

## WAVESTAR

Name of person filing the form (can opt to omit from on-line form)

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Date submitted

07 05 2012

Project name: Wave

Project description:

*Project Developer:* Wave Star A/S

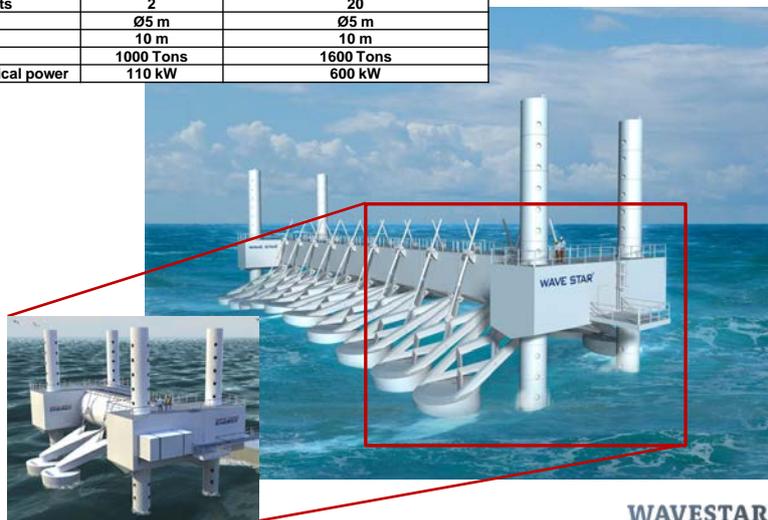
*Technology type:* wave energy converter, multi point absorber

*Resource:* wave

*Project scale (test site, prototype, array, commercial):* 1:2 scale prototype test site: Hanstholm (DK), part of the full scale machine

### The Roshage test unit is a section of the complete machine

Parameter	Roshage test unit	Commercial Wave Star C5-600 kW
Number of floats	2	20
Float diameter	Ø5 m	Ø5 m
Arm length	10 m	10 m
Weight	1000 Tons	1600 Tons
Nominal electrical power	110 kW	600 kW

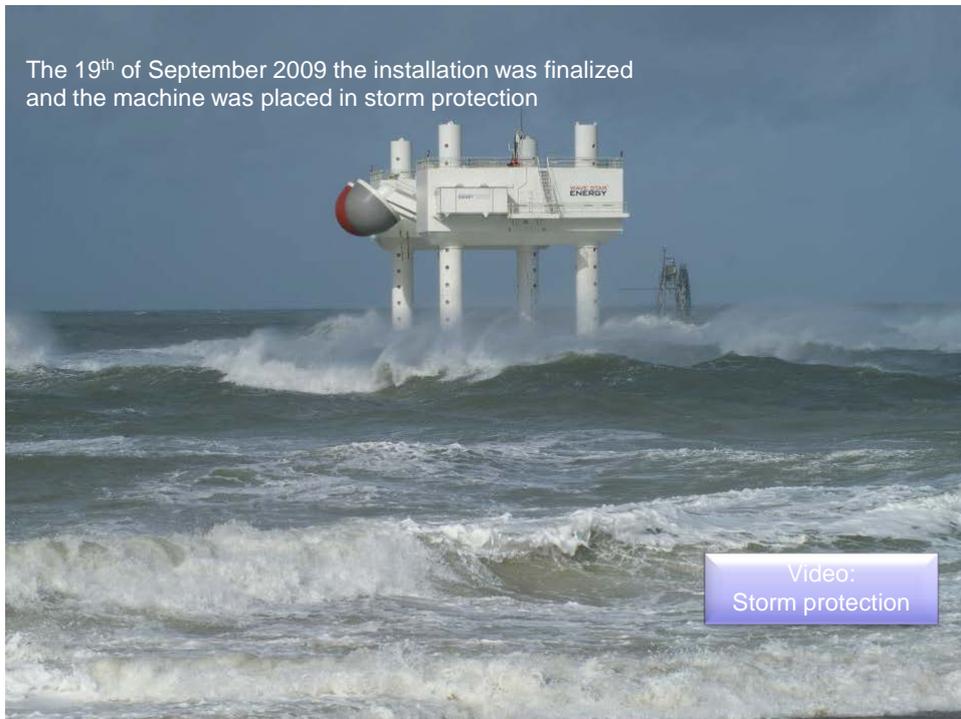


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*Additional Description:* The Wavestar machine draws energy from wave power with floats that rise and fall with the up and down motion of waves. The floats are attached by arms to a platform that stands on legs secured to the sea floor. The motion of the floats is transferred via hydraulics into the rotation of a generator, producing electricity.

