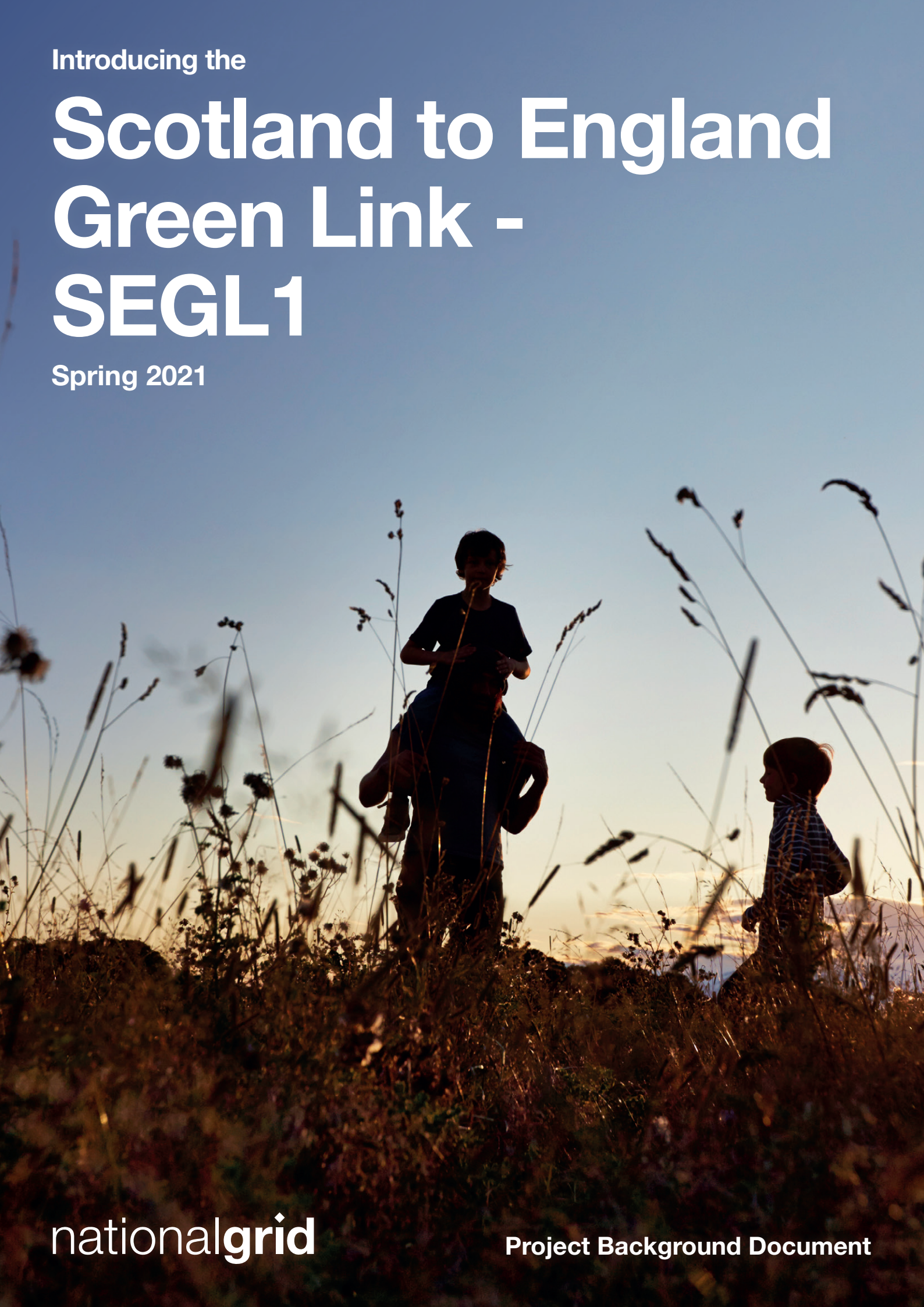
Introducing the

Scotland to England Green Link - SEGL1

Spring 2021



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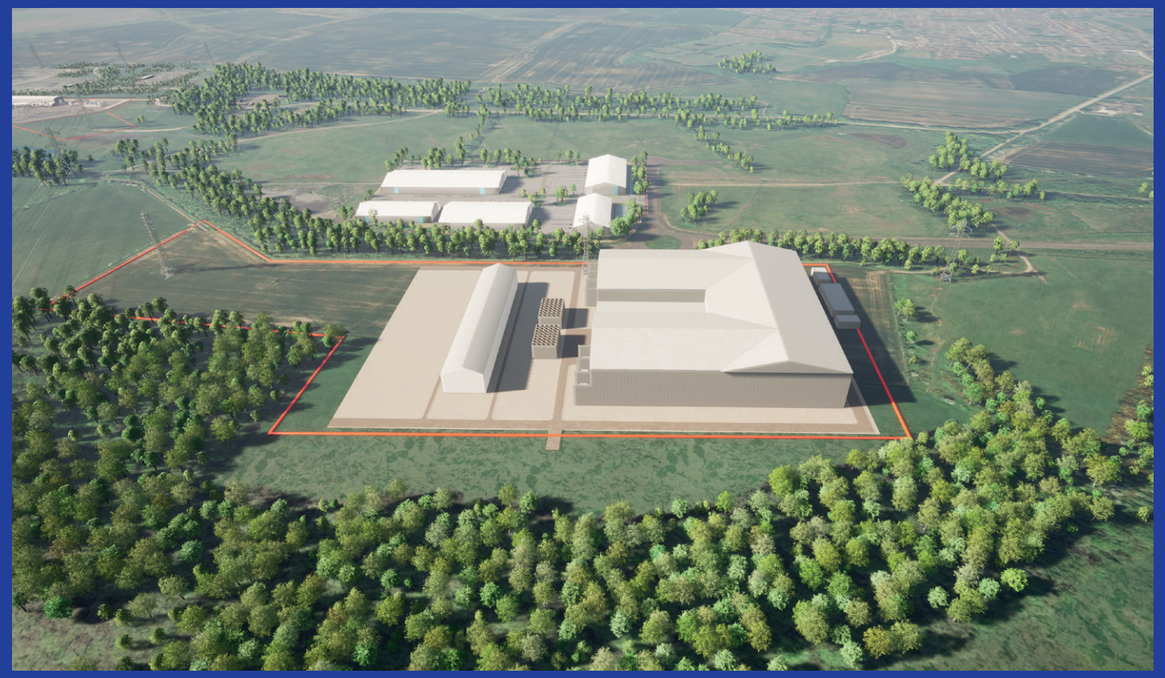
Project Background Document

