Case Story – Highlights

Innovative design lowers costs of offshore wind farm scour protection systems by 30%

Vattenfall reduces installation costs for Denmark's largest offshore wind farm thanks to new single-layer approach

30% cost savings due to optimised scour protection design

Installation steps reduced from three to two

Chance to apply new R&D in the planning and design phase

Challenge

The presence of a monopile in a marine environment changes the flow pattern in its immediate area, resulting in increased local sediment transport. This causes scouring of the seabed around the monopile—a serious risk that may compromise the stability of the wind turbine foundation. In addition, the cables on the seabed may risk exposure due to the eroded seabed around the monopile. The foundation must therefore include relatively costly scour protection.

Vattenfall needed a solution to reduce investment costs for the Kriegers Flak wind farm located in the Danish part of the Baltic Sea. When operating at its full capacity, the wind farm will produce 604 MW of wind power distributed over 72 wind turbines. Kriegers Flak is Denmark's largest offshore wind farm to date and will increase Danish wind production by approximately 16 per cent.

Solution

Scour protection systems are traditionally applied in two consecutive stages, and this includes installing a filter layer around the base of the monopiles consisting of finer material, and an armour layer on top of the filter material.

The monopiles may be installed prior to both layers, or in between the two; in either case, the total installation comprises three steps. However, significant cost reduction could be achieved if just one layer of graded scour protection needed to be installed—as proven possible in this innovative solution.

Single-layer scour protection significantly reduces costs

Modern design principles based on recent research and development has now made it possible to install a single layer of graded scour protection over the traditional two-layer solution. The wide-graded rock material encompasses both the filter and armour effect, and can be installed at the site in one step. Considering the installation of the stone material and the monopiles, the total installation procedure has been reduced from three to two steps, resulting in significant cost savings.

'DHI and LIC Engineering designed the application of wide-graded rock as an innovative solution for scour protection systems, and this has shown to be a viable design option with great potential for cost savings.'

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