

Site Selection Consultation Document – Beauly – Denny 2nd Circuit Upgrade Braco West

August 2023



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Glossary

Term	Definition
Alternating Current (AC)	Type of electrical current in which the direction of flow of electrons switches back and forth at regular intervals or cycles.
Area of Search (Study Area)	A broad geographical area within which possible sites might be capable of identification within approximately 5km of the required connectivity point; usually determined by geographical features such as coastlines or hill/mountain ranges, or designation boundaries, such as National Park boundaries.
Consultation	The dynamic process of dialogue between individuals or groups, based on a genuine exchange of views and, normally, with the objective of influencing decisions, policies or programmes of action.
Distribution Network Operator (DNO)	A licensed company that owns and operates the network of cables, transformers and towers that provide electricity.
Gigawatt (GW)	A unit of electrical power equal to one billion watts.
High Voltage Direct Current (HVDC)	HVDC is an effective way to transmit electricity and is primarily transmitted in this form by overhead lines or underground cables.
Holistic Network Design (HND)	Detailed report identifying the electricity network needs to enable connection of 23GW of offshore wind, including the needs associated with the offshore and onshore transmission network, facilitating the UK government offshore wind target of 50 GW by 2030.
Kilovolt (kV)	A unit of electrical power equal to one thousand volts.
Kilowatt	A unit of electrical power equal to one thousand watts.
Local Development Plan (LDP)	LDP's are usually prepared by the Local Planning Authority and set out the proposals for future development and use of land in their area.
Megawatt (MW)	A unit of electrical power equal to one million watts.
National Planning Framework 4 (NPF4)	The national spatial strategy for Scotland. It sets out the spatial principles, regional priorities, national developments and national planning policy. It replaces NPF3 and Scottish Planning Policy.
Preferred Site	The Option that is the preferred choice, following Stage 2 – Detailed Site Selection based on environmental, engineering and cost perspectives.
Overhead line (OHL)	An electric line installed above ground, usually supported by lattice steel structures or poles.
Stakeholders	Organisations and individuals who can affect or are affected by SSEN Transmission works.
Substation	A node on the network to allow safe control of the electricity network. This could include convergence of multiple circuits, transformation of voltage or other functions to maintain and operate the electricity network.
The National Grid	The electricity transmission network in Great Britain.
Volts	The international unit of electric potential and electromotive force.
Watts	The unit of measurement for the rate at which electrical energy is transferred or used.
Works	Constructing new transmission infrastructure such as substations, overhead lines, underground cables, major refurbishment of these, the dismantling and removal of any parts of the system; and associated works, which may include formation of access tracks, bridge and road improvements, tree cutting, drainage etc.

1 Introduction

This document has been prepared by Scottish and Southern Electricity Networks Transmission (SSEN Transmission). SSEN Transmission, operating under licence held by Scottish Hydro Electric Transmission plc (SHE Transmission), owns, operates and develops the high voltage electricity transmission system in the north of Scotland and remote islands. This document invites comments from all interested parties on the Potential Site for a new 400 kilovolt (kV) substation and associated infrastructure (hereafter referred to as the 'Proposed Development') required at Braco, approximately 16 km north of Stirling.

This document describes the site selection process followed, site options identified, the appraisal undertaken, the alternatives considered during the selection of options and the suggestion for a Potential Site. This document supports the information made available to the public and statutory authorities as part of ongoing consultation. This Consultation Document along with project details is available online at the project website:

[Beauly Denny 400kV Upgrade - SSEN Transmission \(ssen-transmission.co.uk\)](https://ssen-transmission.co.uk)

An ArcGIS Story [maps](#) site and has been prepared in order to provide a more detailed overview of the process that we've followed to reach the current stage in the project. In publishing this document, we aim to facilitate a more standardised format for the public and statutory consultees alike to access the information previously presented and one which enables a wide range of information about the project to be easily downloaded.

1.1 Project Background and Need

As a result of the Scottish and UK Governments' Net Zero climate change targets, together with requirements set out in the British Energy Security Strategy (BESS) (April 2022) and subsequently in National Grid's, the Electricity System Operator (ESO), "Pathway to 2030" Holistic Network Design (HND) (July 2022), significant increases in renewable generation capacity are required across the UK, resulting in significant investment in new transmission network infrastructure to transport this energy and reinforce the network.

The BESS sets out the UK Government's plans to secure the country's future energy independence by reducing the dependence on, and price exposure to, volatile global wholesale gas markets. This will be achieved by accelerating the deployment of homegrown and affordable low carbon electricity generation, together with accelerating the enabling electricity network infrastructure required to connect and transport this power. The BESS included an increased ambition for offshore wind generation of 50 gigawatt (GW) by 2030, up from the previous target of 40 GW.

To enable the connection of that 50 GW of offshore wind by the 2030 target date, the National Grid (the ESO), working in collaboration with the three Great Britain Transmission Owners, developed what is known as the 'Holistic Network Design' (the HND). This sets out the onshore and electricity transmission infrastructure required across Great Britain to deliver this UK Government target, including projects in SSEN Transmission's Licence Area across the north of Scotland.

Caithness and the surrounding area are home to some of Scotland's best wind resources and the existing electricity transmission network in the region is at full capacity, meaning the planned new renewable energy generation required by BESS cannot connect without significant network reinforcement.

As part of the wider UK network reinforcements detailed in the BESS and HND, SSEN Transmission is proposing to upgrade the existing Beauly-Denny 275 kV circuit to 400 kV to mirror the ratings of the existing 400 kV circuit which runs along the route. This upgrade can make use of the existing

overhead line (OHL) infrastructure but requires alterations/additions to the associated substations along the route, namely at Beauly, Fasnakyle, Fort Augustus, Tummel/Errochty/Kinardochy and Braco West. Whilst the project will be considered as one (with common timescales programmed) there are 5 distinct sites requiring works, each with differing scopes, requirements, and therefore consenting types and timescales. See **Figure 1** below.

In December 2022, the energy regulator, Ofgem, approved the need for these projects as part of its Accelerated Strategic Transmission Investment (ASTI) framework decision.

These projects, alongside several other major network upgrades planned in the north of Scotland, are therefore part of a Great Britain wide programme of works that are required to meet UK and Scottish Government energy targets; there is a clear expectation from Government and the energy regulatory, Ofgem, that these projects will be delivered by 2030. More specifically, these projects are needed to deliver Government 2030 renewable targets set out in the BESS.



Figure 1: Main North of Scotland Electricity Transmission Network in 2030.

1.2 Project Overview

SSEN Transmission is proposing to upgrade the existing Beauly-Denny 275kV circuit to 400kV to mirror the ratings of the existing 400kV circuit which runs along the route. The upgrade can make use of existing OHLs infrastructure but requires alterations/additions to several associated substations including at Braco West.

SSEN Transmission is therefore proposing a new substation site near the existing Braco West substation as there is insufficient space on the existing site at Braco West to accommodate the additional equipment associated with the wider 400kV upgrade. The new substation site is required to be in proximity of the existing substation to tie back into it. Whether this will be via OHL or underground cable (UGC) has not yet been determined and will depend on its location.

1.3 Strategic Considerations

Implementing the proposed development of a new substation in proximity to the existing Braco West Substation to house the equipment required to enable the large-scale upgrade will comprise the following:

- 400kV transformers and a new 400kV double busbar;
- Current indicative platform size for an Air Insulated Switchgear Substation (AIS) is approximately 380 x 315m. These are taken to comprise a working 'worst case scenario for site selection'. Earthworks would be required to develop the level platform;
- Removal of some of the equipment from the existing 275kV Braco West substation, with the control building likely to remain;
- Overhead line tie ins from the new substation to the existing Beauly – Denny overhead line; and
- Upgrade existing or provide new access tracks, temporary construction compounds and construction laydown areas.