Contents

The document has been produced as part of our consultation on the Project and is structured as follows:



An indicative image of our proposed Hawthorn Pit converter station. The orange line identifies the boundary of our works. The other buildings are part of Jade Business Park.

Introduction

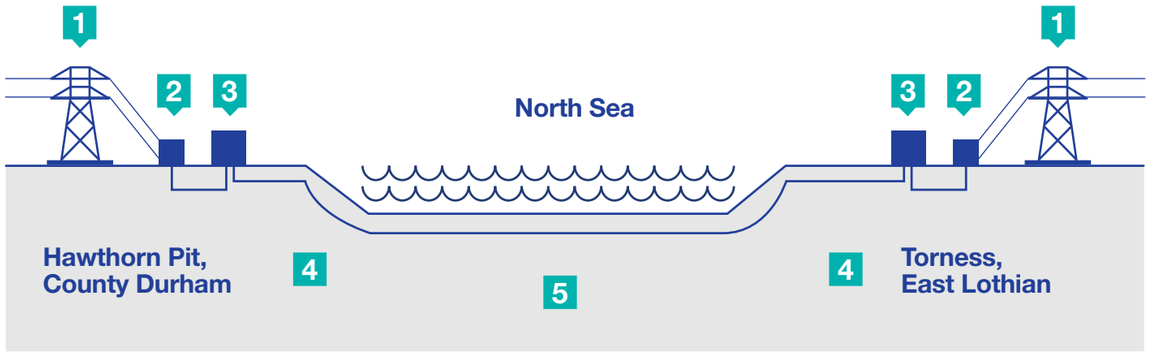
This Project Background Document explains our proposals to construct a High Voltage Direct Current (HVDC) Link from the Torness area in East Lothian to Hawthorn Pit in County Durham.

The purpose of the project is to scale up the capability of our network to deliver greener electricity generated in Scotland to the rest of the UK. If approved, it will carry enough green electricity to power 2 million homes across the UK.

The Project is made up of a number of parts, however, this document has been prepared to support the consultation process regarding the onshore parts of the project. This includes approximately 10 km of underground DC cable from a landfall at Seaham Hall beach to a converter station near Hawthorn Pit substation, which is between Murton and South Hetton. The converter station will connect to a new substation which will connect to our existing substation using 1km of underground cable.

The following illustration shows the main components of the project, which will be covered in more detail in this document.

How SEGL2 will work



HVAC = High Voltage Alternating Current
HVAC = High Voltage Direct Current

1. Existing network
2. Substation
3. Converter station
4. Underground cable
5. Submarine cable

National Grid

Who we are, and how we work

National Grid Electricity Transmission owns and maintains the high voltage electricity transmission network in England and Wales.

The transmission network is operated in Great Britain by National Grid Electricity System Operator (National Grid ESO). Since April 2019, National Grid ESO has been an entirely separate legal entity.

National Grid ESO manages power flows on the network, ensuring the right amount of energy is where it is needed, providing the local electricity supply networks known as Distribution Network Operators (DNOs). National Grid Ventures (NGV) is the competitive division of National Grid, investing in energy projects, technologies, and partnerships to accelerate the development of our clean energy future.

The high voltage electricity transmission system in England and Wales, which operates at 275,000 volts (275kV) and 400,000 volts (400kV), comprises some 7,000 route kilometres of overhead lines, over 600km of underground cable and over 320 substations. At the substations generation is connected to the system and the primary transmission voltage of 400kV or 275kV is transformed to lower voltages. Regional electricity companies take this lower voltage electricity and supply it to homes and businesses across the UK.

We are regulated by Ofgem, the electricity and gas markets regulator, to ensure value for money for consumers and we must satisfy our various statutory duties. We are required under the Electricity Act 1989 to "develop and maintain an efficient, coordinated and economical electricity transmission system, and to facilitate competition in the supply and generation of electricity".

Our project partners

Scottish Power Transmission (SPT) is the Transmission Owner for Central and Southern Scotland and is responsible for the onshore and offshore aspect of this project in Scotland.

nationalgrid
Group PLC

Electricity Transmission

Owns and manages the high voltage electricity transmission system in England and Wales

Electricity System Operator

Ensures that Great Britain has the essential energy it needs by making sure supply meets demand every second of every day

National Grid Ventures

Operates a mix of energy assets and businesses to help accelerate the development of our clean energy future (eg, undersea electricity interconnectors with other countries and European transmission partners)

Delivering net zero

Why is this link needed?

As part of their commitments to tackling climate change the UK and Scottish Governments have set legally binding targets to reach net zero in their greenhouse gas emissions by 2050 in England and Wales and by 2045 in Scotland.

