

Spittal – Loch Buidhe – Beaully 400kV Reinforcement

- Spittal – Loch Buidhe – Beaully 400kV connection
- New Spittal area 400kV substation and HVDC converter station
- New Loch Buidhe area 400kV substation
- New Beaully area 400kV substation and HVDC converter station

Overhead Line Routeing and Site Selection Consultation Booklet

February & March 2023

The consultation events will be taking place on:

20th February (2.30–7pm)	Halkirk – Ross Institute
21st February (2.30–7pm)	Helmsdale – Bunilidh Social Club
22nd February (2.30–7pm)	Dunbeath – Dunbeath Hall
23rd February (2.30–7pm)	Golspie – Fountain Road Hall
27th February (3.30–7pm)	Bonar Bridge – Community Hall
28th February (2.30–7pm)	Ardross – Community Hall
1st March (2.30–7pm)	Dingwall – Legion Hall
2nd March (2.30–7pm)	Beaully – Kilmorack Hall
6th March (5–7pm)	Online consultation event

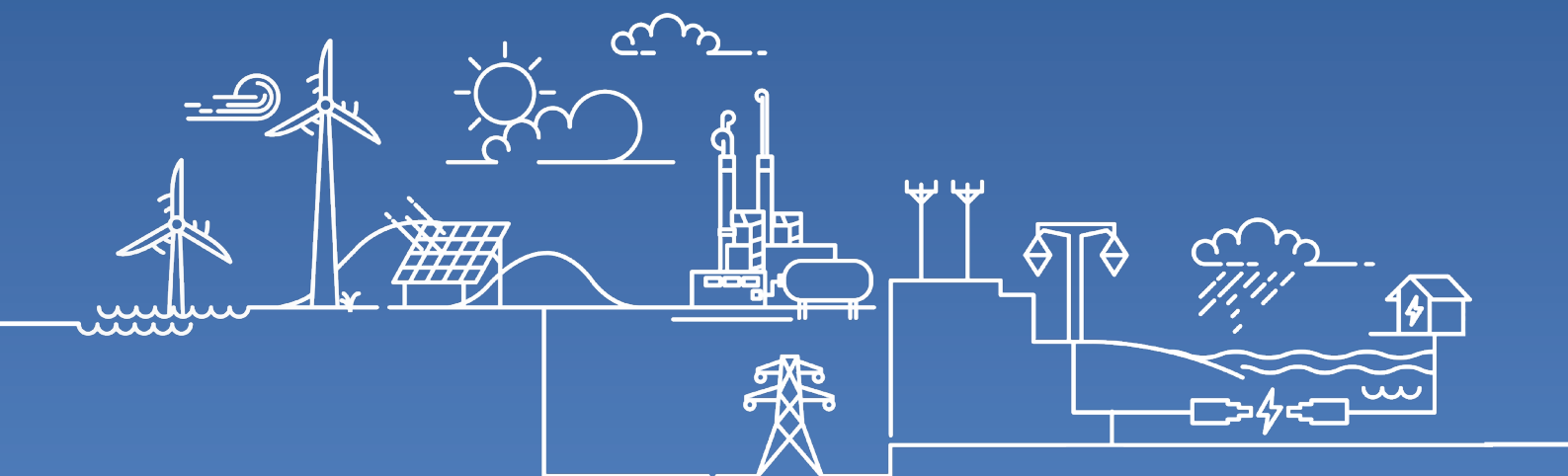


Scottish & Southern
Electricity Networks

TRANSMISSION

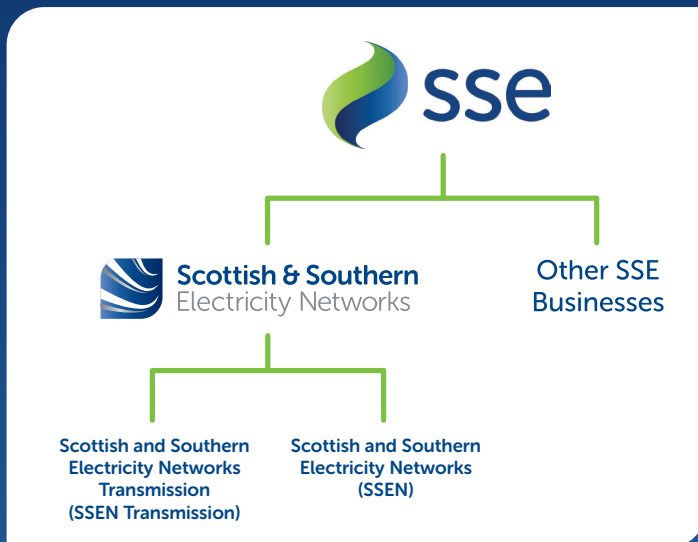
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Who we are

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



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. Our 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 plants.

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.

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.



The Pathway to 2030 Holistic Network Design

Achieving Net Zero

In July 2022, National Grid, the Electricity System Operator (ESO) who are responsible for making sure that the electricity flows across the UK’s system, balancing supply and demand at all times, set out how the transmission network needs to develop to accommodate the growth in renewable electricity across Great Britain. This also included the UK and Scottish Government’s 2030 offshore wind targets of 50GW and 11GW. For the north of Scotland, this needs over £7 billion of investment in the transmission network to deliver the 2030 targets and help the country on its pathway to net zero and greater energy independence.

MAIN NORTH OF SCOTLAND ELECTRICITY TRANSMISSION NETWORK IN 2030

In-flight Investments

1. Argyll 275kV strategy
2. Fort Augustus to Skye 132kV upgrade
3. Orkney 220kV AC subsea link




Pathway to 2030 Investments

- 1a. Beauly to Loch Buidhe 400kV reinforcement (BLN4)
- 1b. Loch Buidhe to Spittal 400kV reinforcement (SLU4)
- 2a. Beauly to Blackhillock 400kV double circuit (BBNC)
- 2b. Blackhillock and Peterhead 400kV double circuit (BPNC)
3. Beauly to Denny 275kV circuit to 400kV (BDUP)
4. East Coast Onshore 400kV Phase 2 reinforcement (TKUP)
5. Spittal to Peterhead 2GW HVDC subsea link (PSDC)
6. Peterhead to Drax 2GW HVDC subsea link (E4D3)
7. Peterhead to South Humber 2GW HVDC subsea link (E4L5)
8. Arnish to Beauly 1.8GW HVDC link
9. Aquila Pathfinder

Public Consultation to Inform Project Development

All new reinforcements remain subject to detailed consultation and environmental assessments to help inform route and technology options

More detail on these projects, including how to sign up for updates, will be made available on SSEN Transmission’s website, www.ssen-transmission.co.uk

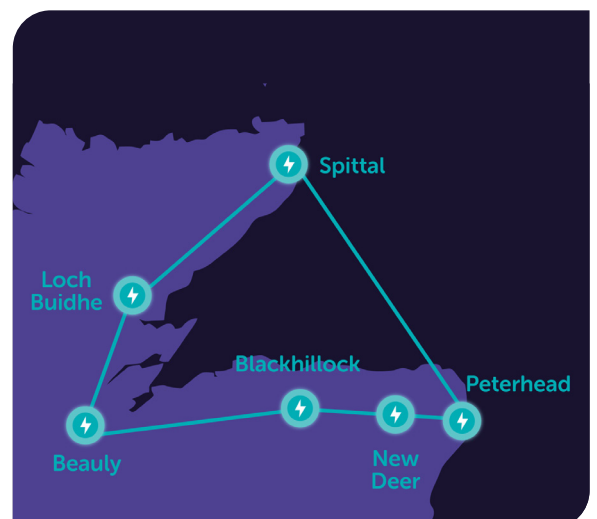
-  New Infrastructure (Routes shown here are for illustrative purposes)
-  Upgrade/Replacement of Existing Infrastructure
-  Existing Network



What does this mean for the North Highlands and North East of Scotland?

Extensive studies informing the ESO’s Pathway to the 2030 Holistic Network Design confirmed the need to reinforce the onshore transmission network between Spittal and Beauly, Beauly to Peterhead and provide a subsea connection between Spittal and Peterhead.

Providing new higher voltage connections between these sites will deliver the significant increased capacity needed to transport energy from new large scale onshore and offshore renewable generation (mainly wind farms) to demand centres via onshore and HVDC subsea links. To enable these new connections, new 400kV substations are required at key locations as shown on the adjacent map. Spittal, Beauly and Peterhead converter stations are required to convert electricity from the subsea cables that transport electricity from the Western Isles, between Spittal and Peterhead and Peterhead south. These key locations will also allow offshore and onshore renewable generation to connect to the reinforced electricity network. These projects have been highlighted as critical to delivering the UK and Scottish Government’s targets, with their development accelerated to meet the target dates of energisation by 2030.



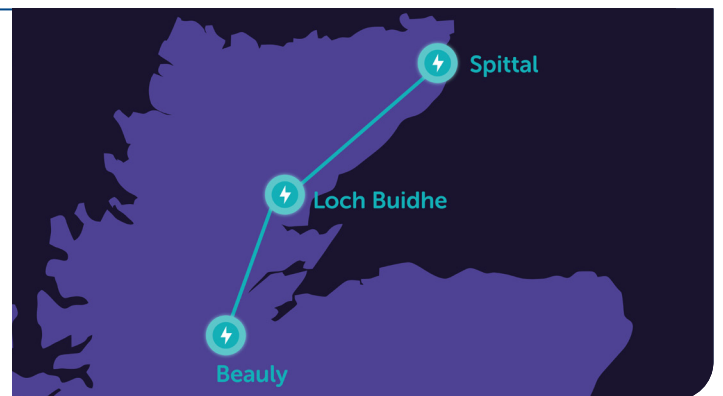
About the North Highland projects

Based on the requirements outlined in the ESO's Pathway to 2030 Holistic Network Design, we have developed proposals to reinforce the onshore corridor between Spittal and Beauly, via Loch Buidhe. To facilitate this connection, and others as part of the wider strategy, new additional 400kV substations and associated infrastructure is also required in these three locations.

Due to the criticality of these works, there is a requirement for accelerated development and delivery to meet the 2030 connection dates.

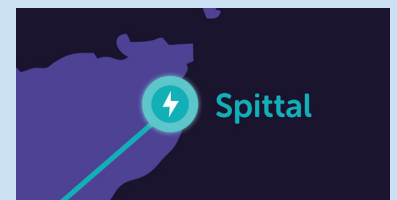
Spittal – Loch Buidhe – Beauly 400kV connection

This reinforcement project spans a significant length of the north of Scotland and will involve the construction of a new 400kV overhead line connection, between the new proposed substations at Spittal, Loch Buidhe and Beauly.



New Spittal area 400kV substation and HVDC converter station

A new 400kV substation is essential to enable the existing substation to connect onto the new Spittal – Loch Buidhe – Beauly 400kV overhead line (OHL) and provide a reinforcement for the Spittal – Peterhead HVDC subsea cable link. A High Voltage Direct Current (HVDC) converter station is also required in the vicinity of the new Spittal substation site to connect the Spittal – Peterhead HVDC subsea link project.



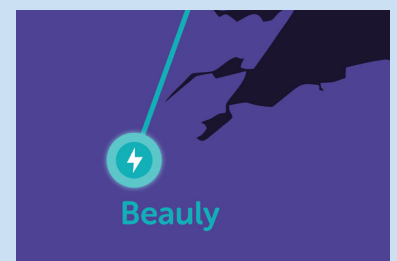
New Loch Buidhe area 400kV substation

A new 400kV substation is required near the existing 275kV substation at Loch Buidhe to provide a connection for the existing transmission infrastructure onto the new Spittal – Beauly 400kV OHL.



New Beauly area 400kV substation and HVDC converter station

A new 400kV substation near the existing Beauly substation is a key element in the delivery of the Pathway to 2030. It will facilitate the connections of the new Spittal – Loch Buidhe – Beauly 400kV OHL and the new Beauly – Blackhillock – New Deer – Peterhead 400kV OHL onto the transmission network via the existing Beauly substation and Beauly – Denny 400kV OHL. An HVDC converter station is required in the vicinity of the new substation near Beauly for the Western Isles connection project. The converter station will connect to the new substation via underground cable.



What we're consulting on

At SSEN Transmission, we are committed to delivering a robust and transparent consultation process underpinned by inclusion and accessibility. As a stakeholder led business, we understand the importance of involving communities and key stakeholders throughout each stage of our development process.

During this consultation, we are presenting our approach to developing the projects listed below. Our consultation includes technology options, environmental considerations, site selection, the routing process and maps which aim to give stakeholders and community members a better visual representation of the work on the projects to date.

This period of engagement in the development phase is vital in shaping our proposals and to do this effectively we need to capture feedback from stakeholders, harness local knowledge to identify risks in key areas of the routes and explore potential community benefit opportunities.

New Spittal area 400kV substation and HVDC converter station (pages 25–28)

We are consulting on our preferred sites for the proposed new substation and HVDC converter station to be located near the existing 275kV substation at Spittal.

We're also sharing information regarding the proposed Spittal – Peterhead subsea HVDC connection which will tie in to Spittal, however, formal consultation will take place on this project later in the year.

Spittal – Loch Buidhe – Beaully 400kV overhead line (pages 11–22)

We are consulting on our preferred routes and technology that have been identified through the use of a sophisticated optioneering software, that considers environmental, engineering and socio-economic factors and surveys.

New Loch Buidhe area 400kV substation (pages 29–32)

We are consulting on our preferred substation site, that has been identified through consideration of environmental, engineering and socio-economic factors and surveys.



New Beaully area 400kV substation and HVDC converter station (pages 33–36)

We are consulting on our preferred sites for the new substation and HVDC converter station to be located near the existing substation in Beaully (Wester Balblair).

We're also sharing information regarding our Western Isles HVDC connection project which will tie in to Beaully, however there will be additional formal consultation events for the Western Isles project later this year.

We are keen to hear your feedback regarding our preferred sites and preferred overhead line route, and if there are further considerations you believe need to be taken in to account during the next stage of the development process.

Biodiversity net gain

We recognise that we have significant interaction with the environment through the activities we undertake in Scotland as we seek to develop and improve the transmission network. With this work comes a responsibility to design and build our projects in a manner which protects the natural and built environment.

We are committed to protecting and enhancing the environment by minimising the potential impacts from our construction and operational activities on biodiversity. To this end, we have committed to no net loss of biodiversity for all of our projects gaining consent from 2020 onwards, and a net gain of biodiversity on all projects gaining consent from 2025. This means that during the development, construction and operation of our projects, we will leave the environment in a measurable better state than before development started; leaving a positive environmental legacy at all of our SSEN Transmission sites.

As this project progresses through the development process, we will actively seek ways to avoid and minimise impacts on biodiversity, through careful routing and site design to avoid areas of highest biodiversity value. Where avoidance is not possible, our impacts are mitigated for through the implementation of habitat creation and restoration efforts. These can be achieved within the boundary of the development site, or by providing support to local groups involved with habitat restoration or creation projects, within the locale of the development site.

Please let us know if you have ideas for biodiversity improvement projects in your local area that SSEN Transmission could get involved with. Contact details for the Community Liaison Manager can be found on page 40.

Argyll Coast and Countryside Trust (ACT) Woodland Planting Collaboration:

Argyll's rainforest is a unique and rare habitat of ancient and native woodland. This collaboration with ACT will help deliver SSEN Transmission's compensatory tree planting commitments in Argyll while helping towards ACT's woodland planting ambitions, supporting its charitable objectives including biodiversity gain, health and wellbeing improvement for local people, outdoor learning opportunities and climate change workshops.



