Orkney Transmission Connection and Infrastructure Project

Public Consultation Events

Monday 24th September Stromness Community Centre, Stromness 14:00 - 18:00

Tuesday 25th September Cromarty Hall, St Margaret's Hope 14:00 - 18:00

Wednesday 26th September Flotta Community Centre, Flotta 09:30 - 13:30 & NorthWalls Community School, Hoy 16:00 - 19:00

Thursday 27th September Firth Community Centre, Finstown 14:00 - 18:00

Friday 28th September Ayre Hotel, Kirkwall 14:00 - 18:00

Tuesday 2nd October Forss Business & Technology Park, Forss, Thurso 15:00 - 18:00





Who we are

We are Scottish and Southern Electricity Networks, operating under licence as Scottish Hydro Electric Transmission Plc (SHE Transmission) for the transmission of electricity in the north of Scotland.



In total we maintain about 5,000km of overhead lines and underground cables – easily enough to stretch across the Atlantic from John O'Groats all the way to Boston in the USA.

Our network crosses some of the UK's most challenging terrain – including circuits that are buried under the seabed, are located over 750m above sea level and up to 250km long.

The landscape and environment that contribute to the challenges we face also give the area a rich resource for renewable energy generation. There is a high demand to connect from new wind, hydro and marine generators which rely on Scottish and Southern Electricity Networks to provide a physical link between the new sources of power and electricity users. Scottish and Southern Electricity Networks is delivering a major programme of investment to ensure that the network is ready to meet the needs of our customers in the future.

Our responsibilities

We have a licence for the transmission of electricity in the north of Scotland and we are closely regulated by the energy regulator Ofgem.

Our licence stipulates that we must develop and maintain an efficient, co-ordinated and economical system of electricity transmission.

What is the difference between Transmission and Distribution?

Electricity Transmission is the transportation of electricity from generating plants to where it is required at centres of demand. The Electricity Transmission network, or grid, transports electricity at very high voltages through overhead lines, underground cables and subsea cables. The transmission network connects large scale generation, primarily renewables, to central and southern Scotland and the rest of Great Britain. It also helps secure supply by providing reliable connection to the wider network of generation plans.

The Electricity Distribution network is connected into the Transmission network but the voltage is lowered by transformers at electricity substations, and the power is then distributed to homes and businesses through overhead lines or underground cables.

Overview of Transmission Projects





Existing Network in Orkney

There is currently no transmission infrastructure on the Orkney Islands. The electricity network on Orkney is connected via two distribution subsea cables between Rackwick Bay on Hoy, and Murkle Bay near Thurso.

These cables were installed in 1982 and 1998 with a total import/ export capacity of 40MW. Demand on the islands varies between 7MW in summer and 46MW in winter. The current connected embedded generation in Orkney exceeds the capacity of the existing 33kV cables and no further generation can connect to the system at this time.

Why reinforcement is required

The reinforcement is required to provide the necessary capacity to facilitate the requirements of renewable electricity generators across Orkney who are looking to connect to the GB transmission system.

To connect this level of generation, a transmission connection is needed between Orkney and the Scottish mainland.



An alternative and innovative approach

To proceed with a transmission connection first requires regulatory approval from Ofgem, which in turn requires the contracted developers to financially commit to their projects. The current regulatory framework requires capacity to be allocated in chronological order based on respective developers contracted position.

Due to a number of factors over recent years, such as changes in government policy or the readiness and commercial viability of renewable energy projects across Orkney, it has not been possible to proceed with the transmission proposal through the current regulatory process.

To try and overcome this impasse and help Orkney realise its vast renewables potential, we are proposing an alternative approach to allocate the necessary volume of capacity required to underpin the case for the reinforcement.

The Alternative Approach is split into two proposals: the first allocates capacity to those who can demonstrate their readiness to connect; and the second proposal temporarily adjusts the amount of liabilities due by developers for the transmission reinforcement works, removing the sub-sea cable element bringing the liabilities more in line with GB main land developers.

This innovative approach, requires approval from the energy regulator, Ofgem, and the System Operator, National Grid.







Our Proposed Solution

Orkney to Mainland Scotland Transmission connection

In order to provide a transmission connection that will allow new renewable generation to connect, a marine cable linking Mainland Orkney and Mainland Scotland will be required. The new link would provide an additional 220MW of capacity.