As the UK shifts away from traditional forms of energy generation to heat homes, charge vehicles and power businesses, there will be a greater need for cleaner, greener energy. Offshore wind will play a key part in helping the country achieve these targets.

The UK is already a world leader in offshore wind energy, with around 10 gigawatts (GW) in operation today. To support its climate change commitments, the Government has set a target to deploy 40GW of offshore wind by 2030 – a fourfold increase on what we produce today and enough to power every home in the UK. In addition, the Climate Change Committee predicts that the UK will need 75GW of offshore wind to meet net zero by 2050.

To transmit this increasing amount of green energy from where it is generated, to where it is needed, we need to increase the capability of our transmission network between Scotland and England.

How does National Grid identify the need for extra network capacity?

A network boundary is used to represent areas of high-power flow between different parts of the electricity network. When flows across a network boundary, such as the boundaries between Scotland and England, are forecast to be above the capability of the network then energy generation needs to be managed to ensure that the capability of network is not exceeded.

Managing shortfalls in network capability across boundaries results in additional costs, referred to as 'constraint costs' to operate the network.

Some level of constraint is expected as part of the economic operation of the network, however, where excessive constraints occur then investment in new infrastructure may be needed to provide additional network capability.

Network capability requirements are reviewed annually as part of a process led by National Grid ESO. This includes the following key activities and publications:

- **Future Energy Scenarios (FES)[1]** – these are developed annually by National Grid ESO with input from industry and other stakeholders. The FES represent a range of different, credible ways in which the energy system could evolve taking account of policy and legislation, including net zero targets.
- **Electricity Ten Year Statement (ETYS)[2]** – using data from the FES, National Grid ESO undertakes and annual assessment to identify points on the transmission system where more network capability is needed to ensure that energy is delivered efficiently and reliably to where it is needed.
- **Network Options Assessment (NOA)[3]** – the Transmission Owners and other stakeholders respond to ETYS with solutions to address network capability requirements. These are assessed by National Grid ESO so that the most economic and efficient solutions are recommended to proceed, and others told to hold or stop.

Due to the substantial quantities of green energy in Scotland, in particular onshore and offshore wind, as well as interconnectors in the north of England there is a need to increase the cross-border capability of electricity transmission network. This has been identified and assessed through activities and publications outlined above.

The need for this increased cross-border transmission capability is well-established. In the first NOA published in 2015/16 an Eastern Link was given a 'proceed' signal. The need for reinforcement has continued to strengthen as the amount of renewable energy generation connecting to, or forecast to connect to, this part of the network has continued to increase.

The most recent NOA publications in 2019/20 and 2020/21 have given 'proceed' signals to two cross-border reinforcements, the first between Torness and Hawthorn Pit (known as SEGL1), and the second between Peterhead and Drax (known as SEGL2). Further information setting out how and why these locations were selected is contained in subsequent sections.

[1] FES (July 2020) https://www.nationalgrideso.com/document/173821/download
[2] ETYS (November 2020) https://www.nationalgrideso.com/document/181711/download
[3] NOA (January 2021) https://www.nationalgrideso.com/document/185881/download

How we develop our projects

When developing our network, under the Electricity Act 1989, we must do so in a way that is efficient, coordinated and economical, whilst minimising impacts on people and places.

To achieve this, we consider a range of engineering, economic, environmental and social factors consistent with our statutory duties. We consult with stakeholders and members of the public at key stages of the process. We are committed to being open and transparent with information about the judgements we make.

Further information about our approach including how we set out to meet our environmental responsibilities and our commitments relating to engagement and consultation about proposals is explained in our Stakeholder, Community and Amenity Policy.

[4]https://www.nationalgrid.com/uk/electricity-transmission/document/81026/download

Strategic proposal

Our projects start with a detailed consideration of the infrastructure requirements. This sets out clearly what is needed and why. That could be a connection to new generation sources, to create more capacity where needed in the existing network, or for some other purpose.

We always see if the existing network can accommodate the customer or capacity needs economically and efficiently before we would consider building any new infrastructure. We consider alternatives including modifying how we operate the network or investing in equipment that can optimise the use of the existing network to reduce or avoid the need for major investment. This is usually more sustainable, less expensive and less disruptive.

Options identification and assessment

Where network reinforcements are required, we carry out routeing studies to identify broad potential corridors for the new transmission route within the strategic proposal, and to identify suitable locations for infrastructure, such as substations or converter stations.

This helps us to identify any constraints that could impact our proposals. For example, for sub-sea cables, constraints that could affect the landfall point include eroding shorelines or sensitive sand dune systems, or marine constraints such as shipping lanes, fisheries, major ports and harbours, and ecological constraints.

When routeing underground cables, we may be restricted by built development, topography, soil type or existing land use. There may also be valuable habitats or cultural heritage sites that would be affected by ground disturbance. In these cases, we try to find a route corridor that avoids these constraints altogether.

Assessment and land rights

Throughout the development of our projects we undertake environmental and other surveys, which help us to refine our designs and help us to develop any required mitigation. We use the survey results to develop our assessments and produce environmental reports such as a Construction Environmental Management Plan, Traffic Management Plan etc.

We work closely with landowners to agree access for surveys, and to agree land rights for our temporary and permanent works.

Application and decision

We hold a public consultation on our draft proposals to help us prepare our application for submission to the relevant consenting authority.

We will normally produce a Consultation Report which sets out the feedback we have received throughout the consultation process and how we have responded to it. This allows all stakeholders who have contributed to see how their comments have been taken into account.

Having carried out detailed assessments and consultation with the public and key stakeholders we prepare all of the documents necessary for our proposed application.

