



## Key facts of Neart na Gaoithe

### Original Offshore Consent

No. of turbines:

Maximum 75

Capacity:

450 megawatts (MW)

Turbine height:

Maximum 197 metres (m) above lowest astronomical tide (LAT) to tip

Space between turbines:

Minimum 450m

Site area:

Maximum 105 kilometres (km)<sup>2</sup>

Water depth:

Between 45m and 55m

### New Offshore Application

No. of turbines:

Maximum 54

Capacity:

450 MW

Turbine height:

Maximum 208m above LAT to tip

Space between turbines:

Minimum 800m

Site area:

Maximum 105km<sup>2</sup>

Water depth:

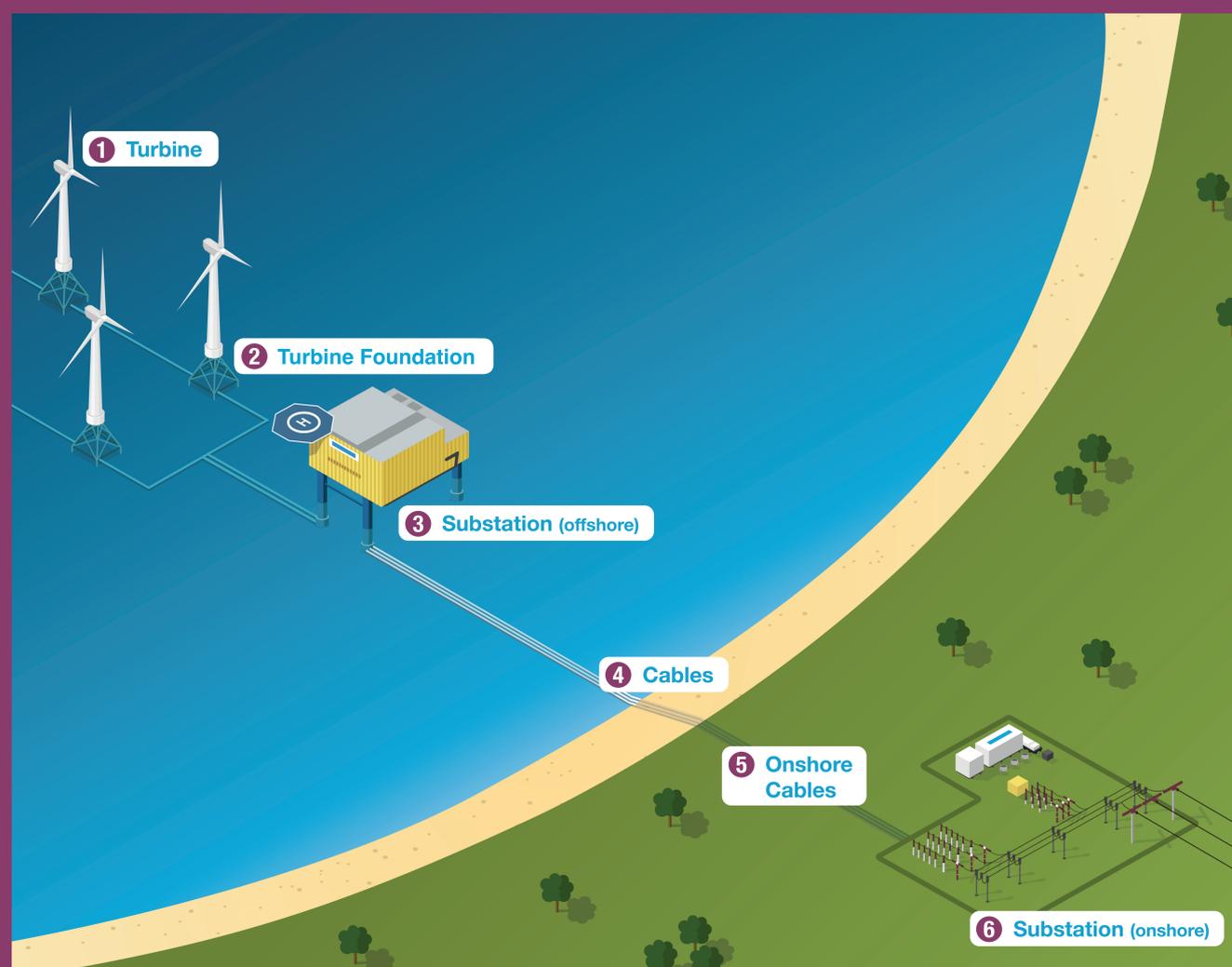
Between 45m and 55m

*NB. only one of these consents will be eventually be built out.*



## The Offshore Wind Farm and Onshore Grid Connection

### Key components of an offshore wind farm



1. **Turbine**  
Three-bladed turbines will be attached to the seabed using the foundation described below.
2. **Turbine foundation**  
The turbines will be constructed using steel jacket foundations, with cables from each turbine connected via subsea 'inter-array' cables.
3. **Offshore substation(s)**  
Subsea inter-array cables will be connected to one or two offshore substation(s).
4. **Offshore transmission cables**  
Two subsea transmission cables will run from the offshore substation(s) to the landfall at Thorntonloch Beach in East Lothian.
5. **Onshore transmission cables**  
Two buried cables will cross farmland for approximately 12.3km from the landfall location to the grid connection point at Crystal Rig wind farm in the Lammermuir Hills.
6. **Onshore substation**  
A new onshore substation will be built to connect the wind farm to the grid.

## Offshore Environmental Studies

Between 2009 and 2012 an extensive campaign of environmental surveys was undertaken to inform a detailed Environmental Impact Assessment (EIA). These included surveys of seabed habitat, geotechnical analysis of the seabed, surveys to identify the presence of seabirds and marine mammals, studies of shipping routes and commercial fishing activity, plus analysis of the seabed to identify any archaeological features such as shipwrecks.

The findings of the EIA were presented in an Environmental Statement, which was submitted to the Scottish Government with the original application for consent to build and operate the wind farm.

A Scoping Report to inform the EIA for the new offshore consent application was submitted to Marine Scotland in May 2017. This reviewed the findings of the original EIA and proposed the content of the new EIA.

Documents related to the EIAs and our latest Scoping Report are available to download from the project website: [www.nngoffshorewind.com](http://www.nngoffshorewind.com).

## Birds, Marine Mammals and Fish

Monthly boat-based bird and marine mammals studies were carried out for three years. A total of 38 species of seabird were recorded within the Neart na Gaoithe study area, with the three most common species being gannet, guillemot and puffin. Additional studies were undertaken, including fitting electronic tags to seabirds and seals to record their movements relative to the wind farm boundary.

Ten marine mammal species were recorded in the Neart na Gaoithe study area, with harbour porpoise and grey seal being the most common species. Harbour seals were also regularly recorded in lower numbers throughout the study area.



