

Borssele Wind Farm

Stability rock armour layer

TenneT TSO is responsible for the installation of the power cables, connecting the Borssele Wind Farm locations to the main land. The cable will be protected with a rock armour layer. TenneT has asked Svašek Hydraulics to determine a suitable rock grade for the protection of this cable at four locations with different prevailing wave and current conditions.

The hydraulic conditions for these four locations are very different: in open sea, in the tidal channel or at a tidal flat. Depending on its location, wave conditions, current conditions or a combination of both determine the design conditions.

Characteristic wave and current conditions were derived from long term simulations with a SWAN wave model and a FINEL hydraulic model for currents.

For all locations an innovative approach was applied. This approach is based on the bed shear stress which is resulting from wave and currents forces. The rock size is deducted from the bed shear stress. It offers the possibility to

combine wave forces and current forces in a sophisticated way.

To improve the reliability of the calculated rock size several sensitivity analyses were performed. For instance the rock size corresponding with 1 in 50 years hydraulic conditions were compared with rock sizes corresponding to 1 in 100 years.

According to this assessment rock sizes were only marginally higher for the 1 in 100 year conditions, so the safety margin for the rock size could be chosen less conservative. This could potentially reduce the customer's costs significantly.

CLIENT

TenneT TSO

LOCATION

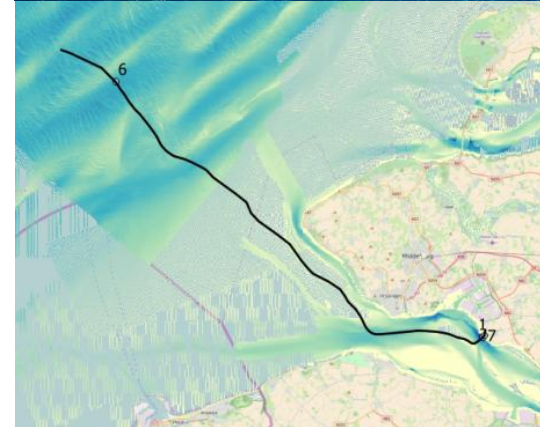
the Netherlands

DATE

2016

SERVICES

Rock armour design
Shear stress approach
Time series analysis



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