1.4 Site Selection Process

The site selection process has followed formal internal guidance to enable a consistent and rigorous selection of alignments and sites for new substations, switching stations and converter stations. The site selection process has three key stages, each increasing in detail and definition. Technical, environmental, and cost considerations are brought together in a way which seeks the best balance in accordance with SSEN Transmission's Network Operator's Licence and the Electricity Act 1989. This staged process leads to the identification of a finalised proposed substation site, which will be taken forward for planning. An overview of the Substation Site Selection Process is provided in **Figure 2**.

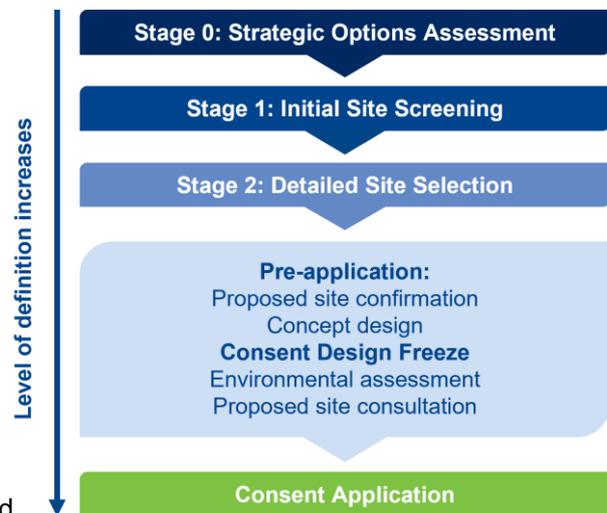


Figure 2: Overview of the Optioneering Process

Pre-Site Selection Activities: The starting point in all substation site selection projects is to establish the need for the project and to select potential engineering options that can deliver this need. This process will be triggered by the preparation of several internal assessments and documents.

Stage 1: Initial Site Screening: This stage seeks to identify technically feasible, economically viable and environmentally acceptable site options within a defined area. The search area may vary depending on terrain, other infrastructure, designated areas and features and connection options. The aim is to identify several potential sites which are initially assessed for suitability and to identify which of the identified sites can be shortlisted for further assessment.

Stage 2 Detailed Site Selection: This stage seeks to identify a potential substation site, which avoids where possible physical, environmental and amenity constraints, is likely to be acceptable to stakeholders and is economically viable, taking into account engineering and connection requirements.

2 Stage 0: Strategic options assessment

A strategic options assessment has been undertaken by SSEN Transmission. The outcome of this strategic options assessment identified the following key requirements for the new site:

- Proximity to the existing Braco West substation site in order to tie back into it. This was set nominally at 5 km for an effective Search Area;
- Large enough to accommodate the estimated size of development outlined in section 1.3.1;
- In areas which do not contain environmental designations and minimise impacts on local environmental receptors; and
- Additional capacity for future connections addressing the potential need for UGC.

The outcome of the strategic options assessment informed the identification of sites to take forward as part of the Stage 1: Initial Site Screening Stage.

3 Stage 1: Initial Site Screening

In this section the 6 potential site options findings are presented, these have been evaluated in detail using a combination of multicriteria analysis, site walkovers and desktop study to identify options to progress to stage 2 analysis.

Assessment of the 6 options was undertaken against the key criteria within SSEN Transmission's internal site selection guidance and using the Red, Amber, Green (RAG) matrix which is provided as **Figure 3** below. This resulted in 3 of the 6 options being discounted from further assessment based on proximity to designated areas and local settlements, visual impact, ecological constraints, and connectivity to the existing and future infrastructure around Braco West, when compared to the 3 shortlisted sites. The following two pages show the location of each Option and the reasons why that Option was not taken forward to Stage 2.

Performance	Comparative Appraisal
Most preferred	Low potential for the development to be constrained.
↓	Intermediate potential for the development to be constrained.
Least preferred	High potential for the development to be constrained.

Figure 3: Overview of the RAG Matrix ratings

The following section highlights the location of each Option and the justification for selection of Options from Stage 2 analysis.

Option 1

- Option 1 is located approximately 3.5 km west of Braco Village
- Option 1 sits within a Drinking Water Protected Area for Groundwater; the site sits on a moderately productive 2B Aquifer.
- Option 1 is located between two surface watercourses that flow directly downstream into the Muckle Burn and Bullie Burn. These water courses are rated Good and Moderate Water Framework Directive (WFD) status respectively, indicating they are of high ecological value.
- Option 1 is located within a landscape character area (Lowland Hills- Tayside). Characterised by; low rounded ridges and hills, soft red sandstone, medium-scale pastures and rough grazing, extensive woodland, and modern settlements limited to farmsteads and hamlets. Potential for visual screening of the development is available for Option 1.
- Option 1 is located within existing commercial forestry (Cambushinnie Forest Plan), site walkover identified forestry activity currently present on site.
- A pre-existing planning proposal for the formation of a battery energy storage compound is located approximately 50 m north of the option (22/02231/FLM).
- There are on-going forestry works (15/01842/PN) within the Cambushinnie Forest which Option 1 is located within, large degrees of felling are thought to be required for development and there is evidence of logging on Option 1.

Option 2

- Option 2 is located Approximately 3.5 km west of Braco Village.
- Option 2 sits within a Drinking Water Protected Area for Groundwater; the site sits on a moderately productive 2B Aquifer.
- Site location within a Landscape Character Area (LCA) (Lowland Hills-Tayside). Characterised by; low rounded ridges and hills, soft red sandstone, medium-scale pastures and rough grazing, extensive woodland, and modern settlements limited to farmsteads and hamlets. Potential for screening exists of sensitive visual receptors for Option 2.
- Option 2 is located within existing commercial forestry (Cambushinnie Forest Plan), site walkover survey identified forestry activity currently present on site.
- There are on-going forestry works (15/01842/PN) within the Cambushinnie Forest which the Option is within.
- Pre-existing planning proposal (22/02231/FLM) for the formation of a battery energy storage compound is located approximately 50 m north of the site.

