Beatrice Offshore Windfarm Limited (BOWL) is a joint venture partnership formed between SSE Renewables (75%) and Repsol Nuevas Energias UK (25%) (formerly SeaEnergy Renewables). In February 2009 we were awarded exclusivity by The Crown Estate to develop the Beatrice Offshore Wind Farm in Scottish Territorial Waters.

SSE Renewables is responsible for the development of SSE’s renewable energy projects across Europe. SSE is the leading generator of renewable energy in the UK, with over 2,450 Megawatt (MW) of renewable energy projects consented.

Repsol Nuevas Energias UK (Repsol) was formed following Repsol’s purchase of 100% of SeaEnergy Renewables Limited in June 2011. It has development rights for a total of 1,190 MW in the United Kingdom, equivalent to a third of the offshore wind capacity currently installed worldwide.

The Beatrice Offshore Wind Farm site is located in the Outer Moray Firth on the north-western point of the Smith Bank. The site is adjacent to the world’s first deep water wind farm development – the two-turbine (10 MW) Beatrice Demonstrator Project. The Beatrice Demonstrator turbines are owned and were developed by SSE and Talisman. The turbines have been operational since 2007.

Building on the success of the Beatrice Demonstrator Project, we are proposing to develop an offshore wind farm which will generate up to 1,000 MW of renewable energy, enough to power over 796,000 homes.

Where is it?

This site is 13.5 km from the Caithness coastline and is 19 km long and 9 km wide. The existing Beatrice Demonstrator Turbines are located 11 km to the south west of the site, and Jacky oil platform is adjacent to the southern boundary. The proposed Moray Firth Round 3 offshore wind farm zone is located directly to the east.

The applications

BOWL is expecting to submit the required consent applications for the Offshore Project i.e. the Wind Farm and Offshore Transmission Works proposals, to Marine Scotland in January 2012. An application for the Onshore Project i.e. the onshore transmission works proposals, will be submitted to The Moray Council in Spring 2012.

What are we proposing to develop?

The proposed Wind Farm will have a maximum of 142 to 277 turbines, depending on turbine size. The offshore components of the Wind Farm will include the following.

- Turbines (tower, nacelle, blades and hub).
- Turbine substructures and foundations.
- Up to three offshore electricity substations.
- Electricity cables at the site connecting the turbines to the substations.
- Up to three meteorological masts.
- Wave measuring equipment.

In order that the electricity generated can reach the centres of demand the Wind Farm will need to be connected to the national electricity grid. We have a grid connection agreement with National Grid which allows us to connect into the existing electricity network at Blackhillock, near Keith, Moray.

The Transmission Works will include the following.

Offshore Transmission Works:
- Approximately 65 km of subsea cable.

Onshore Transmission Works:
- Approximately 20 km of onshore underground cable.
- A new substation nearby the existing substation at Blackhillock.
Beatrice Offshore Project

Wind Farm design

A final site layout has not yet been developed. Therefore the consent will allow for flexibility to define the layout of the Wind Farm once detailed design has been undertaken. This is a recognised approach to offshore wind farm design. An Environmental Impact Assessment (EIA) has been carried out and will be submitted as part of the application. The EIA has considered a number of scenarios and indicative layouts to ensure every possible significant impact has been assessed.

The final layout will have a generating capacity of up to 1000 MW. In order to achieve this maximum capacity a number of turbine scenarios have been considered, including up to 277 turbines of 3.6 MW capacity, or up to 142 turbines of 7 MW capacity.

Wind turbine design

The 3.6 MW wind turbine could have a maximum tip height of 140.6 m, a rotor diameter of 107.2 m, and a hub height of 87 m.

The 7 MW wind turbine could have a maximum tip height of 198.4 m, a rotor diameter of 165 m, and a hub height of 115.9 m.

The turbines will have three blades attached to the hub, which in turn is attached to the nacelle. From time to time engineers will need access to the turbines and this will be by boat or by helicopter. The turbines will be able to be turned on and off from a control room onshore. An illustration of a typical offshore wind turbine is provided below.

The Applications

BOWL is expecting to submit the required consent applications for the Offshore Project i.e. the Wind Farm and Offshore Transmission Works proposals, to Marine Scotland in January 2012. An application for the Onshore Project i.e. the onshore transmission works proposals, will be submitted to The Moray Council in Spring 2012.