Grey seal



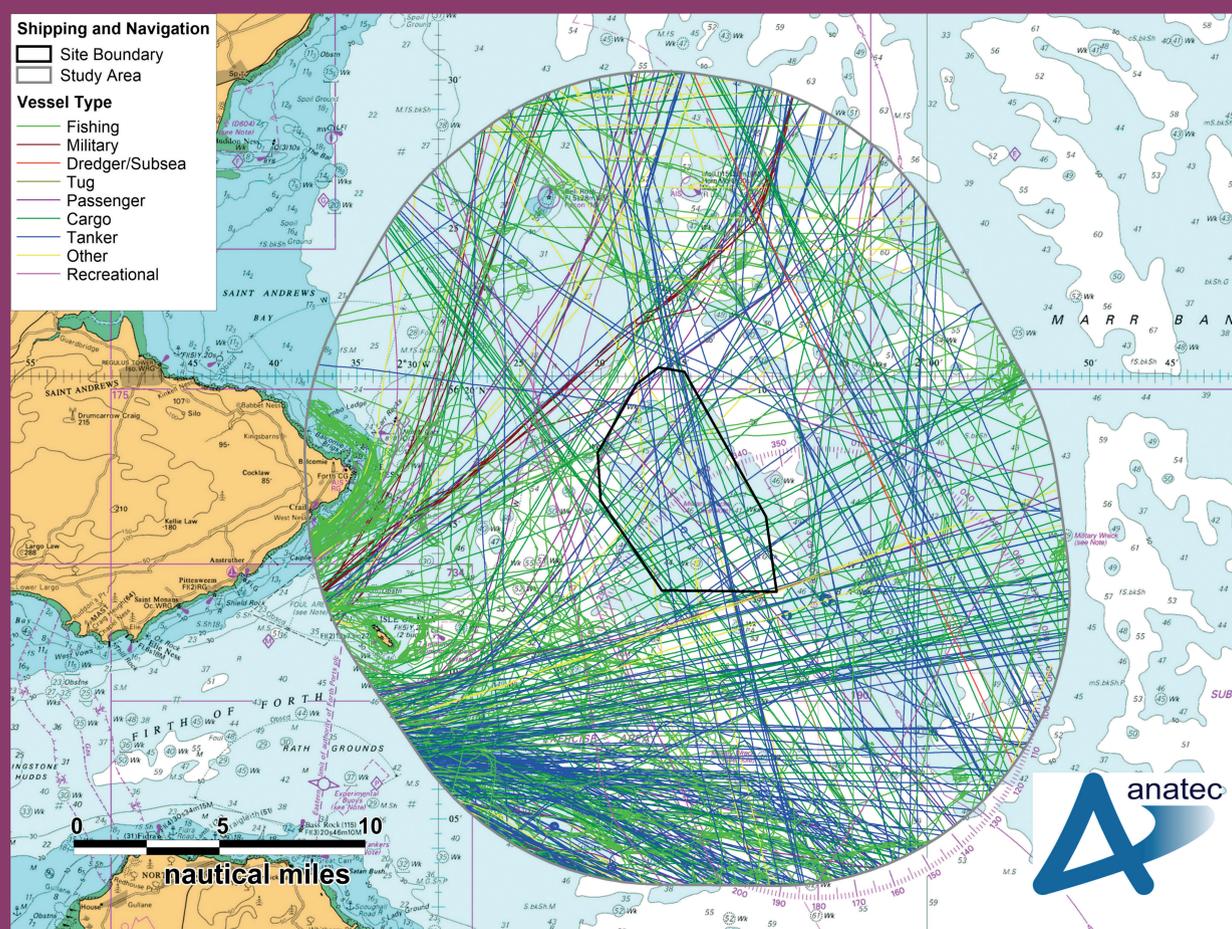
Kittiwake tagging

Noise modelling was undertaken to assess the potential impacts of construction on marine mammals and noise-sensitive fish species.

Through the original application, the number of turbines was reduced from 125 to 64 and the 'air gap' between the sea and the turbine blade was increased to avoid more common flight heights for species such as gannet. The new application will seek to reduce this again to a maximum of 54 turbines, and further increase the air gap.

## Shipping

Large vessels emerging from the Firth of Forth select courses to avoid the Isle of May and therefore these courses generally avoid the Neart na Gaoithe site boundaries. Shipping data has been gathered and the map below shows ship movements through the Firth of Forth over a period of 4 weeks in 2017.



Firth of Forth shipping map

## Commercial Fishing

Information on commercial fishing has been collated through comprehensive consultation with the fishing community and supported by additional data collection and analysis. Any potential interaction between the offshore wind farm and commercial fisheries is a key concern for the project team and consultation with fishermen and their representative bodies will continue throughout the project.

In order to continue the constructive dialogue with the commercial fishing industry, the Forth and Tay Commercial Fisheries Working Group was established, comprising members from local and regional fisheries, as well as Marine Scotland and the Forth and Tay offshore wind farm developers. This group will help to manage the interaction between commercial fisheries and offshore wind farm developments in this area.



## Electrical Transmission System

The turbines will be connected via buried High Voltage Alternating Current (HVAC) cables both offshore and onshore to the grid connection point at Crystal Rig wind farm in East Lothian. Figure 1 shows the key components of an HVAC transmission system.