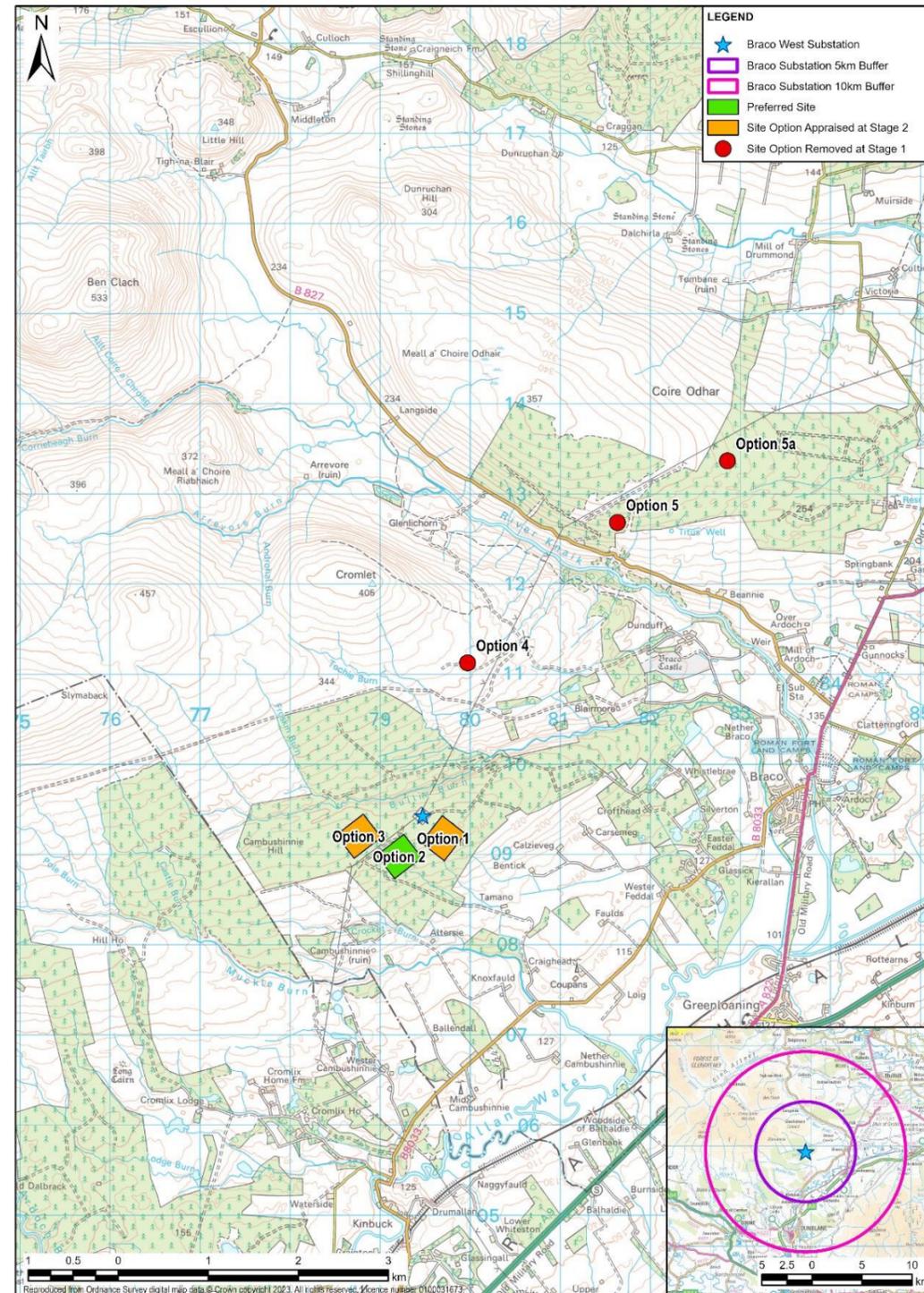


Figure 4: Location of options for the initial screening relative to the existing Braco West Substation

Option 3

- Option 3 is located approximately 3.5 km west of Braco Village.
- Option 3 sits within a Drinking Water Protected Area for Groundwater and sits on a moderately productive 2B Aquifer.
- Option 3 is located within a landscape character area (Lowland Hills-Tayside). Characterised by; low rounded ridges and hills, soft red sandstone, medium-scale pastures and rough grazing, extensive woodland, and modern settlements limited to farmsteads and hamlets. More potential for planning policy conflicts relating to LCA as less opportunity for screening compared to option 1 & 2.
- Existing commercial forestry (Cambushinnie Forest Plan), site walkover survey identified forestry activity currently present on Option 3.
- A pre-existing planning proposal (22/02231/FLM) for the formation of a battery energy storage compound is located approximately 50 m north of Option 3.
- There are on-going forestry works (15/01842/PN) within the Cambushinnie Forest which Option 3 is within.

Option 4

- Option 4 is located approximately 3.4km west of Braco Village.
- Option 4 is located within a Drinking Water Protected Area for Groundwater and 1 Surface Water Drinking Water Protected Area.
- Option 4 is also located on a 2B, moderately productive aquifer.
- Several unnamed surface watercourses flow through Option 4, these drain directly downstream into the River Knaik, which has Good WFD status (SEPA, 2020).
- There are three scheduled monuments located approximately 5 km east of this Option. Braco Garden & Designed Landscape is also located 1 km to the east.
- Option 4 is also located within a landscape character area (Lowland Hills-Tayside). Characterised by; low rounded ridges and hills, soft red sandstone, medium-scale pastures and rough grazing, extensive woodland, and modern settlements limited to farmsteads and hamlets.
- There are currently several existing planning proposals within close vicinity of Option 4. Potential planning and land-use conflicts related to the formation of a battery energy storage compound located approximately 1.5 km north of the site (22/02231/FLM). Additional nearby developments include an operational telecommunications mast (19/00638/PNT), 2 operational wind turbines (12/01082/FLL), as well as an application for the erection of 4 wind turbines (09/02052/FLL) all approximately 400m east, of Option 4.

Option 5

- Option 5 is located within a Drinking Water Protected Area for groundwater and is located on a moderately active 2B aquifer.
- Option 5 is located approximately 3.2 km north of Braco Village.
- Option 5 is located within a Drinking Water Protected Area for groundwater and is located on a moderately active 2B aquifer.
- Several unnamed surface watercourses flow through Option 5, draining directly downstream into the River Knaik, which has Good WFD status (SEPA, 2020).
- Option 5 is located within a Landscape Character Area (Lowland Hills- Tayside). Characterised by; low rounded ridges and hills, soft red sandstone, medium-scale pastures and rough grazing, extensive woodland, and modern settlements limited to farmsteads and hamlets.
- Several scheduled monuments are in proximity of the site, these are present between 5 km and 2 km, north, south, east, and southeast of the site. Braco Garden & Designed landscape is also approximately 1 km southeast of this option.
- Option 5 is also located within existing commercial forestry (Greenscares Forest Plan). The site walkover confirmed that forestry is currently present on site.
- There is currently a planning proposal for a hazardous substances consent for hydrogen, located within 50 m of Option 5 (22/01318/HS)

Option 5a

- Option 5a is located approximately 3.2 km north of Braco Village.
- Potential land-use conflict due to the Surface Water Drinking Water Protected Zone present on Option 5a.
- Option 5a is located within a Drinking Water Protected Area for groundwater and is located on a moderately active 2B aquifer.
- Several unnamed watercourses route through Option 5a which drain into the River Knaik, this river has a good overall rating in the WFD (SEPA, 2020).
- Option 5a is located within a Landscape Character Area (Lowland Hills- Tayside). Characterised by; low rounded ridges and hills, soft red sandstone, medium-scale pastures and rough grazing, extensive woodland, and modern settlements limited to farmsteads and hamlets.
- Option 5a borders existing commercial forestry on the southeast side (Corrieour Forest Plan), Drummond Trust Forest Plan to the east and the Greenscares Forest Plan to the southwest. The site walkover confirmed that forestry is currently present on site.
- There is currently a planning proposal for a hazardous substances consent for hydrogen, located approximately 1.60 km south-west of Option 5a. (22/01318/HS).

