Project overview

Beatrice Offshore Windfarm Limited (BOWL) is a joint venture partnership between SSE Renewables (40%), Copenhagen Infrastructure Partners (35%) and Red Rock Power (25%).

SSE is one of the UK’s leading energy companies, involved in the generation, distribution and supply of electricity and the extraction, storage, distribution and supply of gas. Its core purpose is to provide the energy people need in a reliable and sustainable way. It supplies energy to around 8.2 million customers throughout Great Britain and Ireland and is one of the UK’s leading generators of electricity from renewable sources. SSE became a Living Wage employer in September 2013 and was accredited with the Fair Tax Mark in October 2014. Every year it contributes around £9 billion to the UK economy.

Copenhagen Infrastructure Partners (CIP) is a fund management company founded in 2012. Copenhagen Infrastructure Partners focuses on long term investments in energy and infrastructure assets, primarily in Northern and Western Europe and North America.

Red Rock Power is the UK subsidiary of SDIC Power Holdings Co., a power generation company listed on the Shanghai Stock Exchange. SDIC Power is primarily engaged in the investment, development, construction, operation and management of power projects. The company owns a total installed capacity of 27GW, and more than 60% of the portfolio is renewable energy capacities, including hydro power stations and wind farms.

Beatrice will be located around 13.5 km (at its closest point) from the Caithness Coast in the Outer Moray Firth, with its centre located approximately 25 km (13.4 Nm) south-south-east of Wick. It will have 84 7 MW Siemens wind turbines which together will be capable of generating up to 588 MW of wind powered renewable energy.

In 2009 BOWL was awarded exclusivity by The Crown Estate to develop Beatrice in Scottish Territorial Waters. The project was consented by Marine Scotland and granted an Investment Contract by the UK government in 2014. The project achieved financial close in May 2016, signalling the start of the construction phase.

Work is underway in Moray on the Beatrice substation near Keith and work has begun on the cable route from landfall near Portgordon to the substation. We hope to begin work on the operations and maintenance (O&M) facility in Wick by January 2017, subject to planning permission.

Construction at the offshore wind farm site will begin in 2017 and the project is expected to be fully operational in 2019.
Project overview

At £2.6bn, the 588MW Beatrice offshore wind farm project will be one of the largest ever private investments in Scottish infrastructure. The project will consist of:

1. 84 x Siemens 7MW wind turbines, each installed on ‘jacket’ substructures on pile foundations
2. 2 x 220kV Offshore Transformer Modules (OTMs) which collect the electricity from the turbines for transmission to shore
3. 160km of buried subsea inter-array cables, connecting strings of wind turbines to the OTMs
4. 140km of buried subsea export cables (in two lengths of 70km) connecting the OTMs to the landfall point near Portgordon
5. 20km of underground cable to transmit the electricity from landfall to the substation at Blackhillock
6. 1 x substation at Blackhillock for onward transmission of the electricity to the National Grid

Ports and harbours

Beatrice will require the use of ports and harbours during both the construction and operational phases:

Wick Harbour: With its proximity to Beatrice and with the availability of suitable quayside facilities, Wick Harbour has been chosen as the location for the Beatrice operations and maintenance (O&M) base. The base will be required for the 25 year lifespan of the Beatrice wind farm to facilitate the commissioning, operation and maintenance of the turbines in a safe and efficient manner. Subject to planning consent, we will renovate and utilise two historic Thomas Telford buildings on the harbour front and utilise a currently unused area of adjacent harbour to facilitate mooring up to six Crew Transfer Vessels (CTVs).

Buckie Harbour: We will utilise Buckie Harbour as the Beatrice contingency port which will predominantly be utilised when the CTVs are unable to return to Wick Harbour. We may also utilise Buckie Harbour where additional capacity is required during the construction and operational phases.

Nigg Energy Park: Nigg has been contracted as the construction and marshalling port and will store, pre-assemble and prepare the wind turbines ahead of installation offshore.
Manufacturing and construction is now underway with Beatrice expected to be fully operational in late 2019. Between now and then the construction activity both onshore and offshore will continue with key activities as shown below. One of the biggest challenges facing the Beatrice team is the weather, particularly around the offshore construction phase and so the timelines below are subject to some flexibility.

Onshore

The key onshore construction activities are focused around Wick, the home of our operations and maintenance base and Moray which is where the power from Beatrice will come ashore and join the Grid. In Wick, we expect to begin work on restoring the two Harbour Quay properties in January 2017 with work taking around 18 months to complete. In Moray, work on the substation at Blackhillock has been underway since May 2016 and work has begun on the cable route from landfall near Portgordon to the substation.

