



Scottish & Southern
Electricity Networks

TRANSMISSION

North East 400kV & Eastern Reinforcements

November 2019



Glossary

Conductors and Insulators

Parts attached to steel lattice towers, these usually resemble large discs and can be seen dangling down from a towers arm.

Developer

A person or business that owns a project generating electricity (such as the owner of a large windfarm).

Generators/Drivers

A project that is creating energy, therefore causing the need for work to be done on the Transmission Network (such as a power station).

HVDC

High Voltage Direct Current, this is another way of transporting electricity.

kV

Kilovolts, the volume of electricity being transported.

National Grid

The high voltage electricity power network covering all of the UK.

Overhead Lines

The long metal lines that travel from pylon to pylon.

Steel Lattice Towers

Also known as pylons.

Substations

Structures (varying in size) that allow us to help control the flow of electricity.

Transformers

Equipment used to help us change and manage the voltage of electricity (commonly found inside substations).

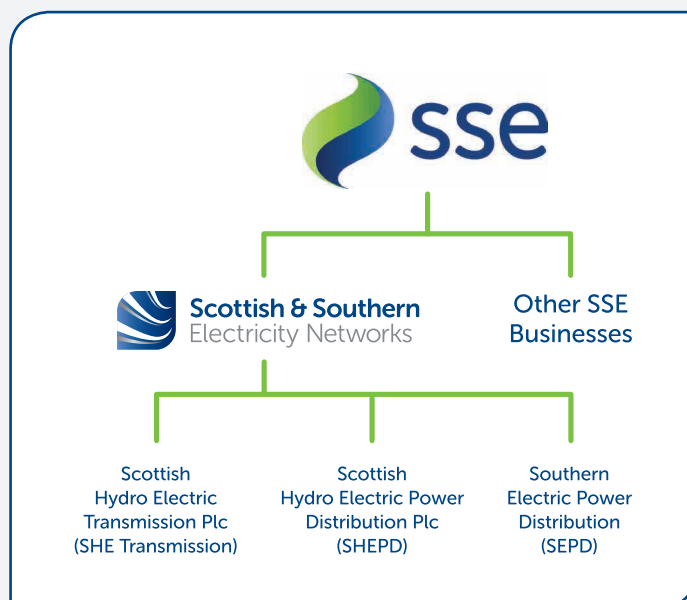
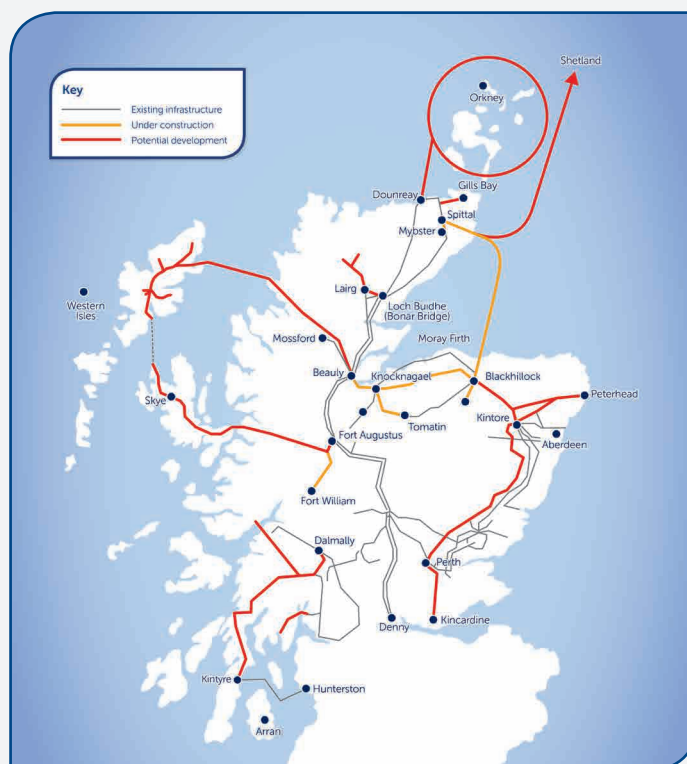
Transmission Network

The infrastructure we own to transport energy across the country.