Within the wind farm, a number of inter-array cables will connect the turbines to one or two offshore substation(s). Subsea transmission cables will run between the offshore substation(s) and the landfall location at Thorntonloch Beach in East Lothian. Close to the landfall, the offshore transmission cables will connect to onshore transmission cables which will be buried for 12.3km between Thorntonloch and a new substation. The new substation will be located adjacent to an existing substation at Crystal Rig wind farm in the Lammermuir Hills, where the grid connection will be made (Figure 2).

In June 2013, Mainstream was granted planning permission by East Lothian Council for the onshore works to connect the Neart na Gaoithe offshore wind farm to the National Grid. The planning permission was implemented in August 2016.

## Key components of HVAC transmission system

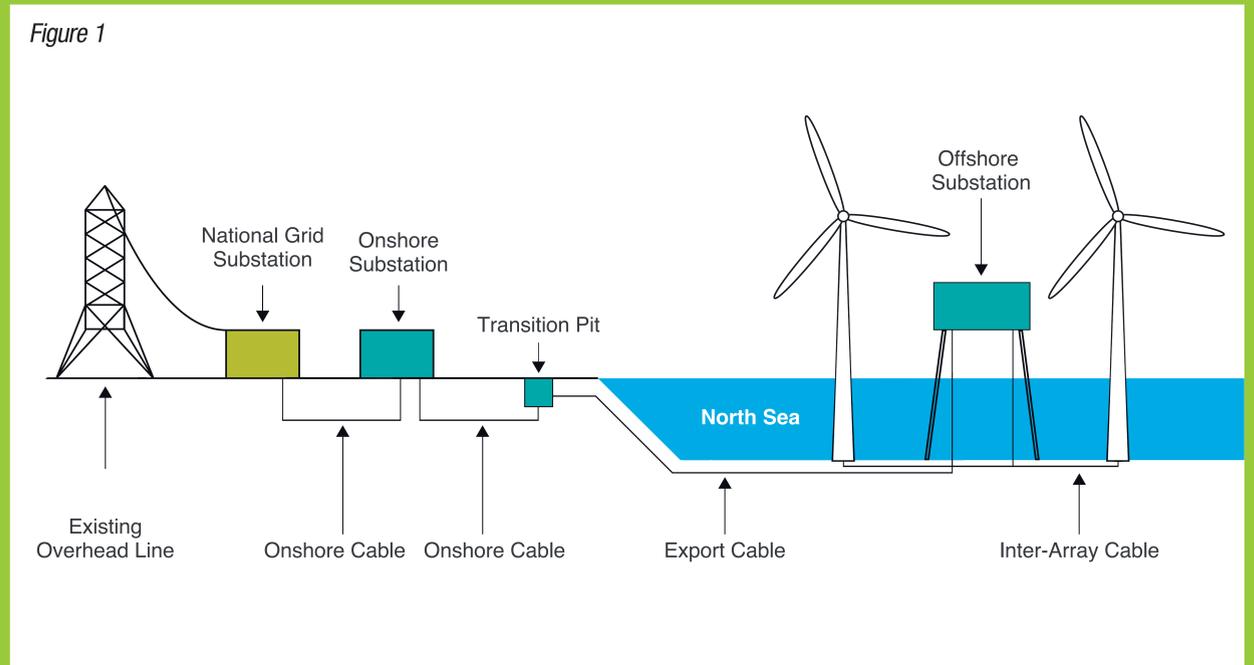
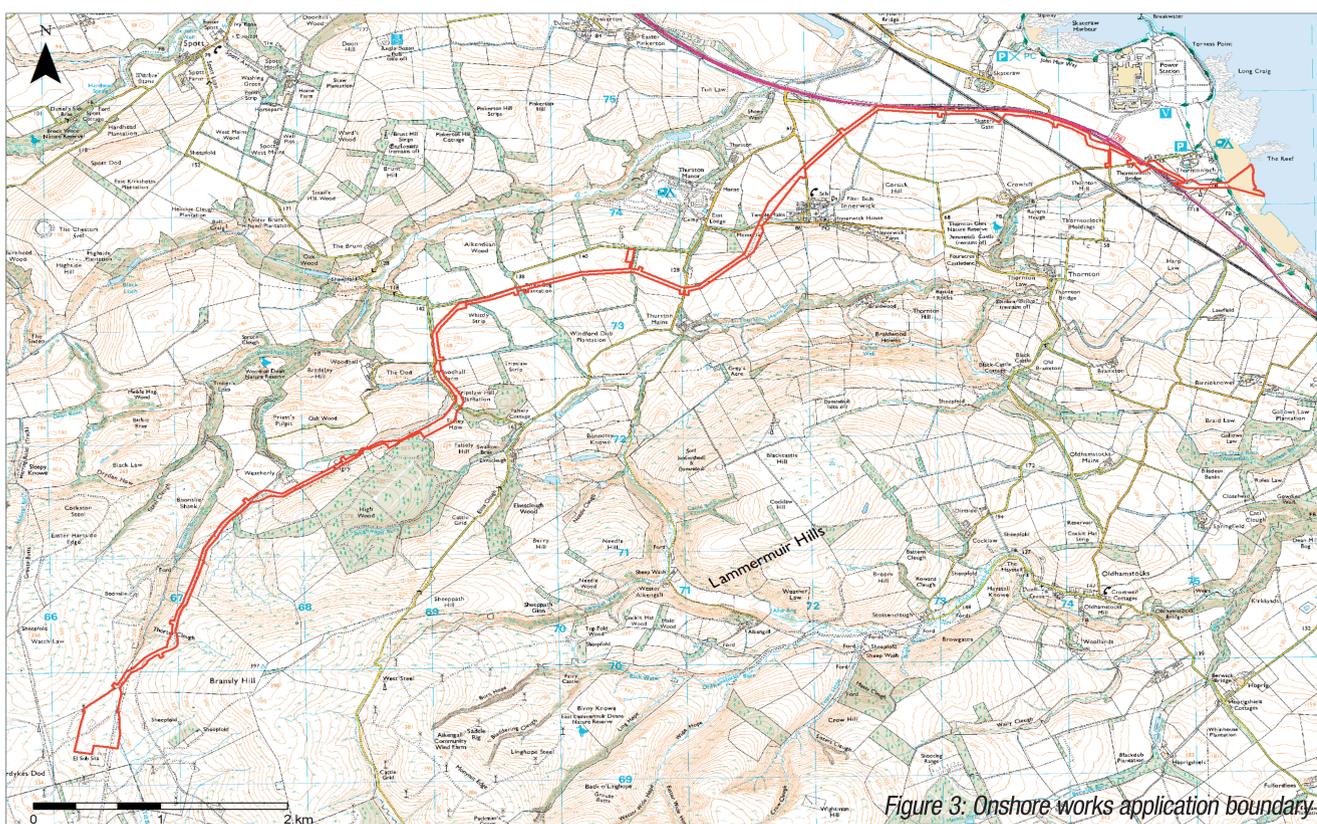