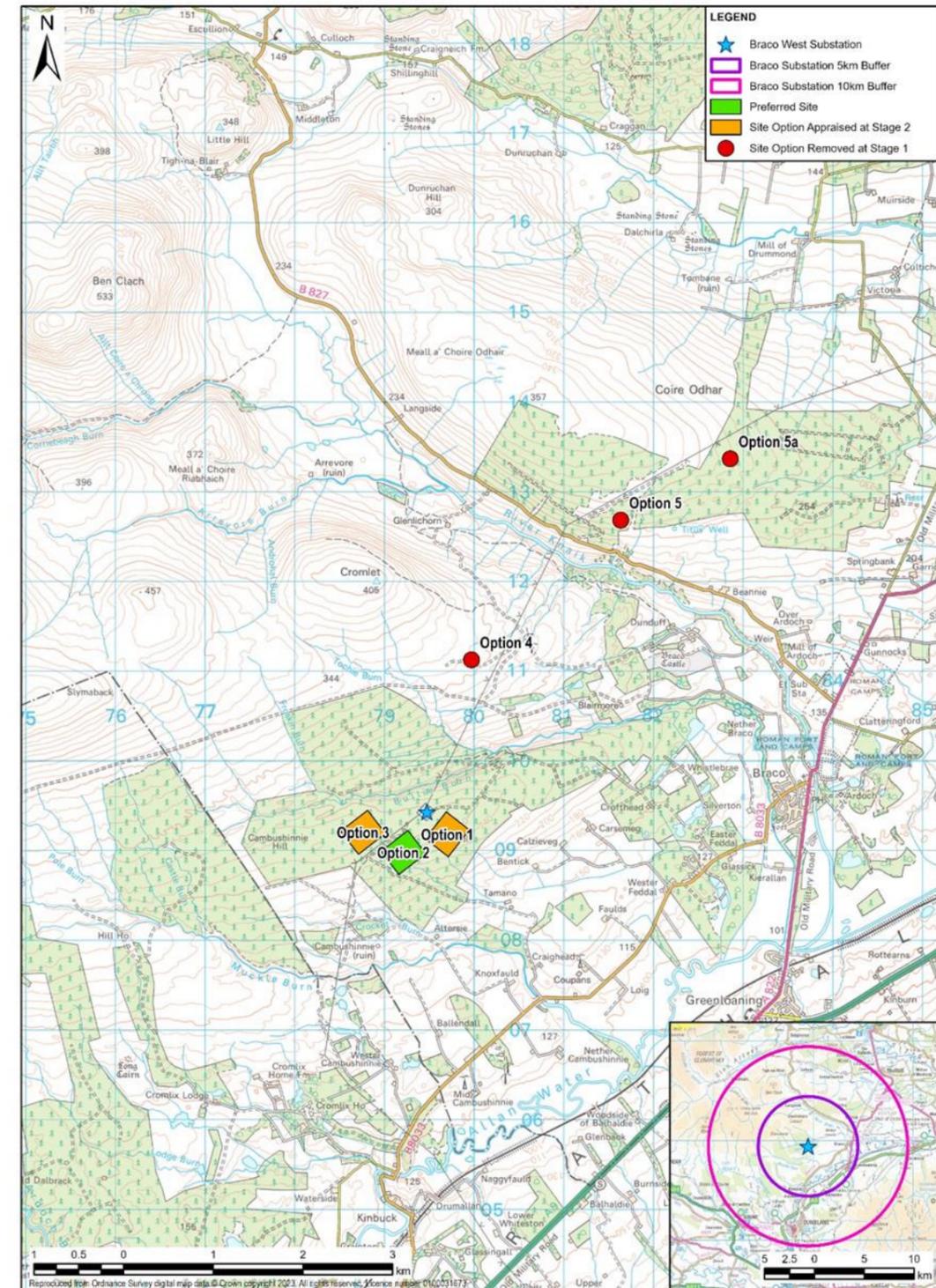


Figure 5: Location of options for the initial screening relative to the existing Braco West Substation

4 Stage 2: Detailed Site Selection

The option selection appraisal conducted in Stage 1, in line with the requirements outlined in Section 1.4, identified that substation options 1, 2 and 3 were recommended to be taken forwards into the detailed assessment in stage 2. A summary outlining the findings of the detailed constraints assessment of each option is set out below:

Option 1

- As Option 1 exhibits an additional suitability for water voles, it would be considered as having a higher ecological potential and would be least environmentally preferred with regards to protected species, while Option 2 and Option 3 cannot be accurately separated regarding their ecological potential.
- Option 1 has a Biodiversity Net Gain figure of +3% based on an area of heathland creation of 3.62ha.
- Option 1 contains marshlands that potentially support GWDTEs, however, this is likely to be surface water fed and is dominated by soft rush.
- The option is located within a Drinking Water protected Area & a Moderately productive 2B Aquifer.
- Potential of surface water run-off from nearby unnamed watercourses.
- Potential visual impact on receptors Tamano Farm and 2 Core-paths, BRAC/111 & BRAC/108, as well as being present in a Landscape character area (LCT-380). Though there is potential for mitigation through screening.
- Option 1 sits within the Cambushinnie Forest Plant. All options sit within this area however, Option 1 would require 100% of the forestry within the option area to be cleared for development. The coverage of forestry within Option 1 is estimated at 70% of the total area. Options 2 & 3 would also require 100% of the forestry within the option area to be cleared for development, however the coverage of forestry within Options 2 & 3 is estimated at 50%, meaning less overall felling and clearing is required within Options 2 & 3.

Option 2

- Option 2 has the largest percentage Biodiversity Net Gain statistic of +114%. This is based on an area of heathland creation of 7.94ha.
- Option is located within a Drinking Water protected Area & a Moderately productive 2B Aquifer.
- Some environmental constraints potentially associated with visual impact of development. Located within LCT 380, the development is potentially visible from two Core Paths, which could lead to landscape and visual policy conflicts. However, there is significant potential to mitigate this through effective screening.

Option 3

- Option 3 is the most constrained Option by Biodiversity Net Gain, with percentage Net Gain figure of -34% based on an area of 2.15ha of heathland created.
- Option is located within a Drinking Water protected Area & a Moderately productive 2B Aquifer.
- Environmental constraints generally limited to the topography and vegetation surrounding Option 3 presenting less opportunity to screen the visual impact of development when compared with Options 1 & 2. Option 3 is also located within LCT 380, development would be more visible in the Ochil Hills in the Southeast, Residential and Farmstead properties, and Core Paths (BRAC 111 & BRAC 108) meaning more risk of, and less control over avoiding landscape and visual policy conflicts.



Figure 6: Location of options for the initial screening relative to the existing Braco West Substation

Following the completion of the Stage 1 initial screening process a total of three sites were identified and taken forward to Stage 2. Environmental and engineering surveys have been undertaken for these options to supplement information gathered from desk-based assessments. The three options can be seen in **Figure 6** on the previous page, summary details of the options are set out below:

- **Option 1:** A 400 kilovolt (kV) Substation connecting into the existing Beauly-Denny Overhead Line, with a connection at a lower voltage back to the existing Braco West Substation, which will be used to power the continuing Grid Supply Point located there. This option will re-use the access track to the existing Substation. Note that due to the complexity of the tie-in to the overhead line from this site location, and the paucity of other factors in which this Option excels compared to Options 2 and 3, it was discarded from an engineering perspective early in the Stage 2 process.
- **Option 2:** As Option 1 but using a new access track comprising of an alternative track following the reinstated Beauly-Denny Overhead Line access route to the south-west. The circuit connection in this option can be made directly onto the overhead line on the same side.
- **Option 3/3a:** Option 3 is as Option 2, but on the opposite side of the line and tying into the first (existing 400kV) circuit instead of the 275kV circuit. Option 3a ties into the 275kV circuit but requires a length of 400kV cable and a Cable Sealing End Compound located on the opposite side of the line in order to achieve this. Note that initial network assessment indicates this new Substation will not be able to tie into the Overhead Line, thus ruling out Option 3 and leaving Option 3a as the only viable approach for this site location.

4.1 Connections Considerations

Figures 7 and 8 show the indicative connection configuration for Options 2 and 3a. Option 1 is not presented as the circuit connection for this option is one of the key challenges for that site which caused it to be discard early in the Stage 2 process. Note that, as indicated in Section 4.0, Site 3 is not viable due to network constraints, so the Stage-by-stage for it is also not shown here.