Construction

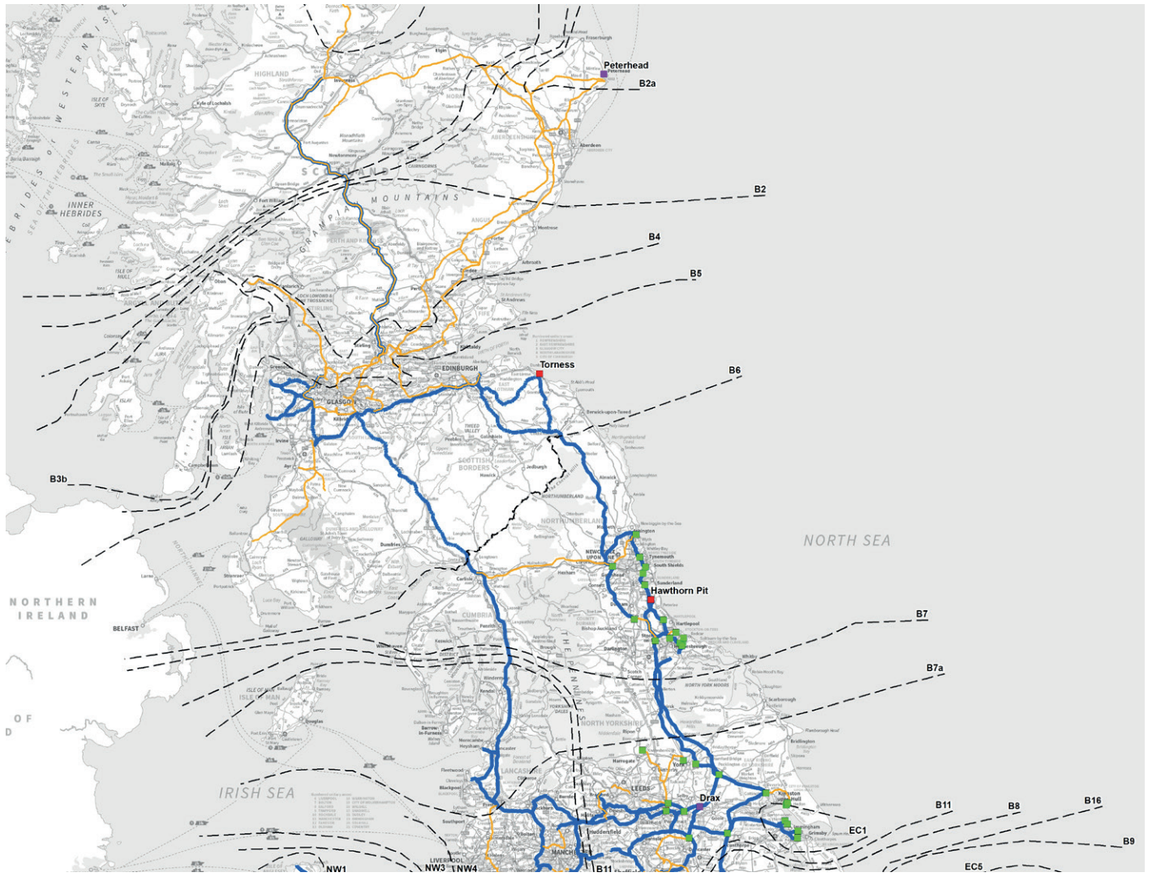
Once planning is approved, we will procure our Main Works Contractor and develop detailed designs. We discharge planning conditions and obtain any licences required for pre-commencement works and the phased delivery of the project.

Before we start our main works we may need to undertake early enabling works, such as site establishment, access works and creation of bellmouths. We then undertake the main construction work, and once completed we test and commission our new equipment. During this period we also undertake reinstatement works, implement mitigation measures and commence any ongoing monitoring.

SEGL1 - Our strategic proposal

In response to the need for additional network capability between Scotland and England we assessed a number of strategic options. A key part of this was considering the scale of reinforcement which would be required. Due to the amount of green generation connecting to, or forecast to connect to, the network in the coming years, two reinforcements will be needed to provide the amount of network capability required.

As a result, the strategic options which we assessed comprised fixed 'start' points on the network in Scotland at Peterhead in Aberdeenshire and at Torness in East Lothian, which were identified by Scottish and Southern Electricity Networks (SSEN) and Scottish Power Transmission (SPT) respectively. These two start points had a number of alternative 'end' points at substations on our network in England, in an area from Blyth in Northumberland as far south as Spalding in Lincolnshire, both on the coast and inland.



KEY

- Substation Location - SEGL 1 Project
- Substation Location - SEGL 2 Project
- Substation Location - Considered at SO Stage
- Network Transmission Boundary

Transmission Network

- 275 kV
- 400 kV

The objective of the strategic options appraisal was to identify the two preferred Strategic Proposals which would best meet the need case by providing additional network capability when it is needed while also taking account of our statutory and licence obligations.

For each strategic option different factors were assessed including:

- **Network capability and technical considerations:** this included different transmission technologies, the additional network capability it would provide as well as factors influencing construction and operation.
- **Environmental and socio-economic impacts:** this included high-level consideration of the potential impacts of different options on the environment and peopleand included a range of onshore and offshore considerations such as biodiversity, archaeology and other land/sea users.
- **Programme and cost implications:** this included consideration of how much different options might cost and how long it would take to develop, consent and construct them taking into account when network capability will be needed in order to prevent constraints.

At a strategic level, a key factor influencing all of the options considered was the distance between the 'start' and 'end' points. A shorter reinforcement would cross fewer network boundaries and provide less network capability but could be delivered more quickly alleviating potential constraints in the short term.

