

Silent Installation of MonoPiLEs (SIMPLE)

Publieke samenvatting / Public summary

Costs of the support structure and the installation of the support structure account for approximately 20% of the total CAPEX of offshore windfarms as indicated in the ECN calculation model provided by RvO. A substantial part of these costs is attributed to a sub-optimal installation method. This current installation method for monopiles, called piling, has the following major downsides:

1. Piling operations using a hydraulic hammer and obligatory noise mitigations are complex, time-consuming and therefore prone to delays in bad-weather conditions.
2. The currently available hammers are difficult to scale to the larger monopiles that the industry needs to build in the future to accommodate even larger wind turbines.
3. Each hammer blow creates high noise levels that are harmful to marine life. Several European governments have introduced regulations that result in the mandatory use of expensive noise mitigation.
4. The impact of the hydraulic hammer on the top of the pile causes fatigue damage to the foundation pile, which leads to overdesigned, heavier and thus more expensive monopiles.

Objective

The project goals are:

- To show that the Vibro-drill technique (patent pending) leads to a reduction of installation and foundation costs and outperforms alternatives by:

Projectinformatie / Project information

Projectnummer / Project number

TEHE119009

Subsidiebedrag / Grant amount

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Algemene informatie / General information

Penvoerder / Secretariat

GBM Works B.V.

Publicaties en materialen / Publications and attachments

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- Eliminating the need for noise mitigating measures;
- Reducing the installation time of the foundations, thus enlarging the window of operation;
- Eliminating the need to over-dimension monopiles to compensate for fatigue damage during the installation process.
- In order to limit financial risks, Project SIMPLE Prototype 4 has been split into 2 phases:
 - Project 4A, focussing on the driveability (can the pile be installed) goals of the project.
 - Project 4B, focussing on bearing capacity (certified foundation for an OWT) goals of the project.

Short Description of Activities

To prove the technical feasibility of the Vibro-drill, first the optimal values of the operational parameters of the Vibro-drill, in specific soil conditions will be approached theoretically.

These activities will be carried out by Deltares in collaboration with the project team of GBM Works. The Offshore Engineering department of the Delft University of Technology is in this phase involved as an advisor and facilitator for the graduation students.

Based on the theoretical optimization of the operational functions, the different product parts of the Vibro-drill prototype will then be designed and produced by TMS Engineering, a firm with its core business in fabrication and engineering for one-off equipment in the offshore industry. The prototype of the Vibro Drill will be assembled on a pile, supplied by De Klerk, an inshore contractor, who will also execute the field tests on the Maasvlakte II and supervised by the SIMPLE project team.

The information and results from these tests will be used to improve the theoretical models by the project team and Delft University of Technology, and a feasibility study will be carried out for experiments on a real scale.

Results

After completion of the project, we expect the following conclusions:

1. A cost assessment of the Vibro-drill technique on full scale, supported by (and validated with) the project results;
2. A validated design for full scale operation;
3. A successful proof of concept test of the Vibro-drill technique by installing a 1.4 meter diameter pile to a depth of 10 meters in a relevant environment, achieving a TRL of 6.

Tests will also learn how to install a foundation pile to the required depth in a typical North Sea soil. The following will be determined:

- Frequency and amplitude of the vibrations to be applied to reduce the friction of the soil along the pile;
- Pressure and flow from nozzles at the bottom of the vibrating elements, for the reduction of the soil resistance under the pile;
- Pressure and flow from nozzles at the top of the vibrating elements and possibly along the shaft of the pile for lowering the friction of the soil along the pile.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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