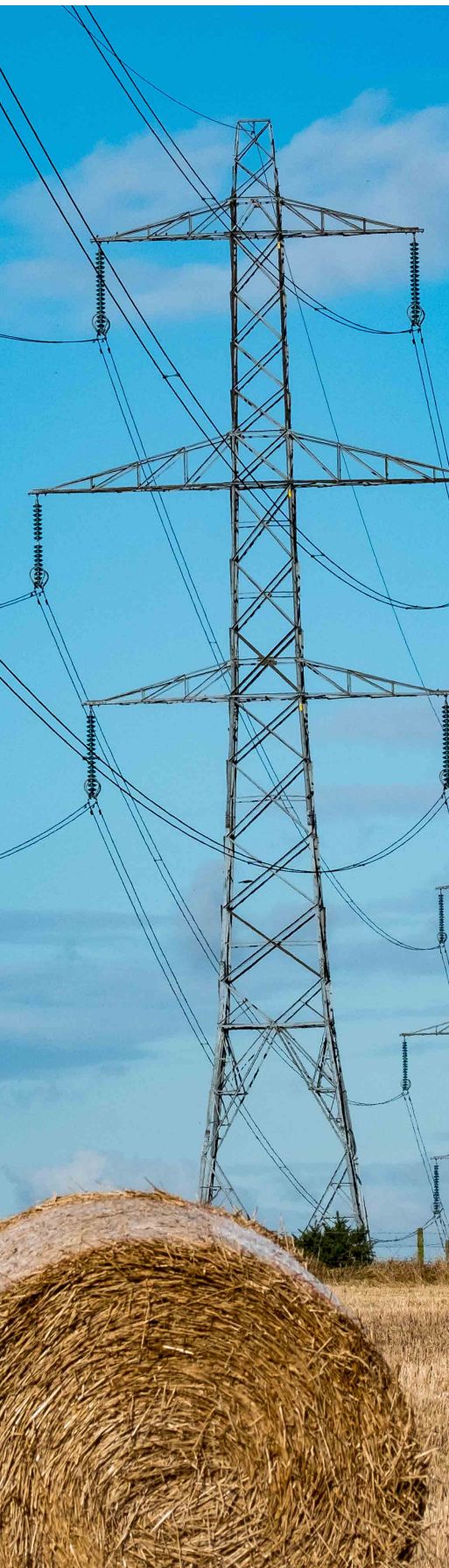
About us

We are Scottish Hydro Electric Transmission (SHE Transmission), part of the SSE Group, responsible for the electricity transmission network in the North of Scotland. We operate under the name of Scottish and Southern Electricity Networks, together with our sister companies, Scottish Hydro Electric Power Distribution (SHEPD) and Southern Electric Power Distribution (SEPD), who operate the lower voltage distribution networks in the North of Scotland and central southern England.

As the Transmission Network Owner we maintain and invest in the high voltage 132kV, 275kV, 400kV and HVDC electricity transmission network in the North of Scotland. Our network consists of underground cables, overhead lines on wooden poles and steel towers, and electricity substations, extending over a quarter of the UK's land mass, crossing some of its most challenging terrain. We power our communities by providing a safe and reliable supply of electricity. We do this by taking the electricity from generators and transporting it at high voltages over long distances through our transmission network for distribution to homes and businesses in villages, towns and cities.



Background



As the Transmission Network Owner for the North of Scotland, Scottish and Southern Electricity Networks (SSEN) is responsible for the maintenance and development of the transmission network in an economic, efficient and coordinated manner. Due to a vast increase in connections of renewable sources of energy in this region, there is now a requirement to upgrade the transmission network to cope with this.

More specifically, the requirement for these projects has been driven by Moray East Offshore Windfarm, Moray West Offshore Windfarm and the North Connect HVDC Interconnector. All these projects are scheduled to be completed by 2024, with the first connection due in 2021.

There is also the need to accommodate an increase in generation capacity at Peterhead Power Station, along with incoming connections from the Caithness- Moray HVDC Link as well as accommodating the current generators already connected to the transmission network. Once completed, these reinforcements will allow for the safe, economic and efficient transfer of power to areas of demand further south, as well as strengthening the local transmission network.

