Scottish & Southern Electricity Networks
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Project Overview

We're leading some exciting projects to power change in the UK and Scotland. To support the delivery of 2030 offshore wind targets set by the UK and Scottish Governments, and to power local communities, we need to upgrade our existing network. In some key areas, we need to develop entirely new infrastructure, and quickly.

Fanellan 400kV substation and converter station

The proposed new Fanellan substation and converter station is a strategic development which is required in the Beauly area.

It will provide connections for the Western Isles Connection project, the Beauly to Peterhead 400kV and the Spittal to Beauly 400kV overhead line projects. In addition, a section of the existing Beauly–Denny overhead line near Fanellan will initially be diverted around the new 400kV substation and converter station and will tie-in to the substation.

It will provide connections for:

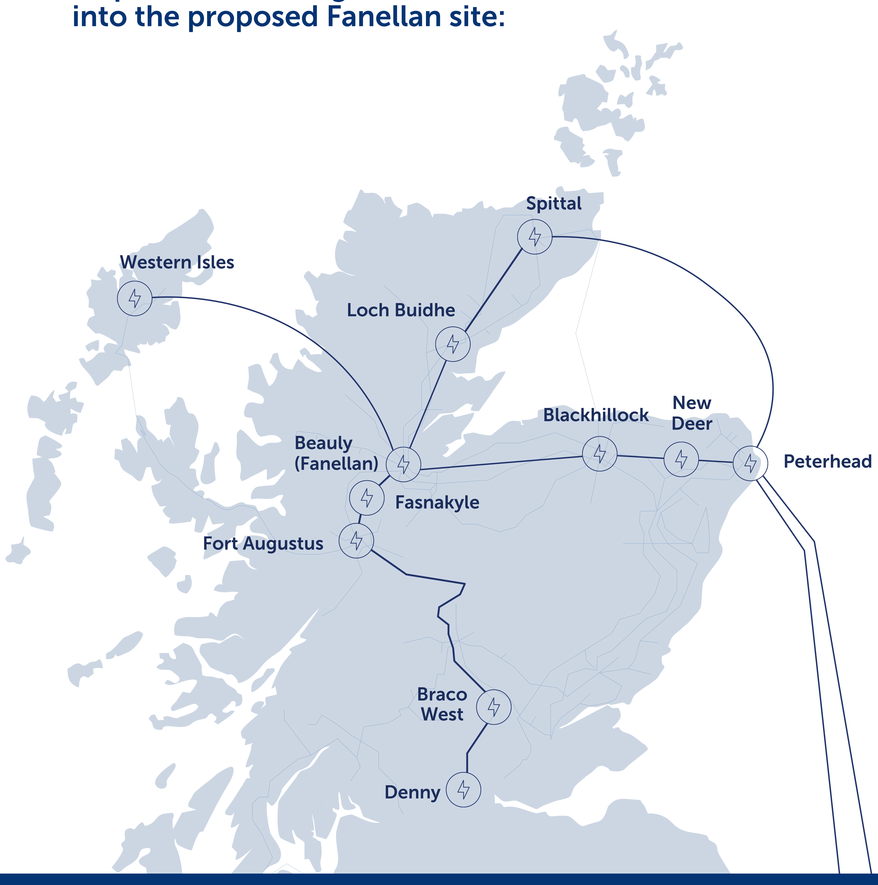
- New Spittal–Loch Buidhe–Beauly 400kV overhead line
- New Beauly–Blackhillock–New Deer–Peterhead 400kV project
- New Western Isles link connection into the HVDC converter station

A joint solution

Following extensive studies and assessments of alternative sites it was concluded that the optimum solution was to locate both new installations on a single larger site rather than two separate sites.

The advantages are the avoidance of lengthy AC (Alternating Current) connecting cables and reduced visual impact from co-locating this new infrastructure in one location.

Map below showing new connections into the proposed Fanellan site:



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Project elements for the substation

What is a substation?