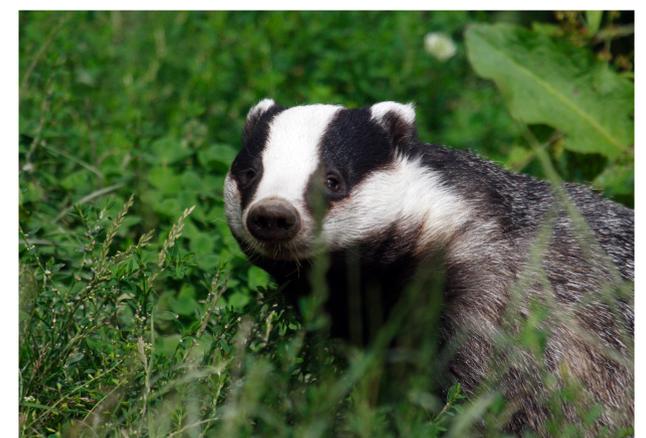
Figure 3 below shows the planning application boundary for the onshore transmission works and Figure 2 (left) shows a visual representation of the new substation. Land along the onshore transmission cable route will be restored to its previous condition following construction with the exception of a number of manhole covers required for inspection.

An Environmental Impact Assessment (EIA) was undertaken as part of the planning application for the onshore transmission works. This included survey and assessment for a number of key aspects such as:

- Ecology;
- Agriculture and land use;
- Construction noise;
- Cultural heritage;
- Landscape and visual; and
- Traffic and transport.