Offshore

The offshore construction activity will focus on the site area itself (for installation of the piles, jackets, Offshore Transformer Modules, turbines and inter-array cables) and along the route of the export cable which runs due south from the wind farm, making landfall at a point to the west of Portgordon. Construction will involve the use of a number of significant vessels (including jack-up vessels) as well as smaller vessels guarding the construction zones to ensure everyone remains safe.
Onshore construction progress - overview

There are a number of key onshore construction activities required as part of the Beatrice project. Work is underway in Moray at Blackhillock and near Portgordon and in Caithness we hope to begin work on the operations and maintenance (O&M) base in Wick at the start of 2017. The information below provides a brief overview of our activities to date:

Construction began in May 2016 soon after the project achieved Financial Close.

Good progress has been made including the completion of the substation platform, numerous concrete foundation pours and the perimeter fence.

Work continues on site with preparations underway for the arrival of the main substation equipment.

Once complete, the substation will transform the electricity generated by Beatrice up to 400kV where it will pass through the adjacent Scottish and Southern Electricity Networks substation and on to the Grid.

Enabling works at the main construction compound near Portgordon began in October 2016 ahead of main construction getting underway. The compound is established and serves as the main base for the onshore cabling works.

Our contractors, Murphys, will be laying around 20km of underground cable between the landfall point and the Blackhillock substation utilising the latest Horizontal Directional Drilling (HDD) techniques in certain areas to ensure we protect the roads, rivers and railway lines.

Wick was chosen as the location for the O&M base due to being near Beatrice and the availability of suitable harbour facilities.

In September 2016 we held a well received public engagement event where we showcased our plans for the renovation and return to use of two harbour front buildings which form part of the original Thomas Telford Lower Pulteneytown development from 1807.

We submitted our plans to the Highland Council seeking consent to sensitively renovate the buildings and await their decision. In the event that consent is granted we expect to begin work in January 2017.
Onshore progress – Blackhillock Substation

Construction at Blackhillock is progressing well with some key milestones, such as completion of the platform, completed safely on time. This image shows the Beatrice substation (outlined in yellow) with the Scottish and Southern Electricity Networks Blackhillock substation behind.

Concrete pours

Base locations excavated or built up  Reinforcement steels are assembled  Concrete pour underway

After 6 hours the pour is almost complete  Bases are ‘polished’ to ensure a smooth flat finish.  A complete base
Onshore progress - main construction compound

The power generated at Beatrice will be transmitted via subsea cable to a landfall point to the west of Portgordon. From here, it will be transmitted via approximately 20km underground cable to the Beatrice substation which is under construction at Blackhillock, near Keith.

In October 2016 we began enabling works at the site of the main construction compound to the south west of Portgordon.

Construction of the compound included preparing the ground and installation of the compound cabins, welfare and storage areas as shown in the plan to the left.

The stone for the site was sourced from the local Limehillock quarry near Keith.

The compound will be the main base for the construction team responsible for the landfall works and the undergrounding of the cable from Portgordon to Blackhillock.

These images show some of the works undertaken to date to develop the site of the main construction compound. Main construction will begin both towards the shoreline (where the export cables will make landfall) and towards the Blackhillock substation.

Once the onshore cabling works are complete and the wind farm operational, the compound will be removed and the land reinstated.
Onshore progress – landfall and underground cabling

Construction has begun on the link from the landfall point near Portgordon (where the power exported by Beatrice comes ashore) to the new Beatrice substation at Blackhillock. This will involve the installation of approximately 20km of underground cable. This is how it will be done:

1. Mark out cable route and fence off work area, creating a safe working zone for construction teams.

2. Construct access points along the route, utilising existing access wherever possible.


4. Ducting is laid for the two Beatrice circuits giving a combined total cable length of around 40km.

5. Protective boards and marking tape are laid over the ducts and the trenches are backfilled.

6. Cable deliveries will begin in April 2017 in readiness for pulling through the ducting.

7. The cables are pulled through the buried ducting at the jointing bay.
**Offshore progress**

Developing an offshore wind farm is a complex and challenging task, requiring a significant amount of work before construction begins. Throughout the development phase and since the Financial Close in May, we have been undertaking a significant number of environmental and engineering surveys and monitoring programmes including:

<table>
<thead>
<tr>
<th>Marine mammal preconstruction monitoring</th>
<th>Sandeel survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boat and aerial ornithological surveys</td>
<td>Geophysical surveys (non-intrusive seabed surveys)</td>
</tr>
<tr>
<td>Benthic grab and seabed photography survey</td>
<td>Geotechnical surveys (bore hole surveys)</td>
</tr>
<tr>
<td>Cod spawning survey</td>
<td>Metocean surveys (sea condition surveys)</td>
</tr>
<tr>
<td>Herring spawning surveys</td>
<td>Unexploded ordinance survey and clearance</td>
</tr>
</tbody>
</table>

We will continue to carry out additional surveys and monitoring and marine mammal monitoring during construction.