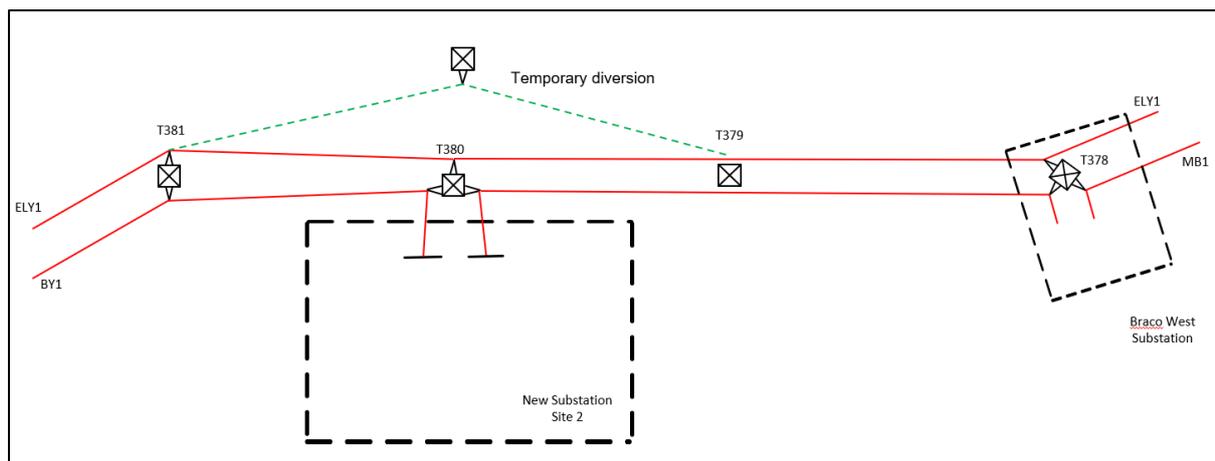


Figure 7 - Option 2 Stage-by-stage circuit connection

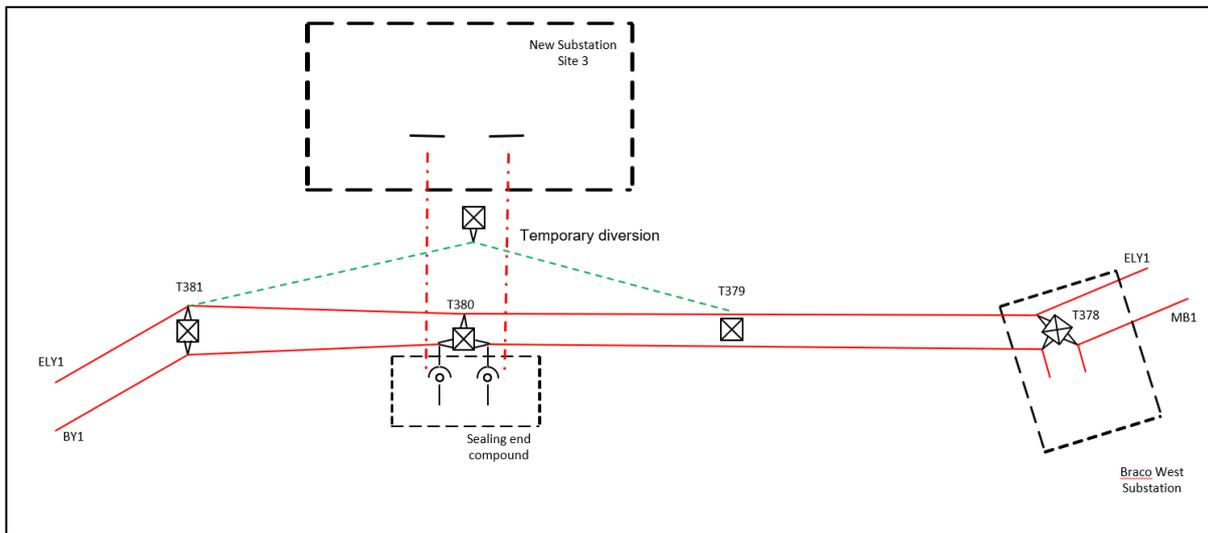
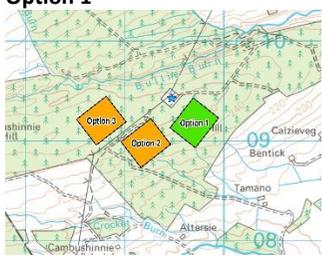


Figure 8 - Option 3a Stage-by-stage circuit connection

4.2 Summary of RAGs

Table 1, Table 2 and Table 3 below provides a summary of the key differentiating factors between each of the screened Options regarding the key Engineering, Environmental and Cost criteria.

Table 1: Engineering Comparison of Shortlisted Options

Engineering Topics		Option 1	Option 2	Option 3
				
Connectivity - Existing circuits/ network	Distance and feasibility of connecting to the existing circuits / network (400kV)	Within one span of existing OHL, but circuit passes over deep gorge at closest connection point	Immediately adjacent to existing OHL	Immediately adjacent but on wrong side of OHL, cable dip required as connection to nearside circuit does not look possible
	Outages for modification to existing circuits	Standard plan for insertion of new in-line tower	Standard plan for insertion of new in-line tower	Standard plan for insertion of new in-line tower
	Extension of site or other circuits	Good circuit access from 3 sides	Good circuit access from 3 sides	Good circuit access from 3 sides
Connectivity - Future development possibilities	Consideration of Business Separation and whole system requirements (Generation)	No SSE Generation connected	No SSE Generation connected	No SSE Generation connected
Connectivity - Interface with SSE Distribution and Generation	Consideration of Business Separation and whole system requirements (Distribution)	Retain present 33kV building	Retain present 33kV building	Retain present 33kV building
	Proximity of LVAC supplies	Resilient site - two supplies from 2 off new Grid Transformers' ETs	Resilient site - two supplies from 2 off new Grid Transformers' ETs	Resilient site - two supplies from 2 off new Grid Transformers' ETs
Connectivity - DNO Connection	i.e., AIS/GIS or certainty of sizing on non-standard plant and equipment	Space for AIS or GIS	Space for AIS or GIS	Space for AIS or GIS
Footprint Requirements - Technology	Availability for ancillary infrastructure like welfare compounds, laydown areas (Temporary)	No constraints	No constraints	No constraints

Footprint Requirements - Adjacent Land use	Availability for ancillary infrastructure like screening and SuDS infrastructure. (Permanent)	No constraints	No constraints	No constraints
	Non-standard substation configurations to accommodate site specific considerations	Optimal configuration possible	Optimal configuration possible	Optimal configuration possible
Footprint Requirements - Space Availability	Unique Hazards	No specific hazards identified	No specific hazards identified	No specific hazards identified
Hazards	Existing Utilities	No utilities	Several 33kV circuits to divert	No utilities
	Topography	12% slope across site	12% slope across site	site slope between 5% & 10%
Ground Conditions	Geology (Superficial Deposits – Peat)	No peat assessment to date	No peat assessment to date, landowner indicates some presence of peat	No peat assessment to date, landowner indicates some presence of peat
	Geology (Site testing to verify properties)	No assessment, assume amber, previous construction at nearby existing Braco West indicated lime mix required for stabilisation	No assessment, assume amber, previous construction at nearby existing Braco West indicated lime mix required for stabilisation	No assessment, assume amber, previous construction at nearby existing Braco West indicated lime mix required for stabilisation
	Elevation	c.250m	c.250m	c.250m
Environmental Conditions	Salt Pollution	c.70km from coast	c.70km from coast	c.70km from coast
	Flooding	Outwith 1000yr flood area	Mostly outwith 1000yr flood area; very small section to north-east of site	Outwith 1000yr flood area
	Carbon Footprint	Not yet assessed	Not yet assessed	Not yet assessed
	SF6	AIS switchgear	AIS switchgear	AIS switchgear
	Contaminated Land	No indication of contaminated land	No indication of contaminated land	No indication of contaminated land
	Noise (proximity to dwellings / residential properties)	Low risk	Low risk	Low risk
	Substation Access Road (from public road)	Use existing substation access road	reuse and upgrade c.4km of OHL access road	reuse and upgrade c.4km of OHL access road
Construction Access	Construction and Transformer Delivery Route	Potentially 1-2 bridges improved	Potentially 1-2 bridges improved	Potentially 1-2 bridges improved