The main elements of this projects are as follows:

- A new substation at Finstown;
- An underground cable linking Finstown substation to a cable landing site at Warebeth, west of Stromness;
- A marine cable linking Mainland Orkney and Caithness;
- A new cable route between the Dounreay marine cable landing point and the new substation at Dounreay; and
- A new substation at Dounreay.



Orkney Infrastructure Project

To facilitate the connection of new renewable generation, Orkney will require the construction of new transmission infrastructure. To provide the most efficient and economical solution for the network we are proposing to connect renewable generators to a central point within the Orkney mainland at our proposed main substation location at Finstown. This will maximise the opportunity for generators across Orkney to connect to the transmission network.

The System Operator has accepted several transmission and distribution owner construction offers, to connect various renewable generation developments. To unlock the renewable potential inherent in the Orkney Islands, this infrastructure project would need to be undertaken.

The aim of the project is to provide a new transmission connection to Orkney and design, construct and install 132kV Transmission infrastructure which will enable access to the electricity network for new generation.

The main components of the project are:

- Construction of a new substation at Doureay
- A Marine cable linking Mainland Scotland and Mainland Orkney
- A new substation at Finstown
- An underground cable linking the cable landing site at Warebeth to Finstown
- Construction and installation of 132kV trident wood pole overhead lines and 132kV cables;
- Installation of 132kV subsea cables;
- Construction and installation of 132kV substation switchgear at each developer's substation and Finstown substation; and
- 2 Switching Stations.

The purpose of this Consultation is to present our final proposals for Finstown Substation, underground cable route from Warebeth to Finstown and all marine elements of the project ahead of applying for planning and marine consents.

As a result of feedback received during our April/May consultation, the extent of local interest in the proposed infrastructure element of the project and potential changes to the contacted generation background, a further round of consultation on these elements will take place in Spring 2019.



Marine Cables

The Orkney HVAC project requires the installation of submarine cables connecting both Orkney to Caithness and between the islands of Orkney. Five subsea cable routes are being considered as part of the project:

- 1. Orkney Mainland to Caithness
- 2. Hoy to Orkney Mainland
- 3. Hoy to Flotta
- 4. Flotta to South Ronaldsay
- 5. Burray to Orkney Mainland

The subsea cable routes are shown in red on the map below.



MV Stril Explorer, Marine Survey Vessel





Marine Survey

To inform the development of these subsea cable routes, extensive marine survey works were undertaken in early 2018. This survey work included the gathering of detailed information on bathymetry, seabed sediments, biological features and wrecks.

This information has been combined with data on other marine factors including fishing, shipping and the suitability of the seabed sediments for cable burial.



Biotope

The Data from the survey Side Scan Sonar (SSS) and The Multi Beam Echo Sounder (MBES) is used to create habitat boundaries which are then checked using cameras and grab samples to create maps of the type and extent of seabed habitats.



Bathymetry

(MBES) is used to create maps of the seabed showing both water depth and texture, along with information on the type of seabed i.e. rock or sand.



Subsea Cable Installation

Each subsea cable route will consider a corridor approximately 200m offshore, and up to 500m wide at landfalls, in which a maximum of two separate cables will be laid.

The installation of the cable can be split into the following campaigns.

- Pre lay survey a detailed survey may be undertaken along the consented corridor;
- 2. Pre lay grapnel run a grapnel will be used to clear any abandoned cables or fishing gear from the route;
- Boulder clearance where boulders cannot be avoided by route refinement boulders will be removed either individually by 'orange peel' grab or on mass using a plough;
- **4.** There are two main options to enable cable burial:
- a). Pre lay trenching a plough is used to create a trench into which the cable is laid prior to the trench being backfilled.
- b). Post lay trenching the cable is laid on the seabed and a plough or jetting tool follows the cable lowering it into the seabed;
- In some areas where the seabed is very hard, i.e. bedrock or where the sediment is very thin, the cable may be protected using rock placement, concrete mattresses or ducting;
- Post installation survey, a detailed survey will be undertaken to confirm the location of the installed cable;
- 7. The cable will be brought ashore either through a pre-installed Horizontal Directional Drilling (HDD) duct or in an open trench which will be backfilled.

Where an HDD is used the cable will emerge onto the seabed up to 1000m offshore.







HVDC cable bundle ducted over a Horse mussel bed



NKT Victoria - cable-laying vessel for Caithness Moray



Footprint and wreckage in Scapa Flow, from one of the recovered vessels from the German Fleet



Cable Route - Warebeth to Finstown

Cable route

A proposed 220kV cable route has been developed from the proposed substation site at Finstown, with a coastal landfall area west of Stromness, near Warebeth.