Thurso South substation:

Creation of approximately 10 hectares of pollinator habitat to support the rare endemic great yellow bumblebee and contribute to wider conservation efforts for this species.

A collaboration with The Bumblebee Conservation Trust facilitated research on forage availability for bumblebees, identifying the need for a diverse seed mix containing key flowering species to enhance early, main and late forage to support the full lifecycle of bumblebees.



Working with landowners

We recognise landowners and occupiers as key stakeholders in the development of our projects and are committed to consultation and engagement with all parties likely to have an interest in our proposals.

Due to the size and scale of the projects, we have not been able to identify and contact all landowners/occupiers at this stage that may be affected, but we will endeavour to contact all who are directly impacted as soon as we can.

As the project design develops, we will work with landowners and occupiers to mitigate the effects of our infrastructure on their properties. Our team of dedicated land managers will be on hand to answer queries and address concerns throughout.

We will be required to carry out various engineering and environmental surveys to inform the design process. Consent will be sought from affected landowners and occupiers in advance for these surveys.

Once we have finalised the design of the overhead line infrastructure and associated works, we will be required to secure the appropriate land rights from landowners and occupiers in order that appropriate consents can be sought from Scottish Ministers. Our land managers will endeavour to reach a voluntary agreement with landowners and occupiers, however, as a statutory undertaker, we may require to underpin voluntary discussions with an application to Scottish Ministers for a Necessary Wayleave or Compulsory Purchase Order. Ultimately this is to ensure nationally significant infrastructure projects are delivered on time and in line with our licence obligations. We also have a duty to protect the interests of the UK bill payer. Statutory powers are not used lightly as we aim to work with landowners and occupiers to secure the necessary land rights voluntarily.

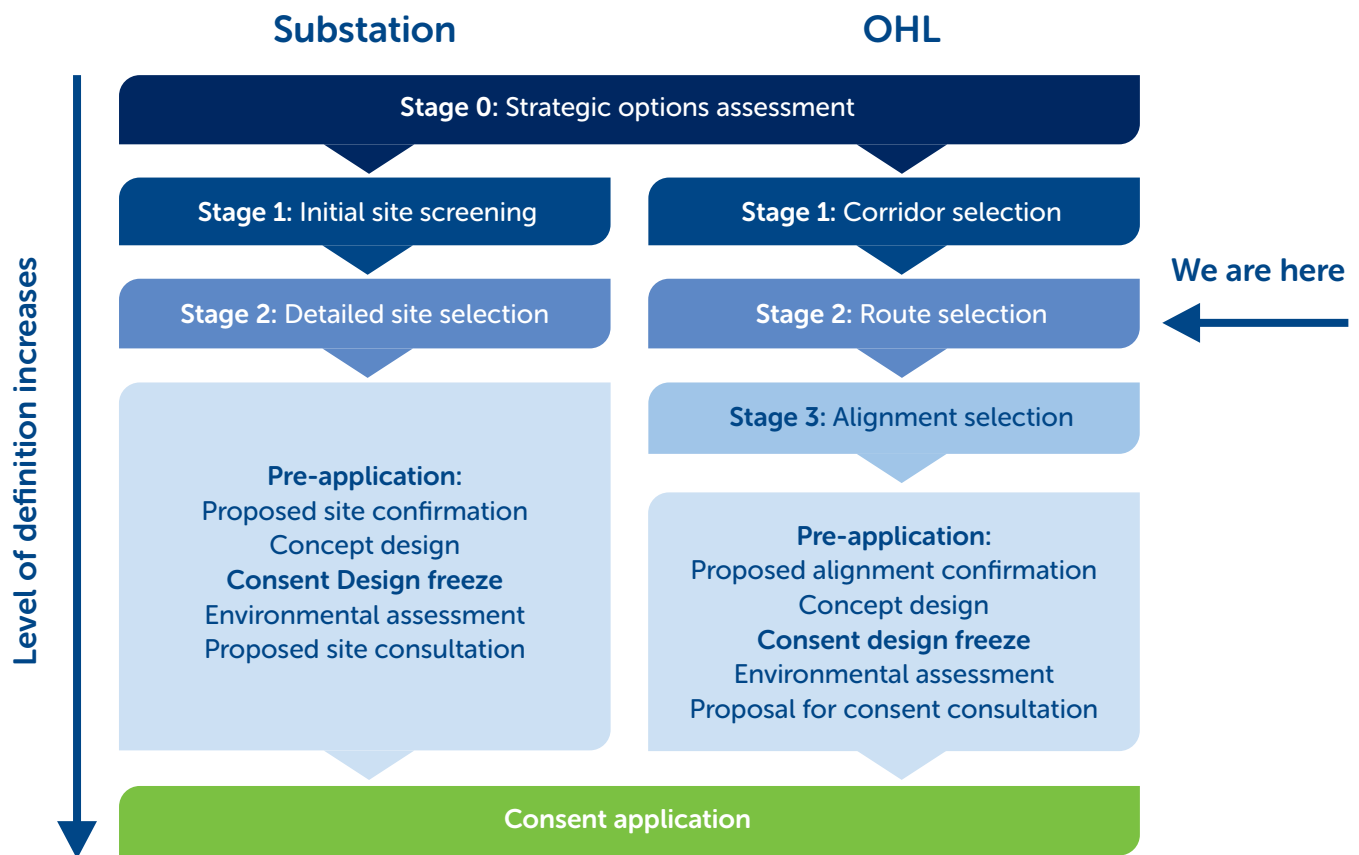
All potentially affected landowners and occupiers have the opportunity to provide feedback at our in person consultation events and by submitting a feedback form. We would encourage all those with an interest to submit their views through this consultation.

Contact details for the dedicated project land managers can be found on the relevant webpages: ssen-transmission.co.uk/projects/2030-projects/north-highlands/



Our optioneering process

We follow formal internal guidance to enable us to consistently and rigorously select alignments and sites for new substations, switching stations and converter stations. Each process has a number of key stages, each increasing in detail and definition and bringing technical, environmental and cost considerations together in a way which seeks the best balance in accordance with our Transmission Network Operator's Licence and the Electricity Act 1989.



Stage 2 – Route and site selection – current project stage

This stage seeks to identify an initial preferred OHL or cable route and substation site from shortlisted options, which minimise where practicable physical, environmental and amenity constraints, are likely to be acceptable to stakeholders and are viable (taking into account engineering and cost requirements). The connections into new and existing assets forms a crucial part of this assessment to reduce the need for additional new infrastructure.

Both the process and our preferred options are then presented to the public and statutory stakeholders for consultation. Comments on our process are critical in ensuring the preferred options are the best to be taken forward to planning. Comments are taken on board and modifications may be made to ensure comments have been accommodated where practicable. These will be presented during further pre-application consultation events to the public and statutory stakeholders.

The planning process

The outcome of the optioneering processes will be developments for which consents under the respective planning regime will be sought.

- **Overhead lines** - these require an application for consent under section 37 of the Electricity Act 1989 to be submitted to the Scottish Ministers via the Energy Consents Unit (ECU).
- **Substations and converter stations** - these require an application for planning permission to be submitted to the relevant Local Planning Authority (namely The Highland Council for Spittal, Loch Buidhe and Beauly) under the Town and Country Planning (Scotland) Act 1997.

The substation and converter stations applications will identify the proposed development, including:

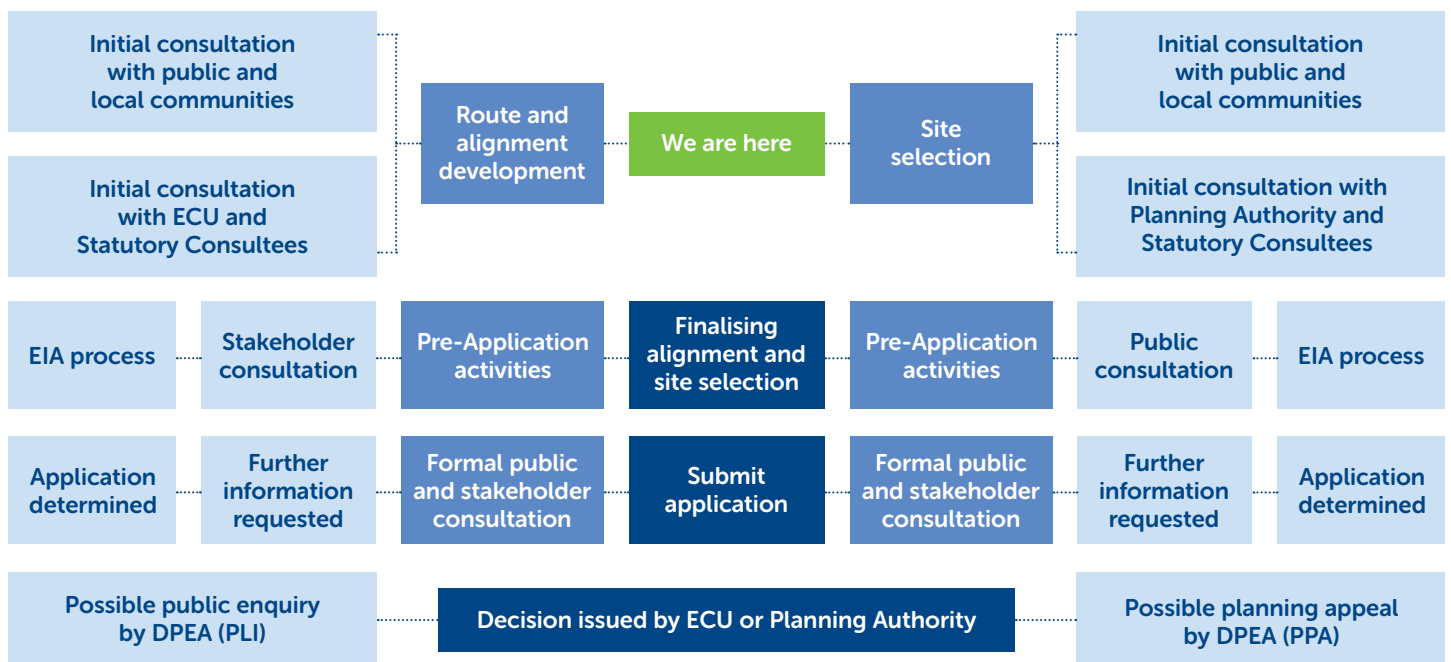
- Site boundary clearly shown in red (the Red Line Boundary) including any permanent and temporary access routes and junctions onto public highways.
- The proposed development in relation to the site boundary with dimensions of all permanent and temporary works including structures, buildings, perimeter fencing, drainage features, key electrical equipment, construction compounds and laydown areas.

These large scale projects will be subject to Environmental Impact Assessment (EIA) requirements under both Planning regimes. This requires any application to be supported by a formal EIA Report together with robust consultation and mitigation proposals.

Should the proposed development be deemed non-EIA (due to its scale or potential environmental impacts), a voluntary Environmental Appraisal will be produced by SSEN Transmission to support the application.

Section 37 application for OHLs (>132kV) —submitted to Energy Consents Unit (ECU)

Planning application for substations and converter stations—submitted to Planning Authority



New Spittal – Loch Buidhe – Beauly 400kV overhead line

Project need

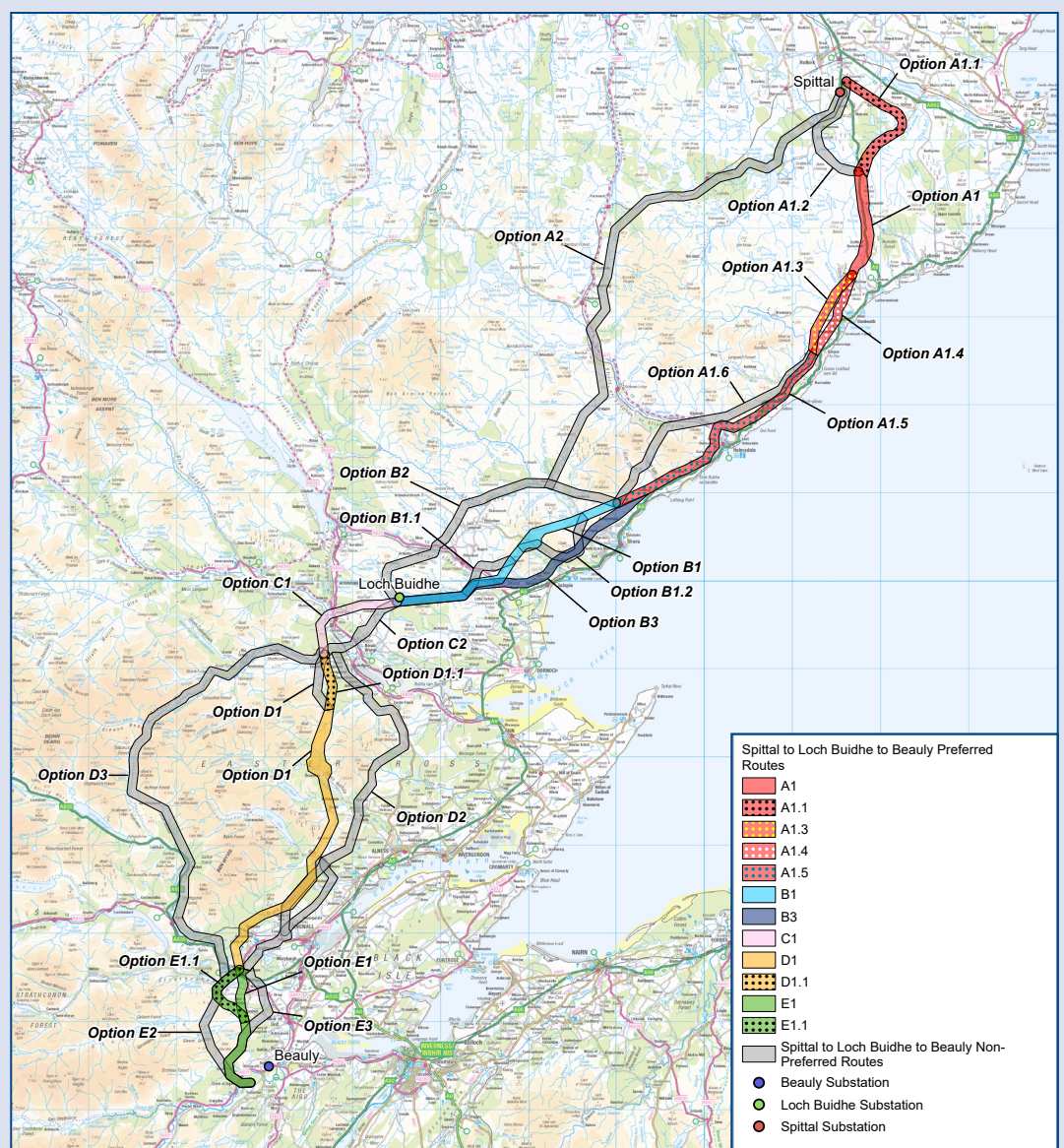
As part of the Scottish and UK Governments Net Zero climate change targets, significant increases in renewable generation connections to the GB energy network are required. Caithness and the surrounding area is home to some of Scotland's best wind resources and the existing electricity network is at full capacity meaning no further generation can connect without significant network reinforcement. A proposed new 400kV connection between Spittal and Beauly will transmit electricity generated by renewables in the north of Scotland to areas of demand on the GB transmission network. It will connect the proposed 400kV substations at Spittal and Beauly, together with a connection for a proposed new 400kV substation at Loch Buidhe.

