

Calibration of fluid dynamics model through laboratory testing

Prediction of flow velocity amplification around monopile foundations on a submerged mound for scour protection design

To mitigate the effects of climate change, it is important that Offshore wind farms are designed and constructed at a faster pace so that greenhouse gas emissions related to the production of electricity using fossil fuels can be substituted by a more sustainable source.

A large number of offshore wind turbines need to be constructed to satisfy society's energy needs, therefore, offshore wind turbines are being installed under more challenging conditions. One such condition is the construction of wind turbine foundations in areas with seabeds comprised of fast-moving sand dunes.

When encountering challenging seabed conditions, scour protection is often installed to prevent the soil material surrounding the foundations of the wind turbines from moving away due to the action of waves and currents, which generally results in more sustainable and cost-effective installations. Scour protection often consists of loose rock of varying sizes and can also create an artificial reef environment for marine species to live in.

The present research project is performed as a collaboration between COWI and Deltares, a Dutch research institution specialised in river, coastal and offshore engineering.

The purpose of the research is to calibrate a fluid dynamics computer model, also known as a computational fluid dynamics (CFD) model, through laboratory testing.

The model aims representing a case in which the scour protection creates a submerged mound after a subsea sand dune moves away from under a wind turbine foundation to predict the velocity of the flow at the top of the mound, so that scour protection can be designed more efficiently. This will help the offshore wind industry to reduce maintenance costs and improve the security of the structures.

The laboratory tests will be performed to measure the velocity of the flow around the submerged mound so that the model can be tuned to represent reality.