We are proposing a range of projects across the North East and East Coast of Scotland to ensure our network remains fit for purpose. The transmission network currently operates at a maximum voltage of 275kV in these regions, we propose increasing this to 400kV to cope with the increased volumes of electricity being transmitted. Part of this transition from 275kV to 400kV means both the upgrade of existing infrastructure (steel lattice towers, overhead lines, substations) and the installation of new infrastructure.

Our chosen solution

Over the coming decade, we are proposing undertaking several projects to upgrade the transmission network in the North East and East Coast of Scotland.

In the North East we are constructing new substations at Rothienorman, New Deer and Peterhead to facilitate connections to major generators. Tying in with these works, we are proposing to upgrade the existing 275kV Overhead Line (OHL) network in the North East which will increase the operating voltage in this region to 400kV. These works will fall under the umbrella of the North East 400.

Running in parallel with this, in the East Coast, a two-stage approach is being adopted to upgrade the transmission network south of Kintore.

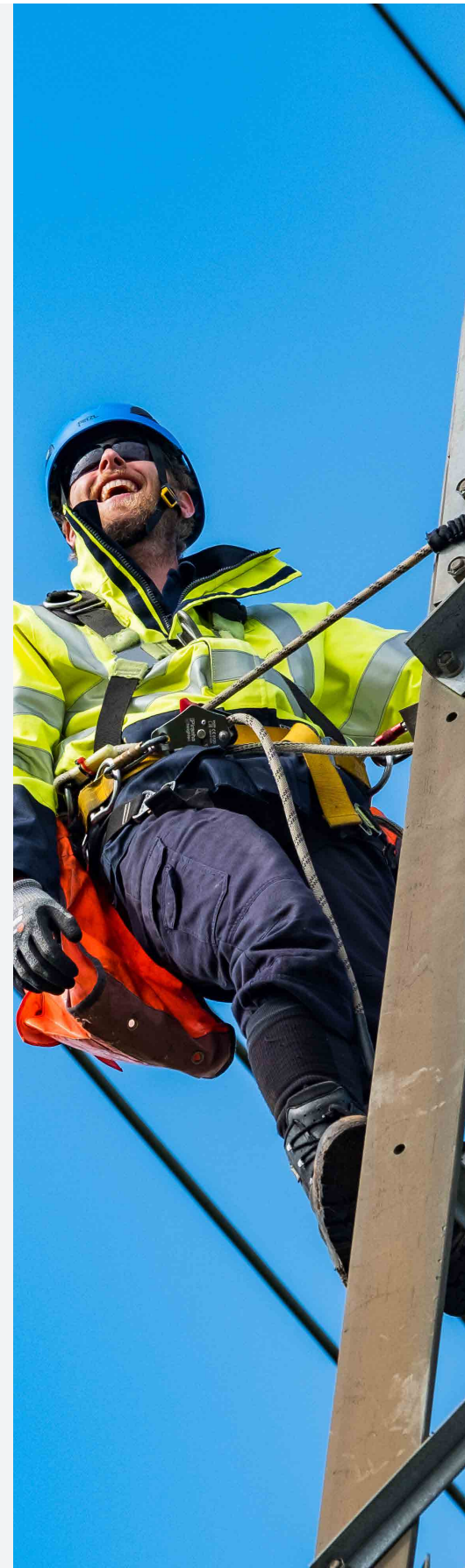
The first suite of projects will fall under the umbrella of the East Coast 275, to be completed in 2023, with the second suite of projects falling under the East Coast 400, to be completed in 2026.

The main advantage of a two-stage approach is that this allows for earlier delivery of increased capacity on the network in this region. This will also help resolve the issue of overloading and congestion on the transmission network.

In addition to this, from 2024, we are also proposing the construction of a new sub-sea High Voltage Direct Current (HVDC) cable from Peterhead to take electricity to centres of demand in England, due for completion in 2029. This project will be called the Eastern HVDC Link.

All of our proposed major reinforcements are assessed annually by the GB System Operator, National Grid, as part of its Networks Options Assessment (NOA). Each year the NOA process will recommended whether a project should go ahead or not. The NOA process is one of the ways in which we ensure that the projects we proceed with are necessary.