Conversely a longer reinforcement would cross more network boundaries and provide greater network capability but would take longer to deliver increasing the risk of constraints in the short term.

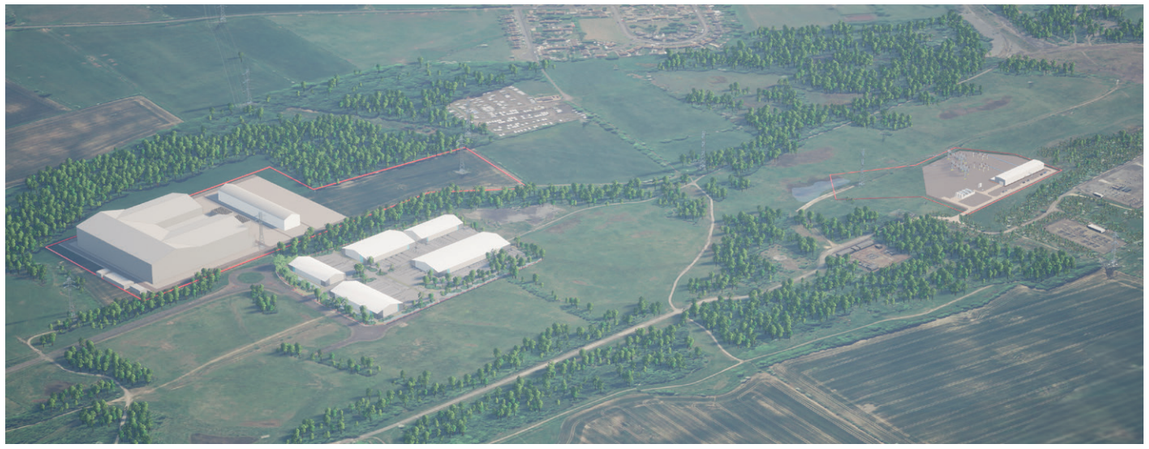
Considering when additional network capability a combination of shorter and longer reinforcements would best meet the need in the short and long term.

Why Hawthorn Pit?

Hawthorn Pit substation provides a strong point on the network to connect into and has the benefit of being relatively close to the coast, which reduces the length of onshore cable routes. Hawthorn Pit substation also benefits from land around the existing substation on which to locate a new substation and converter station.

Potential connection options north of Hawthorn Pit were discounted because they would cross fewer network boundaries and would trigger substantial additional works to reinforce the network and therefore do not deliver a benefit.

Potential connection options south of Hawthorn Pit included Spennymoor, Norton and Lackenby but they have longer routes overall to deliver a similar amount of additional network capability and so have a greater potential for environmental impact and at a greater cost.



An indicative image of our proposed Hawthorn Pit converter station (left) and proposed new substation (right). The orange lines indicate the boundary of our works.

Route and site selection

Options identification and selection

Following identification of Hawthorn Pit as our preferred Strategic Proposal we began to develop more detailed routeing and siting options.

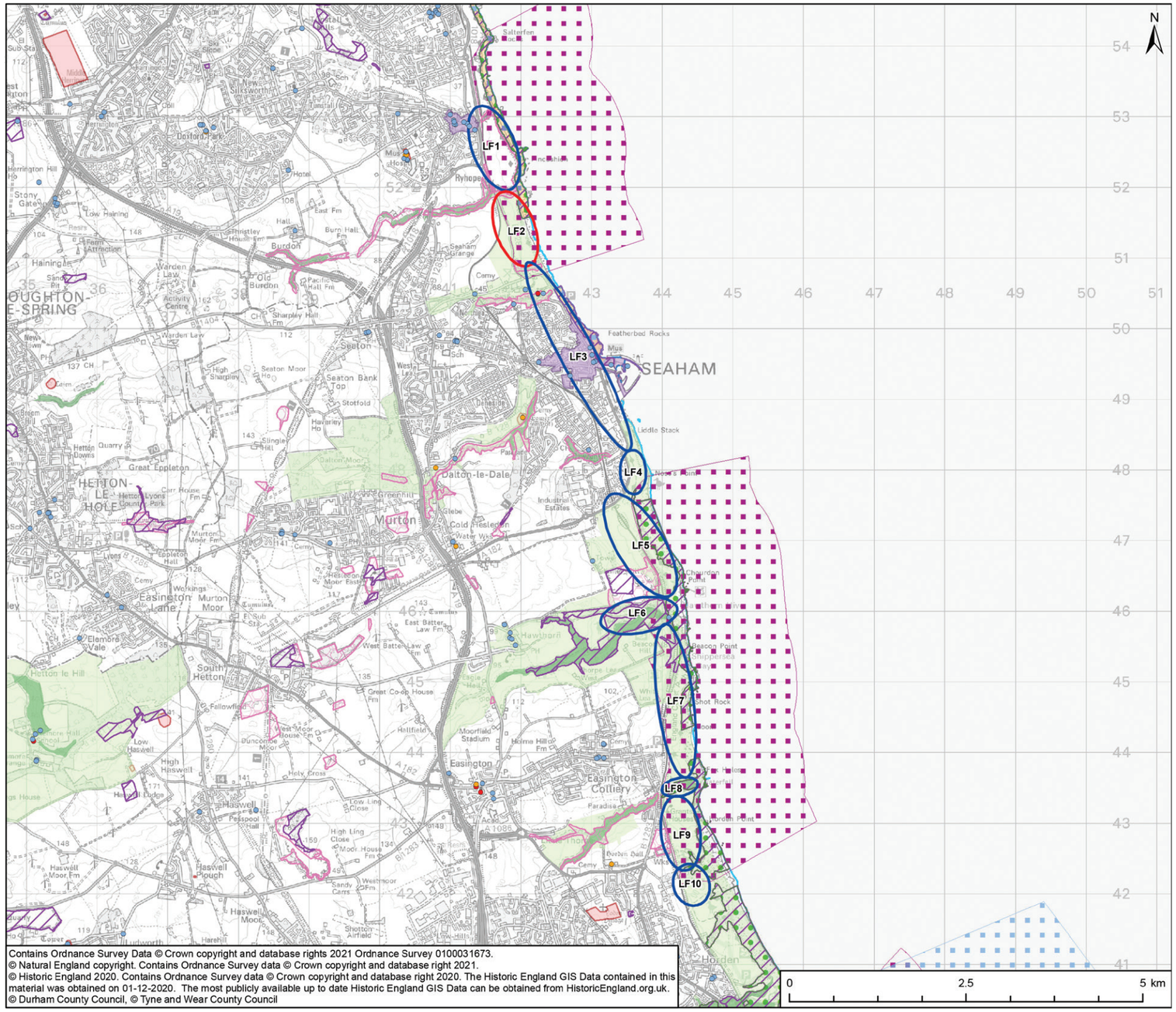
The objective of this stage has been to identify proposed landfall and converter station sites, as well as a proposed cable route corridor and preliminary cable route alignment within it. To do this we have considered a range of engineering, environmental and socio-economic factors in line with our statutory and licence obligations.