In August 2016, advance construction work was undertaken to coincide with the installation of new buried transmission cables for Torness nuclear power station. Before those new cables were laid, a concrete block incorporating several ducts was placed in the ground, allowing the wind farm cables to be fed through at the time of construction, reducing future disturbance.



## Benefits

Near na Gaoithe is a £2 billion capital project that will have a major positive impact on the Scottish economy.

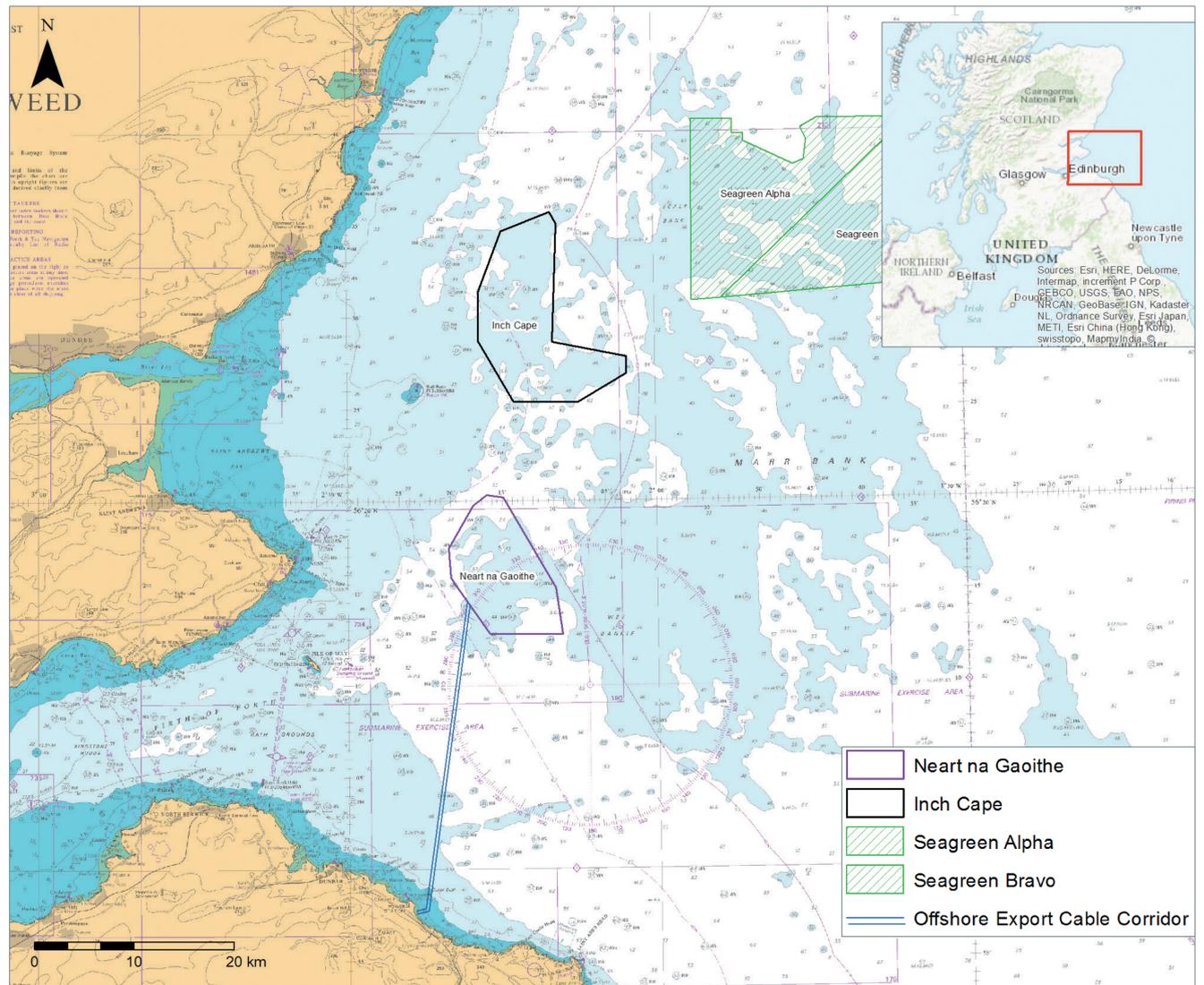
It is anticipated there will be around £510m spent in Scotland during construction, with around a further £610m spent in Scotland during operations and maintenance.