The route chosen is considered to be most direct and constructible route, aiming to minimise the impact and disruption to the environment, local communities and public road network.

The landfall at Warebeth was chosen as the most appropriate place to land a cable based on the geology and topography, with considerations of the outputs of the marine survey data.

The route was selected following a number of detailed walkovers and taking account of environmental designations, settlements and individual properties and the coastline itself to the south. Where possible, the route has avoided areas of peat and marshland.

Route refinement

After determining the preferred corridor, an overhead LIDAR corridor survey was completed to assist in further micro-siting/refinement.

Discussions with landowners about the route are ongoing, and there may be a need for further route adjustments in some places to accommodate landowner requirements.

Archaeology has been a key consideration for route refinement. A local consultancy, ORCA, have been engaged to provide a desk study and site walkover to inform the process. Known archaeology and new potential sites identified on the walkover have been routed around as far as possible. Some targeted geophysics at Howe of Howe has been undertaken to refine the route in this area. Further archaeological investigation is proposed at Warebeth to ensure that impacts on any previously unknown archaeology during construction are minimised. An archaeology watching brief will be in place during construction to ensure that any unexpected archaeology can be identified and protected.

Drainage

A Water Management Plan will be produced to outline what mitigation is likely to be required along the full cable route to help control surface water and sub surface/land drainage during the main phase of construction works. In advance of construction works a survey of the route will be undertaken to assist in the identification of existing land drainage.

Further engagement with landowners will be needed to identify existing drainage such as field drainage not identified in the survey. Outputs from this survey work will be used to develop and prepare drainage/water management designs for the main works and post construction phases. Measures to manage drainage and surface water run-off during the construction phase will be installed ahead of the main cable laying operations.

Key issues

Watercourses

The largest water crossing of the route is at the Brig O' Waithe which will be crossed by horizontal direction drilling beneath the channel This is to minimise the potential for impacts to the water environment. Other watercourses may also be crossed using directional drilling, again to minimise impacts or some maybe more suitable to open cut crossings.

Otter

Otter are known to be present along parts of the cable route. A pre-construction otter survey will allow for suitable mitigation measures to be put in place during construction, and will identify the need for any licensing from SNH.

Birds

Breeding birds may be present along parts of the route. Surveys have already been undertaken to understand their distribution. Further pre-construction surveys will be carried out, and an Environmental Clerk of Works (ECoW) will be on site during the works to ensure that the construction does not impact on breeding birds.





Installing Underground Cable

Methodology

Cables are generally installed using an open cut technique laid at 1.2m to the top of the cable. A construction corridor of 50m is required to facilitate the main works which will be reinstated after use. Due to the long length of the cable circuit there will be several joint positions evenly spaced along the route with link pillars sited above ground or buried in underground chambers to house the earth connections and fibre optic joint for system monitoring. Horizontal directional drilling techniques will be used for some watercourse crossings, and areas where open cut techniques are challenging or unsafe.

Horizontal Directional Drilling (HDD) methodology

It will be necessary to undertake horizontal directional drilling (HDD) where there are areas presenting engineering difficulty. Dependent on the length of bore to be drilled, the required set-up area for land take to facilitate the drilling operation including material storage can be approximately 100m².

The area is fully reinstated after the drilling operations are complete. The drilling method is for installing underground cables through trenchless techniques. A launch and receive pit is excavated to enable the drilling to begin at the desired trajectory profile. It involves the use of a directional drilling machine, equipment and associated drill attachments, to accurately drill



Open cut trench

along a chosen profile path and back ream to the required diameter for pipe liner to be installed. HDD will be deployed at Warebeth to land the subsea cable. Further HDD's are identified along the proposed route at the river crossings at The Bush, Burn of Sunardee and Muckle Burn of Stenness.

Contractors have been invited to bid and provide tender submissions for the cable design and construction. Tender reviews will be undertaken and contract award planned for early 2019. The Contractors will be required to provide further detail on construction methodology, and on any road improvements that may be required to facilitate the works.



HDD under Construction



Conceptual site layout for HDD



Proposed Finstown Substation

The proposed substation site, located to the West of Finstown village, was selected following a detailed site selection process, which considered environmental, technical and cost aspects of the development, in line with SHET's internal site selection guidance. This was supported by site walkovers, environmental surveys and also considered landscape and visual impact, and supported by consultation with the public and key environmental stakeholders. The potential substation site options were originally presented to the public at a series of events held in November 2017 at various locations in Orkney.