**Construction marine mammal monitoring**

These studies will use the baseline data gathered during our pre-construction monitoring to underpin further detailed studies of the responses of harbour seals to the construction of Beatrice.

This work will inform annual estimates of the abundance and reproduction of both priority species. This will be compared to the impacts predicted in the Environmental Statement (ES) and the pre-construction monitoring baseline. We have been working with the University of Aberdeen (based at Cromarty) to undertake significant monitoring over the past five years.

Additional monitoring will also be conducted to monitor responses to Acoustic Deterrent Devices (ADDs). Studies will focus upon harbour porpoise due to their likely occurrence within the development area and will monitor their responses to ADDs and the soft start procedures that will be deployed prior to piling operations.
Offshore construction

Piling and installation of the jacket substructures

The wind turbines will be supported on ‘jacket’ substructures with piled foundations. We will begin by installing the piled foundations in the seabed followed by installing the jackets. This process will take approximately 45hrs at each location. Pile drilling may also be used if the seabed structure requires it.

Turbine installation

Once the jackets are installed we will install the turbine towers, nacelles and blades. The turbines then undergo stringent testing before being commissioned, following which they will be exporting electricity to the National Grid via the Blackhillock substation.

Vessel set up  Install piles  Pile driving  Pile drilling (if required)  Install jacket  Relocate vessel

Preparation & pre-assembly at Nigg  Loading, travel to site & jack-up  Tower lift & install  Nacelle lift & install  Blade lift & install

It will take around two days to install each of the Offshore Transformer Module (OTM) topsides.

The jackets supporting the OTMs will be installed as described above.
Offshore construction - vessels

The Beatrice project is significant both in terms of investment and in terms of the engineering challenges when working with large components and in deep waters. We will be utilising some very large vessels to facilitate the construction work offshore.

**Stanislav Yudin**
Installing:
Foundation piles and Offshore Transformer Module (OTM) topsides
Pile installation is planned from April 2017 to January 2018.
OTM installation is planned from November to December 2017

**Oleg Strashnov**
Installing:
Jacket substructures
Jacket installation is planned from August 2017 to December 2017 and from May 2018 to August 2018

**Pacific Orca**
Installing:
Wind turbines
Turbine installation is planned from July 2018 to March 2019.

**Siem Moxie and/or Siem Amery**
Laying and burying the inter-array cables
Inter-array cable installation is planned from November 2017 to September 2018

**Nexans Skaggerak**
Laying and burying the export cable
Export cable installation is planned from September 2017 to May 2018
Inter-array cables

In much the same way that a number of homes and businesses are connected to substations to receive energy, the Beatrice wind turbines are connected to the two Offshore Transformer Modules (OTMs) in order to export the energy they produce. The connection network (the ‘inter-array’) will require around 160km of interconnecting cables which will be manufactured in the UK.

The OTMs are centrally located in the wind farm. The inter-array cable layout connects the wind turbine strings to the OTMs.

At the OTMs, the generated electricity is transformed to 220kV and exported via the 69km subsea cable route to landfall at the Moray coastline and then the 20km underground cable route to the onshore substation at Blackhillock.

The electricity is then stepped up again to 400kV for onward transmission on the National Grid.

The inter-array cables will be laid on the seabed and then buried, usually within a few weeks of laying.

The target burial depth for the inter-array cables is 0.6m to 0.8m (top of cable).

As the seabed sediments are mainly sands and gravels the preferred method for burying the cable will be by water jetting.

Guard vessels will be employed if required to protect any exposed cables on the seabed prior to burial.

Inter-array cable installation will take place in three stages:

1. Oct 2017 to Apr 2018
2. Feb 2018 to Apr 2018
3. Jun 2018 to Sep 2018

The Siem Moxie and Siem Amery vessels will be used to lay and bury the inter-array cables.
Offshore export cables

To facilitate getting the power generated by Beatrice to shore, we will be laying around 69km of buried subsea cable from the wind farm due south to a landfall point to the west of Portgordon on the Moray coast. There will be two lengths of cable laid (to form two circuits) resulting in around 140km of cable in total.

A specialist vessel, the ‘Skaggerak’ will be used to install the offshore export cable.

Maps of the subsea export cable route are available for you to view at this event.

Export cable installation will begin at the landfall point with the installation of ducts beneath the shoreline using the latest in horizontal directional drilling (HDD) techniques. The offshore cable will be pulled through the ducts and joined with the onshore cable.

In spring 2017 we will begin to excavate the cable trench near to shore (within 4.5km).

The cable will be laid on the sea bed and then buried. If we are unable to bury the cable sufficiently then we will protect the cable by rock armouring.