Landfall site selection

The landfall is the interface between the onshore and offshore components of the Project. It is where the subsea cables come ashore and are joined to the underground cables at a buried Transition Joint Pit (TJP). The landfall could be constructed by excavating a trench through the beach and installing the cable within, or by Horizontal Directional Drilling (HDD) which involves drilling seawards and installing ducts through which the subsea cables are pulled ashore. Once the works to install the landfall are completed, land would be reinstated with no permanent above ground infrastructure left in place.

As showed on the plan we assessed a number of potential landfall locations along the coastline from Ryhope to Easington. This considered a range of constraints including proximity to settlements, accessibility, designated sites including the Northumbria Coast Special Protection Area (SPA) and Ramsar and Durham Coast Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI), the Durham Heritage Coast, as well as offshore constraints including protected sub-tidal reefs.

Our proposed landfall is located on land to the south of Ryhope Dene and to the north of Seaham Hall Beach car park and forms part of the Seaham car boot sale site.



KEY

- Proposed Landfall Location
- Short-listed Landfall Location
- Mean Low Water Springs
- Grade I
- Grade II*
- Grade II
- Scheduled Monument
- Conservation Area
- Heritage Coast
- Special Area of Conservation
- Special Protection Area
- Site of Special Scientific Interest
- Local Wildlife Site
- Ramsar
- Ancient Woodland
- Area of Higher Landscape Value (DCC)

Cable route selection

The cable route will be buried underground for its entire length from the landfall to the converter station. In order to install the cable route, we will establish a temporary working width up to 40 m wide. This will contain a trench, typically 1.5 m wide by 1.5 m deep, in which we will lay a pair of High Voltage Direct Current (HVDC) cables. It will also include a haul road for access during construction as well as areas for soil storage and drainage.

At key locations along the route we will need to establish temporary accesses and construction compounds. At some locations where we need to cross obstacles such as roads, railway lines or watercourses we will use Horizontal Directional Drilling (HDD) to bore a route below the obstacle through which ducts will be pulled and cables installed.

Initially we identified broad route corridors from the coast to the Hawthorn Pit area. This took account of the alternative landfall and converter stations which were being considered as well as key constraints within the wider area such as towns and villages, designated sites and other natural and built features such as woodland, watercourses and road. Within these corridors we identified and assessed potential route alignments taking account of their potential impacts and constructability.

Through this work we have identified a proposed route corridor and preliminary route alignment (the preferred route). The preliminary route alignment is mainly routed in a north east to south west direction for approximately 10 km ensuring as direct a route as possible. We have developed the preliminary route alignment so that it avoids settlements as well as nationally and locally designated sites, however, some parts of the route may be in proximity to settlements or individual properties.

There are also some constraints, for example the railway line and main roads that we cannot avoid and therefore we propose to cross them using HDD to reduce potential impacts as far as possible. The route is mainly located within agricultural land and we recognise the temporary impact cable installation may have so we are engaging with land owners and tenants.