Project overview

The project requires the construction of a new 400kV overhead line between Spittal, Loch Buidhe and Beauly.

The works will comprise of:

- Construction of approximately 85km of a new 400kV double circuit OHL between the proposed new Spittal and Loch Buidhe 400kV substations.
- Construction of approximately 82km of a new 400kV double circuit OHL between the proposed new Loch Buidhe and Beauly 400kV substations.
- Construction of temporary and permanent access tracks along the length of the OHL route.
- Rationalisation of existing high voltage and low voltage infrastructure at points of crossing along the new OHL routes, and around new and existing substation sites.



New Spittal – Loch Buidhe – Beauly 400kV overhead line

Technology options

Initially the suitability of both onshore and marine technology options were considered to provide the reinforcement between Spittal, Loch Buidhe and Beauly. National Grid’s subsequent ‘Pathway to 2030’ Holistic Network Design (HND) study concluded that an onshore overhead line solution was preferred, to be provided in parallel to the currently planned offshore works to connect Spittal to Peterhead via a 2GW HVDC subsea link. As a result, the assessment of onshore 400kV AC technology options was limited, resulting in a comparative analysis of overhead lines and underground cables. The table below presents a summary of their respective advantages and disadvantages.

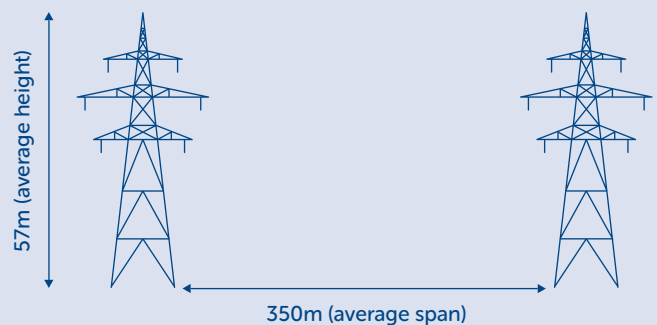
OVERHEAD LINES	UNDERGROUND CABLES
<ul style="list-style-type: none"> Easier to cross challenging terrain like glens, hills, rivers, lochs, railways, roads and other utilities. 	<ul style="list-style-type: none"> Routing is more challenging as there is no option to cross challenging terrain.
<ul style="list-style-type: none"> Quicker, easier and cheaper to identify and repair faults compared to underground cable. 	<ul style="list-style-type: none"> Fault detection of long cable sections is challenging, and repairs can take a substantial amount of time and cost.
<ul style="list-style-type: none"> Can travel long distances with no requirement of additional equipment/expansion of substations to aid in stability of network. 	<ul style="list-style-type: none"> Over long distances cables require additional equipment at substations to maintain stability of the network, resulting in larger substations and higher costs.
<ul style="list-style-type: none"> Lowest cost option when compared to underground cables. 	<ul style="list-style-type: none"> Cable is much greater cost than overhead line to install and operate.
<ul style="list-style-type: none"> Potential for significant landscape and visual impacts. 	<ul style="list-style-type: none"> Minimal landscape and visual impact from cables once construction has been completed.
<ul style="list-style-type: none"> Overhead lines are exposed to possible weather damage. 	<ul style="list-style-type: none"> Due to being underground not subjected to same weather elements as overhead line.

Our preferred technology

Our preferred technology for the new 400kV link between Spittal – Loch Buidhe – Beauly is a new double circuit 400kV HVAC (High Voltage Alternating Current) overhead line.

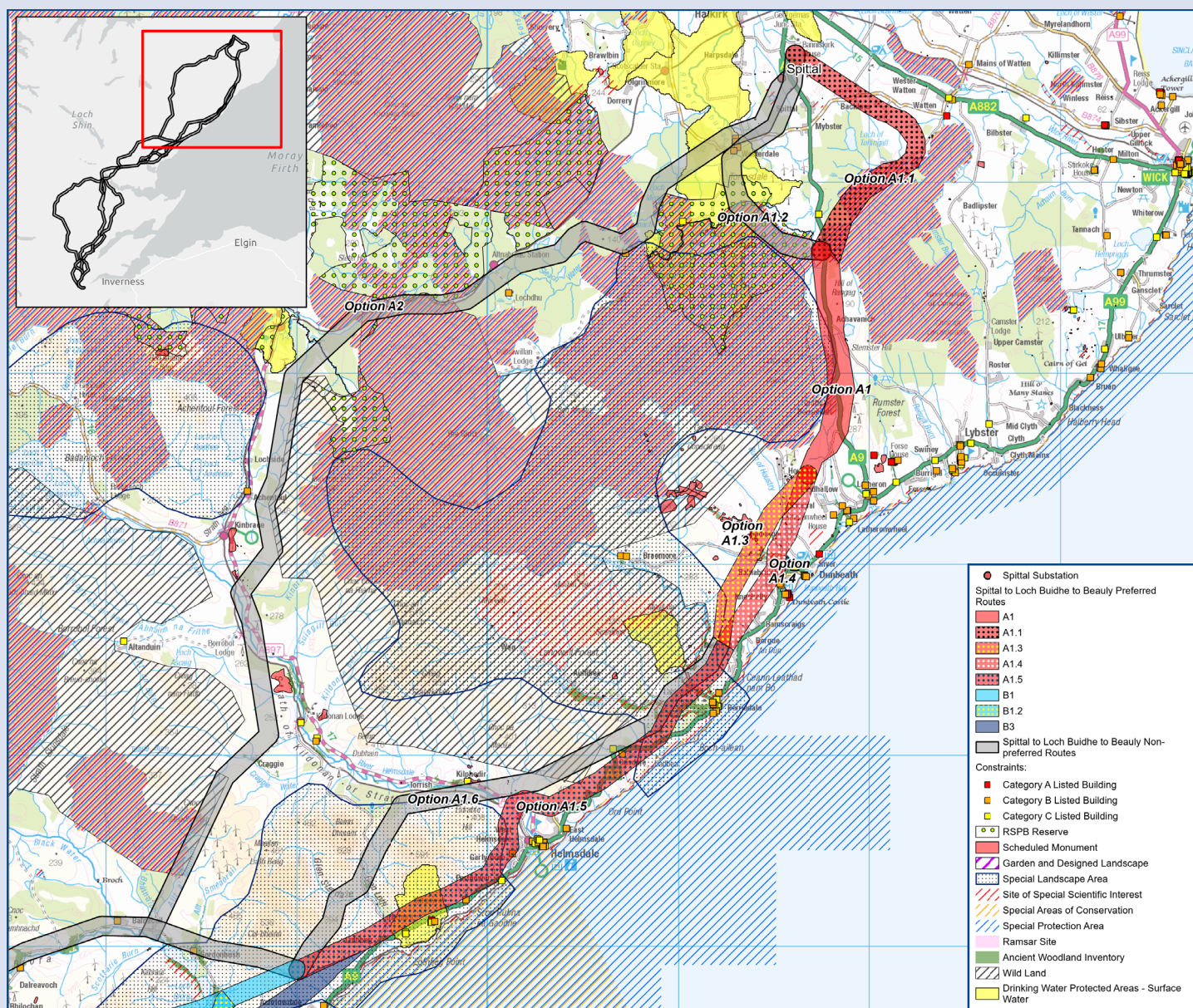
Although this has been identified as the preference, this does not mean that cable sections would not be considered where challenges are met for consenting, construction and operation of an overhead line.

Each tower (often referred to as a pylon) will have six cross arms (the ‘arms’ coming off the centre of the tower) and a peak for lighting protection/ground wire. Each arm will support 3 conductors (the long metal lines that travel from tower to tower). The conductors will be strung on the cross-arms with glass insulators. All the overhead line materials are currently being designed and the specification may vary considering terrain/environmental challenges.



Section A - Spittal to Brora

Constraints between Spittal and Brora include local settlements such as Dunbeath and Helmsdale, alongside the Spittal Hill wind farm and a number of other planned wind farms in the area. In addition, there are a number of RSPB Reserves and Sites of Special Scientific Interest (SSSIs), as well as the Causeymire – Knockfin Flows Wild Land Area (WLA) and the Ben Klibreck – Armine Forest WLA. The terrain in the area is mix of moderate hills with some steep slopes, and then areas with more gradual undulated terrain.



Section A - Spittal to Brora

For section A, there were two main routes identified, A1 and A2. There are three pairs of sub options within Option A1. An assessment of each of these pairs was undertaken (A1.1 vs A1.2, A1.3 vs A1.4, A1.5 vs A1.6). The preferred sub options included in A1 are Option A1.1 and A1.5. There is currently no preference between A1.3 and A1.4.

	Key topics relating to site															
	Geology, hydrology and hydrogeology	Cultural heritage and designations	Landscape designations	Recreation	Existing OHL	Road	Atmospheric pollution	Contaminated Land	Flooding	Peatland	Access	Angle towers	Clearance distance	Wind farms	Communication masks	Urban environment
A1.1	L	M	L	L	M	H	L	L	L	H	L	L	H	H	L	L
A1.2	M	M	H	M	H	H	L	L	L	H	L	L	H	H	L	L
A1.3	L	H	M	L	L	L	H	H	H	H	L	L	M	M	L	L
A1.4	L	M	L	L	M	L	H	H	H	H	L	M	H	L	H	H
A1.5	M	M	H	M	M	M	H	M	M	M	L	M	H	L	H	H
A1.6	L	M	H	M	L	L	H	L	M	M	H	L	L	M	L	L

Option A1 plus the preferred combination of sub options (Options A1.1, A1.3/A1.4 and A1.5) was then assessed against Option A2.

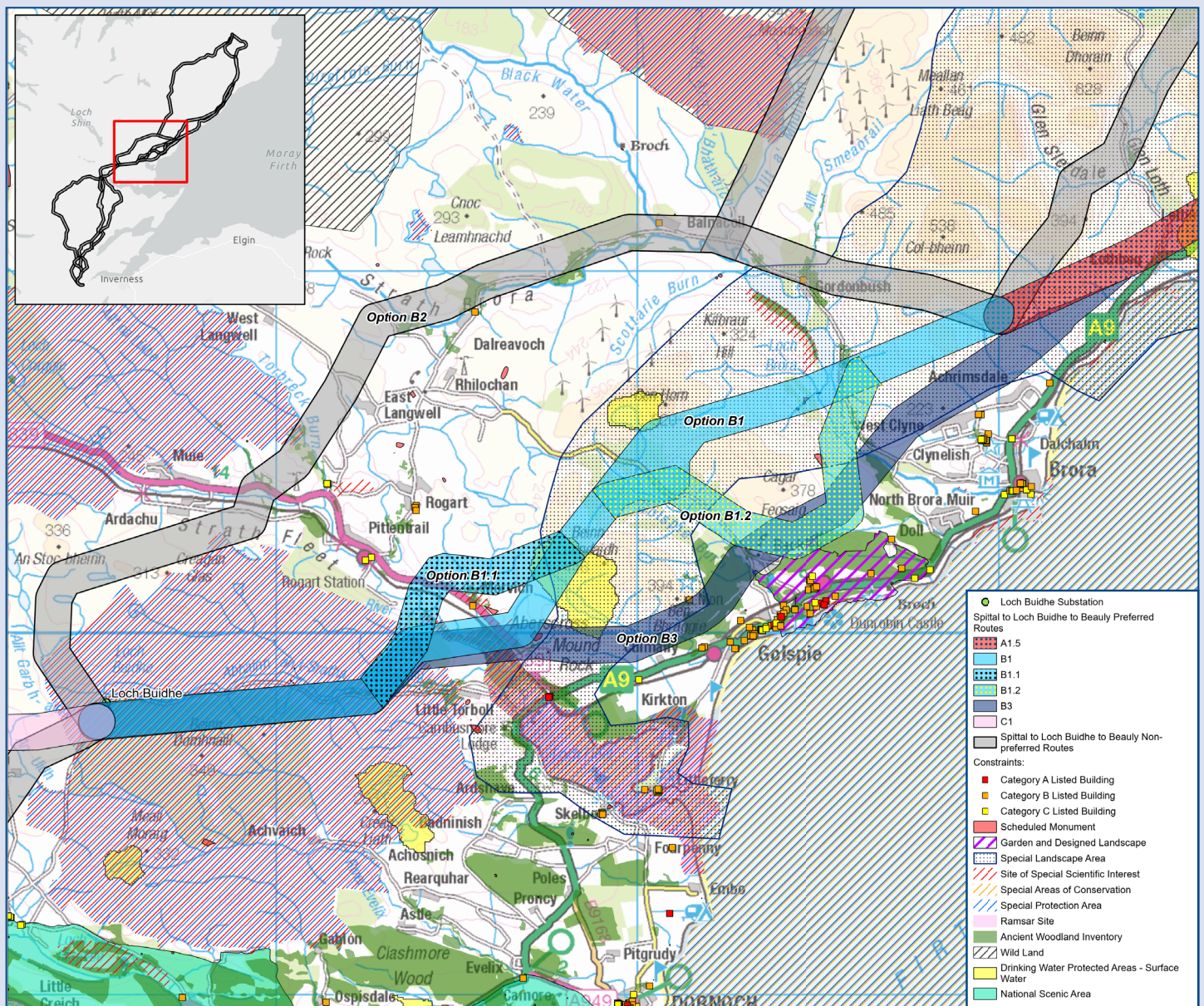
Options	Key topics relating to site												
	Geology, hydrology and hydrogeology	Cultural heritage and designations	Road	Atmospheric pollution	Contaminated land	Flooding	Peatland	Access	Angle towers	Clearance distance	Wind farms	Communication masks	Urban environment
A1	L	M	H	H	H	M	M	L	M	M	H	M	H
A2	M	H	L	M	L	L	H	M	L	L	L	L	L

Our preferred route - Option A1

Option A1 is considered the environmentally and technically preferred option due to the reduced potential to impact designated sites, peat, habitat and landscape character, including areas designated as wild land and an RSPB reserve. Despite its higher ratings in most of the assessments related to crossings and proximity to third party infrastructure, Option A2 terrain is expected to be more challenging with significant areas of unavoidable peatland and the access and construction within this corridor will be more, detrimental, challenging and costly compared to Option A1. Option A1 is the preferred overall route option.

Section B - Brora to Golspie

Constraints between the villages of Brora and Golspie included a number of designated areas such as the Strath Carnaig and Strath Fleet Moors Special Protection Area (SPA) and SSSI, the Dornoch Firth and Loch Fleet Ramsar and SPA, Mound Alderwoods Special Area of Conservation (SAC) and SSSI and Strathfleet SSSI. The terrain in this section has a mix of high hills and steep slopes and as such there are a number of wind farms to avoid including the constructed Kilbraur wind farm and the consented Kilbraur extension wind farm. On the approach to the Loch Buidhe substation, there are a number of OHLs that need to be avoided where possible.



Section B - Brora to Golspie

For section B, there are two sub options within Option B1. An assessment of each of these sub options has been undertaken (B1.1 and B1.2).

There was no clear impact preference between options B1 and B1.1. Option B1.2 is preferred to B1, in spite of the potential environmental impacts that may arise from varying B1 with this sub option, there are significantly greater technical constraints if the B1.2 is not followed.