Foundations and substructures

The foundations are the engineered elements used to secure the substructure and wind turbine to the seabed. The substructure is the component which links the turbine tower to the foundation.

For the Beatrice Offshore Wind Farm, engineering appraisals have concluded that given the water depths, seabed characteristics and wind resource at the site there are a number of feasible designs for foundations. These are pin pile, suction pile, gravity base or conical gravity base.

Suitable substructure designs for the Beatrice Offshore Wind Farm are tubular jacket or monotower.

Examples of these components are illustrated below.
Beatrice Offshore Project

Project Programme

The project programme illustration below shows the main activities that BOWL has undertaken so far in the development of the project. It also indicates the expected timetable that will follow submission of the offshore applications. One activity that runs continuously throughout this programme is ‘consultation’.

Consultation with decision makers, regulators, key consultees and other interested parties has, and will continue to be, undertaken throughout the entire project programme. Consultation is a key tool in helping define the project design and agreeing the scope of the surveys and assessments undertaken.

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Your views and comments

Whether formal or informal, your views and opinions about the proposals are welcomed and valued. If you have any comments, queries or views you would like to share with BOWL please feel free to contact us at the address below, or fill in a comment sheet available from BOWL staff here at the exhibition.

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Consenting process

Pre-Application

- BOWL undertakes preparatory work identifying issues, constraints, discussing proposal with the decision makers, statutory bodies, public etc. BOWL undertakes the EIA Scoping and prepares the ES

Application

- BOWL shows Draft Advert to decision maker and submits ES. Application information is circulated to statutory consultees and advertised by Scottish Ministers.

Consideration of Application

- All consultees (including public and non-statutory) can make representations on the application.

Proposals Evaluated

- All responses from statutory and non-statutory consultees and the public assessed by Marine Scotland, the decision maker.

Additional Information (if required)

- If necessary, further information from BOWL is sought and used as an addendum to the application. The addendum will be subject to consultation and circulated to relevant stakeholders.

Determination of Application

Decision Announcement

Post Decision
Construction timeline

There will be a lot of activity in the sea during the construction phase. Construction could potentially start in 2014 and continue to 2018. Offshore construction is likely to be carried out 24 hours a day when weather and sea conditions permit.

The wind turbines will be designed to operate for a period of 25 years. After this time the Wind Farm could be decommissioned, or continue operating and be upgraded. If the project was to be decommissioned, towards the end of the project life a Decommissioning Plan will be prepared and submitted to Marine Scotland for approval.

The main construction activities are indicated in the timetable below and the sequence in which they are undertaken will likely follow through activity 1 to 5. It is possible that more than one set of construction activities will be taking place at any one time, for example, foundations could be installed at two separate locations within the Wind Farm at the same time by two separate vessels.

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Construction Methods

The vessels used during the construction phases will range from small crew vessels, transporting workmen on and offshore, to large specialist installation vessels. An illustration of the types of vessels used for the various construction phases are provided below. During the construction phases these vessels could be based at a port within the Moray Firth area, or it is possible they could sail with the components from another location within the UK or Europe. Whilst construction is taking place there will be safety zones created to make sure both construction vessels and other users of the sea can navigate safely.

1 – A seabed investigation vessel.
2 – Typical vessel installing a foundation.
3 – Typical cable lay vessel with trencher being lowered to seabed.
4 – Transporting substructures on a barge.
5 – Fully assembled turbine ready for transport.
6 – Vessel carrying complete turbine to site.
7 – Typical installation vessel.
Both the Moray Firth and East Caithness Cliffs Special Protection Areas (SPAs) are sites of European importance for certain sea birds and wildfowl. It is therefore required by law that BOWL assess whether the proposed Wind Farm would have an impact on these sites and the species important to them. The key bird species BOWL has assessed are as follows:

- Fulmar
- Kittiwake
- Great black-backed gull
- European storm-petrel
- Gannet
- European shag
- Guillemot
- Northern fulmar
- Great skua
- Arctic skua
- Herring gull
- Scooty shearwater
- Pink-footed goose
- Greylag goose
- Barnacle goose

In order to assess the impact of the Wind Farm and Offshore Transmission Works on these species, BOWL examined the distribution and abundance of these birds at the SPA and within the Moray Firth and the range of species present in these locations.

This assessment was undertaken by using existing data, sightings from boats, aerial surveys from aeroplanes and satellite tracking surveys.