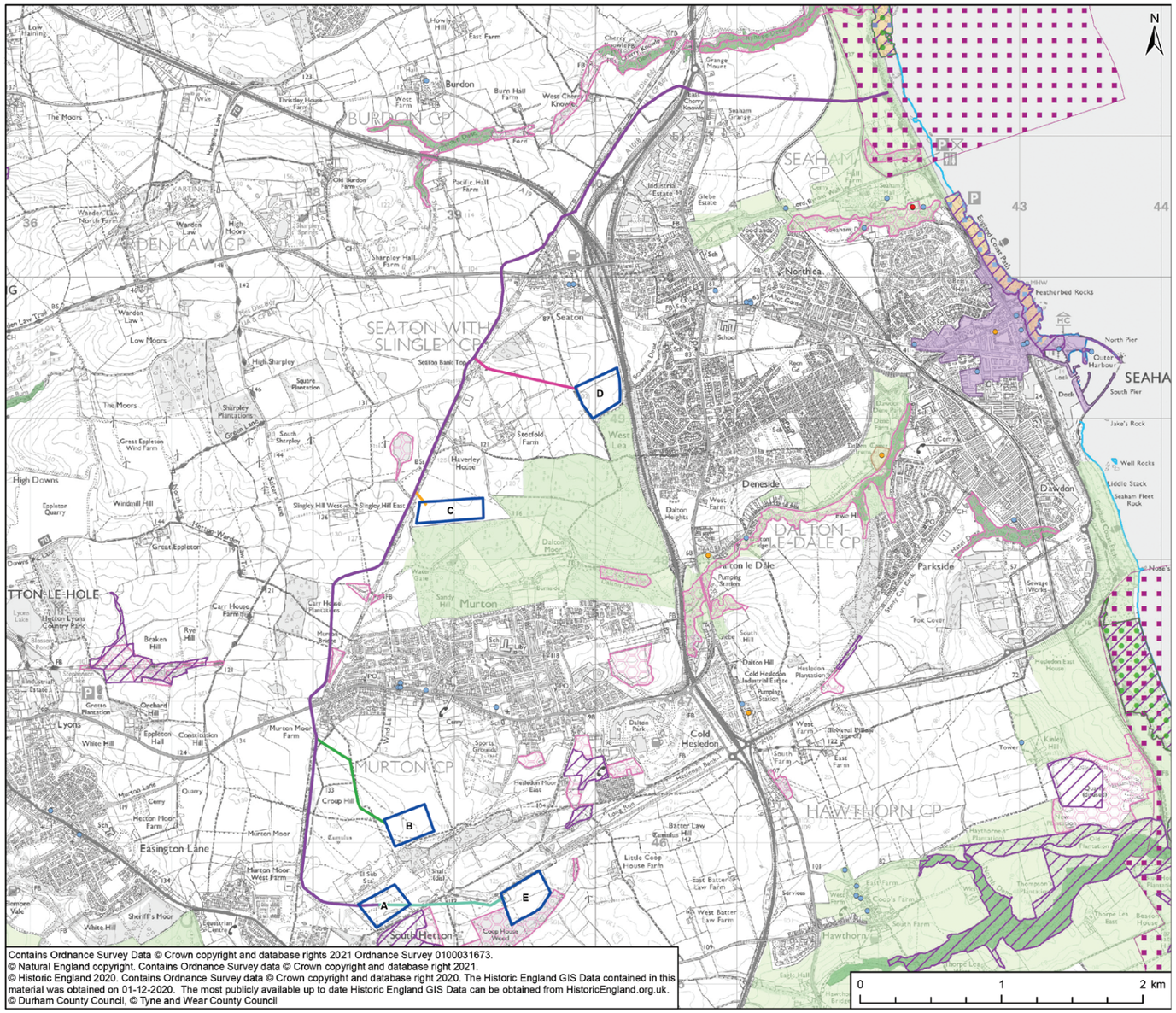
Converter station site selection

Converter stations are the key components of a HVDC links. They enable electricity to be converted from AC to DC or vice versa depending on the direction of operation. Converter stations contain specialist electrical equipment, some of this must be located indoors in buildings potentially up to 30 m tall, while some could be located outdoors or in smaller buildings. The total footprint of the converter station is approximately 6 hectares (ha) but additional land will be needed during construction.

To connect the cable into the existing substation at Hawthorn Pit we need to add new connection bays and there is not enough space on the existing site to accommodate them. Therefore, we also assessed a number of potential substation sites for a new 400kV substation which is approximately 1.5ha and will connect to the existing Hawthorn Pit substation.

We assessed a number of potential converter station and substation sites within the vicinity of the existing Hawthorn Pit substation. The assessment considered engineering and environmental factors for each site including proximity to Hawthorn Pit, access from the road network as well as potential impacts on landscape, visual amenity, ecology and cultural heritage.

Given the presence of the existing Hawthorn Pit substation and the need to install underground cables from the converter station to the new substation and then on to the existing substation it is preferable to locate the new equipment as close as possible to the existing substation. As result we propose to locate the new substation on land immediately south of the existing substation, and to locate the converter station on agricultural land just under 1km to the south east.



KEY

- Potential Converter Station Location
- Cable Route - Option A
- Cable Route - Option B
- Cable Route - Option C
- Cable Route - Option D
- Cable Route - Option E
- Mean Low Water Springs
- Grade I
- Grade II*
- Grade II
- Scheduled Monument
- Conservation Area
- Heritage Coast
- Special Area of Conservation
- Special Protection Area
- Site of Special Scientific Interest
- Local Wildlife Site
- Ramsar
- Ancient Woodland
- Area of Higher Landscape Value (DCC)