13,900 person years of employment will be supported by this project over its lifetime; with 8,000 person-years of employment in the construction phase, and a further 5,900 during the operations and maintenance phase.

It is estimated that over the lifetime of this project NnG will support the equivalent of 0.6% of the total value of Scottish Onshore GDP in 2016.

The project will have a major role in carbon emissions abatement and play a key part in meeting the emission reduction targets of both the Scottish and UK governments. It will displace some 400,000 tonnes of CO<sub>2</sub> every year and provide enough power for all the houses in a city the size of Edinburgh.

If the UK fails to decarbonise its power sector it will not meet the statutory climate reduction goals in the Climate Change Act, and will not meet its other global commitments to greenhouse gas emissions reduction. Near na Gaoithe is an integral part of that decarbonisation strategy. There are no other comparable projects at Near na Gaoithe's state of readiness.



Cable laying vessel



## Supply Chain

Local procurement is at the heart of our development strategy and we are actively working with the Scottish Government, local authorities, local suppliers, potential manufacturers and other parties to maximise the economic benefit to Scotland, and in particular the east of Scotland. This will help position the region to benefit from longer term UK and international opportunities.

Fife and the wider areas of east-central Scotland in particular will see benefits the Near na Gaoithe offshore wind farm will bring in terms of jobs and local supply chain activities.

Many of the local supply chain companies' employees will bring skills developed in the construction of the Forth Crossing and the aircraft carrier projects, as well as other offshore wind farms, to help deliver Near na Gaoithe. These highly skilled engineering jobs will be sustained by Near na Gaoithe, and added to with opportunities across the region's supply chain.

To register your interest in becoming a member of the supply chain, complete the short registration form at [www.nngsupplierdatabase.com](http://www.nngsupplierdatabase.com).

## Construction

### Installation of turbine foundation

Construction will start with the installation of up to six jacket piles at each of the turbine locations.

*Jacket foundation pile: large steel tube up to 3.5 metres (m) diameter, up to approximately 50m long.*

### Lifting of turbine foundation

Steel jacket foundation: lattice support structure.

A large installation vessel will lift each of the foundations into place over the pre-installed piles.



*Cable laying vessel*

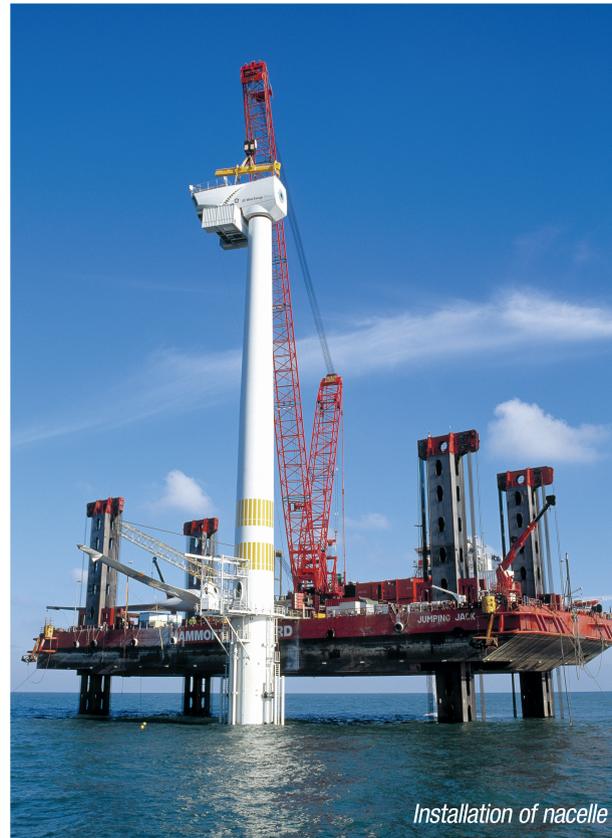
### Installation of cables

A cable installation vessel will start the process of laying the inter-array cables that will connect the turbines to the offshore substation(s). Specialist equipment such as a cable plough may be used to cut a trench in the seabed, lay the cable into the trench then backfill to cover the cable.