The public were invited to comment on the choice of preferred site. Further design information was presented at a public event held on the 11th July 2018.

This public event was attended by around 55 people, and was an opportunity for the public to ask questions, as well as to provide feedback on the proposed development. Feedback was sought in particular on the visual appearance of the development.



Proposed substation layout

Substation Dimensions:

- Planning application boundary is approximately 33Ha this includes both the finished substation, access tracks, landscaping and drainage, but also all temporary works such as the site compound
- Substation platform area is 5.5Ha this is the operational area
- Substation platform dimensions: 285 x 253m (irregular L-shaped area)
- Substation building heights vary between 5.5m and 14.5m

As technical requirements, landscape and visual impact, and environmental issues have been considered as an integral part of the design process.

These have helped to drive the proposed layout, the location and orientation of the proposed substation platform and of the buildings.



Proposed Finstown Substation

Landscape: aim to minimise adverse landscape effects

- Position the buildings into the side of the hill and create a naturalistic landform to the north and west of the site;
- Design platform levels as low as possible without compromising cut/fill balance, drainage and to avoid creating any risk of flooding within the site.

Visual: aim to minimise adverse visual effects

- Position the site so that as far as practicable the buildings will be seen against a backdrop of hills and limit the buildings significantly changing the <u>horizon;</u>
- Introduce small areas of native planting to increase screening/ filtering of views from closest properties where possible;
- Locate the substation platform to limit any exposed rock cuttings being visible;
- Locate security fencing as far as possible behind landscape landforms to minimise visibility

Biodiversity and other

- Microsite the substation to avoid encroaching into particularly sensitive areas i.e. peat to the south or the better arable fields to the north;
- Areas of planting with native species mix appropriate to location, maximising the potential for habitat creation;
- Introduce limited amounts of native scrub and tree planting;
- Design re-routed drainage channels as natural burns and wetland features;
- Locate the noisier pieces of electrical equipment as far away as possible from the closest houses.

As part of detailed design, and following feedback from Orkney Islands Council, Historic Environment Scotland and Scottish Natural Heritage, architecture and landscape architect design will be considered in detail to ensure that the design is sympathetic to the surrounding landscape and environment, while keeping the design functional.

In particular, building form, colour, and use of local materials will be considered, as well as the construction of landscaping to the north and west of the site, which will help to reduce the apparent height of the taller buildings when viewed from properties, roads and the World Heritage Site to the north and west.

Following the public event in July 2018, the design has continued to progress.

This has included amendments to the proposed access track, in consultation with the landowner. The proposed access track now joins the public carriageway around 200m further west compared to the original proposal.

Further development of the proposed landscaping and architectural detailing, including building colours has also taken place.

What happens next?

The documents and drawings needed to support the planning application are being drafted.

Feedback from stakeholders and the public on the design proposals will be reviewed by the project team, and any necessary amendments and additions will be made in support of the planning submission. A pre-application consultation report will also be submitted as part of the planning application.

The planning application for the proposed Finstown substation is expected to be submitted to Orkney Islands Council in late November 2018.



Dounreay Cable Connection

A cable construction corridor of 50m has been established to facilitate the works in providing safe access and egress for operatives, plant and materials, cut-off drainage, soil stripping and storage, temporary track road, and the main ducting and cabling works.

The 220kV cable will be landed on the foreshore at Dounreay about 800m west of the Vulcan facility. It's anticipated the subsea cable will be installed within a ducted pipe, pre-drilled using horizontal directional drilling (HDD) technique. The overall length of the drill will be approximately 700m-900m. Optimisation of the drilling profile will require further development taking account of cable rating and pulling tensions.

A transition joint bay will be created to join subsea cable to land cable close to the foreshore. The cable will route from the transition bay in a southerly direction across grazing fields then taking an easterly direction towards the new Dounreay West substation. No major crossings have been identified along the route. The cables will be installed in ducts, the ducts will be installed by traditional open-cut trenching techniques.

The ducts are laid at a depth of 1500mm approximately for majority of the full route and reinstated to back to original ground level. With drum weight and pulling tension restrictions due to the overall length of the route it will be necessary to create a mid-point joint bay to join the cables.

