DOT3000 Power Train System

Publieke samenvatting / Public summary

Current turbines are reaching the limits of monopile support structures, therefore a reduction in top mass may be crucial to future increases in turbine size (and cost efficiency). A possible solution is to use hydraulic drive trains since they have a high power to mass ratio, allowing for a smaller nacelle mass for the same power per turbine.

The DOT hydraulic drive train turbine concept aims to reduce the cost of an offshore wind turbine by 25-50%. This is achieved not only through a reduction in top-mass but also through the replacement of several maintenance critical components by more reliable hydraulic components. DOT turbines operate in a cluster connected to a single Pelton turbine allowing more efficient energy generation and optimization of the power produced by every cluster.

Objective
The goal of the DOT3000 Power Train System (PTS) project is to develop a seawater-hydraulic drive train that is ready to be deployed as part of a multi-MW class wind turbine.

The main deliverables are:
1. A low-speed, high-pressure, high-efficiency seawater pump,
2. A hydraulic support system to supply clean water to the pump and control pressure,
3. A test bench to accurately assess the capabilities of the entire DOT3000 PTS.

Projectinformatie / Project information

Projectnummer / Project number
TEHE119007
Subsidiebedrag / Grant amount
€ 4.796.804,00

Algemene informatie / General information

Penvoerder / Secretariat
Delft Offshore Turbine B.V.

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The design should result in:
1. A nacelle mass reduction of at least 35% compared to a standard nacelle,
2. A drive train efficiency of at least 90% at nominal operating conditions and at least 80% throughout the operational envelope.

Short description
At the heart of the DOT concept, a low RPM, high torque, multi-MW seawater pump is required to replace the gearbox and generator of a regular wind turbine. This type of pump exists (up to 2MW) for oil-based systems however, due to lack of demand, a suitable multi-MW seawater pump does not yet exist. In combination with this new to be developed seawater pump, an efficient, offshore-proof, auxiliary hydraulic support system needs to be developed as well to provide water to the main pump and generate power from the pressurised outlet flow. The overall challenge in the development of these systems is to maximize the overall efficiency, mass reduction and maintenance benefits compared to conventional wind turbines.

Results
The result of this project will be a fully tested drive train ready to be installed in the next phase of the overall DOT development: the planned offshore test set-up. As indicated in Figure 1 the drive train will consist of the following components:
• A1: Seawater pump: Low rotation speed (RPM), high-torque, high-pressure, high-efficiency seawater pump
• A2: Hydraulic support system: High-efficiency, low-maintenance, compact hydraulic support system

Besides the delivered hardware DOT will also have gained considerable knowledge in the design and fabrication of a multi-MW seawater pump and the needed auxiliary support systems. This knowledge will be used for the next step in the DOT hydraulic drive train development; full-scale demonstration**.**

Website

More information on the DOT3000-PTS project can found on the GROW website.

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