*Array Cable: up to a depth of 2m – up to 140 kilometre (km) to be installed.*



*Offshore substation*



*Installation of nacelle*

### Installation of turbines

A turbine installation vessel will transport several sets of turbine components from the base port. A turbine can be installed whole or, as is more common, in several sections. The bottom tower section is lifted into place and bolted to the foundation. The nacelle is then bolted to the top piece of the tower. Each of the three blades are lifted up to the nacelle (or 'hub') in turn and bolted on. The inter-array cable is then connected to the turbine at the transition piece.

*Tower: cylindrical steel sections*

*Nacelle: contains the direct drive generator and all control systems – up to 126m high (from lowest astronomical tide [LAT]).*

*Blades: up to 80m long Glass Reinforced Epoxy (GRE) – 3 blades per turbine – 21,904m<sup>2</sup> swept area.*

*Tip Height: maximum 208m above lowest astronomical tide*

### Offshore substation

The offshore substation consists of a jacket foundation and a 'topside'. The jacket foundation, a larger version of the turbine foundation, will be installed in a similar way. The 'topside' is likely to be in excess of 2,000 tonnes and require a specialist heavy lift vessel. All of the array cables will be routed to the offshore substation and connected into the electrical equipment on the 'topside'.

*Offshore Substation: up to 60m high (LAT) – in excess of 2,000 tonnes.*

### Export cables

Two export cables will be installed from the offshore substation(s) to the landfall location at Thorntonloch Beach in East Lothian. They are larger versions of the inter-array cables and will be installed in a similar way. At the shore they are connected to two onshore transmission cables.

*Export Cables: buried up to 3m deep – 43km to be installed.*



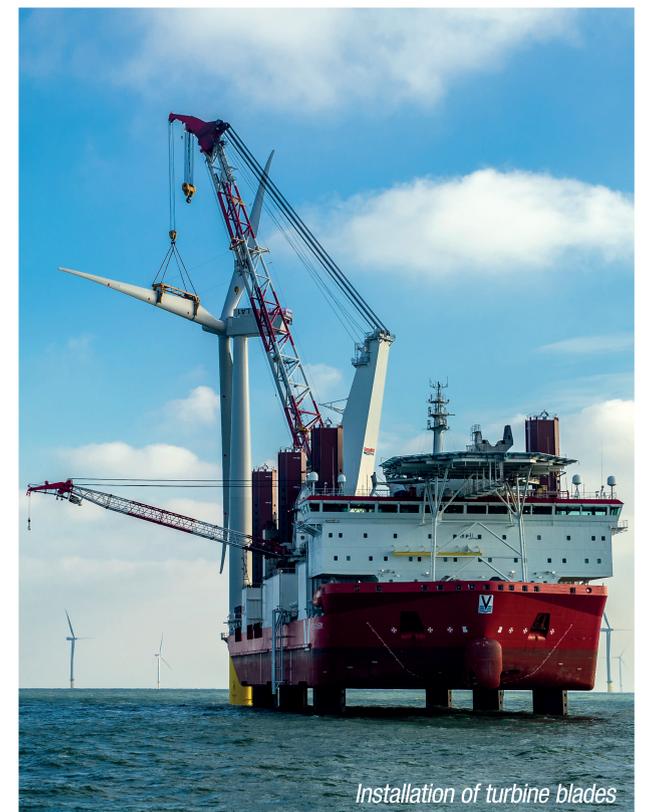
*Installation of onshore cables*

### Onshore infrastructure

All the onshore infrastructure will be installed with two cables from Thorntonloch Beach to Crystal Rig wind farm in the Lammermuir Hills. An onshore substation will be built to allow the connection of the onshore transmission cables to specialist transformers to connect to the National Grid.

*Onshore Infrastructure: 12.3km onshore cable.*

*Onshore Substation with transformers.*



*Installation of turbine blades*