Joint bays are excavated to facilitate cable pulls and jointing operation. Cable is installed by setting up the drum carriage at remote ends where cables are pulled in from the opposite end by use of a hydraulic winch in readiness for jointing. Once cables are jointed the bays are reinstated to original ground conditions. Cables will terminate inside the building within the substation at pre-prepared cable termination bay, mounted onto vertical structures.

At Dounreay West, using similar installation methods as the 220kV land cable the 275kV cable will route from the east side of the new Dounreay Substation and terminate into the pre-prepared GIS bay at the existing Dounreay 275kV substation. No joints are anticipated to be installed in the 275kV cable due to the short distance between each substation.

A fibre optic cable(s) will be installed along with the power cores for the full length of the circuit to provide cable protection, control measures and cable performance monitoring.





Overhead Line/Cable Routeing Process

SHE Transmission's approach to identifying where a new overhead power line is to be located follows the four stages illustrated below. This project is currently at Stage 4 - Alignment Selection.



Following confirmation of the proposed route after previous consultation, the first task is to plot a Baseline Alignment which is designed using the following technical engineering factors:

- Environmental design altitude and proximity to coast
- **Topography** terrain, waterbodies and slopes
- Ground conditions peat, rock and flood zones
- Access existing road networks and access tracks
- Existing infrastructure roads, pipelines, properties and wind turbines
- Existing electricity network proximity to existing overhead lines, connectivity and crossings
- **Operational** maintenance, flexibility and fault finding

At each stage in the process, studies are increased in detail and resolution to enable us to determine the best balance of cost, technical and environmental considerations.

This staged process leads to the eventual identification of a proposed alignment to be taken to consent application stage. Consultation with relevant stakeholders is carried out at every stage of the process.

The objective of Stage 4 is to identify a "Preferred Alignment" within the preferred route for further appraisal and consultation. Preferred alignments are typically 30 - 50m wide, although may be narrower or wider in specific locations in response to certain constraints.



The land and environmental teams then systematically evaluate this baseline alignment and identify potential deviations to reduce impacts on the environment, residents and landowners.

These deviations are appraised by engineering, environment, land and the project management teams to select and

agree which options are included in the preferred alignment and why.

The Preferred Alignment is what we are presenting for consultation and represents our best opportunity to achieve an economically viable, technically feasible and environmentally sound alignment for consent application. Following consultation with the public, statutory bodies and landowners the Preferred Alignment will be finalised into the Proposed Alignment for consent application.

This will be presented during the final consultation in Spring 2019.



Consideration of Environmental Effects

The environmental work undertaken to date has included detailed surveys, mapping and assessment of all potential corridors, routes and alignment options, together with identifying key environmental constraints which the Preferred Alignment could impact upon.

Environmental survey work

A range of environmental surveys have been undertaken to provide baseline data to inform the design of the Preferred Alignment. The following surveys have been completed over the past 12 months and are ongoing until March 2019:

- Detailed desk study of the proposed alignment including ecological, water and ground conditions and the proximity of residential receptors;
- Landscape and visual walkover survey by landscape architects;
- Cultural heritage walkover survey by archaeologists;
- Bird surveys for wildfowl, raptors, breeding birds and wintering birds;
- Habitat survey;
- Otter survey; and
- Peat survey.

Key environmental constraints

Whilst all aspects of the environment have been considered, the key environmental constraints that have informed the Preferred Alignment design process are:

- Views from residential properties
- Special Protected Areas (SPA), for birds
- Special Areas of Conservation (SAC), for habitat
- Sites of Special Scientific Interest (SSSI)
- Local Nature Conservation Sites and RSPB Reserves
- National Scenic Area and World Heritage Sites
- Scheduled Monuments
- Listed Buildings
- Peat

The environmental constraints relevant to each section of the Preferred Alignment are included on "The Preferred Alignment" boards.









The Preferred Alignment - North Section

This section shows the preferred alignment between Finstown substation, Westray and Costa Head, which has been developed along the proposed routes. We believe this alignment represents the best balance between economic, technical efficiency, constructability and environmental issues. The key design considerations and decisions are presented below.





The Preferred Alignment - South Section

This section shows the preferred alignment between Finstown substation, Hesta Head and the south of Hoy, which has been developed along the proposed routes. We believe this alignment represents the best balance between economic, technical efficiency, constructability and environmental issues. The key design considerations and decisions are presented below.





Preferred Alignment in Detail (North/South)

Finstown to Ellibister (FE) (North Section)

The Preferred Alignment heading north out of the proposed Finstown substation consists of underground cable for approximately 500 m in order to reduce cumulative visual impact with the substation and avoid setting impacts from the World Heritage Site.