Options	Key topics relating to site						
	Geology, hydrology and hydrogeology	Settlements	River/canal	Elevation	Terrain	Peatland	Access
B1	M	L	H	M	M	H	M
B1.1	M	L	L	M	H	H	M
B1	H	H	L	H	H	H	H
B1.2	H	H	L	M	M	M	M

Option B1 (plus the preferred combination of sub options B1/B1.1 and B1.2) were then assessed against Option B2 and B3.

Options	Key topics relating to site												
	Geology, hydrology and hydrogeology	Cultural heritage and designations	Existing OHL	River/canal	Elevation	Atmospheric pollution	Terrain	Peatland	Access	Angle towers	Clearance distance	Communication masks	Urban environment
B1	M	H	L	L	H	M	H	H	M	M	M	L	L
B2	L	L	H	L	M	M	M	M	M	M	L	L	L
B3	M	H	M	M	M	H	M	M	L	M	M	M	M

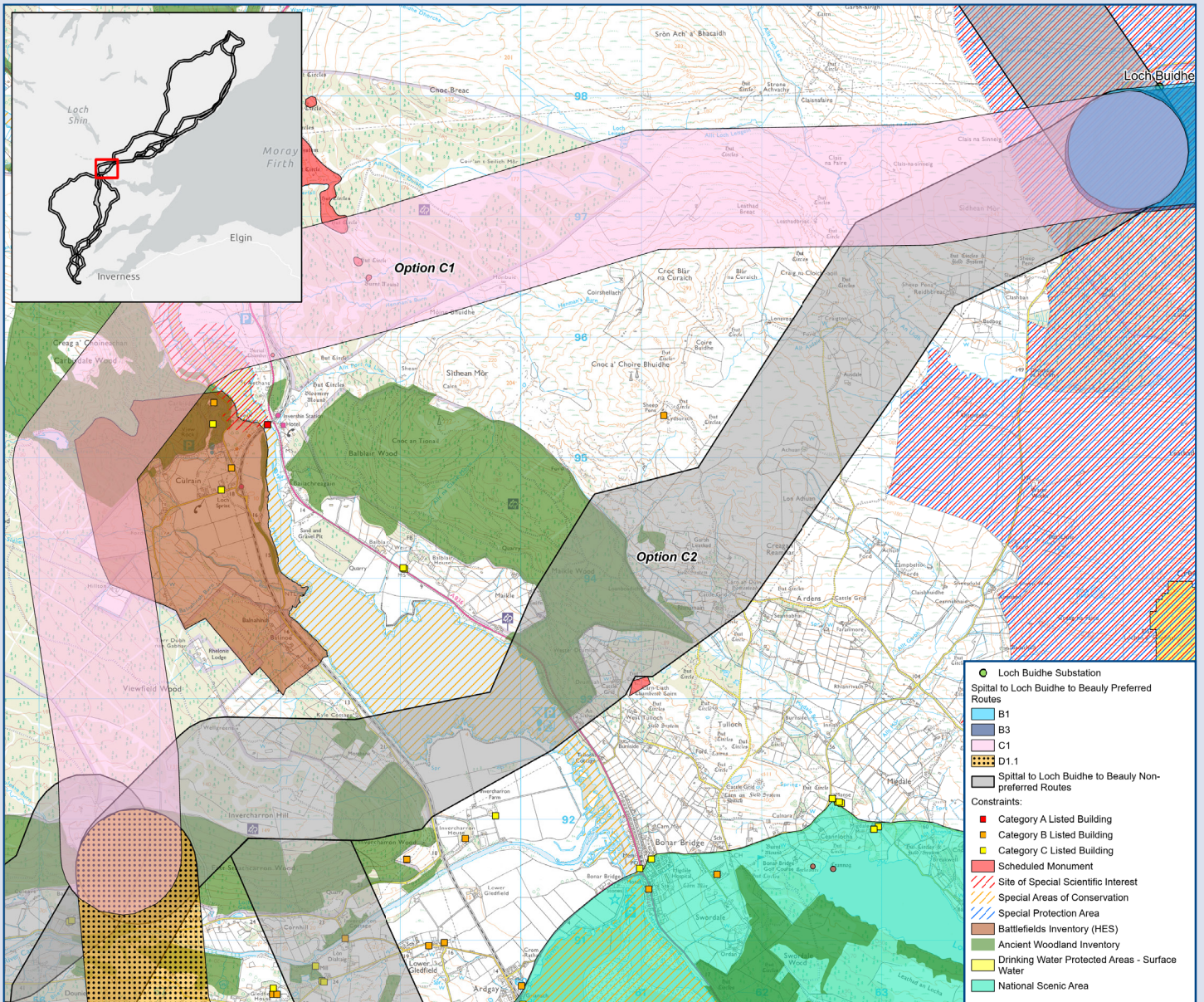
Our preferred route - no preference overall

From an environmental perspective, all options perform similarly, however Option B2 is preferred. Option B1 and B3 have a greater potential to impact the Special Landscape Area designation and the setting of the Dunrobin Castle Garden and Designated Landscape (GDL) and scheduled monuments. Option B3 is considered the technically preferred option due to the greater technical constraints associated with Options B1 and B2 including terrain, steep gradients, peat and construction/maintenance challenges.

At this stage there is no clear preferred route option for Section B due to the environmental constraints associated with B1 and B3 and the technical constraints associated with B1 and B2.

Section C - west of Dornoch

Proximity to local properties around the Bonar Bridge area toward Invershin were noted as a key constraint in this section. Other constraints in this section included a number of natural heritage designations such as the Dornoch Firth National Scenic Area (NSA), Strath Carnaig and Strath Fleet Moors SPA and SSSI, the River Oykel SAC and Kyle of Sutherland Marshes SSSI. There are a number of scheduled monuments, Battle of Carbisdale Registered Battlefield and areas of ancient woodlands within this section.



Section C - west of Dornoch

Section C does not have any sub options. Options C1 and C2 have been assessed against each other.

Options	Key topics relating to site					
	Cultural designations	Flooding	Peatland	Access	Clearance distance	Urban environment
C1	H	L	L	L	L	L
C2	M	H	M	M	M	M

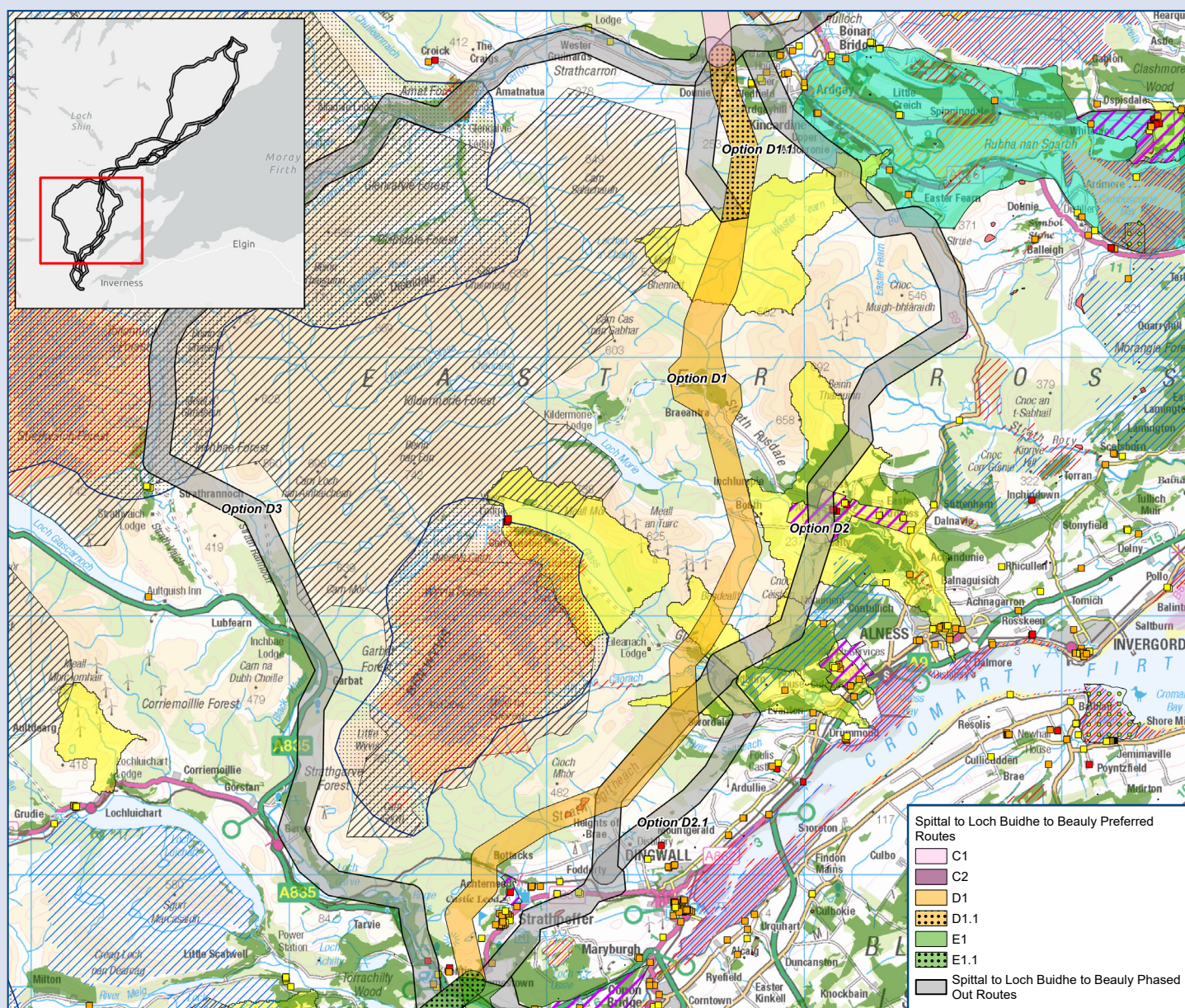
Our preferred route - Option C1

Environmentally, there is no clear preferred option. Both options pass through areas of ancient woodland and natural heritage designations with Option C2 also passing through the Kyle of Sutherland Marshes SSSI. Option C1 is more visible from Bonar Bridge and passes through the Battle of Carbisdale Registered Battlefield. Option C1 is the technically preferred route as it crosses the Kyle of Sutherland at a narrower section. For Option C2, there are significant areas of coastal flooding and the span crossing Kyle of Sutherland is more challenging with respect to construction, operation and maintenance.

Option C1 is the preferred overall route as there are fewer technical constraints associated with crossing the Kyle of Sutherland.

Section D - Dornoch to Dingwall

Local settlements including Ardross, Alness, Dingwall, Evanton, Contin and Strathpeffer were key constraints in this section. Other constraints in this section include a number of commercial forestry areas and areas of ancient woodland, the Novar SPA, the Amat Wood SAC and SSSI, Grade A listed buildings such as the Ardross Castle and Ardross Castle Garden and Designed Landscape (GDL). There are a number of existing OHLs within this section including the existing 132kV Beauly – Shin OHL and 275kV Beauly – Loch Buidhe OHL. The terrain in this section varies with large sections comprising very challenging hilly terrain.



Section D - Dornoch to Dingwall

For section D, there is one sub option for each of D1 and D2. An assessment of each sub option has been undertaken (D1.1 and D1.2) to arrive at a preferred route D1 and D2. Sub Option D1.1 was preferred against D1, and D2 was preferred against sub option D2.1.

Options	Key topics relating to site												
	Natural heritage and designations	Geology, hydrology and hydrogeology	Cultural heritage and designations	Forestry	Existing OHL	Elevation	Terrain	Peatland	Access	Angle towers	Wind farms	Communication masks	Urban environment
D1	M	M	L	M	L	H	H	L	H	M	L	L	L
D1.1	M	M	L	M	L	L	L	M	M	L	L	L	L
D2	H	M	L	L	L	M	M	L	L	L	H	M	M
D2.1	H	L	M	L	H	M	M	L	L	L	H	M	M

Option D1 (plus sub option D1.1) and Option D2 were then assessed against D3.

Options	Key topics relating to site																
	Cultural designations	Cultural heritage assets	Landscape designations	Landscape character	Forestry	Existing OHL	River/canal	Elevation	Terrain	Peatland	Route length	Access	Angle towers	Clearance distance	Wind farms	Communication masks	Urban environment
D1	M	L	L	M	M	L	M	L	L	H	L	M	L	M	H	M	M
D2	H	H	H	H	L	H	M	M	M	M	M	L	M	H	H	H	H
D3	M	L	H	H	L	L	H	H	H	M	H	H	H	L	L	L	L

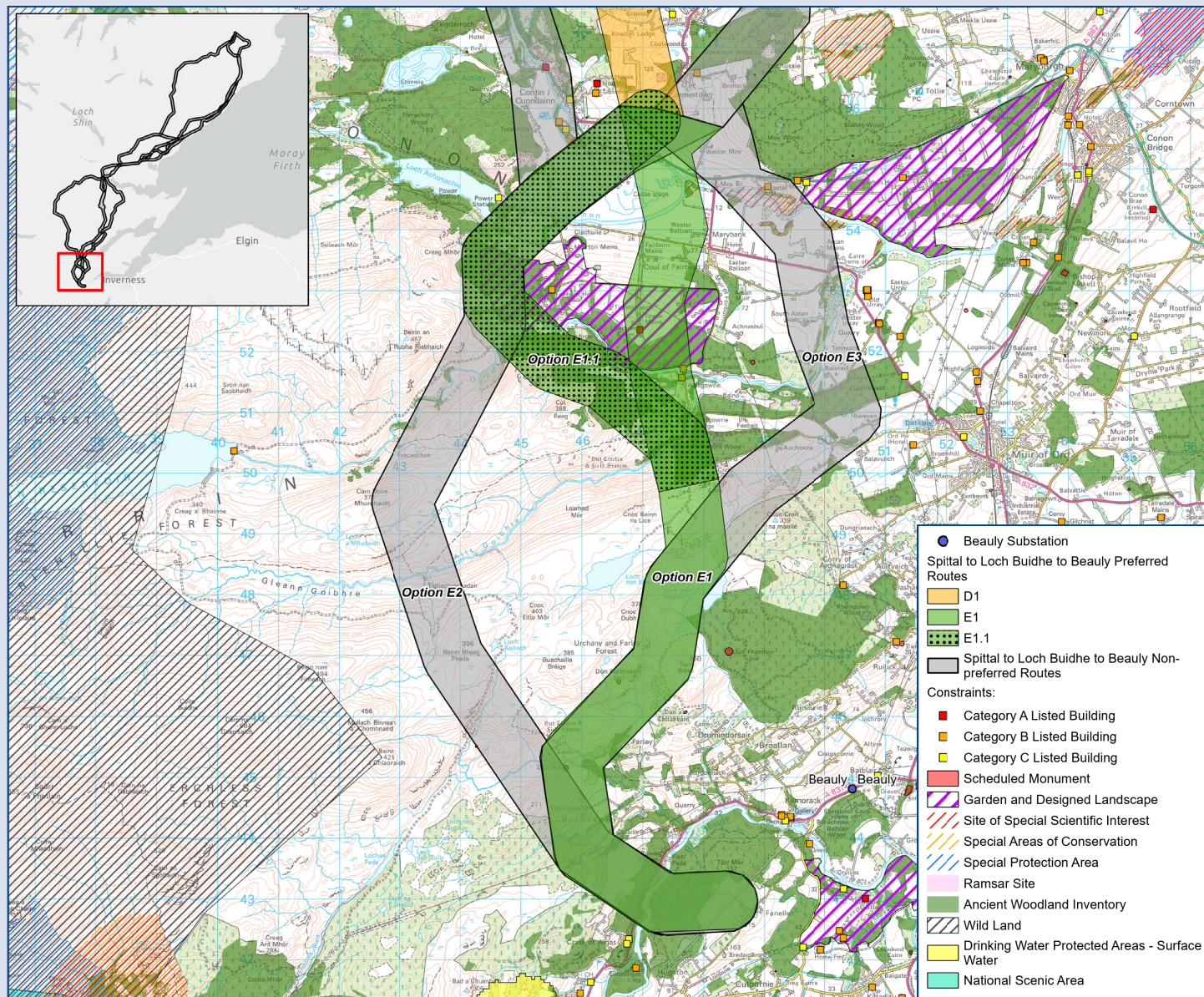
Our preferred route - Option D1

Option D1 is both the environmentally and technically preferred option as it avoids direct impact on SAC, SPA and SSSI sites and also has lower potential for impact on cultural heritage receptors as well as landscape character and designations. In addition it has comparatively lower gradients with fewer construction challenges and access road requirements. It also has fewer interactions with existing infrastructure and dwellings.