	Customer access disruption during construction	Potentially traffic through Braco village	Potentially traffic through Braco village	Potentially traffic through Braco village
Operation and Maintenance		5km from public road [as per existing Braco West s/s]	c.3.5km along sections of old OHL construction road	c.3.5km along sections of old OHL construction road

Table 2: Environmental Comparison of shortlisted Options

Environmental Comparison of Shortlisted Options		Option 1	Option 2	Option 3
Designations	International European or National Designations (e.g., SAC, SPA RAMSAR, National Parks, SSSI, Ancient Woodland)	Areas of ancient woodland (long-established woodland – plantation origin) are present approximately 1 km from each option, however none of the Options are likely to interfere with this woodland, compromise the conservation status or the designating features. Therefore, each option was assigned a green rating.		
	Regional designations (e.g., Local Nature Reserves, Wildlife Sites, RIGS)	A green rating was assigned to each option as no Regional Designations were identified within 5 km of any of the options. Therefore, none of the Options likely to compromise the conservation status or any designating features.		
Protected Species	European Protected Species (EPS)	An amber rating was assigned to option 1 due to the area potentially supporting the following European Protected Species. - Water vole: Very minor watercourse with its origin in a marsh in south of Option 1 that flows southward into the Muckle Burn. Has areas of soft bank with some potential for water vole burrows and foraging.	A Green rating was assigned to option 2 due to the area being found to be unsuitable for supporting European Protected Species.	A Green rating was assigned to option 3 due to the area being found to be unsuitable for supporting European Protected Species.

	UK Biodiversity Action Plan (BAP) Species	All Options assigned a Green rating as Options are unlikely to compromise conservation of UK BAP species.		
Habitats	Annex 1 Habitats	All options were assigned a Green rating as none of the options are likely to compromise the conservation status of any Annex 1 Habitats due to the poor condition and low ecological value of the Annex 1 habitats identified across the options. Modified bog is found on Option 1 and Dry Heath is present on both Options 1 & 2. Blanket Bog is also found on Option 3.		
	Groundwater Dependent Terrestrial Ecosystems (GWDTE)	Each Option was given a Green rating due to all Options being unlikely to compromise the integrity of any GWDTEs.		
	Biodiversity (BNG)	Assigned a yellow rating. Biodiversity Units for both baseline and post-intervention habitats are presented as follows for Option 1: Baseline = 42.74 Post-intervention = 43.99 Total Net Unit change = +1.25 Total Net % change = +3% Option 1 requires 3.62ha of heathland creation to account for habitat loss.	Assigned a green rating. Biodiversity Units for both baseline and post-intervention habitats are presented as follows for Site 2: Baseline = 41.85 Post-intervention = 89.69 Total Net Unit change = +47.84 Total Net % change = +144% Option 2 requires the largest area of heathland creation (7.94ha) of the 3 Options	Assigned a red rating. Biodiversity Units for both baseline and post-intervention habitats are presented as follows: Baseline = 39.45 Post-intervention = 26.13 Total Net Unit change = -13.32 Total Net % change = -34% Option 3 requires an area of heathland creation of 2.15ha.
Ornithology	Schedule 1 Birds	All options assigned a Green rating as although the desk study identified suitability across all Options for Common Crossbills and Capercaillie, it was also found all options are unlikely to compromise the conservation status of these birds for the following reasons: <ul style="list-style-type: none"> - Common Crossbills are likely to breed across all Options. However, they are likely to have survived periodic large-scale felling. - For Capercaillie, area around all options lacked suitable semi-natural coniferous woodlands, Capercaillie are now very rare and confined to specific locations in the Highlands. It can be reliably stated they would no longer be present across the 3 options. 		
	Bird of Conservation Concern (BoCC)	All options assigned an amber rating due to the presence of the following species of conservation concern: Annex 1 of Birds Directive:		

		<ul style="list-style-type: none"> - Capercaillie <p>SBL:</p> <ul style="list-style-type: none"> - Capercaillie - Cuckoo - Curlew - Kestrel - Lesser Redpoll - Siskin - Song thrush <p>BOCC5 Red List:</p> <ul style="list-style-type: none"> - Capercaillie - Cuckoo - Curlew - Mistle thrush - Skylark
Hydrology/Geology	SG Drinking Water Protected Areas (Over 10m ³ per day or supplies over 50 people)	All options assigned an Amber rating as there is a risk all Options could compromise groundwater of regional importance as all are located within a Drinking Water Protected Area (Groundwater).
	<p>Aquifer providing regional resources e.g., Abstractions for small public or private water supply.</p> <p>Hydrological supply to GWDTE</p>	<p>All Options assigned an amber rating due to the location on a 2B classified Aquifer. Meaning there is a risk of the Options to compromise the quality and/or quantity of regionally important groundwater.</p> <p>The following private water supplies are present within 1km of the 3 options.</p> <ul style="list-style-type: none"> • L14OD3BENT/1; (Source type: Unknown) • L14OD3CALZ/1; (Source type: Unknown) • L14OD3CARS/1; (Source type: Unknown) • L14OD3HOUS/1; (Source type: Unknown) • L14OD3BLAI/3; (Source type: Unknown) • L14ID3BRAC/1; (Source type: Rainwater) <p>The private water supplies listed above are all downstream of the 3 options.</p>

		Option 1 exhibits marshland that potentially supports GWDTEs however, this is likely surface water fed and these examples are small, degraded in status and of poor ecological value. Limited suitability of the hydrological supply to Groundwater Dependant Terrestrial Ecosystems exists for Options 2 & 3.		
	Surface waters	Assigned a Red rating as two unnamed watercourses identified within Option 1 Identified on a 1:50,000 OS Map.	Assigned an amber rating due to unnamed watercourses located 50 m away from Option 2 identified on a 1:50,000 OS Map.	Assigned a Green rating as no surface waters are identified within 50 m of Option 3 on a 1:50,000 OS Map.
Cultural Heritage	Designations (World Heritage Sites, Scheduled Monuments, Inventory Gardens and Designed Landscapes, Inventory Battlefields)	All options assigned a green rating as there is likely to be no direct impact on World Heritage Sites, Scheduled Monuments, Inventory Gardens and Designed Landscapes, Inventory Battlefields due to distance of designations from each of the options.		
	Cultural heritage assets: Listed buildings, A, B & C Non-inventory GDL Conservation areas	All options were assigned a Green rating as there is likely to be no direct impact on Listed Buildings and Non-inventory GDL Conservation areas due to the distance of each option from any of this type of Cultural heritage assets.		
	Sites & Monument Record Entries	All options assigned a Green rating as few SMRs exist within or near any of the options proposed for development, indicating low potential for presence of unidentified archaeological/cultural heritage features.		
Landscape and visual:	Landscape Character as defined in published charter assessments (e.g., SNH / NatureScot National Assessments)	<p>All options assigned an amber rating because the effect on Landscape character across the three options relate to the potential landscape elements removed, the topography and pattern specific to each option and their relationship with adjacent landscape elements. Most of the characteristics that shape the host LCT are unlikely to be substantially affected. Change to the setting or the perceptual quality of the surrounding LCTs is likely to be limited.</p> <p>All options are located on the same Landscape type, LCT 380: Lowland Hills – Tayside. A Series of low ridges and hills between Strathallan and Strath Tay. Characterised by; low rounded ridges and hills, soft red sandstone, medium-scale pastures and rough grazing, extensive woodland, and modern settlements limited to farmsteads and hamlets.</p>		
	Nation or Regional Designations: National Parks, National Scenic Areas, Inventory Gardens and Designed Landscape (GDL)	All options assigned a green rating due to all the options being unlikely to compromise the special qualities of the landscape due to the distance of the Options from any National or Regional Designations. The Braco Garden and Designed Landscape is 2.2 km from any Option and The Ochil Hills are 4.4 km away from any of the options.		
	Visual	All Options assigned an amber rating. All Options could be visible beyond forestry from a cluster of individual farmsteads including Tamano Farm within 1 km which is both a residential and tourist receptor.		

