

SWAY's special deep-water wind turbines

Norwegian renewable energy company SWAY has developed a concept for wind turbines that can produce power in deepwater locations.

There, the average wind speed is higher and the location of the turbines is less controversial. SWAY's technology facilitates economical extraction of wind power in nations with good wind resources and access to water depths of 80–300 m, within 50–60km from the coast. Report outlines a series of model tests MARIN performed.

Between 2007 and 2008, MARIN carried out model tests on the 190 m high towers and mooring system of SWAY's wind turbine concept. The main goal was to generate a database for calibration and validation of computer software. Producing the model of the tower was a particular challenge because although the total weight of the tower is low, most of this weight is concentrated at the bottom of the tower. A larger diameter, watertight section is needed to provide buoyancy. To achieve the correct buoyancy and weight distribution at model scale, the tower model was produced from thin-walled aluminum.

Joris van den Berg
j.v.d.berg@marin.nl

Three-phase tests Testing was done in

three phases. First, captive tests were done in MARIN's High Speed Basin. The wave and current loads on the tower were measured, as well as wave run up. Next, the Vortex Induced Motion (VIM) behaviour was tested in the Depressurised Towing Tank. For these tests the Tension Leg Mooring was included. A floor plate was connected to the basin carriage and the spar-type tower was moored to this by means of a Tension Leg. In this set-up the VIM behaviour was measured, with and without strakes. Finally, wave-induced motions were measured in MARIN's Offshore Basin. Using a moveable floor and different Tension Leg models, the behaviour was checked at multiple water depths.

SWAY intends to locate its first turbine in the ocean outside Karmøy in Rogaland, where it will be connected to a planned testing centre for marine renewable energy. The testing period is estimated at two years. MARIN certainly expects to see more testing on wind turbines as interest in renewable energy grows. □



The SWAY deep water turbine in the MARIN Offshore Basin