The projects being considered and proposed under the North East 400, East Coast 275 and East Coast 400 projects are as follows.



Project list

Project	East Coast 275	East Coast 400	North East 400
Alyth 275/400kV Substation	✓		
Tealing Substation extension	✓		
Kintore 400kV Substation		✓	✓
Transformer Installations		✓	✓
New Deer 275/400kV Substation			✓
Rothienorman 275/400kV Substation			✓
Peterhead 400kV Substation			✓
Overhead line upgrades	✓	✓	✓
Eastern HVDC link			

The table above indicates whether our projects will fall under the East Coast 275, East Coast 400 or North East 400 works.

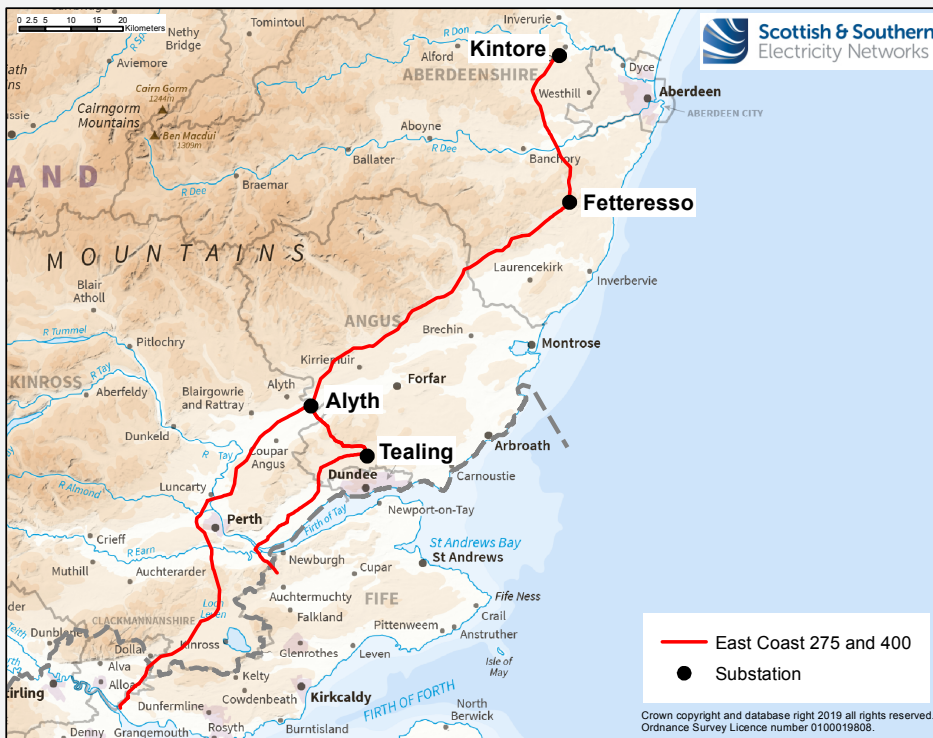
There is the potential that some projects may overlap across both the East Coast 400 and North East 400; therefore, certain projects appear in both columns. As our proposals advance, we will have a clearer definition as to what suite of works the projects will sit within.

The Eastern HVDC link does not directly fall under the East Coast 275, East Coast 400 or North East 400 works and is a stand-alone project. It is however part of the bigger picture of works being carried out within the North East and East Coast of Scotland.

Project locations



The map pictured adjacent indicates the locations of projects associated with the North East 400 and the location of the Eastern HVDC link.



The map pictured adjacent indicates the locations of projects associated with the East Coast 275 and East Coast 400.

The area south of the grey dotted line is where the Transmission Network switches from SSEN to Scottish Power ownership.

Project details



As referenced in the previous table and maps, there are several projects which make up the overall picture of proposed works across the North East and East Coast of Scotland. Below is a summary of what each of these individual projects involve and the need for each project.

There will be a consultation process held for each individual project, this will involve the SSEN team visiting various locations to provide more in-depth information and technical knowledge about each project and how it may impact the local community in each affected area.

