Scottish & Southern Electricity Networks

TRANSMISSION

Why the Pathway to 2030 projects require both onshore and offshore solutions

Introduction

We are regularly asked why our Pathway to 2030 Transmission Network upgrades cannot all be delivered offshore via subsea links. There are a number of factors explaining the need for both onshore and offshore solutions, across Great Britain (GB), to meet UK and Scottish Government energy targets.

Firstly, in their assessment of the upgrades required to the GB Transmission Network to meet the UK Government's 50GW of offshore wind 2030 target, National Grid ESO assessed a number of potential solutions comprising both onshore and offshore schemes.

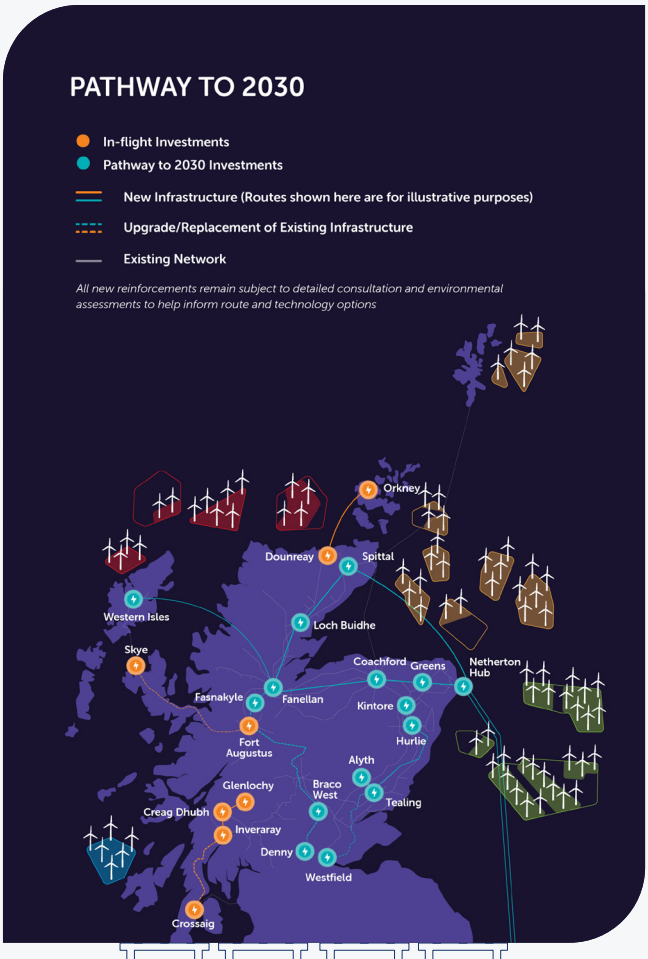
Their Pathway to 2030 Holistic Network Design (HND), which was assessed and recommended as a single integrated GB wide network plan, concluded that a combination of both onshore and offshore schemes is required to transport the volumes of generation necessary to meet 2030 targets to key centres of demand across the country.

As part of the Pathway to 2030, several offshore schemes are being progressed alongside onshore schemes. These include connecting Spittal to Peterhead via a 2GW high voltage direct current (HVDC) subsea link; a 1.8GW subsea HVDC link from the Western Isles, connecting to the Beauly area; and two 2GW subsea HVDC links from Peterhead to England: Eastern Green Link 2 (EGL2), connecting to Drax; and Eastern Green Link 3 (EGL3) connecting to Norfolk.

In addition, the HND set out plans for an Offshore Grid to be developed from north east Scotland to south east England, supplying a further 2GW of capacity on the East Coast of GB utilising offshore transmission assets and subsea cables.

Alongside these reinforcements, there are two 2GW HVDC links planned from the east coast of SP Energy Networks transmission region in central and southern Scotland to England; alongside an Offshore Grid that will transport a further 2GW of capacity from the west coast of SP Energy Network to Wales.

Therefore, a significant proportion of the infrastructure required to transport renewable energy from Scotland to areas of demand further south, which includes around 11GW from the ScotWind leasing round, will be transported subsea.



Key considerations between onshore and offshore technologies

Below are some of the key development and operational considerations between onshore and offshore technologies that have helped inform the planned upgrade of the GB transmission network and the ESO led assessment of the recommended reinforcements that are now being taken forward.

