

## Interaction of jack-up legs with the seabed

# Wind Jack JIP

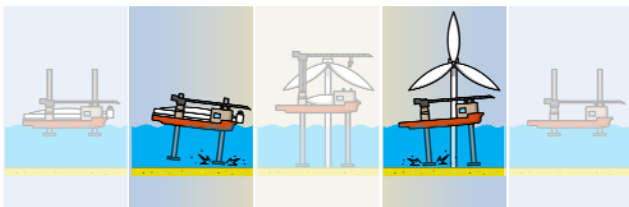


### Background

Offshore wind power is one of the key energy sources needed to reach the EU's targets of renewable energies. Before wind energy can be harvested from an offshore wind park the wind turbines of course first need to be installed.



The installation of wind turbines offshore is generally performed by jack-up type wind turbine installation vessels. When sailing to and from the offshore wind park location these workunits can be considered as vessels, while installing the wind turbines in the offshore wind park as platforms. The phase in between these two operational stages, i.e. positioning of the legs on the seabed, is generally considered as the most critical phase in the whole installation process and is the limiting factor in the overall workability of a wind turbine installation vessel.



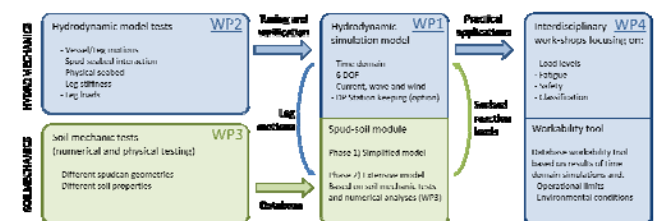
### Objectives

To increase insight, understand and be able to predict the complex interaction and loading mechanism between jack-up legs and the seabed during the moments of touch-down and lift-off MARIN and

Deltare are joining forces within the Wind Jack JIP. The final objective of the Wind Jack JIP is to quantify operational limits and be able to predict the workability of jack-up type wind turbine installation vessels.

### Scope of work

The objective of the Wind Jack JIP is to predict the interaction between jack-up legs and the seabed by means of a numerical model. To accomplish this objective an existing hydrodynamic time domain simulation model will be extended with a newly developed numerical soil mechanic routine. As input and for verification of the numerical model both soil mechanic as well as hydrodynamic physical model tests will be performed. Finally the coupled numerical model will be applied to solve practical design or operational problems within interdisciplinary workshops amongst all participants.



The scope of work is split up in four work packages:

- WP 1: Development of a numerical time domain model to calculate vessel motions and the penetration and drag loads on the legs due to interference with the seabed;
- WP 2: Hydrodynamic model tests to accurately measure the behaviour of a station keeping vessel under influence of (measured) leg loads at the moment of touchdown;
- WP 3: Development of a geotechnical response model based on existing literature (Phase 1) and by combining geotechnical model tests with numerical models (Phase 2).

- WP 4: Development of a workability analysis tool and interdisciplinary workshops to determine operational criteria and limits.

### Project deliverables

The deliverables of the Wind Jack JIP are as follows:

- Coupled hydrodynamic – soilmechanic numerical time domain model. The model will represent a typical wind turbine installation vessel but can be modified to represent a specific vessel outside the scope of the JIP;
- Easy-to-use workability analysis tool for a limited range of vessel types and soil conditions;
- Description of the simplified and improved soil reaction force models;
- Reports of both the hydrodynamic as well as soilmechanic physical model tests programs;
- Correlation analysis report comparing the results of the numerical model with hydrodynamic model test results.

### Participants

The Wind Jack JIP is focussing on, but is not limited to, the offshore wind industry. Other industries involving jack-up platforms might participate and benefit from the results of the JIP as well. The Wind Jack JIP aims at the following participants:

- Offshore contractors
- Operators of jack-up vessels
- Designers of jack-up vessels
- Builders of jack-up vessels and subcomponents
- Windpark developers
- Classification societies
- Maritime engineering companies
- Geological and geotechnical consultants
- (Renewable) energy companies

### Time Schedule

The project duration will be 2 years (Q3 2012 – Q2 2014), including the physical model test, numerical modelling, interdisciplinary workshops

and reporting. The project will have meetings with the participants every half year.

### Participation fee

A participation fee of € 60,000 is foreseen for all JIP participants who participate in the Wind Jack JIP. The payment of the participation fees can be divided over 3 years: (50% in 2012, 25% in 2013, 25% in 2014)

### More information

For more information on the Wind Jack JIP please contact:

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