The construction, operation and decommissioning of the Wind Farm and Offshore Transmission Works may disturb some bird species and potentially displace them from areas used for feeding, roosting, resting, moulting or passage. Some bird species may be vulnerable to collision with the turbines during operation of the Wind Farm. There may also be potential indirect effects, which could be positive or negative, through changes to habitat and foraging conditions during construction, operation and decommissioning.

Bird populations within the range of the application site will experience low levels of impact as a result of displacement or collision due to the presence of the turbines. Potential impacts on bird populations are not considered to be significant and will not affect the status of the SPAs.

Potential impacts on bird populations using the site were found to be of no significance. Displacement of these species is not considered to constitute a significant impact on the East Caithness Cliffs SPA population.

The Wind Farm site is located approximately 13.5 km from the coastline of Caithness, at its closest points.

A computer generated Zone of Theoretical Visibility (ZTV) has been produced. This identifies locations within a 40 km radius study area of the Wind Farm where it may be theoretically possible to see the turbines or offshore substations. The ZTV is based on topographical height data only and does not take account of structures or vegetation which may obscure views of the Wind Farm.

The ZTV indicates the offshore turbines could be visible from locations along the Caithness coast, however due to the distance this is likely to only be the case in clear weather conditions.

The areas where the Wind Farm may be visible lies within the Moray Firth, but also encompass an area of the Highlands landscape. This land is mainly made up of the Caithness and Sutherland coast and hinterland.

Computer generated images have been prepared to illustrate and assess the likely view of what the Wind Farm would look like from certain vantage points on the coastline. The ZTV and a selection of visualisations are presented at this exhibition.
Benthic Ecology

Benthic ecology relates to the animals living on the seabed. BOWL has studied the benthic ecology at the Wind Farm site by undertaking a series of surveys as follows.

- Grab samples from the seabed were collected at locations in the area of the Wind Farm and along the offshore cable route.
- A specialist camera was dropped down to the sea bed at locations in the area near and within Wind Farm site and Offshore Transmission Works route to obtain video and stills images.
- Beam trawls were performed within the Wind Farm site to investigate smaller surface dwelling fish and organisms.
- Sidescan sonar survey of the whole Wind Farm site was undertaken to understand the physical characteristics of the seabed.

The results of these surveys allowed BOWL to ascertain the following.

- No populations of nationally important, rare or otherwise unusual species were found during the surveys.
- Biological communities were dominated by a variety of worms and molluscs.
- On the coarser seabed, starfish, urchins, queen scallop, hermit crabs and spider crabs were found.

A habitat classification of the seabed (biotope classification) was carried out, taking into account all of the trawl, grab, camera and sediment (including sidescan sonar) information.

Direct impacts to benthic ecology occur through the direct loss of habitat associated with activities such as the placing of turbine bases on the sea bed. If the largest bases were used it is estimated that about 3% of the Wind Farm site’s benthic habitat would be affected. Due to the introduction of new structures in the sea this could be seen as the creation of additional habitat.

Fish

BOWL has assessed impacts to both commercial fishing and the fish and shellfish ecology.

Commercial Fish

The main commercial species found within the Wind Farm site, Offshore Transmission Works route and surrounding area include the species below.

- Scallops, haddock, herring, monkfish, langoustine, lobster, and squid.

Landing records suggest that over half of the species (by weight) caught within approximately 50 km of the Wind Farm site are scallops; a quarter of the catch is haddock; and the remainder are made up of herring, monkfish, langoustine, lobster and squid. The area of the Wind Farm constitutes a small proportion of the fishing grounds for these species in the Moray Firth.

The Wind Farm and cables will introduce new infrastructure to the fishing areas which could restrict certain types of fishing in these areas. Consultation with a wide range of fisheries interests has been ongoing throughout the EIA to minimise this issue and will continue throughout the development process.

Fish Ecology

The Wind Farm site and Offshore cable route is located within, or in proximity to the spawning and nursery grounds of a number of species including.

- Sandeels, cod, plaice, lemon sole, sprat, herring, whiting, langoustine and lobster.

BOWL has also considered that certain species of conservation importance may use or pass through the Wind Farm site and cable route, including those below.

- Salt / freshwater migratory species such as salmon, sea trout, sea lamprey, river lamprey, European eel, and shads.
- Certain species of sharks and rays.