Overhead line upgrades



North East 400kV (OHL) Upgrades*

Works Begin – April 2021

Works Completed – October 2023

- The current steel lattice towers (pylons) and the Overhead Lines (OHLs) which they support are currently operating at 275kV. However, during their initial construction, these towers were built with the capability to be upgraded to operate at 400kV. As part of this project we would need to upgrade the OHL network in the North East.
- The OHL network across the North East of Scotland would be reinforced between the following points:
 - Peterhead to Blackhillock (via Rothienorman)
 - Rothienorman to Kintore.
- These works involve replacing existing conductors and insulators on the existing OHL with variants suitable for operation at 400kV. The project will require some new towers at substation sites and to allow temporary diversions, but is otherwise upgrading existing infrastructure.



East Coast Overhead Line (OHL) 275kV Upgrades

Works Begin – April 2021

Works Completed – October 2023

- The current steel lattice towers and the Overhead Lines (OHLs) which they support are currently operating at 275kV. However, during their initial construction, these towers were built with the capability to be upgraded to operate at 400kV. As part of this project we will upgrade the OHL network in the East Coast of Scotland.
- The OHL network on the East Coast will be reinforced between the following points:
 - Alyth – Tealing
 - Kintore – Alyth – Kincardine
 - Tealing – Westfield** – Longannet**
- These works will involve re-profiling the existing conductors, where the lines will effectively be pulled tighter to improve their ground clearance. This is to assist with allowing the conductors to operate at an elevated temperature, hence providing a higher capacity, whilst maintaining required clearance heights. There will be a handover point during upgrade works on the east coast as our network responsibilities transfer across to Scottish Power.

Substation works



Alyth 275/400kV Substation

Works Begin – April 2021

Works Completed – Autumn 2023 (275kV), Autumn 2026 (400kV)

- There is the need to install a new 275kV substation at Alyth to help manage incoming connections between Kincardine, Kintore and Tealing. This project will also assist with the load sharing across those circuits. Without installing this substation, we will not be able to accurately and effectively take electricity from where it is being generated, to where it is needed.



Tealing Substation Extension

Works Begin – May 2021

Works Completed – October 2023

- There is the need to extend the existing substation at Tealing for the installation of two new Phase Shifting Transformers, these Transformers are essential to help us effectively manage the transmission network in this area.



Rothienorman 275/400kV Substation

Works Begin – March 2019

Works Completed – March 2021 (275kV), March 2023 (400kV)

- There is a requirement to build a new substation at Rothienorman to help control the flow of energy across the north east, in particular for generation connecting around Peterhead, and assist with delivering energy south to various centres of demand.
- Rothienorman is at a key location on the current OHL network within the north east of Scotland and as such is a crucial point in which we need to strengthen the transmission network.
- Initially this substation will operate at a voltage of 275kV. However, following the completion of the North East 400kV OHL works, Rothienorman Substation will be upgraded to operate at 400kV.





Kintore Works

Works Begin – 2020

Works Completed – October 2026

- In 2020 we will be installing two new Super Grid Transformers at Kintore. These SGTs will sit outside the footprint of the existing 275kV substation and upon completion of a new proposed 400kV substation, will act as a bridge between both substations.
- We are proposing to construct a new 400kV substation in Leylodge, south-west of Kintore, adjacent to the existing 275kV substation. This is to assist with the increased load on the network, ultimately tying in with works under the North East 400 and East Coast 400 projects. Once constructed, the existing 275kV substation will remain operational.



New Deer 275/400kV Substation

Works Begin – April 2019

Works Completed – April 2021 (275kV), June 2023 (400kV)

- New Deer has been chosen as the preferred location in which key developer Moray Offshore East Windfarm will connect to the National Grid.
- A new substation is currently consented and being constructed by Moray Offshore East in this location, this will be owned and operated by Moray Offshore East.
- SSEN will also have their own substation at the New Deer site, adjacent to the Moray Offshore East Substation.
- As with the Rothienorman Substation, New Deer will originally operate at a voltage of 275kV and then be upgraded to 400kV following the completion of the North East 400kV OHL reinforcement works.