	Settlements and residential properties, key transportation and recreational routes utilised by tourists and visitors to an area, vantage points and tourist destinations from where views and landscape appreciation is important.	<p>Additionally, all Options are potentially visible from the following core paths: Core Path BRAC/111 at least 1.2km North from any Option. Core Path BRAC/108 at least 853m southeast from any Option.</p> <p>It is likely the effects could be screened with landform mitigation for Options 1 & 2. However, Option 3 is more visible from these receptors as there is less opportunity for visual screening due to the height of land and would appear in combination with existing overhead lines and pylon towers.</p>		
Land use:	Agriculture (National Scale Land Capability for Agriculture)	All Options were assigned a Green rating as all Options were found to contain different classifications of unproductive agricultural land according to the Scottish Government's Soil Map. Option 1 contained a mix of Classes 5.2 and 5.3, Option 2 was Class 5.2 only and Option 3 was class 6.3 only.		
	Woodland	Option 1 was assigned a red rating as 100% of the woodland contained within the option area will require felling and clearance. This is approximately 70% of the total area of Option 1 and is covered by mature commercial forest. This would require an overall larger volume/area of felling compared to options 2 & 3.	Option 2 was assigned a red rating as 100% of the forestry within the option area will require felling and clearance. This is approximately 50% of the total area of Option 2.	Option 3 was assigned a red rating as 100% of the forestry within the option area will require felling and clearance. This is approximately 50% of the total area of Option 3.
	Commercial Forestry	Option 1 was assigned a red rating, the area is located within the Cambushinnie Forest Plan, there is evidence of land being used as logging site. Option 1 appears to comprise more mature commercial forestry. Meaning there a higher potential for sufficient loss of woodland to tree-felling/wayleave clearance activities.	Option 2 was assigned an amber rating, also located within the Cambushinnie Forest Plan with Options 1 & 3. There is evidence of land use as a logging site however current state of forestry is dominated by newly planted woodland between 1 and 2m tall. Less potential for sufficient loss of woodland compared with Option 1.	Option 3 was assigned an amber rating, Option 3 appears to have been previously logged, however the current forestry is comprised of very recent growth with saplings. Less potential for sufficient loss of woodland compared with Option 1.
Recreation	Public Footpaths, National Cycle Routes etc	All Options were assigned an amber rating. National core paths are present near all options, specifically BRAC/111 and BRAC/108 none of the options expected to directly impact public use. The primary concern for recreation relates to visual impacts arising from development.		
	Commercial Highland Sports, fishing, stalking	Option 1 & 2 assigned a Green rating as no evidence of these activities are in proximity of either Option.	Option 3 assigned a Green rating, evidence of grouse shooting on Option 3 however development unlikely to affect recreation.	

Planning	Policy: National/Regional/Local planning policy within the Local Development Plan	<p>The three options would be considered National Development – Part 2 National Planning Policy, under the Strategic Renewable Electricity Generation and Transmission Infrastructure strategy.</p> <p>The following classes of development that are captured by the policy are described below:</p> <p>b) New and/or replacement high voltage electricity lines and interconnectors of 132kv or more; and</p> <p>c) New and/or upgraded infrastructure directly supporting high voltage electricity lines and interconnectors including converter stations, switching stations and substations.</p> <p>All Options assigned an amber rating as they are located within proximity of one another and would require assessment against the same national and local planning policies. There is general national and local planning policy support for development which supports renewable energy and the compatibility of the development.</p>		
	Proposals: Existing information in the Planning Portal	<p>All Options have been assigned an amber rating as there are multiple planning applications for developments on or in the immediate vicinity of all Options. This means there is a risk of all Options being inconsistent with other 3rd party proposals.</p> <p>Four existing planning applications are in proximity to Option 1. Three planning applications have been approved and are listed below:</p> <p>15/01842/PN: Forestry related works, Cambushinnie Forest, Braco. Decision: 'Approve the Application' Encompasses southern section of Option 1. Operational status: In operation</p> <p>21/00756/FLM: Formation of a 49.9MW energy storage facility comprising 50 battery storage container units, control building,</p>	<p>All Options have been assigned an amber rating as there are multiple planning applications for developments on or in the immediate vicinity of all Options. This means there is a risk of all Options being inconsistent with other 3rd party proposals.</p> <p>Four existing planning applications are in proximity to Option 2. Three planning applications have been approved and are listed below:</p> <p>15/01842/PN: Forestry related works, Cambushinnie Forest, Braco Decision: 'Approve the Application' Encompasses Option 2. Operational status: In operation</p> <p>21/00756/FLM: Formation of 49.9MW energy storage facility comprising 50 battery storage container units, control building, ancillary equipment, parking, access</p>	<p>All Options have been assigned an amber rating as there are multiple planning applications for developments on or in the immediate vicinity of all Options. This means there is a risk of all Options being inconsistent with other 3rd party proposals.</p> <p>Four existing planning applications are in proximity to the Option 3. Three planning applications have been approved and are listed below:</p> <p>15/01842/PN: Forestry related works. Cambushinnie Forest, Braco. Decision: 'Approve the application' Encompasses Option 3 Operational status: In operation</p> <p>21/00756/FLM Formation of a 49.9MW energy storage facility comprising 50 battery storage container units, control building, ancillary equipment, parking, access</p>

		<p>ancillary equipment, parking, access track, boundary treatments, landscaping, and associated works. Decision: 'Approve the application' Operational status: Not in operation</p> <p>20/00020/PAN: Formation of an energy storage facility. Decision: 'PAN Notice sufficient' Within the area of Option 1 Operational status: Not in operation</p> <p>Planning application still awaiting decision:</p> <p>22/02231/FLM & 20/00013/PAN: Formation of a 49.99MW battery energy storage compound. Status: 'Awaiting decision' 50m North of Option 1 Operational status: Not in operation</p>	<p>track, boundary treatments, landscaping, and associated works. Decision: Approve the application. 500m from Option 2 Operational status: Not in operation</p> <p>21/00020/PAN: Formation of a battery energy storage compound. Decision: 'PAN notice sufficient' 700m from Option 2 Operational status: Not in operation</p> <p>Planning application still awaiting decision:</p> <p>22/02231/FLM & 20/00013/PAN: Formation of a 49.99MW battery energy storage compound Status: 'Awaiting decision' 700m north of Option 2 Operational status: Not in operation</p>	<p>track, boundary treatments, landscaping, and associated works. Decision: 'Approve the application' 700m north of Option 3 Operational status: Not in operation</p> <p>21/00020/PAN: Formation of a 49.9MW energy storage facility comprising 50 battery storage compound. Decision: 'Approve the application' 900m north of Option 3. Operational status: Not in operation</p> <p>Planning application still awaiting decision:</p> <p>22/02231/FLM & 20/00013/PAN: Formation of a 49.99MW battery energy storage compound Status: Awaiting decision 900m north of the Option 3. Operational status: Not in operation</p>
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Table 3: Cost Comparison of Shortlisted Options

Cost Topics	Option 1	Option 2	Option 3
Capital	All options assigned a Green rating as the expected capital costs are considered to be broadly similar for all three Site Options.		
Operational	All options assigned a Green rating as the expected costs for the operational stage are considered to be broadly similar for all three Site Options.		