Option D1 is the preferred overall route option.

Section E - Dingwall to Beauly

Constraints in this section included areas of ancient woodland, the Fairburn GDL and Grade A-listed Fairburn Tower, Conon Islands SAC and Lower River Conon SSSI, and the Brahan GDL. There are a number of existing OHLs in the area including the 132kV Beauly – Corriemoillie OHL near to Muirton Mains and Loch Achonachie. Proximity to properties in this area was also a key consideration.



Section E - Dingwall to Beauly

For section E, there is one sub option for E1. An assessment of sub option E1.1 has been undertaken against E1. There is no clear preference between E1 and E1.1.

Options	Key topics relating to site					
	Geology, hydrology and hydrogeology	Elevation	Terrain	Route length	Access	Angle towers
E1	M	L	L	L	L	L
E1.1	L	H	H	H	M	H

Option E1/ E1.1 was then assessed against Options E2 and E3.

Options	Key topics relating to site												
	Habitats	Ornithology, geology, hydrology, and hydrogeology	Cultural heritage and designations	Cultural heritage assets	Visual	Agriculture	Elevation	Terrain	Peatland	Access	Wind farms	Communication masks	Urban environment
E1	M	M	H	M	M	M	M	M	L	M	L	M	M
E2	H	L	H	L	M	L	H	H	H	H	L	M	M
E3	M	M	L	M	H	M	M	M	L	M	M	H	H

Our preferred route - E1 with potential sub option E1.1

There is no clear environmentally preferred option. However, Option E1 (with sub option E1.1) presents the best opportunity to reduce impact on the Fairburn GDL, visual receptors and habitat. Option E1 (without sub option E1.1) is considered the technically preferred option considering ease of access, construction and less terrain/gradient challenges; it is considerably shorter in length and avoids peatland.

Whilst Option E1 is the preferred route option, at this stage it is not clear whether the final route should incorporate sub option E1.1; although there are technical and engineering challenges associated with E1.1, there is greater potential for environmental impact via incursion on the GDL area if E1.1. is not incorporated.

Substations

The new overhead line has to connect to the existing transmission network at connection points along the route. Therefore, new 400kV substation sites are required in addition to the existing sites at these locations.

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 132kV stepping-up to 275kV), 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.

Types of substations



The 275kV AIS substation at Loch Buidhe

Air Insulated Switchgear Substation (AIS)

An AIS substation is constructed with switchgear which relies on open air components, which can require large clearance areas for operation and safety, which takes up a larger area of land than GIS.

Pros: Traditionally lower cost and typically less construction time with less components required and easier maintenance.

Cons: Larger area of land required, exposed to elements, not recommended for coastal environments.

Gas Insulated Switchgear Substation (GIS)

A GIS substation is constructed with switchgear with gaseous reliant components which allows operation and safety clearances to be reduced compared to AIS.

Pros: Less space required, reduced visual impact.

Cons: High costs, specialised maintenance required, longer outage repair times.

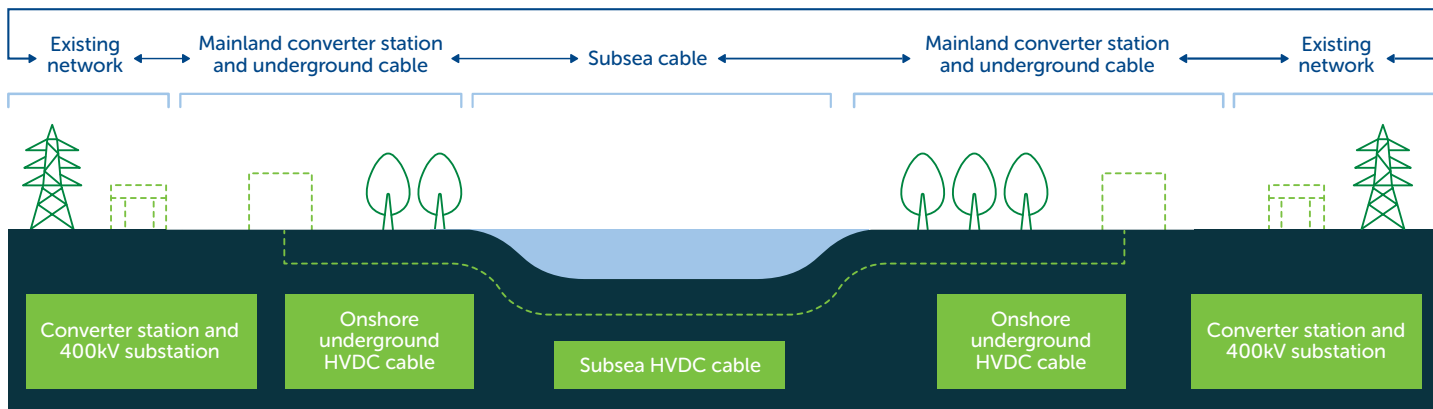


The GIS substation at Peterhead

HVDC converter stations

What is a converter station?

This is a site which converts Direct Current (DC) to Alternating Current (AC) or AC to DC. AC is how our houses and businesses use electricity from the grid. High Voltage DC (HVDC) is a well established technology that allows the efficient transmission of large quantities of electricity across long distances, with much reduced electrical losses compared with AC. It also introduces greater flexibility and resilience in the operation of the network and the management of variable outputs from renewable generation. A converter station needs to connect to a substation or switching station to access the AC network.



Converter station requirements

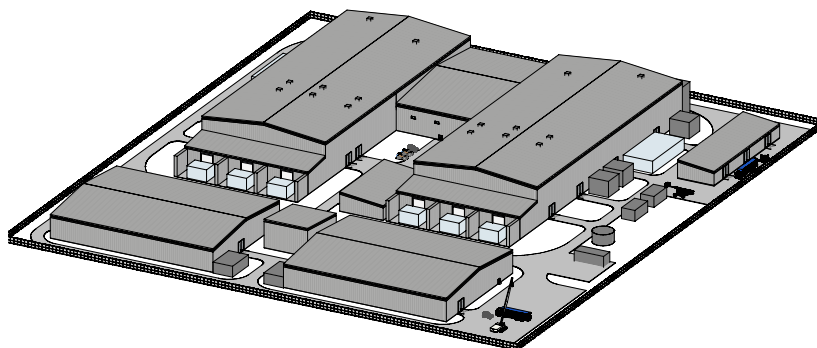
A Converter station requires a large area of generally level ground approximately 290m x 325m.

Most of the equipment would be contained within a large metal clad, climate-controlled building, approximately 200m x 170m with other smaller auxiliary buildings adjacent.

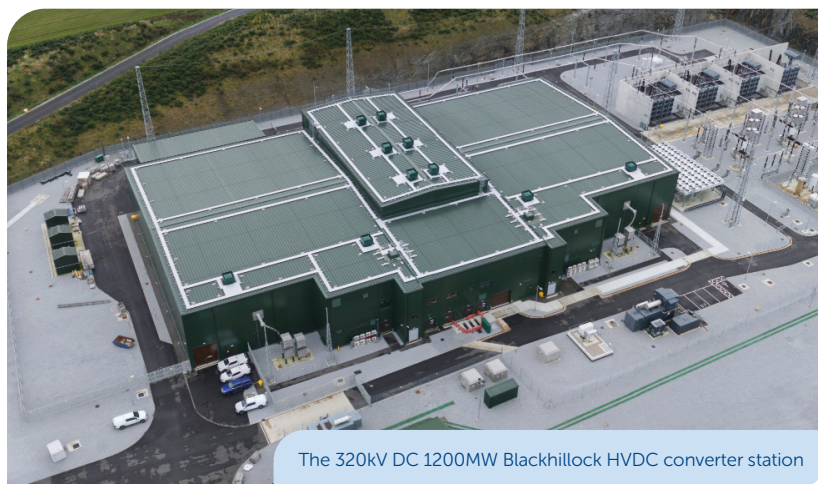
The buildings would typically consist of suitably coloured steel cladding with a pitched roof. The proposed rating of the subsea links requires the main building to be around 26m in height. This is due to the clearance distance required between the high voltage equipment and the buildings' structure.

All of the finished building designs are subject to approval with The Highland Council.

Converter stations need to be located as close to the AC transmission network as is practicable to minimise additional infrastructure and improve network operation.



Indicative conceptual design for 2GW 525kV Bipole converter station



The 320kV DC 1200MW Blackhillock HVDC converter station

New Spittal area 400kV substation and HVDC converter station

Project need

Caithness and the surrounding area is home to some of Scotland's best wind resources and the existing electricity network is at full capacity meaning no further generation can connect without significant network reinforcement. A proposed new 400kV substation and HVDC converter station in the area of Spittal is an integral part of this reinforcement, facilitating the connection of new onshore and offshore renewables generation whilst ensuring reliability of supply to the Caithness region.

New 400kV substation overview

A new 400kV substation is being proposed in the Spittal area to connect to the proposed new 400kV overhead line from Beauly, the new Spittal to Peterhead HVDC link and the existing Spittal 275/132kV substation.

The works will comprise of:

Substation:

- Construction of a new outdoor 400kV substation complete with 400kV double busbar arrangement that is approximately 530 x 340m (AIS) or approximately 250m x 200m (GIS)*.
- Installation of 2 new super grid transformers (SGT).
- A new substation control building.

Connections:

- The site requires to be connected to the existing Spittal substation via new underground cables.
- Connection with the proposed Spittal – Loch Buidhe – Beauly 400kV OHL.
- Space provision to allow for connection of future renewable energy generation projects.

*Note designs for both AIS and GIS are currently being considered. GIS would be the option of choice for a joint site with the HVDC converter (see below).

A joint solution

Rather than two separate sites, it is desirable to locate both new installations on a single large site, the advantages of this would be avoidance of longer AC connecting cables and a potentially reduced visual impact from keeping all new infrastructure in one location. The disadvantages are having to find a much larger site which is relatively flat and the potential to sterilise connection routes for the proposed new OHLs. Our site selection process has considered both separate and joint site options. Our preferred combined site would have a footprint of 870m x 340m.

New HVDC converter and Peterhead link overview

The Spittal to Peterhead HVDC project is a 2GW link and comprises of the following:

Onshore works in Caithness:

- A new 525kV DC 2GW Bi-pole HVDC converter station with a platform of 325m x 290m to be located near the new 400kV Spittal substation.
- AC underground cable connections to the New 400kV Spittal substation.
- HVDC underground cables from the converter station to a new landfall (still to be determined).

Offshore works:

- Subsea HVDC cables across the Moray Firth to Morayshire/Aberdeenshire landfall (still to be determined).

Onshore works in Moray/Aberdeenshire:

- These will consist of the same new infrastructure as proposed for Spittal and Caithness, running from a new landfall to a new Substation and converter station near Peterhead.

We are consulting on the HVDC converter station element of the Spittal – Peterhead subsea link at this stage, with the remainder of the works still in early development. Detailed consultation on the full Spittal – Peterhead project is due to be undertaken later this year.



Existing 320kV DC converter station at Spittal under construction in 2017/2018

New Spittal area 400kV substation and HVDC converter station

Stage 0 – Strategic options assessment

The following key requirements were identified for the new sites:

- Proximity to the existing 275kV network to minimise the amount of new overhead lines or cabling required to connect to the network.
- Large enough to accommodate the proposed individual or joint substation/converter station footprints, together with associated landscaping, contractor compounds, access and new connection routes.
- Additional space for future expansion.
- In areas which do not contain environmental designations and minimise impacts on local environmental receptors.
- Enable connection routes for the proposed new 400kV overhead lines and HVDC cables.

Stage 1 – Initial site screening

16 feasible site options were identified within a 10km search radius of the existing Spittal 275kV substation using publicly available data and multi criteria analysis (MCA) to provide high level constraints information. This allowed the team to identify areas which were too sensitive, constrained or technically challenging to construct a new site on.

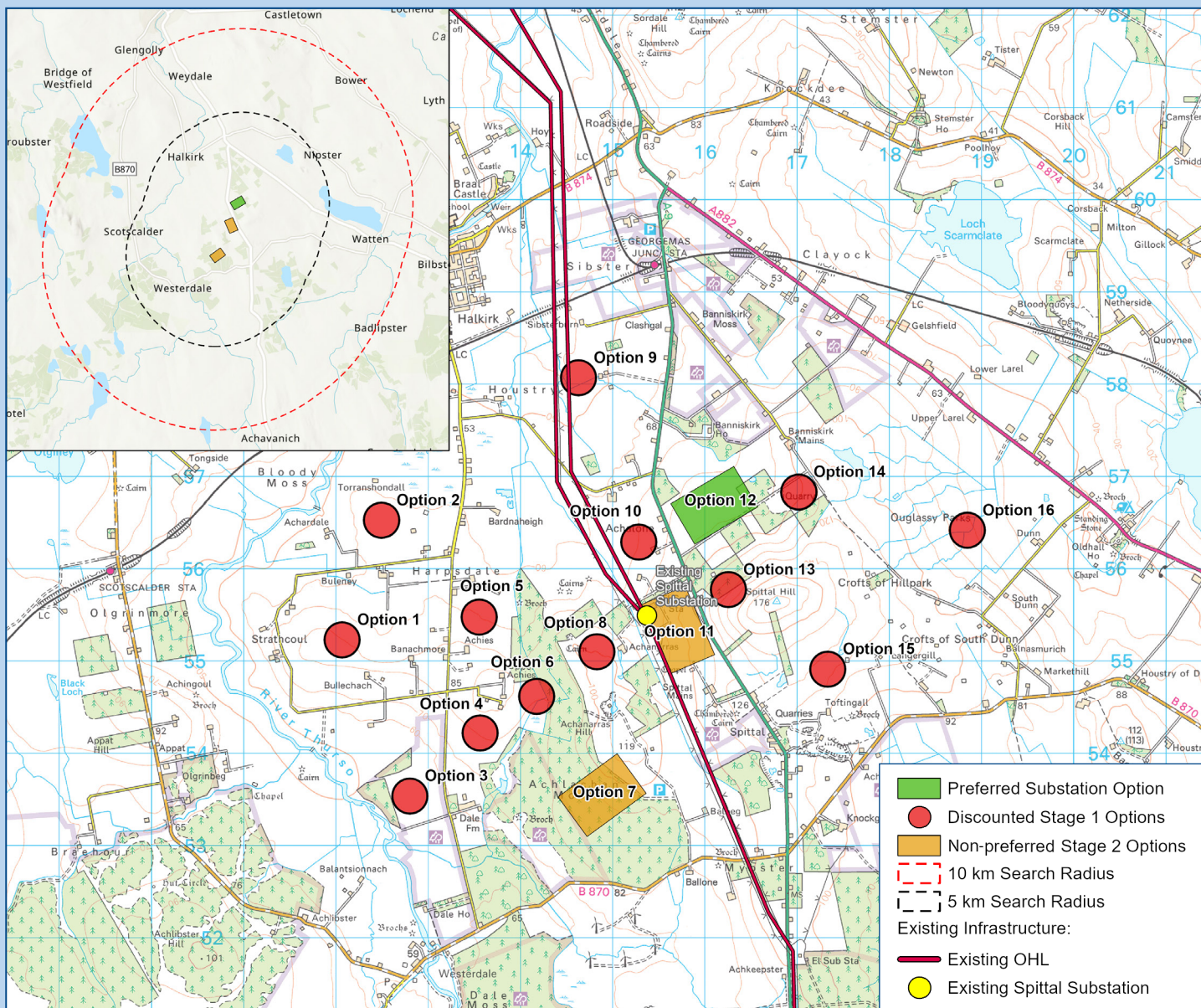
Assessment of the 16 options was undertaken against the key requirements and using the Red, Amber, Green (RAG) matrix in our Site Selection Guidance. This resulted in 13 of the 16 options being discounted from further assessment based on proximity to properties, distance from existing infrastructure and ecological sensitivities. Options 7, 11 and 12 were taken forward to Stage 2.

