

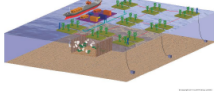


H2Ocean – Sustainable Harvesting of the Ocean Developing an open-sea platform for energy conversion and use in hydrogen generation and aquaculture

The opportunity

The sustainable exploitation of ocean resources is seen as a crucial source of renewable energy, and food and water security. In the future, offshore platforms that can combine many functions within the same infrastructure offer significant benefits in terms of economics, optimising spatial planning and minimising the impact on the environment.

The H2OCEAN project is developing an innovative design for an economically and environmentally sustainable multi-use open-sea platform that builds on the considerable wealth of experience that Europe has in offshore engineering, renewable energy conversion and process technology. Wind and wave power will be harvested and part of the energy will be used for multiple applications on-site, including the conversion of energy into hydrogen that can be stored and shipped to shore as a green energy carrier and a multi-trophic aquaculture farm.



The unique feature of the H2OCEAN concept, besides the integration of different activities into a shared multi-use platform, lies in the novel approach for the transmission of offshore-generated renewable electrical energy through hydrogen. This concept allows effective transport and storage of the energy, decoupling energy production and consumption, thus avoiding the grid imbalance problem inherent in current offshore renewable energy systems. Additionally, this concept also eliminates the need for a cable transmission system which takes up a significant investment share for offshore energy generation infrastructures, and so increasing the price of energy.

The challenge

The challenge is to develop a flexible design which can be varied to address the requirements of the location and local economics. The system will comprise hydrogen generation in open-sea from renewable sources (wave and wind), a facility for fresh water production and multiple uses of the electrical energy produced in open-sea: low power maritime surveillance radar, support for aquaculture, communications, etc.



An existing design of large stable floating wave power converter (DexaWave) will be used as the basis for the energy harvesting units. The unit uses a high flow water based power take-off system with a novel hydropower turbine runner with self adaptive blades.



The hydraulic system flow will be shared with ruggedized wind turbines with high flow water power takes offs which will be developed to boost power output or directly supply nanomembrane reverse osmosis units at elevated pressures to provide fresh water to electrolytic generators for hydrogen production.

The produced hydrogen will be compressed and stored in modular vessels on the service platform for collection by ship. Depending on local economics, options exist to sell the water and hydrogen and transport it to a variety of locations or transmit hydrogen, water or electricity to shore.

The oxygen derived from hydrogen electrolysis can be stored or used directly to boost fish weight gain and prevent algal blooms and BOD contamination caused by high density fish farming. To reduce the risk of handling these sensitive processes in a harsh environment, they have been gathered in a sole service module which will be a stable floating structure, unlike the other energy harvesting units.

In addition, the service platform will be equipped with both autonomous remote weather and deep ocean marine monitoring systems including physical, chemical and biological oceanographic measurements. This latter will measure the effect of the platform on the local environment and allow comparison with other nearby ocean stations.

The project team

H2OCEAN brings together 17 partners from 5 countries around Europe, and who are leaders in the fields of renewable energy, hydrogen generation, fish farming, maritime transport and related disciplines. The project also builds on the commercially available products, emerging product developments and leading edge research activities that are already being carried out by the partners.

H2OCEAN started on the 1st of January, 2012 and will last 3 years. The project is supported by the European Union through the FP7 Ocean of Tomorrow, "Multi-use offshore platforms" Theme (Grant No 286145).



For further information visit the project website www.h2ocean-project.eu

Figure 37. Leaflet on H2OCEAN project