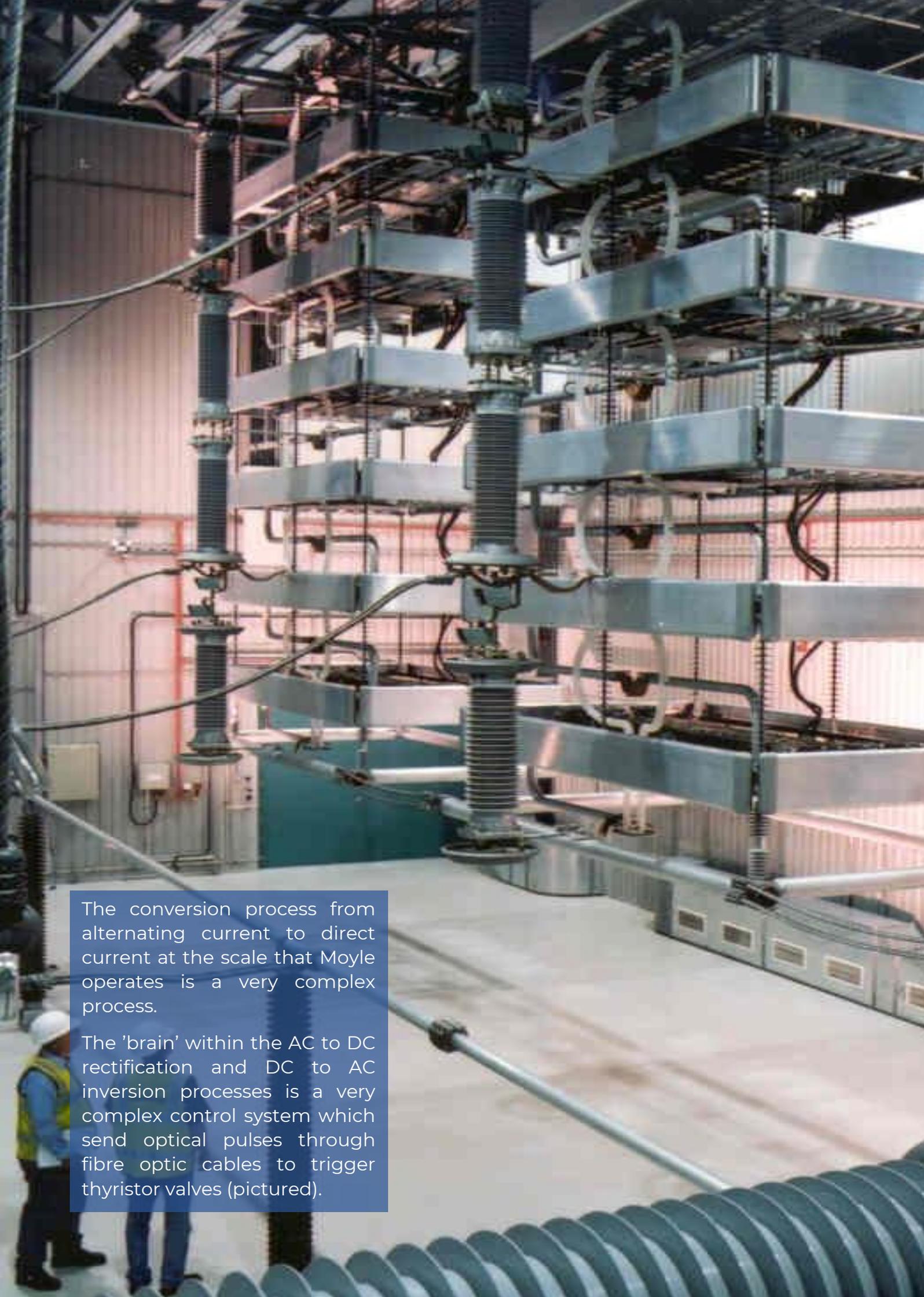
Because power transfers are dictated by the market, we do not have direct control over the levels and direction (import or export) of power flows in the interconnector. From a **security of supply** point of view however, there are commercial and operational protocols in place between the NI system operator SONI, GB operator NGENSO and ourselves which enable the operators to change the physical power flows if either of the respective electricity systems require support.

As well as capacity transfers, the interconnector provides the TSOs with **frequency support** for their respective systems. If, for example, a large electrical generator trips and frequency in the electrical network falls below a certain trigger level, the interconnector can react almost instantaneously to inject (or remove) significant amounts of power in support.

The higher the availability and reliability of the interconnector therefore, the greater the commercial and physical benefit that can be brought to the respective Irish and GB electricity systems.

Between 2010 and 2016 Moyle's availability was impacted because of long-term forced outages to repair cable faults caused by a systemic design issue within the submarine cables. Since the issue was addressed, availability has been extremely high, typically above 99.5%. This is well above the international average availability for interconnectors.

However, trips and short forced outages do occur in an unpredictable manner, as with any unit. We have robust maintenance and support arrangements in place and a high level of spares holding, all with the aim of minimising downtime when such trips do occur.



The conversion process from alternating current to direct current at the scale that Moyle operates is a very complex process.

The 'brain' within the AC to DC rectification and DC to AC inversion processes is a very complex control system which send optical pulses through fibre optic cables to trigger thyristor valves (pictured).

Control system upgrade project

For the past four years we have been undertaking the full refurbishment of Moyle's Control System in parallel with maximising the operation and availability of the interconnector to its users (pictured in August 2022). The refurbished control system was successfully tested and commissioned in September 2022. To date, availability has been exceptional, at least on a par with the world-leading levels of availability achieved by the previous reliable, but near obsolete system.

We are, however, still in the early stages of operation of this new control system which will serve interconnector operations for the next 15-20 years, and we are monitoring its performance extremely closely. But with two months of almost flawless operation we are growing in confidence that the interconnector will be available and reliable at its usual high levels through winter 22/23.

Converter stations

Regarding the rest of the converter station plant and equipment, we monitor the system 24/7 and our technicians respond quickly to typical HVDC faults and reliability issues, usually resolving issues and restoring full availability with hours. Whilst unlikely, were any issue to arise with the submarine cable system, it would have a much longer-term negative impact on our availability and the benefits the asset provides.

The two converter stations are designed to cope with temperature extremes beyond anything likely to be encountered in Scotland or Northern Ireland. Therefore, there are no specific actions required to protect the technology within the two converter station sites.

The converter stations are reliant on the availability of the local electricity supply from the NIE Networks and Scottish Power distribution networks on the Scottish and Northern Irish sites. These supplies are via dual 11kV infeeds from the respective distribution networks. These supplies are backed up by diesel generation on each site, with sufficient fuel for five days operation. In extreme storm events, the decision may be taken to man the two stations on a 24/7 basis, in order to effect any switching operations required to secure these auxiliary supplies. Plans are also in place to enable access to the converter stations in extreme weather conditions.

Credits

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