Stage 2 - Detailed site selection

Further appraisal and comparison of the 3 shortlisted options was undertaken based on the RAG matrix criteria within our Site Selection Guidance. A simplified version of the RAG table is presented here showing only those criteria which scored differently across the site options. The following criteria scored the same across all site options—designations, protected species, habitats, ornithology, geology, hydrology & hydrogeology, cultural heritage assts, landscape designations, agriculture, planning, DNO connection, elevation, salt pollution, carbon footprint, SF6 and contaminated land.

Options	Key topics relating to site																
	Visual	Landscape character	Forestry	Recreation	Connection access	Operation and	Existing circuits/networks	Future development possibilities	Interface with SSEN Distribution and Generation	Technology	Adjacent land use	Space availability	Unique hazards	Existing utilities and installations	Topography	Geology	Noise
7	H	H	M	M	M	M	M	M	L	M	M	M	M	M	M	M	L
11	L	M	L	L	L	L	L	H	M	L	M	M	M	M	M	L	M
12	M	M	L	L	L	L	M	L	L	L	L	L	L	L	L	L	L

New Spittal area 400kV substation and HVDC converter station



New Spittal area 400kV substation and HVDC converter station

Environmental

Natural heritage and planning: All options performed equally against these criteria. Designations in the area include the Achanarras Quarry SSSI, Caithness Lochs SPA.

Cultural heritage designations: Option 11 has the highest risk of cultural heritage impact due to close proximity of site to the Magnus Hospital and Church Scheduled Monument.

People: Option 7 is highly visible from Achanarras Quarry, a nearby recreational site. Option 12 is visible from sections of the A9 and the nearby village Halkirk. Option 11 is visible by traffic on the A9.

Landscape: Option 7 has high potential for an adverse impact on the local landscape due to the loss of the woodland, a spare feature of the landscape. Options 11 and 12 have some potential to impact the landscape character.

Land use: Options 7 would require the removal of commercial woodland and may affect the recreational value of the Achanarras Quarry SSSI, used by fossil hunters.

Our preferred site

The environmental preferred site is Option 11. Option 7 has the potential for more significant landscape and visual impact. Sites 11 and 12 are closely balanced, with Option 12 having potential for a higher impact on landscape and visual receptors and Option 11 the greater potential for impact on cultural heritage due to the St Magnus Hospital and Church Scheduled Monument close to the southern site boundary. Of these two constraints, landscape is considered likely to be more significant and as such, Option 11 is preferred.

The Engineering preferred site is Option 12 from connection, future expansion and connectivity aspects. Option 11 is also closely balanced from access aspect but future expansion would be challenging. Option 7 is more challenging compared to Options 11 and 12 due to forest cutting and peatland possibility. The preferred option is Site Option 12.

Therefore, taking these factors into consideration our overall preferred site is Option 12.

Engineering

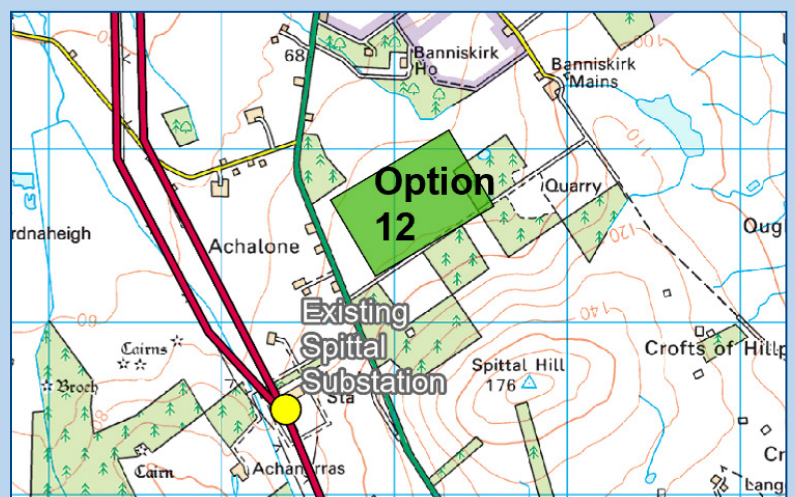
Connectivity: New HVDC cable connecting Peterhead from Spittal in case Option 7 will require crossing of existing HVDC cable. However, it has an advantage over the HVAC OHL circuit connection. Option 11 is in proximity with existing 132kV Spittal – Mybster OHLs and existing Spittal substation. Spittal – Mybster OHLs may require to be undergrounded at sections to facilitate entry of new OHL and cable connection at 400kV Spittal substation. Option 12 has advantages with respect to the preferred route corridor for 400kV Loch Buidhe – Spittal OHL and to avoid the crossing of existing HVDC cables.

Footprint requirement: All options performed equally against these criteria. However from adjacent land use aspects Option 12 has an advantage for potential future expansion possibility.

Hazards: Options 7 and 11 performed equally against these criteria due to facilities in proximity. Option 12 potentially has fewer underground utilities and less height difference compared to Options 7 and 11.

Ground condition: Option 7 will require existing forest tree cutting and area is a possible peatland and forestry drainage required to be managed. Option 11 is in proximity to the A9 trunk road required possible additional stabilization and it is also in proximity to archaeology. Option 12 has a low flood area, flat ground, is in proximity to an agricultural farming field and located nearby good quality stone.

Construction access, operation and maintenance: Option 7 will require major public road improvements. Options 11 and 12 performed equally against these criteria being in proximity to public road A9.



New Loch Buidhe area 400kV substation

Project need

In order to support the wider connection of both onshore and offshore renewables promoted as part of the UK's commitment to delivering green energy targets and the transition to a low carbon energy network, SSEN Transmission proposes the establishment of a new 400kV substation adjacent to the existing 275/132kV Loch Buidhe substation. The new 400kV substation is needed because the current 275kV network is at capacity and no further renewable energy can be connected without significant reinforcement of the north of Scotland electricity transmission network. This new substation will connect to the existing transmission network at Loch Buidhe, allowing existing and proposed renewable generators to transmit electricity to areas of demand on the GB transmission network.

Loch Buidhe 400kV substation overview

The project will see the construction of a new 400kV substation close to the existing 275kV substation site at Loch Buidhe.

The works will comprise of:

- Construction of a new outdoor, AIS, 400kV substation complete with 400kV double busbar arrangement.
- Installation of 2 new super grid transformers (SGT).
- A new substation control building.
- Installation of underground cables to connect the new 400kV substation to the existing 275kV substation.
- New 400kV overhead line connections to the 400kV substation.
- Space provision to allow for connection of future renewable energy generation projects.

This substation is required in line with the delivery of the 400kV Spittal – Beauly overhead line (OHL) Project. The project is located approximately 9.5km northeast of Bonar Bridge and will connect to the 400kV lines proposed for the Spittal – Beauly Overhead Line reinforcement. The existing 275kV AIS substation at Loch Buidhe is shown below.



The existing 275kV AIS substation at Loch Buidhe

The currently proposed substation footprint is 463m x 311m utilising outdoor air insulated switchgear.

The closer we can establish the new 400kV substation to the existing 275kV substation the less excavation and cabling will be required to connect the two sites minimising the disruption of the existing landscape.

We have engaged Environmental Resource Management (ERM) specialist environmental consultants to assess the surrounding environmental, landscape and sustainability options and provide us with feedback on potential site and associated scoring locations.

New Loch Buidhe area 400kV substation

Stage 0 - Strategic options assessment

The following key requirements were identified for the new sites:

- Proximity to the existing 275kV substation to minimise the amount of new overhead lines or cabling required to connect to the network.
- Large enough to accommodate the proposed substation footprint, together with associated landscaping, contractor compounds, access and new connection routes.
- Additional space for future expansion.
- In areas which do not contain environmental designations and minimise impacts on local environmental receptors.
- Enables connection routes for the proposed new 400kV overhead line.

Stage 1 – Initial site screening

5 feasible site options were identified within a 10km search radius of the existing Loch Buidhe 275kV substation using publicly available data and multi criteria analysis (MCA) to provide high level constraints information. This allowed the team to identify areas which were too sensitive, constrained or technically challenging to construct a new site on.

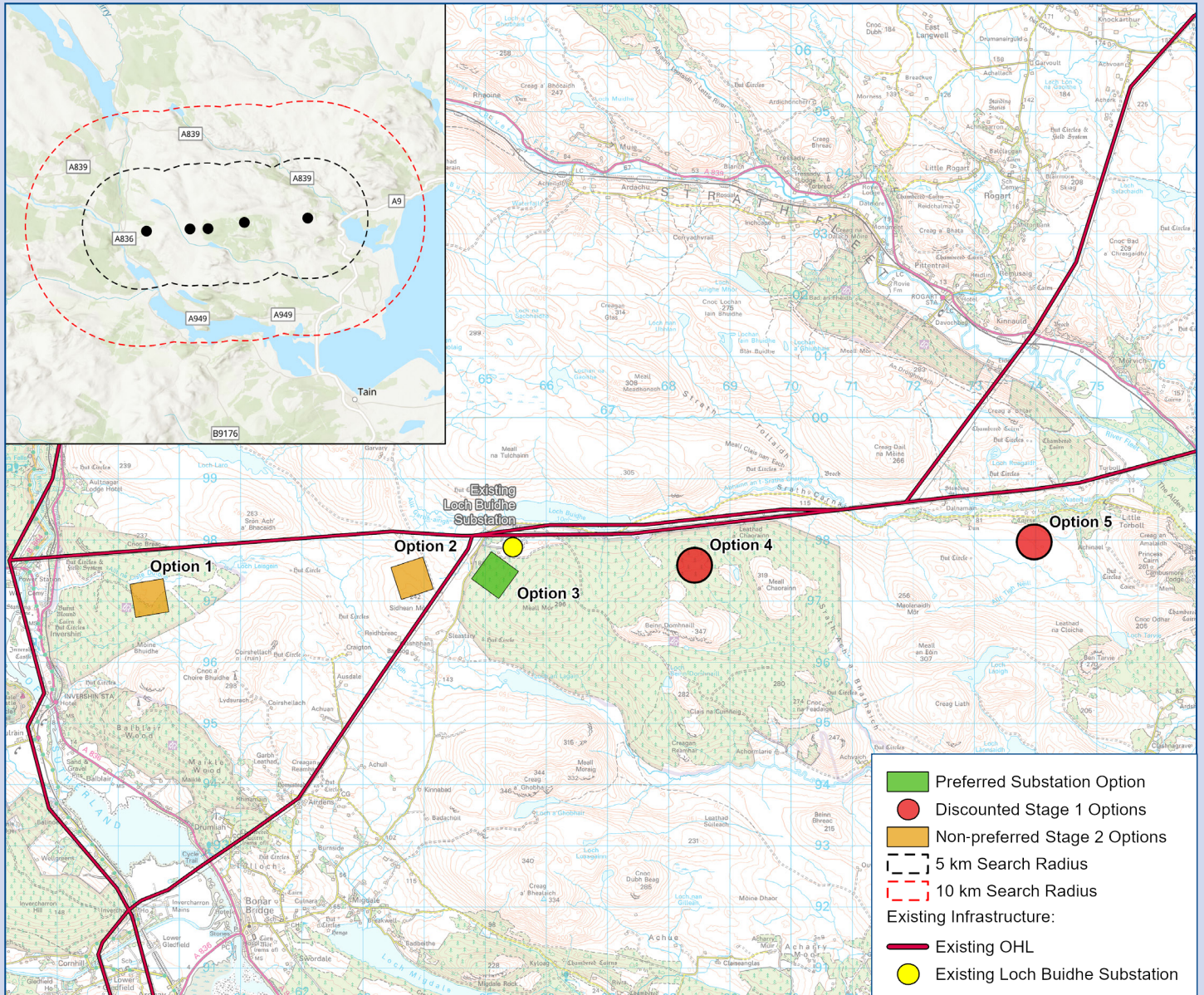
Assessment of the 5 options was undertaken against the key requirements and using the Red, Amber, Green (RAG) matrix in our Site Selection Guidance. This resulted in 2 options being discounted from further assessment based on access constraints, land use impacts and environmental sensitivities. Options 1, 2 and 3 were taken forward to Stage 2.

Stage 2 – Detailed site selection

Further appraisal and comparison of the 3 shortlisted options was undertaken based on the RAG matrix criteria within our Site Selection Guidance. A simplified version of the RAG table is presented here showing only those criteria which scored differently across the site options. The following criteria scored the same across all site options - protected species, settlements, physical effects, landscape designations, landscape character, agriculture, Interface with SSEN Distribution and Generation, DNO Connection, technology, space availability, topography, elevation, salt pollution, SF6, contaminated land and noise.

Options	Key topics relating to site																		
	Natural habitat/designations	Habitats	Ornithology	Geology, hydrology and hydrogeology	Cultural heritage/designations	Cultural heritage assets	Visual	Forestry	Recreation	Planning	Connection access	Operation and maintenance	Existing circuits/networks	Future development possibilities	Adjacent land use	Unique hazards	Geology	Carbon footprint	Noise
1	L	H	L	L	H	H	M	M	M	M	M	M	L	M	H	M	H	H	L
2	M	H	M	M	L	M	L	L	L	H	L	M	L	M	H	L	H	H	M
3	H	L	H	M	L	L	L	M	L	L	L	L	M	L	M	L	M	M	L

New Loch Buidhe area 400kV substation



New Loch Buidhe area 400kV substation

Environmental

Natural heritage designations: Option 3 is within, and Option 2 is adjacent to the Strath Carnaig and Strath Fleet Moors SPA and SSSI. Option 3 would result in loss of habitat within this internationally and nationally designated site. Historical bird surveys suggest this area is not heavily used by nesting hen harrier.

Habitats: Habitat is of higher value at site options 1 and 2 with peatland present and greater potential to compromise the integrity of ground water dependent terrestrial ecosystems (GWDTE).