The line passes east of the Scheduled Ancient Monument at Knowes of Trotty to avoid interrupting important views west towards Hoy. Siting the line at the base of the hill also reduces its visibility from the World Heritage Site, reducing setting impacts.

The line passes over the moorland on the south side of the Lyde Road. Work is still ongoing to understand the potential impacts of an overhead line on bird species associated with the Orkney Mainland Moors SPA. The Proposed Alignment will be based on this assessment and consultation with Scottish Natural Heritage (SNH).

Between Lyde and Ellibister switching station the Preferred Alignment passes along the base of the slope outside of designated areas and sites. It is also set back from the coast to avoid interfering in seaward views east from residential properties and the A966. The Preferred Alignment currently passes through a section of the RSPB Reserve at Cottasgarth. Whilst a deviation has been identified, due to its proximity, work is still ongoing to understand the potential impacts of an overhead line on bird species associated with the Reserve. The Proposed Alignment will be based on this assessment and consultation with RSPB and Scottish Natural Heritage (SNH).



Ellibister to Costa Head (EC) (North Section)

The Preferred Alignment heading north from Ellibister switching station runs west of the existing wind farm at Hammars Hill and maintains the required separation distance from potential new turbines. Heading north, the line is sited to minimise impacts on designated sites whilst reducing interference with seaward views east from residential properties. Underground cable is required approaching Costa Head wind farm from the south as the required separation distance between an overhead line and the new wind turbines cannot be achieved.



Ellibister to Rendall (ER) (North Section)

Due to a lack of options, the Preferred Alignment is the most direct line between our switching station and the Westray Tidal Scheme's substation that maintains separation distance from residential properties and avoids designated sites.



Hoxa Head to Rinnigill (HR) (South Section)

Underground cable is selected as the preferred option to cross Flotta. This is because an overhead line would potentially interfere with the safe operation of the airfield. Continuing the cable across the entire island avoids the technical risk of converting from underground cable to overhead line and back to cable again over a relatively short distance as well as reducing the potential for visual and landscape impacts on the many properties on the island.



Hesta Head to Hoxa Head via South Ronaldsay (HS-SH) (South Section)

The Preferred Alignment is selected as the most direct line between the proposed Hesta Head wind farm substation, our South Ronaldsay switching station and the proposed subsea cable connection at Hoxa Head. This alignment also reduces impacts on seaward views to the west, remains on lower ground and minimises the potential for impact on designated sites.



(South Section)

habitat



Preferred Alignment in Detail (South)

Finstown to St Mary's (FS) (South Section)

Heading south from the proposed substation at Finstown, the Preferred Alignment runs south east, over the Hill of Heddle.

There is currently a 50m section of underground cable out of the substation to reduce cumulative visual impact.

Work is ongoing to confirm the full extent of this undergrounding and to minimise the visual impact of the line as it crosses the Sensitive Ridgeline for the World Heritage Site in consultation with Historic Environment Scotland and Orkney Islands Council.

The Preferred Alignment then passes south of Wideford Hill to the north of the Special Protection Area (SPA) for birds and SSSI. Work is ongoing here to understand the potential impact on birds and if the line could move south to enable a straighter line in parallel with the existing line.

The line then crosses the A961 and runs south towards St Mary's. The line runs along the base of the slope, and east of most residential properties to avoid interrupting sea views to the west. Further south the line runs up the hill in response to request from land owners to follow field boundaries.

East of St Marys, a section of underground cable is required for the connection with the subsea cable.

This underground cable section is extended northwards to reduce visual impact on seaward views from the multiple scattered residential properties at Greenwall, Woodstock, Towerhill and Braehead.



St Mary's (SS) to South Ronaldsay (South Section)

Underground cable will continue across Burray from the proposed subsea cable landfall at Bu Sand.

This avoids the technical issues of converting from underground cable to overhead line and back again over a relatively short distance and reduces the potential for visual and landscape impacts.

Underground cable has now been selected as the preferred technical option for crossing Churchill Barrier Number 4 in order to reduce potential visual impacts on the A listed structure and following feedback from previous consultation.

The Preferred Alignment continues southwards to South Ronaldsay switching station through open farmland maintaining separation distance from residential properties. The line is further east from St Margaret's Hope than other considered options and reduces the potential for visual impact on residents and visitors.

Extending the underground cable is technically difficult as it would involve crossing the Flotta pipeline.