An essential component in the energy network, substations connect sources of generation, such as wind farms and power stations. They connect overhead and underground circuits and can connect nearby utility systems. Substations manage electricity flows within the network, which can include connection and disconnection of circuits to direct the flow, transform voltages to higher or lower ratings (step-up or step-down—for example 275kV stepping-up to 400kV), manage the frequency of the electricity and increase efficiency and reliability of the power supply.

Other key substation functions

Substations are critical in maintaining an efficient and healthy energy network, as they monitor and report back to operators on statistics and events to provide live information on our network. This allows for the following functions:

- Fault monitoring and identification which allows for isolation to protect the network and allow repairs.
- Allow for redirection and disconnection of energy to allow for demand/maintenance.
- Provide data such as voltage, current and power flow to allow for efficient running and future predictions.

Substation project elements

Both the substation and converter station projects will share common access, security arrangements, site drainage and landscaping. A new access point from Fanellan Road, adjacent to the site, will be used to create the required compounds, laydown and storage areas in the initial stages. An additional access road is also being proposed further east of the site, at the main junction, which will eventually be used as the main construction haul road and permanent access. This would then follow the route of the existing Beauly–Denny overhead line into the new Fanellan substation and converter station site to facilitate heavier construction traffic. This will reduce construction traffic on Fanellan Road. Access tracks around the site perimeter are also required to facilitate general maintenance.

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Project elements for the substation

The proposed Fanellan 400kV substation shall comprise:

- The AC substation platform, indicatively 305m x 525m.
- AIS switchgear and busbar, to connect incoming circuits including the HVDC converter station and to facilitate the cable connection from the HVDC converter station.
- Step-down transformers, to provide the site with a Low Voltage Alternating Current (LVAC) supply.
- A control building, indicatively 50m x 25m, maximum height 8m.
- Existing access point from Fanellan Road to be used for construction access, subject to road upgrades.
- Construction of a haul road and longer term permanent access, for heavier load vehicles and to reduce extent of public road use.
- Sustainable Drainage Systems (SuDS) and access for maintenance.
- Temporary access tracks for overhead line construction activities, temporary construction compounds and temporary storage compounds for topsoil and materials (size and location to be agreed).
- Land required on a temporary basis during construction for temporary construction laydown, equipment storage, site offices and welfare facilities.
- Site clearance activities, including some tree felling.

Our consideration of Gas Insulated Switchgear (GIS) at 400kV

An Air Insulated Switchgear (AIS) substation is constructed with switchgear which relies on open air components. This means infrastructure must be positioned with sufficient clearance from other components in order to allow for safe operation and maintenance. This typically takes up a larger area of land than Gas Insulated Switchgear (GIS) which relies on housed components.

Feedback received for the substation was in favour of GIS technology and initially, this was a consideration. Through project design and further study there is a fundamental difference in the GIS technology used at 132kV (such as that being built for the Beauly 132kV project at Wester Balblair) and higher voltages, such as 400kV. It is more straightforward to connect high voltage cables directly to 132kV GIS, this becomes more complex with 400kV GIS, which then necessitates the use of lengths of Gas Insulated Busbar (GIB). Therefore, increasing the size of the substation footprint.

Across Pathway to 2030 projects, GIS will only be progressed at sites where environmental requirements (such as coastal locations) dictate an indoor solution was required. In those cases, the downsides associated with a 400kV AIS substation indoors made GIS more favourable.

Our approach to AIS vs GIS across the whole Pathway to 2030 portfolio in general and at each site including Fanellan, has been presented to Ofgem over recent months; Ofgem agreed with our approach.

Image from March 24 event, updated images will be available at the June events.

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Project elements for the converter station

What is a converter station?

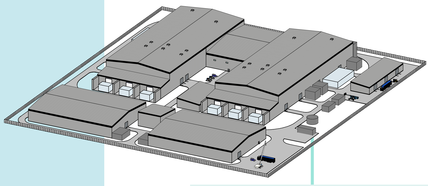
Converter stations change electricity from alternating current (AC) to direct current (DC), or vice versa. Alternating current is used in households, whereas direct current is used to efficiently transport electricity over long distances, such as via subsea cables, with fewer electrical losses.