Geology, hydrology and hydrogeology: There are three known private water supplies within 600m of Options 2 and 3.

Cultural heritage designations and assets: Option 1 has the potential to impact the setting of scheduled monuments a battlefield and category A, B and C listed buildings.

Visual and recreation: Option 1 may be visible from core paths in Invershin and national cycle network (NCN) Route 1.

Forestry: Options 1 and 3 would require the removal of coniferous woodland which would require to be compensated with an equivalent area of trees.

Engineering

Connection access, operation and maintenance: The existing track for Option 1 is too steep and would need to be assessed/ upgraded for both construction/ permanent access.

Existing circuits/networks: Option 3 would require the undergrounding of both a 275kV circuit and 132kV circuit.

Future development possibilities: Options 1 and 2 have more obstructions limiting future expansion of the substation.

Unique hazards: Option 1 is within the anticipated wake zone of the proposed Garvary wind farm turbines.

Adjacent land use, geology and carbon footprint: Options 1 and 2 are within large areas of Class 1 and Class 2 carbon and peatland. Extensive excavations of peat and importation of large quantities of engineered fill material would be required to produce a stable level platform on which to construct a substation.

Noise: There are residential properties located on Loch Buidhe Road, 650m from Option 2. Option 2 is also within an area of open moorland with no natural acoustic barriers between the substation and the residential properties.

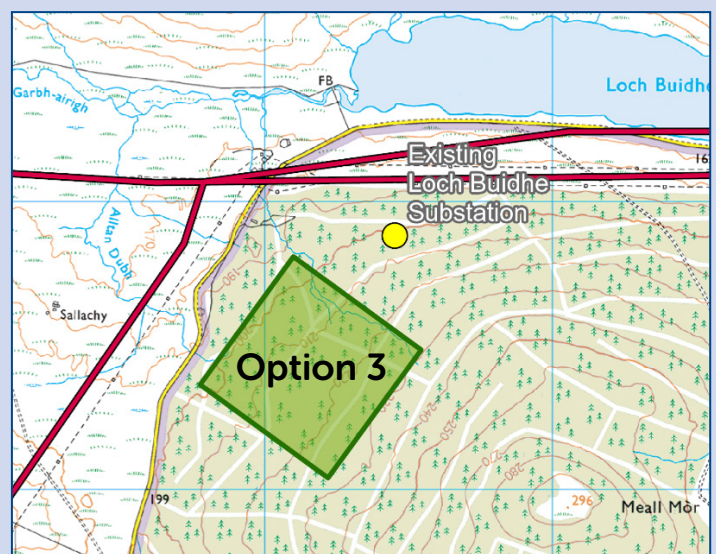
Our preferred site

Option 3 is considered the environmentally and technically preferred option.

Clustering development adjacent to the existing substation limits the potential for landscape and visual impact in the wider area. In addition habitat is of lower value and the site is further from the proposed Gavaray wind farm.

Although within the Strath Carnaig and Strath Fleet Moors SPA and SSSI, historical bird surveys suggest this area is not heavily used by nesting hen harrier so may not present a significant constraint.

Option 3 would require the shortest connections and could use the access road for the existing Loch Buidhe substation.



New Beauly area 400kV substation and HVDC converter station

New 400kV substation

A new 400kV substation is being proposed in the Beauly area to connect the proposed new 400kV overhead line reinforcements from Spittal and Peterhead, together with the new Western Isles Link.

The existing Beauly substation at Wester Balblair, together with the proposed new substation and Beauly – Denny 400kV OHL are the centre point of these critical reinforcements.

The proposed new substation will serve as a 'switch', allowing power to be directed in whichever direction is needed.

Overview

The proposed new substation comprises the following:

Substation:

- A switching station on a platform that is approximately 500m x 270m (AIS) or approximately 250m x 200m (GIS).*
- Control building, switchgear and busbar.

Connections:

- The site requires to be connected back to the existing Beauly substation, via new 400kV infrastructure (either OHL or underground cables). This could be achieved by connecting directly onto the existing Beauly – Denny 400kV OHL.
- Connection with the proposed Spittal – Loch Buidhe – Beauly 400kV OHL.
- Connection with the proposed Beauly – Blackhillock – Peterhead 400kV OHL.

Western Isles link and HVDC converter

The Western Isles is home to some of Scotland's greatest wind resource and the existing network is at full capacity meaning no further generation can connect without significant network reinforcements. The new HVDC connection will transmit electricity generated by renewables on the Western Isles to areas of demand. This requires a long connection using subsea and onshore underground cables to provide a link between the Western Isles and Beauly, the most suitable place on the 400kV transmission network. National Grid ESO's 2022 Holistic Network Design (HND) required an increase to the size of the subsea link from 600MW to 1.8GW.

Overview

The proposed Link comprises the following:

Onshore works in the Highlands:

- A new 525kV DC 1.8GW Bi-pole HVDC converter station to be located close to the New 400kV AC substation near Beauly. The platform size will be circa 300m x 275m.
- An AC underground cable connection to the new 400kV substation.
- HVDC underground cables from the converter station to a landfall on the West Coast at Dundonnell.

Offshore works:

Subsea HVDC cables between the landfalls at Dundonnell and Arnish Point, Stornoway.

Onshore works on the Western Isles:

These will consist of similar new infrastructure as proposed for Beauly, running from a new landfall at Arnish Point to a new 275kV substation and converter station near Stornoway.

A joint solution

Rather than two separate sites, it may be feasible to locate both new installations on a single larger site (approximately up to 775m x 290m depending on technology). The advantages of this would be avoidance of the AC connecting cables and a potentially reduced visual impact from keeping all new infrastructure in one location. The disadvantages are having to find a much larger site which is relatively flat and the potential to sterilise connection routes for the proposed new OHLs. Our site selection process has considered both separate and joint site options.

New Beauly area 400kV substation and HVDC converter station

Stage 0 – Strategic options assessment

The following key requirements were identified for the new sites:

- Proximity to the existing 400kV network to minimise the amount of new overhead lines or cabling required to connect to the network.
- Large enough to accommodate the proposed individual or joint substation/converter station footprints, together with associated landscaping, contractor compounds, access and new connection routes.
- Additional space for future expansion.
- In areas which do not contain environmental designations and minimise impacts on local environmental receptors.
- Enable connection routes for the proposed new 400kV overhead lines and HVDC cables.

Stage 1 - Initial site screening

16 feasible site options were identified within a 10km search radius of the existing Beauly 400kV substation using publicly available data and multi criteria analysis (MCA) to provide high level constraints information. This allowed the team to identify areas which were too sensitive, constrained or technically challenging to construct a new site on.

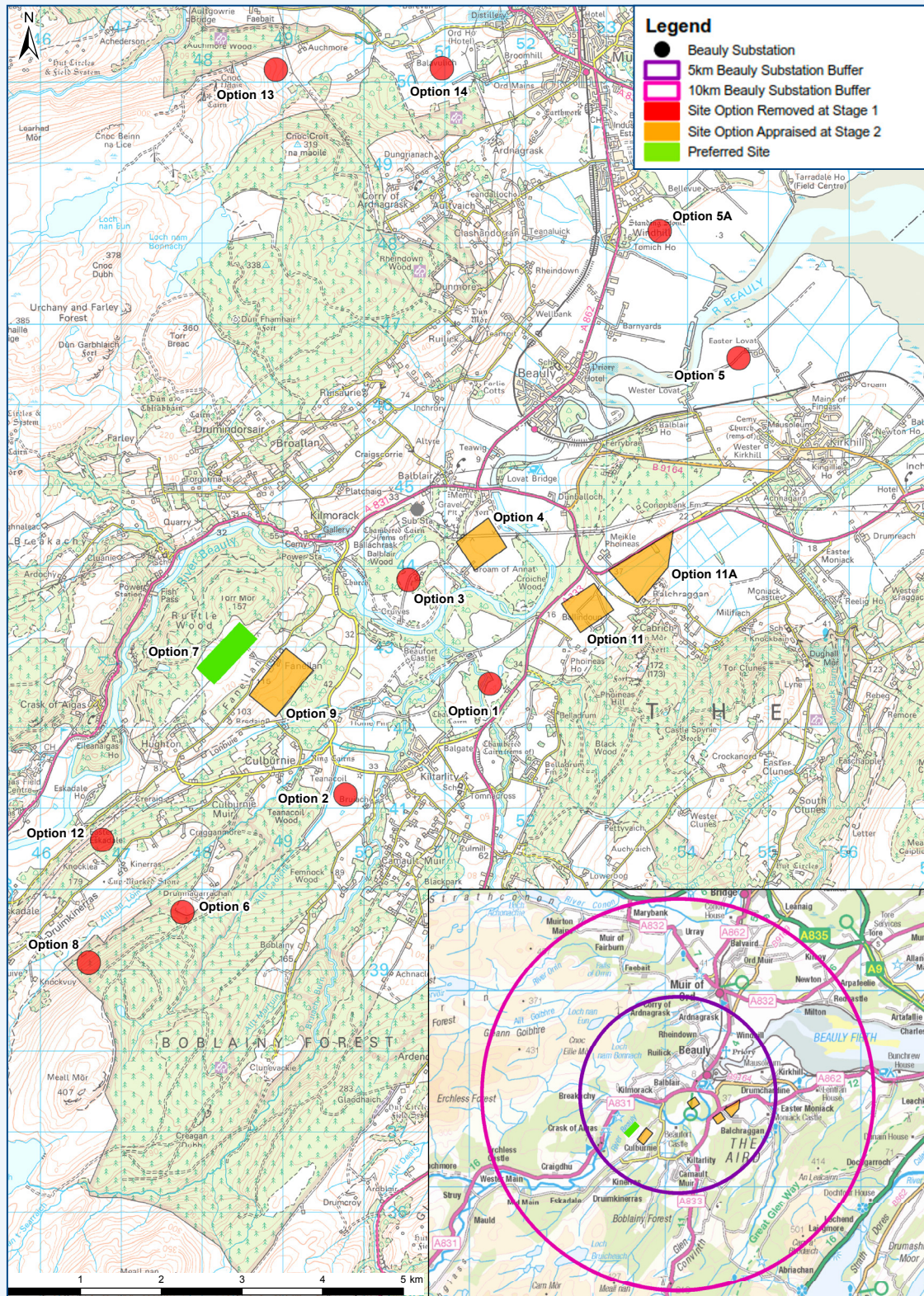
Assessment of the 16 options was undertaken against the key requirements and using the Red, Amber, Green (RAG) matrix in our Site Selection Guidance. This resulted in 12 of the 16 options being discounted from further assessment based on proximity to designated areas and local settlements, visual impact and connectivity to the existing and future 400kV circuits around Beauly. Please note, Option 10 was an area option represented by site Options 3 & 4, and is therefore not shown on the site options map. Options 4, 7, 9 and 11 together with a combined option of 11/11a were taken forward to Stage 2.

Stage 2 – Detailed site selection

Further appraisal and comparison of the 4 shortlisted options was undertaken based on the RAG matrix criteria within our Site Selection Guidance. A simplified version of the RAG table is presented here showing only those criteria which scored differently across the site options. The following criteria scored the same across all site options - ecological designations, habitats, heritage designations, settlements, physical effects, landscape designations, Interface with SSEN Distribution and Generation, DNO Connection, salt pollution, SF6, contaminated land and noise.

Options	Key topics relating to site														
	Protected species	Geology, hydrology and hydrogeology	Cultural heritage assets	Visual	Landscape character	Agriculture	Recreation	Planning policy	Construction access	Connectivity, existing circuits/network	Future development possibilities	Adjacent land use and space availability	Unique hazards	Existing utilities and installations	Ground conditions
7	M	L	L	H	M	M	L	M	H	L	M	L	M	H	M
7/9	M	L	L	H	M	M	L	M	H	L	M	L	M	H	M
4/11	H	H	M	M	M	H	M	H	M	M	H	M	M	M	M
11/11a	H	M	M	M	M	H	L	H	L	H	M	H	M	M	M

New Beauly area 400kV substation and HVDC converter station



New Beauly area 400kV substation and HVDC converter station

Environmental

Natural heritage and planning: All options performed equally against these criteria. Designations in the area include the Beauly Firth, Inner Moray Firth and Moray Firth designated as a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar Site and Site of Special Scientific Interest (SSSI), the Lower River Conon SSSI and Conon Islands SAC and the Moniac Gorge SAC/SSSI.

Cultural heritage designations: Options 4/11 and 11/11a have the highest risk of cultural heritage impact due to close proximity of site to heritage designations within the search area including scattered scheduled monuments and listed buildings, the Beauly Conservation Area, and two inventory gardens and designed landscapes (GDL); most notably the Beaufort Castle GDL.

People: Options involving site 11/11a are highly visible from the local road network and nearby settlements. Option 4 has the potential to use existing woodland screening but the connections elements will be highly visible.

Landscape: Options 4/11 and 11/11a have high potential for significant adverse impacts on the local landscape due to loss of woodland and large amount of new 400kV connections infrastructure. Options 7 and 7/9 can use the undulating topography and proximity to Beauly – Denny to limit wider visual impacts.

Land use: Options 4/11 and 11/11a would have the highest impact on Best and Most Versatile (BMV) agricultural land.

Our preferred site

Option 7 is located high up on undulating topography which offers the opportunity to reduce its visual intrusion into the surrounding environment. It is screened by woodland to the north and west. It will require road improvements for construction and operational purposes. Option 7 will minimise new 400kV connections and therefore comparatively will result in less disruption to the wider area.

Overall, when considering the sites alongside the required connections, it is considered that Option 7 offers the best opportunities to limit the overall environmental impacts to the wider area whilst also reducing the engineering complexities and associated costs.

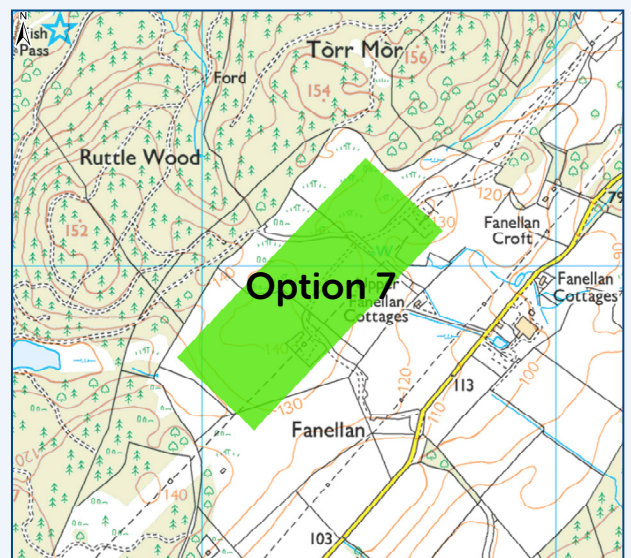
Engineering

Connectivity: Options 4/11 and 11/11a require the most complex and challenging 400kV connections back to Beauly – Denny OHL, existing Beauly substation and the two new OHLs from the north and east. Options 7 and 7/9 have significantly reduced connections requirements.