The device installed has only 2 floats with a nominal electrical power of 110 kW and 1000 tonnes. Each float has 5m of diameter and an arm length of 10 m. in case of high waves (>3m),

the float and arm are raised up, in case of storm, the all platform is coming up. Several major storms have been experience in Hanstholm without damaging the machine due the efficient storm protection system



*Project Website:* <http://wavestarenergy.com>

*Location:*

*Closest city:* Hanstholm

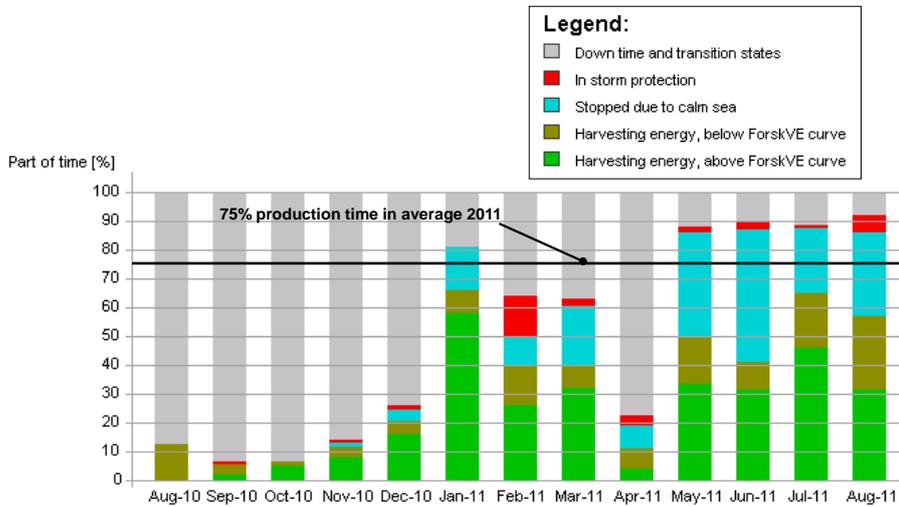
*Country:* Denmark

Depth between 6-8 m (8m on front legs, 6m behind), the machine is placed around 350m from the coast

Process status: The device was installed on 19 September 2009 at Hanstholm, Denmark and since February 2010 has been supplying electricity to the grid.

Current status of the project implementation and future developments: the machine has generated constantly power to the grid. Many developments have been made on the energy extraction from wave. The focus now is on the energy transformation and the global efficiency of the device.

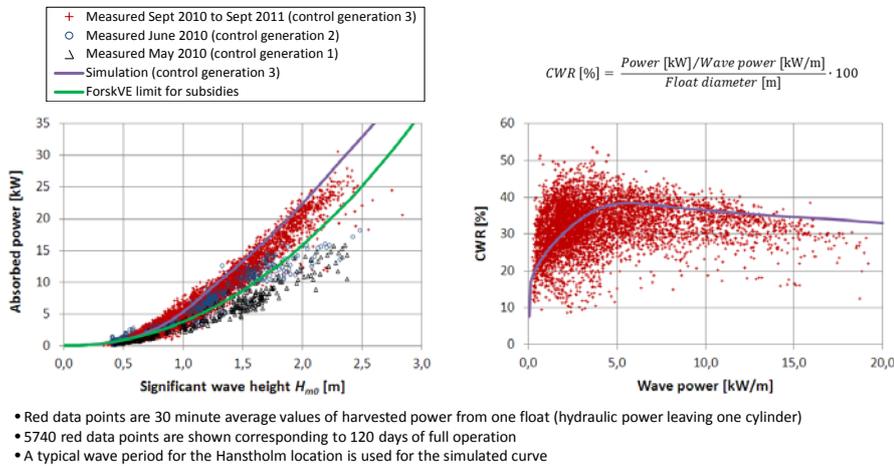
## Operational time 2010-2011



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## Power measurements from the Hanstholm test unit



- Red data points are 30 minute average values of harvested power from one float (hydraulic power leaving one cylinder)
- 5740 red data points are shown corresponding to 120 days of full operation
- A typical wave period for the Hanstholm location is used for the simulated curve

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### Licensing information (brief description):

Wave star has signed a partnership agreement with DONG Energy in Denmark for the test and installation of a complete machine at Horns Rev 2, the goal of the agreement is to analyze the potential of coupling wind and wave at the same location. The machine will be connected to an existing wind turbine in the front of the park. The energy production will be sent to the common distribution network.



Key Environmental issues: for the Horns Rev2 application, an application has been sent to the ministry of energy regarding the impact on the environment. In this application it has discussed the impact of foundation (during installation and after) and the hydraulic system for energy generation. The hydraulic fluid used is environment friendly but should not be lost into the sea. No noise impact has been selected.

Environmental webpage:

The basis data used have been the existing wind farm plant:

[http://193.88.185.141/Graphics/Energiforsyning/Vedvarende\\_energi/Vind/havvindmoeller/vvm%20Horns%20Rev%202/Book%20VVM%20internet.pdf](http://193.88.185.141/Graphics/Energiforsyning/Vedvarende_energi/Vind/havvindmoeller/vvm%20Horns%20Rev%202/Book%20VVM%20internet.pdf)

using the same discussion points.

The following reports have been used for the study:

- /4/ Horns Rev II Offshore Wind Farm, Monitoring of Resting Waterbirds, Baseline studies 2007-08. Orbicon-DHI 2008.
- /5/ Horns Rev II Offshore Wind Farm, Monitoring of Migrating Waterbirds, Baseline studies 2007-08. Orbicon-DHI 2008.
- /6/ Horns Rev II Offshore Wind Farm, Food Basis for Common Scoter, baseline studies 2007-08. Orbicon-DHI 2008.
- /7/ Horns Rev II Offshore Wind Farm, Monitoring of Bird Migration, extended baseline studies 2008.
- /8/ Harbour porpoise response to pile driving at the Horns Rev II offshore wind farm in the Danish North Sea. BioConsult 2009.

The report itself is not available yet, as the ministry of energy is still in progress dealing with the case.