HVDC project elements

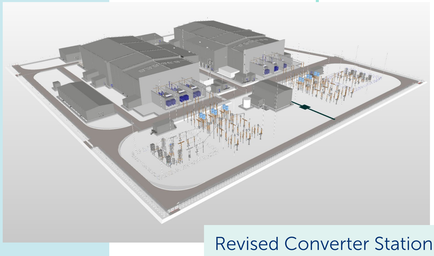
- Two Main Converter Pole Buildings (63m by 123m by 26.4m). Each converter building has an attached service building of dimensions 51m by 17m by 23.2m.
- An Outdoor AC Filter Yard.
- Smaller ancillary and support buildings around the perimeter of the main converter station buildings.
- Underground cable connection from Fanellan to Dundonnell (circa 80km), and subsea cable (circa 80km to Isle of Lewis).

Following the PAC1 events in March our technology provider and building designer have further refined the proposed converter station design. As a result of this work, the following improvements have been made;

- HVDC platform has reduced in area by 16.5%.
- Buildings around the AC filter equipment removed completely.
- The main HVDC converter buildings have reduced by 44%.
- AC filter buildings removed completely.
- The height of the main converter building reduced by 2.5m.



Indicative HVDC Converter Station layout presented at PAC1 (290m x 350m).



Revised Converter Station Layout (244m x 297m).

The 320kV DC 1200MW Blackhillock HVDC converter station.

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What size is the platform?

The total platform size (base of the site) containing both the substation and converter station has been reduced since our public events in March and will be approximately 305m x 837m, which includes a 4m high security fence.

Landscape forms at the front and side of the platform will help to screen the development and there are requirements for SuDs ponds for drainage and Biodiversity Net Gain (BNG) enhancements.

Beauly–Denny 400kV overhead line diversion

The existing Beauly–Denny 400kV overhead line crosses the proposed Fanellan 400kV substation and converter station site.

This overhead line will therefore require a section of diversion to:

- Enable the Fanellan 400kV substation and converter station to be built.
- Facilitate the connection of the Fanellan 400kV substation to the existing Beauly—Denny overhead line. This will enable the connection between the Fanellan substation and the existing Beauly substation at Wester Balblair and the wider electricity network.

The permanent diversion will consist of six towers being installed to divert the existing overhead line around the proposed substation development on the northern side. In total the number of towers will change from 4 (existing overhead line) to 6 (newly diverted overhead line) in order to allow for redirecting the conductors and for the final tie-in to the new site. This results in approximately 1.7km of modified 400kV overhead line.

A temporary diversion will also be needed to allow for replacement of two existing towers. At this stage it is anticipated that the temporary diversion will be to the south of the existing Beauly Denny overhead line between the new Fanellan substation and converter station and Fanellan Road.

There will also be a temporary diversion of the telecoms fibre. Access tracks, temporary compounds and laydown areas will be needed to facilitate construction of the overhead line and these may be shared with the proposed Fanellan substation and converter station to maximise efficiencies and minimise disturbance. The access tracks created will remain permanently for operational use. Drainage will also be shared with the substation and converter station site.

Some tree felling will be needed to accommodate safety clearances for the overhead line diversion. The overhead line diversion and temporary telecoms diversion will not form part of the formal planning application for the Fanellan substation and converter station and will be progressed under a separate consenting regime by the Energy Consents Unit of Scottish Government (telecoms fibre which may be covered by Permitted Development).

As all overhead lines of 132kV and above fall into the relevant regulations, an Environmental Impact Assessment (EIA) screening opinion will be sought from the Energy Consents Unit to confirm whether or not an EIA is required. If our project is deemed non-EIA (due to its scale or potential environmental impacts), a voluntary Environmental Appraisal (EA) may be produced by us to support the consent application.

This assessment would be made publicly available once submitted.

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What has changed?

Following our March consultation events and consideration of feedback received, we've concentrated on refining our Red Line Boundary and added more detail to our proposals.

Creation of the Indicative Red Line Boundary

Through the design development of the project and since the PAC1 event, as temporary land take requirements have been more clearly understood, the project team has reviewed the PAN boundary presented at the PAC1 event and refined it into the indicative red line boundary currently being shared.