Preferred Overhead Line Alignment

132 kV Underground Cable Alignment
220 kV Export Cable Alignment
Cable Landfall Area
Subsea Cable Route
Potential Future Subsea Cable Route*
Finstown Substation Area
Switching Station Search Area
Developer Substation Area

The Preferred Alignment is sited to the north of the Rinnigill peninsula to avoid interrupting views south from residential

Rinnigill to Melsetter (RM)

properties. Heading south from Rinnigill, there are points where the line passes through Internationally and Nationally designated sites (SPA, SAC and SSSI) for birds and

This is done to avoid interrupting views east to North Bay and allow sufficient separation distance behind residential properties. Work is ongoing to understand the potential impact on birds and habitat in this section through consultation with SNH.

The Preferred Alignment then keeps to the west of Melsetter House (a collection of A listed buildings and walled garden) and the most sensitive views from that property.





* This route is being consulted on as part of the marine licence pre-application consultation (PAC). However any associated terrestrial element that may be required will be consulted on separately, should the option be developed further.



Proposed Technology

Overhead Line

The proposed overhead lines will consist of double "Trident" wood pole with a steel crossarm, back stays and 3 vertical insulators.

The lines will be a single circuit construction made up of three wires (conductors) in a at formation with an under running non-metallic wire referred to as an All Dielectric Self Supporting cable (ADSS). This carries fibreoptics to allow the circuits to be protected by providing communication between substations.

The new overhead line will operate at 132kV. The average height is anticipated to be 14m although depending on the lie of the land to terrain, the height may vary between 14m and 17m.

Terminal structure

Five pole arrangement. Two taller poles at the rear supporting and terminating the overhead conductors and three shorter poles supporting the cables.

A steel platform links the front and rear poles which support surge arrestors that protect the cables and substation equipment from lightning. A short length of conductor connects the overhead line to the cables ends via the surge arrestor. Some associated cable equipment is also located on the pole.

Angle structure

Two Pole Arrangement with Steel Crossarm and Horizontal Insulators and a conductor looping across the top on a vertical insulator, this has stay wire supporting the structure from the wires angling on the structure.

Intermediate structure

Two Pole Arrangement with Steel Crossarm and Three Vertical Insulators (may require some side stays to keep vertical in poor ground conditions, i.e. peat).









SSEN branded Hilux and wooden pole structure



Comparison drawing of proposed 132kV Trident Pole against scale of existing 33kV Infrastructure on Orkney



Switching Stations

A switching station is like a substation without transformers and is required where 2 or more overhead line circuits meet. It allows the flow of power to be switched between different circuits or allows one or more circuits to be disconnected. There are 2 switching stations proposed where a "T" connection is required for developers onto the main circuit. One station is required near Ellibister, north of Finstown, and the other on South Ronaldsay, to the south of St Margaret's Hope. Both switching stations will require their own Town & Country Planning Applications, to be submitted in June 2019.

A number of potential sites have now been identified within these search areas and they are currently going through our site selection process. This involves a high level environmental, engineering and cost appraisal together with work by the Land Team. The sites are scored, and together with feedback from statutory consultees and the public, a preferred site is identified. This will be developed into a proposal for planning and presented for consultation in Spring 2019.

The technology confirmed for these stations is Indoor Air Insulated Switchgear (AIS) which provides the best compromise on cost and environmental grounds. They will comprise a single "T" shaped building, measuring approximately 100m long x 50m wide x 12m high at Ellibister and 75m x 45m x 12m on South Ronaldsay. Ellibister is slightly bigger as it has an extra bay included for a potential future connection to Stronsay. The overhead line will terminate away from the sites and enter the buildings by underground cable.

The potential sites shown below have been chosen with the following factors in mind: connectivity to the overhead lines, constructability, access, visual impact and habitats and ecology.





Each planning application will be accompanied by a landscape mitigation plan and the buildings will be coloured sensitively to help them blend in to the surrounding landscape. An assessment of cumulative effects with the overhead lines will also be undertaken and appropriate mitigation will be included within the final design.



Project Timeline

All dates are indicative at this stage.

The chart below shows the main stages of the development process and the opportunities there will be for members of the public to give feedback as the project site design is refined.