The marine environment

Subsea cables present many technical and marine environment challenges. There are significant constraints in the marine environment that can limit the amount of infrastructure that can be placed subsea. This includes the identification of suitable installation routes on the seabed.; navigating around existing and planned offshore windfarms and oil and gas infrastructure; crossing existing and planned cables and pipelines; as well as potential impacts to the marine environment and other legitimate users of the sea, including fisheries, marine life and marine protected areas (MPA). These challenges are similar to those faced by onshore schemes, with both having to assess their impact on their surrounding environments to determine if they are able to be taken forward.

Additional infrastructure requirements

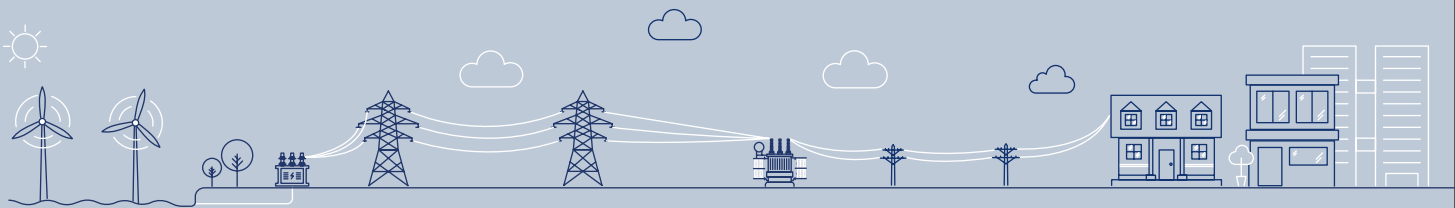
An increase in the number of subsea cable links would require additional infrastructure onshore. HVDC convertor stations would be required at each connection point where onshore generation was connecting, alongside AC substation infrastructure where they connect to the existing Transmission Network. These convert HVDC into AC, which is the voltage type ultimately delivered to homes and businesses, to allow the electricity to be transported across the onshore network to where it is required.

Operational requirements

400kV double circuit overhead lines are capable of carrying over 5GW of electrical power when compared to up to 2GW for subsea cables. To achieve the same capacity carried offshore would require 3 subsea cables to be developed, procured, and delivered to achieve a similar output.

The onshore schemes allow further connection of onshore renewable generation and energy storage developments, including to support local and community decarbonisation ambitions, including the electrification of heat and transport as our electricity usage increases to reflect changing technologies.

These onshore reinforcements will also strengthen network reliability and security of supply for homes and businesses across the north of Scotland.



Economic considerations

To deliver the same capacity transfer of power, the cost of HVDC subsea links and the associated HVDC Converter Stations are estimated to be at least five times that of 400kV onshore reinforcements over the lifetime of assets. We are required by our Transmission Licence to balance making efficient, coordinated and economical investments which are as affordable as possible to bill payers.

Restoring power in the event of a fault

Offshore cables are more difficult to maintain and fix in the event of a fault. Should a subsea cable fault, then the return to service time could be expected to be in the region of weeks or months, compared to a far shorter time for onshore options. During this time, significant amounts of energy would be constrained on the network, risking network reliability and security of supply. Should the limited number of specialist vessels that can undertake these repairs be deployed elsewhere globally, repairs could be delayed, potentially by several months, until a vessel becomes available.

Delivery requirements to meet 2030 targets

As set out in the UK Government's British Energy Security Strategy, there is an urgent need to reduce the country's dependence on and price exposure to volatile movements in global wholesale gas prices, as experienced following Russia's invasion of Ukraine and the energy crisis this triggered across Europe.

As the HND was assessed and recommended as a single integrated GB wide network plan to meet 2030 targets, reassessing these recommendations is not an option if we are to deliver in the timeframes, we have been instructed to meet by Government to deliver energy security and net zero.

In Summary

To successfully deliver the Government's 50GW of offshore wind by 2030 ambition will require a combination of both new onshore and new offshore electricity transmission network being consented and delivered within this decade across the country. The need for both onshore and offshore solutions has been firmly established by the National Grid ESO and SSEN Transmission are committed to working with stakeholders to find the right technology solution for each project which balances technical, operational, environmental and economic factors.