Guard vessels will be employed, if required, to protect any exposed cables on the seabed prior to burial.

The installation of the export cable will take place in three phases:

1. Cable 1 commencing April 2017
2. Offshore Transformer Module interconnector commencing August 2017
3. Cable 2 commencing March 2018

The installation of the export cable is expected by June 2018.
Supply chain

With construction required both onshore and offshore, the Beatrice project has three EPCI (Engineering, Procurement, Construction and Installation) contracts in place, covering the various elements of the project.

The companies responsible for these contracts are:

**Subsea 7** (with Seaway Heavy Lifting as their 1st tier contractor) is the marine EPCI Contractor responsible for the design, manufacture and installation of the substructures and array cables and the installation of the Offshore Transmission Modules (OTM).

**Siemens Wind Power** are responsible for the design, manufacture and installation of the wind turbine generators.

**Siemens Energy Management (STDL) and Nexans Norway** are responsible for the design and manufacture of the OTMs and the design, manufacture and installation of the onshore electrical system. They are also responsible for the manufacture and installation of the onshore and offshore export cables.

In addition to the works described above we are tendering for a contractor who will be responsible for the redevelopment of the buildings on Wick Harbour which will become home to the Operations and Maintenance base.

The project also provides other supply chain opportunities during both the construction phase and the 25 year operational phase. These opportunities may include the provision of:

- Logistics / transport
- Safety equipment
- Spare parts
- Consumables
- Crew transfer vessels (CTV)
- Helicopter service operation
- Accommodation for staff
- Construction support services including
  - Site cabins
  - Generators
  - Fuel
- Service tools

If you wish to offer your services to the project please, in the first instance, email: offshoreprocurement@sse.com
Socio-economic benefits

The Beatrice offshore wind farm, at around £2.6bn, is one of the largest private investments ever made in Scottish infrastructure. A project of this scale is important to local, regional, Scottish and UK economies and we are committed to maximising benefits wherever possible. Opportunities include job creation, skills training, investment in Scottish ports and harbours, supply chain opportunities and community benefit funding.

Beatrice has a tier 1 supply chain comprising Seaway Heavy Lifting, Subsea 7, Nexans and Siemens and expect to deliver c. £680m into the UK and Scottish economy via employment and supply chain opportunities during the construction phase and c. £400 - £525m during the 25 year operational phase.

Job creation

The operations & maintenance base in Wick is expected to support a peak of around 65 jobs during the construction and around 90 long term jobs are anticipated during the operational phase.

Opportunities at Wick are expected to include onshore operational staff, offshore turbine technicians and skippers for the Crew Transfer Vessels which will transport the offshore teams to and from Beatrice.

Supply chain

On 23 May 2016, the green light was given for construction to proceed. Since then many significant contracts have been awarded and construction and fabrication has begun in readiness for delivering an operational wind farm in 2019.

As construction ramps up, many local businesses including restaurants, accommodation providers, shops and service providers will see increased business.

Community benefits

As well as significant employment and supply chain opportunities, Beatrice brings with it a £6m Community Benefit fund, for distribution in the Highland and Moray regions. We will announce further details of the fund in the coming months, including the areas eligible to benefit and how eligible groups and organisations can apply for funding to support their aspirations.

Be the Difference

As well as the opportunity to apply for funding, SSE operates a volunteering scheme called ‘Be the Difference’. This affords every member of staff the chance to take a day away from their day job to support local good causes that are close to their hearts.
Keeping in touch

We would like to keep you informed as we progress and there are a number of ways in which we can keep you up to date:

**Email updates:** If you would like to receive email updates, please complete a comments form before you leave today so that we can add you to our mailing list. You can unsubscribe at any time.

Updates are generally sent to mark key developments or project milestones or when there are specific construction activities that we would like to tell you about.

**Project website:** For more general information, you can visit the Beatrice website which can be found at sse.com/beatrice.

As construction progresses, we will update the website with the latest news as well as links to some interesting short videos explaining some of the processes required to bring a project like Beatrice to life.

**@Beatricewind Twitter feed:** Our Twitter feed has interesting bite sized pieces of news, views and project information and more. You do not have to have a Twitter account to see what we are posting. Simply go to www.twitter.com/beatricewind to read our latest posts. Alternatively, visit the project website and you will see the latest Tweets to the right of the page.

**Contacting us:** Of course, you may want to contact the project team to talk about some concerns or simply to get more information about an aspect of the project. In the first instance, please contact our Liaison Manager:

Noel Cummins  
Corporate Affairs  
Inveralmond House  
SSE  
200 Dunkeld Road  
Perth  
PH1 3AQ  
Email: noel.cummins@sse.com  
Telephone: 01738 516901