Q3 2018

- Public and statutory bodies consultation on OHL alignment and switching station site selection
- Finstown substation and marine cables pre-application public consultation
- Consultation Reports produced for OHL's

Q2 2019

- S.37 applications for OHL's
- Planning consent applications for switching station

Q3 2020

Commence Construction

Q2 2018

- Public consultation on routing of Orkney Infrastructure Project
- Public consultation on Orkney to Dounreay Marine link, proposed cable route and Finstown Substation

Q4 2018 - Q1 2019

- Finstown substation planning application submission
- Marine licence application submission
- EIA Screening for OHL's
- EIA Screening for switching stations
- Public and statutory bodies consultation on OHL proposed alignment
- Switching stations pre-application event
- Dounreay substation pre-application event and planning application submission

2022

- Q2 Commissioning
- Q4 Energisation



What happens now and how do I have my say?

We understand and recognise the value of the feedback provided by members of the public during all engagements and consultations. Without this valuable feedback, the project development team would be unable to progress projects and reach a balanced proposal.

We are keen to receive your views and comments in regards to the following questions:

- Has the information provided explained the need for the Orkney Transmission Connection and Infrastructure Project?
- Have we adequately explained the approach taken to select areas identified suitable for overhead line, underground cables and subsea cables?
- Do you agree with the proposed Finstown substation location?
- Do you have any comments on the appearance of the substation or on the proposed landform landscaping
- Do you have any comments on the proposed cable route between Warebeth and Finstown?
- Do you have any comments on the installation of subsea cables in the areas shown?
- Do you have any knowledge of wrecks or features of conservation value within or near the marine route corridors?
- Do you have any comments on potential interaction with fisheries and the installation of subsea cables in the areas shown?

Comments

Your views and comments can be provided to the project team by completing a feedback form or by writing to Lesley Dow, Community Liaison Manager. We will be seeking feedback from the members of the public and Statutory Bodies until 2nd November 2018.

All received feedback will be assessed and the proposed options adapted where necessary.

Community Liaison Manager Lesley Dow





07876 837 490

Lesley Dow Scottish and Southern Electricity Networks, Inveralmond House, 200 Dunkeld Road, Perth, PH1 3AQ



Additional information

Information will also be made available via the project webpage and social media channels:

Project Website:

www.ssen-transmission.co.uk/projects/orkney

Follow us on Twitter:

@ssencommunity





Your Feedback

Thank you for taking the time to attend this consultation event. In order to record your views and improve the effectiveness of our consultation, please complete this short feedback form.

Please complete in **BLOCK CAPITALS.** (Please tick one box per question only)

Q1	Has the information provided explained the need for the Orkney Transmission Connection and Infrastructure Project? Yes No Unsure
Q2	Have we adequately explained the approach taken to select areas identified suitable for overhead line, underground cables and subsea cables? Yes No Unsure
Q3	Do you agree with the proposed Finstown substation location? If not, why not? Yes No
Q4	Do you have any comments on the appearance of the substation or on the proposed landform landscaping?
Q5	Do you have any comments on the proposed cable route between Warebeth and Finstown?
Q6	Do you have any comments on the installation of subsea cables in the areas shown?

Q7	Do you have any knowledge of wrecks or features of conservation value within or near the marine route corridors?					
Q8	Do you have any comments on potential interaction with fisheries and the installation of subsea cables in the areas shown?					
Q9	Following your review of the information displayed today, how would you rate your understanding of the Orkney Transmission Connection and Infrastructure Project?					
	Excellent	Quite good	Neither	good or poor		
	Poor	Very poor				
Name	e, Address and Telephone					
Email						
lf you	would like to be kept info	ormed of progress on t	he project please ti	ck this box.		
lf you	would like your commen	ts to remain anonymo	us please tick this b	ox.		
Which	event did you attend?					
St	romness St I	Margaret's Hope	Ноу	Flotta		
Fir	nstown Kirł	wall	Thurso			
Thank you f	for taking the time to complete this	feedback form.				
lease hand	I your completed form in at the eve	nt or alternatively by one of the	e methods below:			
'ost : Lesley	Dow, Scottish and Southern Electric	ity Networks, Inveralmond Hous	e, 200 Dunkeld Road, Pertl	n, PHI 3AQ Email: lesley.dow@sse.com		
The feedbac	e for feedback is 16:00, Friday 2nd I ck form and all information provided transmission co.uk/projects/orkney	November 2018. at the event can also be downlo	aded from the dedicated w	rebsite:		
Any informa	tion given on the feedback form car	be used and published anonym	nously as part of Scottish an and Southern Electricity Net	d Southern Electricity Networks works using feedback for this purpose		
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