4.3 Summary of Comparative Assessment

4.3.1 Environmental

When considering the Stage 2 substation options in isolation based on the results of the detailed study and comparative analysis, it is recommended that from an environmental perspective Option 2 is the preferred development. The proximity of the options to each other means the results of the comparative assessment across most environmental criteria were similar. However, a preferred option is still recommended based on the following.

Option 1 exhibited ecological potential suitable to support protected species such as potential areas for water vole burrows and foraging in areas of marsh and soft bank. Option 2 and 3 could not be accurately separated regarding their ecological potential but showed limited suitability for protected species or habitats.

Biodiversity Net Gain figures also favour Option 2 over Options 1 & 3. For Option 3 the Total Net % change was found to be -34%, Site 1 +3% and Site 2 +114%. These percentages include the proposal of a 50 m buffer for heathland creation to account for habitat losses. Option 2 requires the largest area of heathland creation across the Options. The area for Option 2 would amount to 7.94ha compared with 3.62ha for Option 1 and 2.15ha for Option 3.

Option 1 exhibits environmental constraints in surface water hydrology, with unnamed watercourses passing directly through the site. Although Option 3 is rated better than Option 2 regarding surface hydrology due to the lack of surface waters passing within 50 m of Option 3.

All options are located on the Cambushinnie Forest Plan, however the difference in woodland and forestry across the options was important in selecting the most suitable Option. The proportion of forestry on each Option was a significant environmental constraint in Option 1, a larger proportion of forest means a greater level will be lost permanently due to clearing for the development compared with the rate of forest requiring felling for Option 2 and 3 which were found to be the same.

All Options are located within a Landscape Character area with most of the key characteristics found to be unlikely to be affected by developing any option, however Option 3 is rated based on being located on ground that is higher and more exposed due to previous felling and moorland developing, the development is more widely visible to visual receptors, whereas there is more opportunity for screening for Options 1 and 2.

Overall, Option 2 was rated the best relating to habitat constraints with less potential protected habitat areas than Option 1. Additionally, Option 2 presents less environmental constraints regarding surface water than Option 1. Option 2 also has greater mitigation options for the visual effects on the surrounding landscape that are not available on Option 3 due to the topography and vegetation.

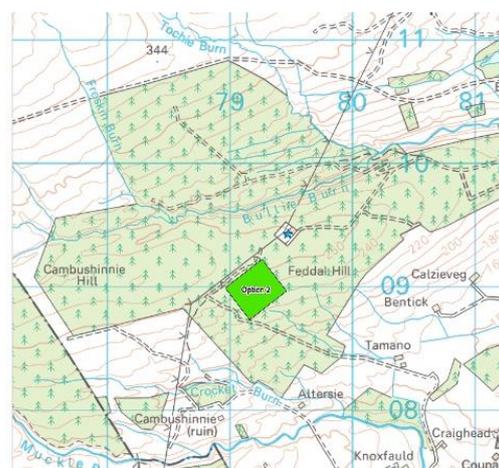


Figure 9: Location of the potential Option 2

4.3.2 Engineering

Option 1 is poorly positioned to tie into the existing Beauly-Denny line, as it would need to cross a gorge to reach the nearest suitable tower, and Site 3 would require a short run of 400kV cable to reach the correct side of the Beauly-Denny OHL, where a cable sealing end compound would need to be established in order to provide a connection onto the OHL. Option 2 is immediately adjacent to the Beauly-Denny line and on the correct side, so can be connected directly onto the line.

Lastly, the slope for Options 1 and 2 are above 10%, which will make for a large cut and fill. Site 3 is shallower and is more undulating than sloped so the platform would be easier to construct there.

The quantity of woodland and existing network connectivity favour Option 2, whereas topology favours Option 3, however as there has been limited rationalisation of space in the substation design there is larger scope for mitigation of the risks and costs at Option 2 in respect to the topology than there is in respect to woodland and connectivity at Options 1 or 3 and therefore Option 2 is preferred.

4.3.3 Cost

The approximate construction cost of the substation site options has been calculated based on standard rates derived from SSEN Transmission's experience of similar projects.

From a cost perspective, the construction costs of all substation site options are considered to be broadly similar, as a result they all score the same in the cost impact rating table (table 3). Temporary diversions and Public Road Improvements will be required for each of the substation site options. Tree felling highlights the most significant differences between the cost options, with Site Option 2 likely to be lower than Option 1 in particular, due to the volume of expected tree felling, and also Option 3, however these likely differences are not large enough to differentiate the Site Options within the RAG ratings shown in Table 3.

For all 3 Site Options the site footprints are located within third party land and therefore a land agreement(s) would be required. Consent mitigation cost is unknown at this time but it is anticipated any further mitigation would likely be required for all Options considered with the mitigation requirement broadly similar across all Site Options.

In terms of cost for the operation and maintenance of the Substation all three Site Options are considered to be similar, as the design for each option would be broadly similar and are geographically close enough that the same environmental conditions will be encountered, and therefore maintenance requirements are likely to be similar.

The cost impact rating summary is provided in Table 3.

4.3.4 Conclusion

Option 2 is preferred for environmental and engineering factors for the reasons set out in this consultation document and is neutral between options for cost. As such, Option 2 is the overall potential option as shown on **Figure 9**.

5 Next Steps

A public consultation event is to take place to help inform the final selection of a proposed Site Option and to consult on the potential Site Option (Option 2). The responses received from the consultation event, and those sought from statutory consultees and other key stakeholders will inform further consideration of the preferred Site Option.

A Report on Consultation will be produced which will document the consultations received, and the decisions made in light of these responses.

The outcome of the site selection process will be a development for which a proposed site option will be confirmed and consent under the Town & Country Planning (Scotland) Act 1997 sought. The application will identify:

- The site boundary clearly shown in red (the Planning Red Line Boundary) including any access route (up to the public road including junction improvements).
- The Proposed Development in relation to the site boundary with dimensions of all permanent structures, buildings, perimeter fencing, and any key drainage features e.g. SuDS pond and key electrical features, such as transformers.

The application may be subject to EIA under the Town & Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. This may result in further alterations to the Proposed Development to reflect outcomes of the EIA consultation process. Should the Proposed Development be deemed non-EIA (due to its scale or number and significance of potential environmental effects), a voluntary Environmental Appraisal would be carried out to support the application.

Where overhead line elements (including tie-ins from proposed development to existing overhead line) are required, a similar application is made to the Scottish Ministers under Section 37 of the Electricity Act 1989.

Further public and stakeholder consultation will be undertaken to present our proposals ahead of submitting a planning application.