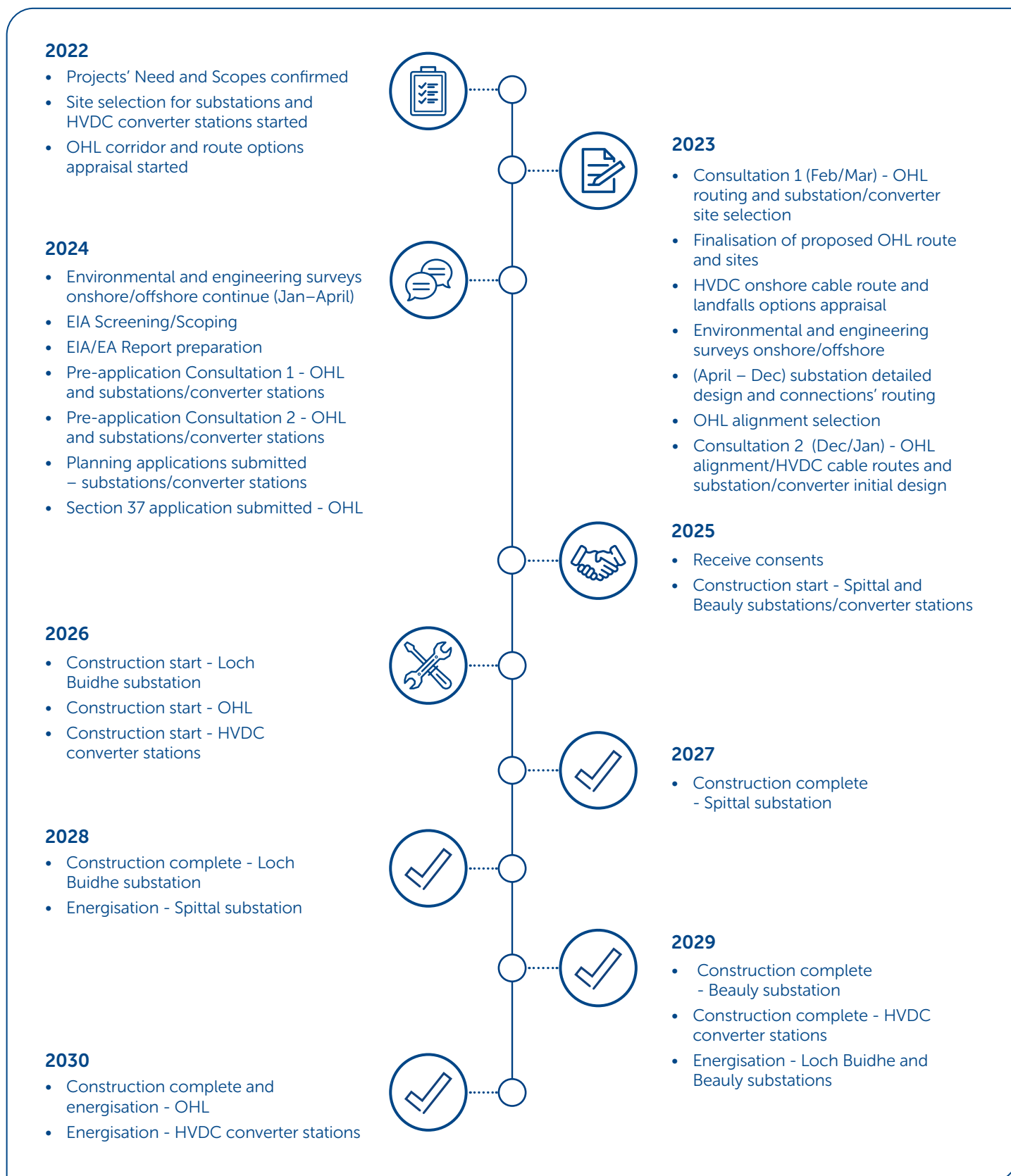
Footprint requirement: Options involving Site 11/11a performed the worst against these criteria. For adjacent land use availability, Options 7 and 7/9 have an advantage for potential future expansion possibility.

Ground condition: All options performed equally against these criteria, subject to further ground investigations. Option 4 is partially within a flood zone.

Construction access, operation and maintenance: Options 4/11 and 11/11a performed better as they are located close to main roads. Options 7 and 7/9 will require upgrades to local minor roads to facilitate construction traffic.



Project timeline



Other projects

Central Highlands (Beaully) area

Projects in development

Beaully to Denny 400kV Second Circuit Uprating

This project will see the second circuit on the Beaully – Denny overhead line (OHL) upgraded from 275kV to 400kV, to accommodate new renewable energy generators. The Beaully – Denny line was constructed for 400kV operation on each of its two circuits but put into service with one operating at the lower voltage of 275kV. This means that no alterations to the existing OHL are required to upgrade it to 400kV. This upgrade includes new, additional substations near Fasnakyle and also at Braco to accommodate the 400kV equipment, alongside some modifications to other substations including: Fort Augustus, Errochty, Kinardochy and Tummel.

Beaully - Blackhillock - New Deer – Peterhead 400kV OHL

This project has been identified as key to connecting the growth in onshore and offshore renewables across the north of Scotland. A 400kV connection, alongside new substations is needed to connect new renewable power sources and transport it from source to areas of demand across the country. Following initial consultation in Autumn 2022, further consultation will take place in Spring 2023 regarding route options.

West of Beaully Asset Replacement projects

New substations to provide hydro generation connections to the associated generator are required at Deanie, Culligran, Aigas and Kilmorack, collectively termed as 'The West of Beaully Asset Replacement' projects. These existing ageing assets need to be replaced to meet modern standards and provide reliability of supply. Consultation events were held in Autumn 2022 where feedback and comments were sought on site options and further consultation will be held early 2023.

Glen Strathfarrar VISTA (Visual Impact of Scottish Transmission Asset)

This project involves the removal of overhead line between Deanie Power Station and Deanie Lodge, Glen Strathfarrar to be replaced by installing underground cables. The identification of a cable route and sites for sealing-ends where the line will pass from overhead to underground in the vicinity of Loch Beannacharan. Deanie Substation will be the planned connection point for the VISTA project.

Approximately 13 towers will be removed and replaced with approximately 3.5km of underground cable. The project is in early development and further details will be shared once available.

Western Isles Connection

As described as part of this consultation, a Beaully area HVDC converter station is required to help facilitate the Western Isles connection. Further consultation regarding this project will be held in early 2023 regarding the rest of the scope.

Beaully - Aigas - Deanie Reconductoring

Intervention on the 132kV double circuit tower line from Beaully to Aigas, Kilmorack, Culligran and Deanie has been identified as required due to the age of the asset. The proposal involves the full refurbishment of the tower line including the replacement of phase conductors, earth wire and fixtures and fittings.

This project is in early development and a project webpage will be created later this year providing more information once project details are confirmed.

Projects in construction

Beaully 132kV Redevelopment

Construction on this project (required to replace ageing assets to connect the Loch Luichart Extension II wind farm) began in late 2022. The works involve a new 132kV GIS substation building at Wester Balblair substation. Once this is completed, all existing 132kV AIS circuits will be brought into the new building and the existing 132kV AIS substation will be decommissioned and removed. Three transformers will be replaced and fitted with noise enclosures and the project will also decommission and remove the last four spans of overhead line into the existing substation and replace this with underground cabling into the new GIS substation building.

Other projects

North Highlands (Caithness & Sutherland) area

Projects in development

Gills Bay 132kV Connection

This project will enable the connection of Meygen Tidal and Hollandmey wind farm to the transmission network. The main elements of the project are a new switching station at Phillips Mains, near Gills Bay, 10km of underground cable and 13km of overhead line on steel lattice towers.

Spittal – Peterhead Subsea cable link

As described as part of this consultation, a new Spittal area HVDC converter station is required to help facilitate the Spittal to Peterhead HVDC Link and move large volumes of power (up to 2GW) from Caithness closer to the demand centres. Further consultations for the cabling elements of this project will be held later in 2023.

Scotwind Connections

Scotwind is a programme where Crown Estate Scotland leased areas of the seabed around Scotland for wind farm developments. Developers applied to the scheme to be granted the rights to build offshore wind farms in Scottish waters. As much as 27GW of new generating capacity will be built over the next decade through Scotwind.

As the owner of the electricity transmission network for the north of Scotland, we have a licence obligation to connect these Scotwind projects to the national grid. Through our 'Pathway to 2030' plan we will connect up to 10GW of the Scotwind generation.

Further investments will be needed to realise Scotwind's full ambition, with the National Grid Electricity System Operator expected to set out the additional network reinforcements required in Spring 2023.

Wind farm connections

As the transmission license holder in the north of Scotland, we have a duty under Section 9 of the Electricity Act 1989 to facilitate competition in the generation and supply of electricity. We have obligations to offer non-discriminatory terms for connection to the transmission system, both for new generation and for new sources of electricity demand.

We have a licence obligation to connect the following wind farm developments once consented to the transmission network:

- Achany wind farm
- Armadale wind farm
- Chleansaid wind farm
- Kintradwell wind farm
- Lairg 2 wind farm
- Strathy South wind farm
- Strathy Wood wind farm
- Slickly – goes into Gills Bay
- Hollandmey – Hollandmey goes into Gills Bay
- Beinn Tharsuinn
- Melvich
- Achrugan
- Garvary

Projects in construction

Lairg – Loch Buidhe

This project will connect renewable energy to the transmission network and includes a new Lairg substation (Dalchork) and a new substation north of Lairg, adjacent to the existing overhead line. We've also constructed approx. 17km of overhead line between the new Lairg substation and the Loch Buidhe substation on a new alignment and are continuing with the removal of the Cassley Shin line, currently programmed to be complete for Spring 2023.

Caithness HVDC Switching Station (Noss Head)

To enable a subsea transmission cable from Shetland to connect to the UK National Grid, we are constructing an HVDC switching station at Noss Head in Caithness. Construction works are now in the completion and commissioning stages.

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:

- Have we adequately explained the need for these projects?
- Do you feel sufficient information has been provided to enable you to understand what is being proposed and why?
- Are you satisfied that our approach taken to select our preferred overhead line route and/or substation locations has been adequately explained?
- Do you agree with our preferred overhead line route and/or substation locations if not, why?
- Are there any factors, or environmental features, that you consider may have been overlooked during the preferred overhead line route and/or substation location selection process?
- Do you have any other comments or concerns in relation to the transmission infrastructure requirements or about the preferred overhead line route/substation locations?

Additional information

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



Project website:
ssen-transmission.co.uk/north-highlands

Follow us on Facebook:
[@assencommunity](https://www.facebook.com/assencommunity)

Follow us on Twitter:
[@assetransmission](https://twitter.com/assetransmission)

Feedback

Following our events, a consultation period will open until **Friday 31st March 2023**.

You can submit feedback by completing our online feedback form available on our project webpage or using the feedback form at the back of this booklet. Alternatively, you may also submit feedback in writing, email or by phone.

The feedback will be analysed by the project team and a report on the consultation will be produced and published on our website detailing our response to your feedback.


For overhead line, Spittal and Loch Buidhe-based enquiries:



Martin Godwin
Community Liaison Manager

 martin.godwin@sse.com

 +44 (0) 7467 399 592


 SSEN Transmission
10 Henderson Road,
Inverness, IV1 1SN


For Beaully-based enquiries:



Sally Cooper
Community Liaison Manager

 sally.cooper@sse.com

 +44 (0) 7918 470 281

 SSEN Transmission
10 Henderson Road,
Inverness, IV1 1SN

Comments

Your views and comments can be provided to the project team by completing our online feedback form available on our project webpage or using the feedback form at the back of this booklet. Alternatively, you may also submit feedback in writing, email or by phone to the Community Liaison Manager. All feedback received will be assessed and the proposed options adapted where necessary.

Your feedback

- Spittal – Loch Buidhe – Beaully 400kV overhead line
- New Spittal area 400kV substation and HVDC converter station
- New Loch Buidhe area 400kV substation
- New Beaully area 400kV substation and HVDC converter station

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

Please complete in **BLOCK CAPITALS**.

Q1 Which consultation event did you attend? (Select all that apply)

- | | | | | |
|---------------------------------------|------------------------------------|-----------------------------------|----------------------------------|---------------------------------|
| <input type="checkbox"/> Halkirk | <input type="checkbox"/> Helmsdale | <input type="checkbox"/> Dunbeath | <input type="checkbox"/> Golspie | <input type="checkbox"/> Online |
| <input type="checkbox"/> Bonar Bridge | <input type="checkbox"/> Ardross | <input type="checkbox"/> Dingwall | <input type="checkbox"/> Beaully | <input type="checkbox"/> None |

Q2 Is there a specific section of the overhead line route or a new substation/HVDC converter station that you are interested in? (Select all that apply)

Please note – it is important that you select which projects you are most interested in and refer back to these in any comments made in following questions so that we can accurately process your feedback

- | | |
|--|--|
| <input type="checkbox"/> Section A – Spittal to Brora overhead line | <input type="checkbox"/> Section B – Brora to Golspie overhead line |
| <input type="checkbox"/> Section C – West of Dornoch overhead line | <input type="checkbox"/> Section D – Dornoch to Dingwall overhead line |
| <input type="checkbox"/> Section E – Beaully to Dingwall overhead line | <input type="checkbox"/> New Spittal area 400kV substation |
| <input type="checkbox"/> New Spittal area HVDC converter station | <input type="checkbox"/> Loch Buidhe area 400kV substation |
| <input type="checkbox"/> New Beaully area 400kV substation | <input type="checkbox"/> New Beaully area HVDC converter station |

Q3 Have we adequately explained the need for this project?

- Yes No

Comments:

Q4 Do you feel sufficient information has been provided to enable you to understand what is being proposed and why?

- Yes No

Comments:



Q5 Are you satisfied that our approach taken to select our preferred overhead line routes and/or substation locations has been adequately explained?

Yes No

Comments:

Q6 Do you agree with our overhead line route and/or substation locations, if not, why? (Please indicate which area your comment relates to if you have selected multiple answers for Q2)

Yes No

Comments:

Q7 Are there any factors, or environmental features, that you consider may have been overlooked during the preferred overhead line route and/or substation location selection process? (Please indicate which area your comment relates to if you have selected multiple answers for Q2)

Yes No

Comments:

Q8 Do you have any other comments or concerns in relation to the transmission infrastructure requirements or about the preferred overhead line route/substation locations? (Please indicate which area your comment relates to if you have selected multiple answers for Q2)

Comments:

Full name

Address

Telephone

Email

If you would like to be kept informed of progress on this project via email, please tick this box.

If you would like your comments to remain anonymous please tick this box.

Thank you for taking the time to complete this feedback form.

Please submit your completed form by one of the methods below:

Post: SSEN Transmission, 10 Henderson Road, Inverness, IV1 1SN

Email: martin.godwin@sse.com, sally.cooper@sse.com

Online: ssen-transmission.co.uk/projects//2030-projects/North-Highlands

Download: Comments forms and all the information from today's event will also be available to download from the project website.

The feedback form and all information provided in this booklet can also be downloaded from the project websites.

Any information given on the feedback form can be used and published anonymously as part of Scottish and Southern Electricity Networks consultation report. By completing this feedback form you consent to Scottish and Southern Electricity Networks using feedback for this purpose.

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For information on how we collect and process your data, please see our privacy notice: ssen.co.uk/PrivacyNotice

Any information given on the feedback form can be used and published anonymously as part of Scottish and Southern Electricity Networks consultation report. By completing the feedback form you consent to Scottish and Southern Electricity Networks using feedback for this purpose. Comments made to SSEN Transmission are not representations to the Scottish Ministers and if SSEN Transmission submit an application there will be an opportunity to make representations on the application to Scottish Ministers.



Notes