This indicative RLB for planning is reduced compared to the PAN Boundary, in the north east and south east sides of the development. As temporary laydown areas are developed we will inform the local residents and the relevant community councils of the details of these requirements.

The HVDC Converter Station

Following the PAC1 event in March our technology provider and building designer have further refined the proposed converter station design. As a result of this work, the following improvements have been made;

- **HVDC platform has reduced in area by 16.5%.**
- **Buildings around the AC filter equipment removed completely.**
- **The main HVDC converter buildings have reduced by 44%.**
- **AC filter buildings removed completely.**
- **The height of the main converter building reduced by 2.5m.**

3D modelling and visualisations

We understand the need for attendees to be able to visualise what the proposals may look like in their local area and have commissioned 3D visualisations which model these into the local landscape.

A fly through video and photomontages will be available to view on the project webpage and copies of the interactive model will be available at our public events, so attendees can see the views of the proposed development from where they request. Through further design refinement, stakeholder feedback and requests from The Highland Council, these may change and will be updated on the project webpage and at future events.

Landscaping and screening

Our independent Landscape Architect has been in dialogue with The Highland Council and working with our design team to inform the design for the landscaping. This has now been further developed to create land forms wrapping around the development to the west, east and south. The landscape forms are included in our 3D model which is available to view at the PAC2 events so youcan see how these landscape forms help to screen the development from different places. Moving forward the Landscape Architect will also develop a planting design to further screen the proposed development.

Further design refinement of the site drainage requirements has also allowed for the rationalisation of the SUDs ponds and we are currently progressing review of options to reduce the number of ponds as well as their locations behind proposed landscape forms.

We have also incorporated indicative felling requirements through Ruttle Wood for the proposed Spittal to Beauly 400kV overhead line into our 3D model at the event.

Reduction in platform size

Following on from feedback and through ongoing design refinement we have reduced the platform size for the substation and converter station from 305m x 875m to 305m x 837m.

To find the 3D flythrough video, scan the QR code or visit the following URL:
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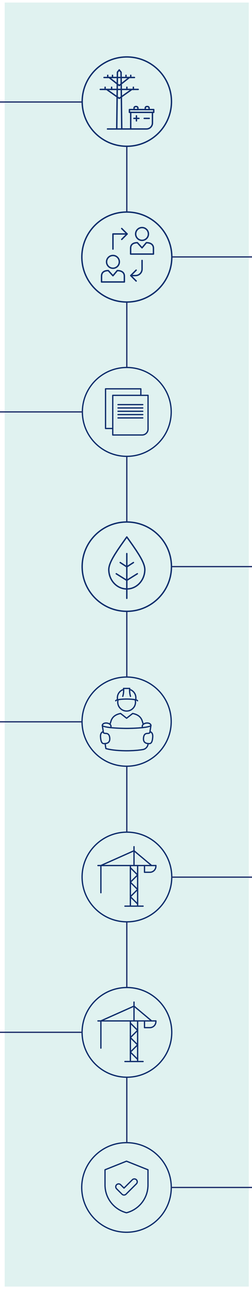
Project timeline

The project programme for the proposed Fanellan substation and converter station together with the Beauly–Denny OHL diversion.



2022
- Projects' need and scopes confirmed
- Site selection for substations and HVDC converter stations started

2023
- Consultation 1 Feb/Mar: substation and converter station site selection
- HVDC onshore cable route and landfalls options appraisal
- Environmental and engineering surveys site selection concluded

2023
- Detailed Design and connections routing
- Report on Consultation
- OHL EIA Screening

2024
- Scoping Environmental Impact Assessment and surveys
- Spring: Pre-Application Consultation 1
- Summer: Pre-Application Consultation 2
- Substation/converter station EIA

2024
- Planning application submitted: substation/converter station
- Section 37 application submitted (Beauly–Denny OHL diversion)

2025
- Receive planning decision
- Discharge of planning conditions
- Construction start (subject to planning consents received)

2026-2029
- Construction works ongoing

2030
- Construction complete
- Commissioning complete

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