Lillgrund wind farm

7 kilometres off the southern coast of Sweden lies Vattenfall's offshore wind farm Lillgrund, one of the largest in the world. Experts from Pöyry have served as consultants from planning to operation.

BACKGROUND

Today, wind power provides one percent of the world's electricity, but this proportion is growing. Vattenfall´s Lillgrund, commissioned in 2007 and located in the Øresund between Malmö in Sweden and Copenhagen in Denmark, is one of the world's largest offshore wind farms. Consisting of 48 wind turbines, the farm produces 330,000 MWh every year, enough electricity for 60,000 homes.

The choice of location in the Sound was crucial when the project started. The middle has the optimum conditions, with regular strong winds and an average wind speed of 8,4 m / s at a height of 64 metres.

From the early design process Vattenfall Power Consultant performed evaluations of wind measurements and made production calculations. The wind consultants continued working in the project until the farm was operational. These consultants are now part of Pöyry, since Vattenfall divested its consultancy business.

CLIENT CHALLENGES

Some of the project's major challenges included making accurate calculations of profitability in the planning phase and ensuring a properly positioned submarine cable for safe electricity delivery to a connection point on land.

Another challenge was passing the environmental assessment and gaining acceptance from the local residents. Lillgrund is located only seven kilometers from the Swedish mainland and there were great local concerns about environmental impact, including the noise from the wind turbines.

When measuring the noise level during operation, it was found that the sound from the wind farm was actually lower than the background noise. "We had great difficulty to even measure it," says Thomas Davy, Project Manager at Pöyry, who was responsible for several important environmental studies before, during and after construction.

It was also critical to keep to the schedule and budget for construction. The construction process started in spring 2006 and Lillgrund had to be operational before 2008.

SOLUTIONS

At an early stage a wind mast was placed at the site to make it possible to perform wind measurements for accurate wind analysis and production calculations.

For the electrical connection a seven-kilometer submarine cable was planned from the transformer platform to a substation on land. Successful cable laying was critical, partly because the cable needed to be protected and partly because the cable would pass close to a waterfront neighborhood.

"It was necessary the cabling was performed as planned in order to limit the environmental impact and to protect the cable," says Thomas Davy, who explains that the seabed was

Image: Hans Blomberg, Vattenfall

SUCCESS FACTORS

"We have full confidence in the sound environmental and technological expertise of Pöyry, which helped to make Lillgrund the success story it is. The wind farm delivers renewable energy entirely as expected and according to plan."

Fredrik Forslund,
Lillgrund Site Manager, Vattenfall

Image: Hans Blomberg, Vattenfall

control-scanned before and after the cable was installed.

To minimise Lillgrund´s impact on the environment Pöyry's experts worked closely with the local Swedish county administration, both during project development and construction. There was even an archaeologist on site whilst the cable trenches were dug on land, so they could survey the works.

BENEFITS

Since Lillgrund became operational in November 2007, it has delivered renewable energy completely in line with initial estimates. The wind farm is expected to be operational for 20-25 years. After which almost all the parts can be recycled and the site restored completely. The environmental impacts of the decommissioning of a wind farm is approximately the same as when constructing it.

The project was implemented within the set budget and time frames. This was helped by a realistic timetable and because most of the cable work at sea was carried out in the summer. During construction, audits were carried out on the site and at the supplier´s workshops to ensure that contracts and legal requirements were followed.

Also important to the success of Lillgrund was the dedicated project team, where everyone worked closely together. "We could help each other to identify risks and find opportunities for improvement," states Thomas Davy.

The experiences from Lillgrund have been documented carefully and publicly. The client and other project developers were able to take full advantage of the lessons learned in other wind projects. It is knowledge of great value for the further expansion of wind power; still a young industry under development.

The local residents' initial concerns and claims disappeared when Lillgrund became operational and no environmental impact was observed. In contrast to initial environmental concerns, a positive effect has been noticed. The number of various fish species at the wind farm have actually increased, since valuable reefs have formed around the wind turbine foundations.

KEY FACTS

- Number of turbines: 48 Siemens wind turbines
- Rating of each turbine: 2,3 MW
- Rotor diameter: 93 m
- Total height: 115 m to blade tip
- Installed total power: 110 MW
- Average wind speed: 8,4 m / s
- Water depth: 6-10 m
- Connection cable: 7 km 130 kV submarine cable leads from the transformer platform to the station on land
- Power Generation: 330,000 MWh per year, electricity for approximately 60,000 homes

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