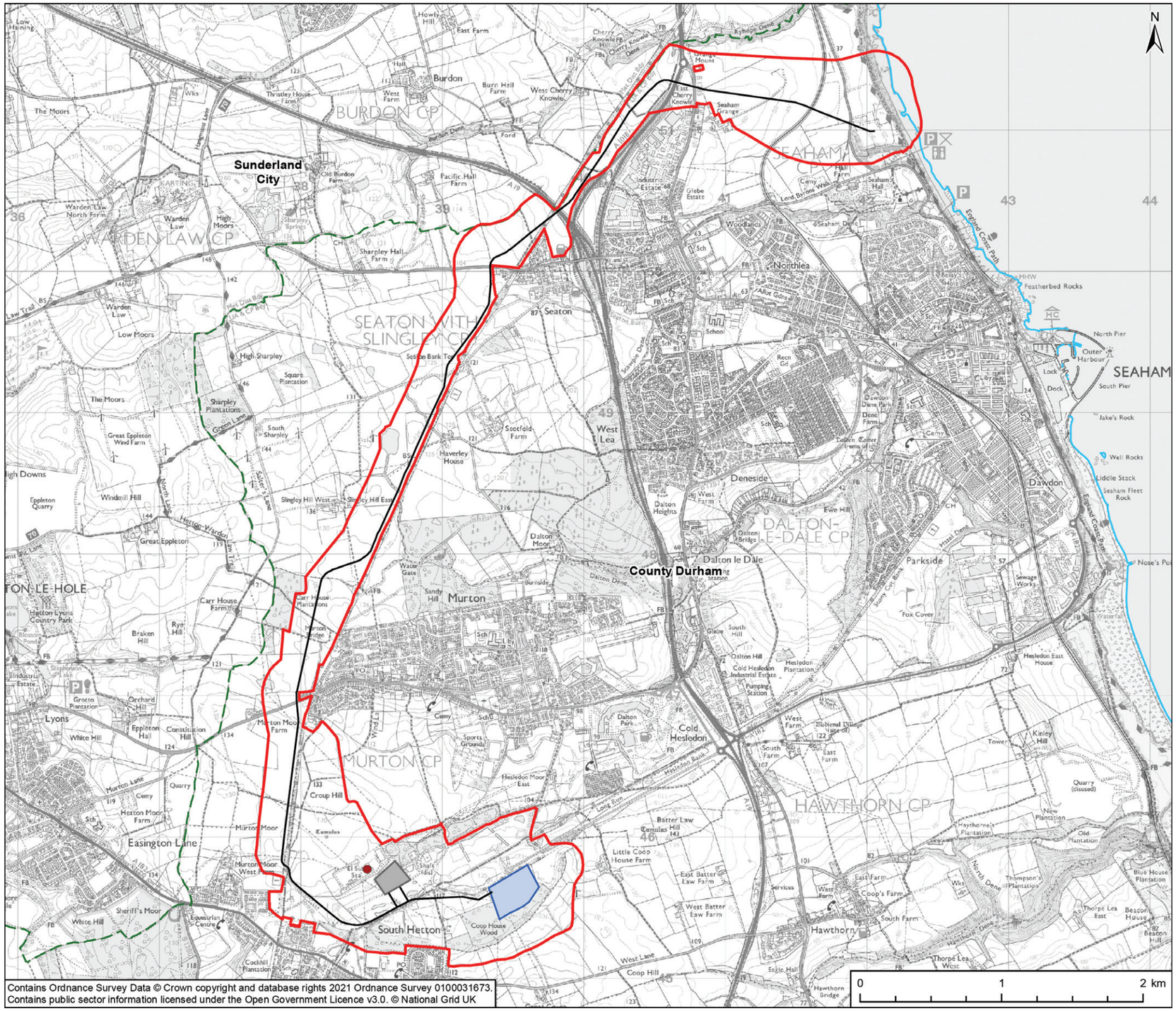
Our proposed option

Our proposed option is comprised of a 10 km long underground cable, which will run from a landfall at Seaham to a converter station at Hawthorn Pit.

The following map shows our proposed route which comprises a landfall at the Seaham car boot sale site near Seaham Hall Beach, connected to a converter station nearby to Hawthorn Pit substation by approximately 10 km of underground cable. A new substation will be located next to the existing Hawthorn Pit substation.

As we develop our proposals ahead of making a planning application in 2022, it is important that we hear the views of local people and we will be speaking to local communities, elected Members and interested groups to explain our plans and ask for feedback.

Knowing what matters to local residents and other key stakeholders matters to us, so that we can see if we can take that into account when developing our proposals.



KEY

- English Onshore Scheme Scoping Boundary
- Existing Hawthorn Pit 400kV Substation
- Proposed DC Cable Route Alignment
- Proposed Converter Station Location
- Proposed Substation Location
- Mean Low Water Springs
- District Borough Unitary Boundary

Proposed cable route

Project timeline

Our public consultation will run from 24 May to 18 June and will be held our our dedicated project website: nationalgrid.com/segl1.

We will be holding a number of live Q&A and meet the team video sessions so that you can engage with the team directly. These will be held at the following times, and details of how join can be found on our website:

Live Q&As
- **Tuesday 25 May 8am – 12pm**
- **Thursday 27 May 4pm – 8pm**
- **Monday 7 June 4pm – 8pm**
- **Wednesday 9 June 12pm – 4pm**

Meet the team video sessions
- **Tuesday 15 June 6pm – 7:30pm**
- **Thursday 17 June 10am – 11:30am**

Once our consultation is closed, we will review your feedback as we continue to develop the detailed designs. We will hold further Public Information events before we submit our planning application, expected in early 2022. Here we will be able to share further details of our proposals, including any changes we have made as a result of your feedback.

We intend to submit our planning applications in early 2022. The Local Planning Authority will hold a 21-day consultation period where you have an opportunity to formally comment on the planning application. The Local Planning Authority will then consider the application and a decision will be taken to grant planning permission or not.

A summary of the timeline to application can be found below:

Winter 2020/2021 Marine surveys

Spring – Autumn 2021 Environmental surveys

Spring 2021 Public consultation

Early 2022 Public information events

Early 2022 Submission of planning application

2023 Construction to begin, if planning consent secured

2027 Construction phase complete

Landowners

Throughout this process, we will continue to engage with landowners, and those with an interest in land, who may be impacted by our proposed works. If your land is impacted by these proposals, then you should have been contacted by our land agents. If you wish to speak to a member of our land team you can use the details opposite.

Who to contact if you would like information or documents in an alternative format?

We are committed to making project information accessible to all users. If you need any information or documents in an alternative format such as large print, Braille or audio tape, get in touch using the contact details right.

Who to contact for a media enquiry

If you are a member of the media and wish to contact the National Grid team, please call **0808 1968 405** or email: **info@segl1.nationalgrid.com**

Our project website will be updated throughout the project's development, but if you have any questions in the meantime, please visit the contact us page of our website or get in touch using the details below.

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