

Pioneering wind turbines for deep water locations



New technology in an innovative region

Lyse is planning the world's first deep-water wind farm off the island of Utsira in Rogaland, Norway. The project's first phase is to carry out testing and demonstrate new technology for floating deep-water wind turbines, developed by the Norwegian entrepreneurial company, SWAY AS.

The international potential for offshore wind power is huge, and Lyse's vision is to contribute to new Norwegian business activity based on renewable offshore energy.

Norway has the possibility of becoming a leading producer of renewable maritime energy, based on new Norwegian technology. Considerable value creation and new jobs will be generated from such a development.

The offshore wind farm off Utsira reflects Lyse's core values to be an innovative and socially-aware company.

In the short term Lyse will acquire competence from developing and operating onshore wind farms. Several of the best Norwegian land-based wind farms are under development by Lyse in Rogaland.

Utsira offshore wind farm:

Pilot phase:

- Build a 5 MW prototype floating wind turbine in 2009
- The proto type will be installed off the coast of Rogaland
- Planned start up 2010

Phase 1:

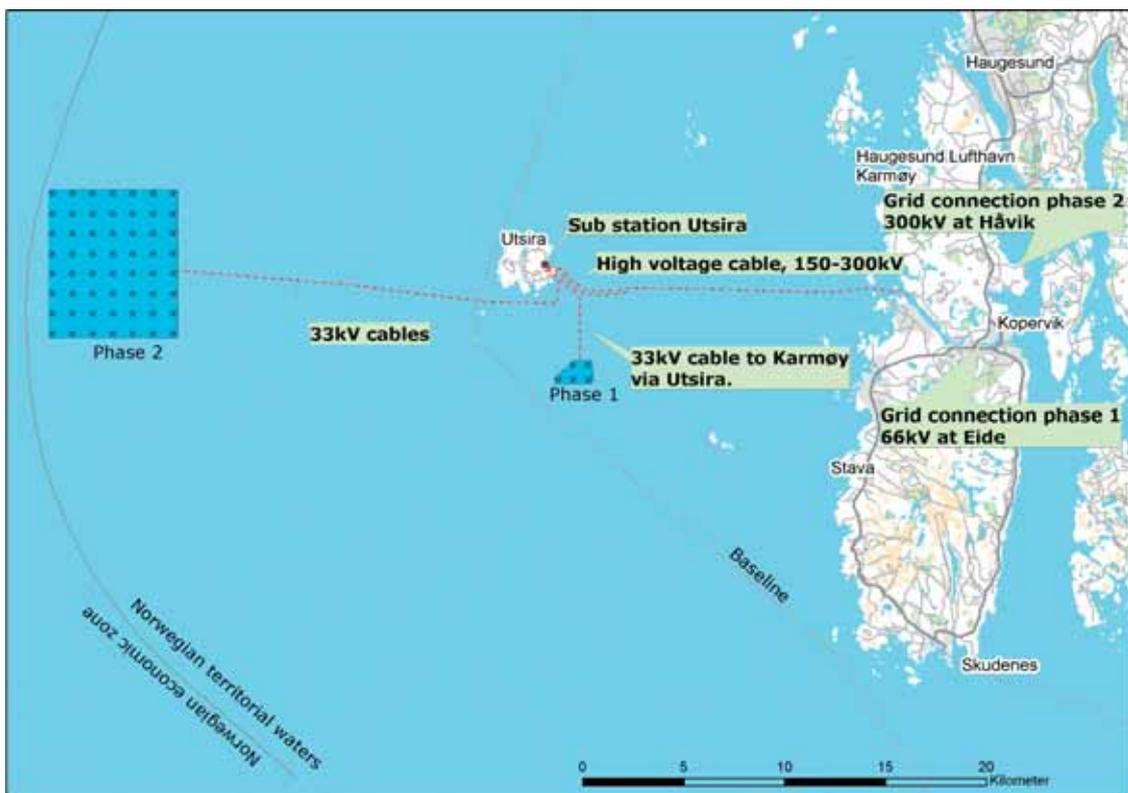
- A demonstration farm to be set up with five wind turbines
- Located approx. 5 km east of Utsira
- Total installed output 25 MW
- Possible start up 2012

Phase 2:

- An offshore wind farm to be set up with 56 wind turbines
- Located approx. 17 km west of Utsira
- Total installed output 280 MW
- Total power generation approx. 1.2 TWh
- Possible start-up 2016

Criteria for location of the wind farm:

- Excellent wind conditions (over 10 m/s at turbine height)
- Suitable water depth (150-270 metres)
- Near a strong onshore power grid
- Acceptable level of conflict with possible affected parties
- Near harbours and shipyards
- Positive attitude from the local communities at Utsira and Karmøy.



Floating wind turbines

The SWAY system consists of a 186-metre tower, of which 90 metres raises above sea level and 96 metres sticks down in the ocean. This floating tower is anchored to the seabed by a tension leg and suction anchor.

The anchor tension leg is fixed to the tower by a yaw mechanism which allows the entire windmill, including the tower, to rotate with the wind direction. Water depths of 120 to 400 metres are considered suitable for this type of floating wind turbine.

The wind turbine is placed on top of the tower at approx. 90 metres. The rotor will have a diameter of between 110-130 metres. Contrary to most conventional windmills the SWAY system uses a downwind rotor. The design reduces the load on the system and allows the structure, under normal operating conditions, to tip approx. 10 degrees with the wind. The turbine house (nacelle) and tower are aerodynamically designed to limit the turbulence and reduction of wind velocities onto the rotor blades.

A transformer is placed inside the tower and a sea cable from each individual turbine is hooked up in a transformer station for further transmission of power. A high-voltage cable will be laid between the offshore transformer station and the onshore power grid.

Facts about SWAY AS:

- Company established in 2001 based upon competence from floating maritime and offshore structures.
- Patented floating wind power system in 2002.
- Research and simulation phase in 2003-07, sponsored by Statkraft, Shell, Lyse and the Norwegian Research Council.
- Awarded DnBNor's Innovation Prize in 2006
- Major owners: Statoil, Inocean, Lyse, Scatec, Rosenberg yard, Gyldenlove Eiendom and Eystein Borgen (entrepreneur).

More info: www.sway.no

The assembly of the tower and wind turbine will take place onshore and the unit is towed out on location. Access to the wind turbine for maintenance is planned by boat or helicopter. The unit can easily be disconnected from the sea bottom and moved. The wind-power plant will have a lifetime of approx. 25 years.

Being a world-leader in maritime technology, having many years of experience in power development projects and having a strong coast-near power grid, gives Norway considerable advantages in the development of solutions for wind power in deep water.



Lyse – an ambitious Norwegian multi-utility company



Utsira. Photo: From the archiv of Utsira local council.

Lyse is a Norwegian energy and telecommunications company owned by 16 municipal authorities in Southern Rogaland County. The business comprises of production and sale of energy and telecom products, as well as the construction and operation of infrastructure. The Lyse group has approx. 640 employees and had a turnover in excess of NOK 3.5 billion in 2006. Lyse's head office is in Stavanger.

Lyses annual electricity production is 5,6 TWh, of which the bulk is generated from hydro-electric plants with excellent capacity of reservoirs.

Lyse seeks to build a flexible and robust energy system where different alternatives coordinate and complement each other. Wind power, natural gas, district heating and hydro-electric power are all included in this energy system. In recent years Lyse has shown a willingness and ability to carry out innovative and demanding projects, both within energy and telecommunications.

Lyse has furthermore taken on a leading role in realising floating wind turbines for deep water. Lyse seeks to develop and operate offshore wind farms.

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