Peterhead 400kV Substation

Works Begin – June 2020

Works Completed – October 2023

- There is a requirement to build a new 400kV substation at Peterhead. In the main, this is to facilitate the incoming North Connect HVDC Interconnector from Norway, but subsequently this will take in a connection from works included in the North East 400 and provide a connecting point for the proposed Eastern HVDC link.

Other projects



Transformer installations

There may be the requirement to install new Transformers as part of the construction process of some substation projects. Transformers allow us to increase and decrease the voltage of electricity when required, this allows delivery of electricity across the transmission network to be much more manageable and efficient.

Transformers vary in size, and in some cases, can require specialist haulage equipment to transport them to site. Our Community Liaison Team will work alongside all local communities that may be affected by the delivery of a Transformer to ensure that any disruption is kept to a minimum.



Eastern HVDC Link

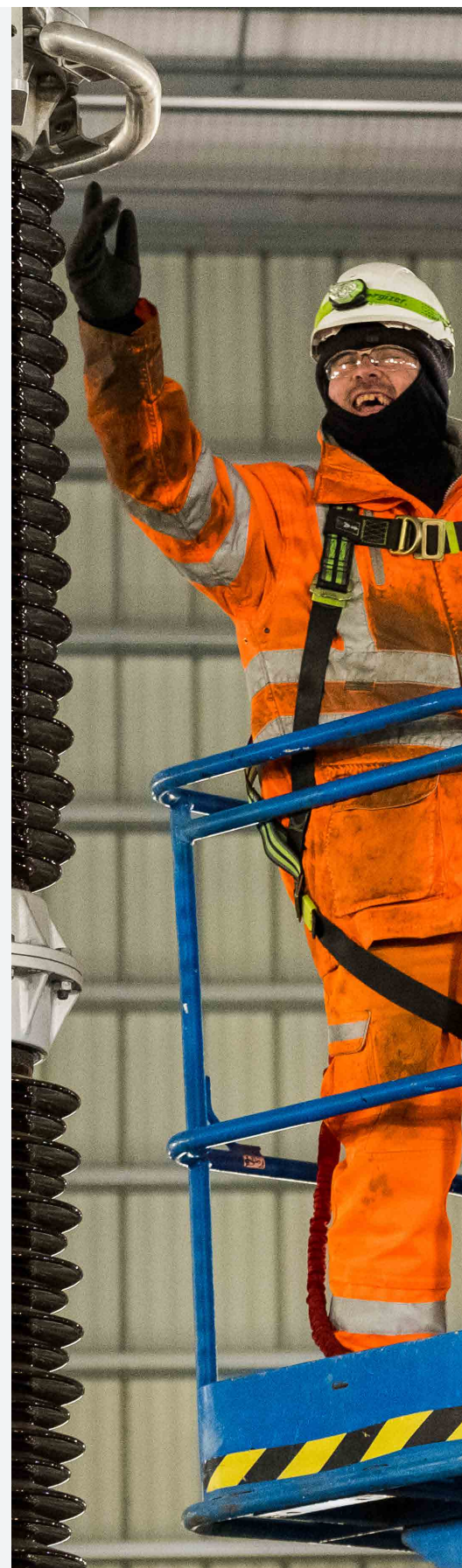
Works Begin – 2024

Works Completed – 2029

In addition to the above projects, there are also plans in place to install a subsea HVDC cable running from Peterhead to Drax in England. This is to further assist with reducing congestion on the on-shore transmission network, by allowing the flow of energy to England via this sub-sea cable.

As mentioned earlier, there is a huge amount of incoming generation connecting into the North East and East Coast of Scotland. In addition to the key drivers of Moray Offshore East, Moray Offshore West and the North Connect HVDC Interconnector, there are also incoming connection requests from the Firth of Forth wind farm, Caithness - Moray HVDC link and from Spittal wind farm to Blackhillock substation. This is in addition to pre-existing connections already on the Transmission Network.

All of this means that there is a real need to alleviate congestion on the current transmission network. The introduction of this cable alongside the reinforcement of the on-shore network in this region to operate at 400kV will greatly assist with this.



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If you have any questions or queries on projects in this booklet, or if you would like more detailed information regarding project details then please get in touch with our Community Liaison Manager, Gary Donlin:



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