Impacts on the fish ecology will vary between species. For example, some species are more prone to noise impacts than others. In order to minimise these impacts measures will be taken such as soft start engineering operations.

There will be some loss of seabed habitat such as from turbine bases. Sandeel have the potential to be affected by this loss of habitat, however, the assessment has found the impacts on sandeel will not be significant in the overall population.
Marine mammals

The Moray Firth area is known for its presence of marine mammals. The main species known to visit the area of the Wind Farm include those below.

- Bottlenose dolphin.
- Harbour porpoise.
- Minke whale.
- Common dolphin.
- Risso’s dolphin.
- White-beaked dolphin.
- Harbour (or common) seal.
- Grey seal.

The Moray Firth, and Dornoch Firth and Morrich More, are sites of European importance for certain marine mammals. The Moray Firth is designated as a Special Area of Conservation (SAC) for of bottlenose dolphins. The Dornoch Firth and Morrich More SAC is designated for the conservation of the harbour (common) seal.

Marine mammals are sensitive to underwater noise and therefore construction techniques will be carefully assessed and adopted to reduce potential noise impacts. One measure is to have marine mammal observers on board construction vessels. The observer will indicate to the operatives when sensitive species are within a certain range of the vessel and measures will be put in place to stop/delay/control noisy activities. A further measure is to implement what is know as 'soft start' engineering operations. As an example this could be implemented when a foundation is getting piled, the hammer blows would be started off at a low force/noise to allow sensitive species to move away from the area if they are present. The blow force of the hammer is then increased gradually until it reaches its required operating levels.

Other potential indirect impacts relate to the distribution and local abundance of food (prey species) and how this may change as a result of constructing, operating and decommissioning the Wind Farm and cable route. This is addressed in assessment such as Natural Fish and Benthic Ecology.

In order to assess the impact of the Wind Farm on marine mammals, studies and surveys were undertaken to determine the distribution and abundance of these species in and around the Moray Firth and Wind Farm site and the Offshore Transmission Works route. Previous studies were reviewed and surveys were completed including sightings from boats, aerial surveys from aeroplanes and satellite tracking surveys.

Our surveys have shown that there are relatively few occurrences of bottlenose dolphin within close proximity to the proposed Wind Farm site and Offshore Transmission Works route, but that there is a relatively high movement of bottlenose dolphin within the Inner Moray Firth and along the Moray coastline. Harbour seals are likely to be more frequent visitors to the Wind Farm site and Offshore Transmission Works route as they move between the Dornoch Firth and feeding areas.
Onshore Project

In order that the electricity generated can reach the centres of demand the Wind Farm will need to be connected to the national electricity grid. We have a grid connection agreement with National Grid which allows us to connect into the existing electricity network at Blackhillock, near Keith, Moray.

The onshore components of this connection include the following.

- Approximately 20 km of onshore underground cable.
- A new electricity substation nearby the existing substation at Blackhillock.

Onshore cable

The onshore underground cable is proposed to follow a route from the landfall point at Portgordon to the proposed electricity substation location at Blackhillock. The cables will be underground and construction and installation will involve the following.

- Ground preparation works, such as scrub clearance and ground levelling, if required.
- Digging trenches, storing of excavated materials to be used for backfilling following laying of the cable.
- Underground directional drilling for at some locations along the route.
- Delivery of cables to site by HGV for laying in the trenches.
- Underground jointing pits approximately every 0.5 -1 km.

Substation

The substation at Blackhillock, near Keith provides a connection to the wider electricity grid network. A new dedicated substation will be built by BOWL near the existing substation. The onshore cable will connect into the new BOWL substation which will in turn be connected to the existing Blackhillock substation, which will be upgraded.

Construction of the substation will take approximately two years. Components of the substation will be transported to the site by road. A transport study will be undertaken to identify the routes and timing for such deliveries to reduce the impact on other road users and residents along the route.

The design and assessment of the substation is ongoing and further information will be presented at later exhibitions specific to the Onshore Project.

Next steps

The BOWL project team is currently carrying out an EIA for the Onshore Project, similar to that being carried out for the Offshore Project. BOWL is proposing to hold further consultation, including exhibitions, with the public and key stakeholders on the Onshore Project proposals in 2012.

It is proposed to submit the Onshore Project planning application to The Moray Council, along with the supporting Environmental Statement and other documentation in Spring 2012.