

The FloWatt Project

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FLOWATT

HydroQuest

Ifremer



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Introduction & Aim

The FloWatt project aims to develop an innovative design of a tidal turbine for high energetic sites and to deploy seven vertical axis turbines in the Alderney Race site, in the English Channel. The project is dedicated to demonstrate the efficiency of the HydroQuest's 2.5 MW turbine for commercial farm deployment. These industrial developments (led by Qair, HydroQuest and CMN) are based on a scientific research project presented here, knowing that industrial developments need specific study to take into account all site specificity. Indeed, tidal energy sites are characterized by strong currents disturbed by bathymetry variations, wave and coastal effects, increasing flow variations.

Method

The tidal energy potential assessment of the Alderney Race and its optimization for a commercial deployment is studied based on pilot farm data measurements, numerical simulations and experimental measurements. The environmental impact of a large-scale deployment is analyzed, based on measurements of the initial state and the return pilot farm experience. Those tasks are carried out by 4 complementary partners: Hydroquest, Energie De la Lune, Ifremer and University of Caen.

A major part of the objective will be reached after the first demonstrator has been commissioned. Many tasks depend on the successful operation of the demonstrator. Indeed, the partners use the turbine to carry out in-situ measurements. An overall comparison between real and modeled data will be performed.

Experimental, numerical and in-situ tools

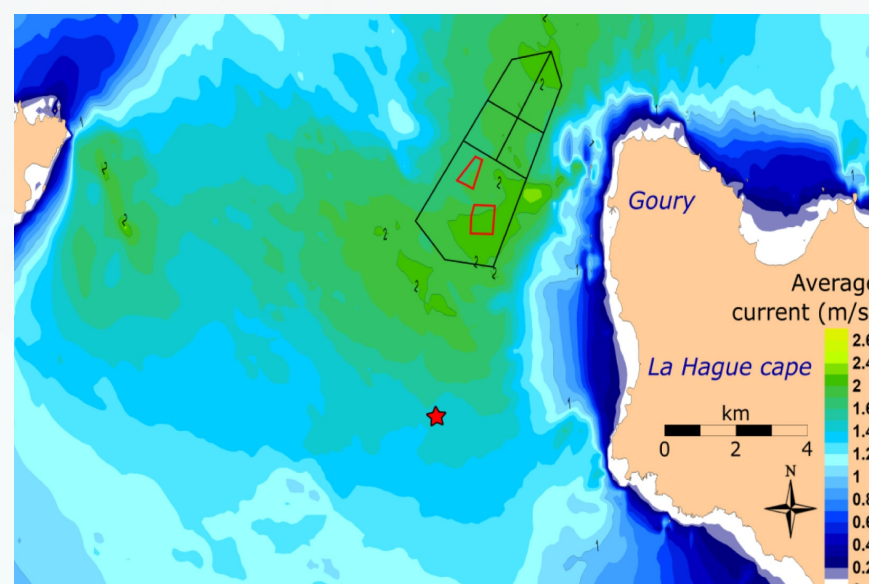
The scientific tools developed by the FloWatt partners are used to fully study the Alderney Race tidal site and to qualify the new 2.5 MW design of HydroQuest's vertical axis turbine at sea critical offshore. The preliminary developments have been validated from the successful deployment of a 1 MW turbine on the Paimpol-Bréhat test site (in Brittany, France).

Experimental and numerical tools are used, as well as in-situ measurements to help to the farm deployment. The experimental work is done in the Ifremer wave and current flume tank at a 1/20 scale. Local and regional numerical models are used to quantify the tidal potential of the site. The three-dimensional model Telemac3D with turbines represented as actuator disks is used to assess the efficiency of a tidal array in realistic flow conditions and for different operating scenarios.

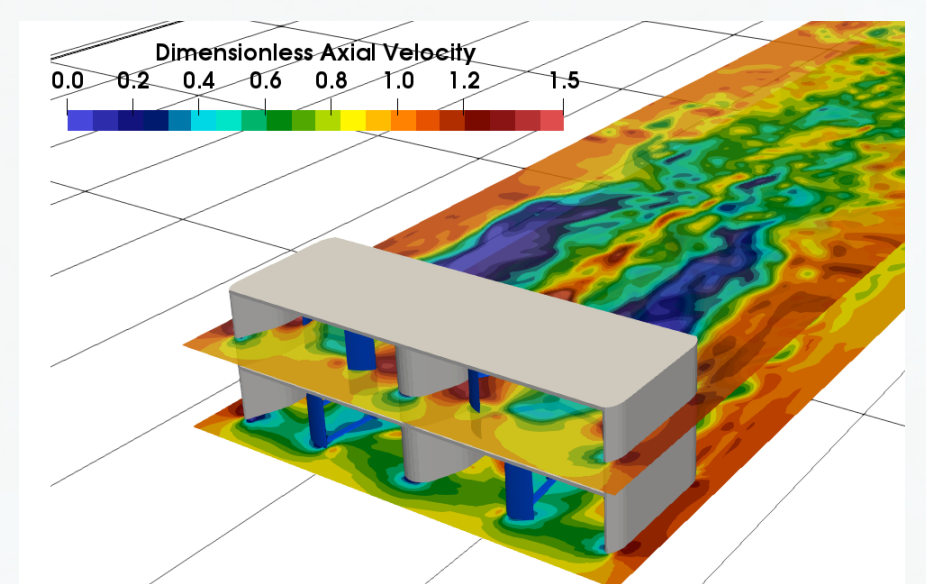
Specific in-situ measurements are also done in order to improve environmental and operational condition assessment. High technology tools (for instance High Frequency and X-band radars) are used to qualify as accurately as possible a theoretical evaluation of the Alderney Race. The hind-cast database ResourceCode is used to provide a relevant estimation of the power potential in the Alderney Race.



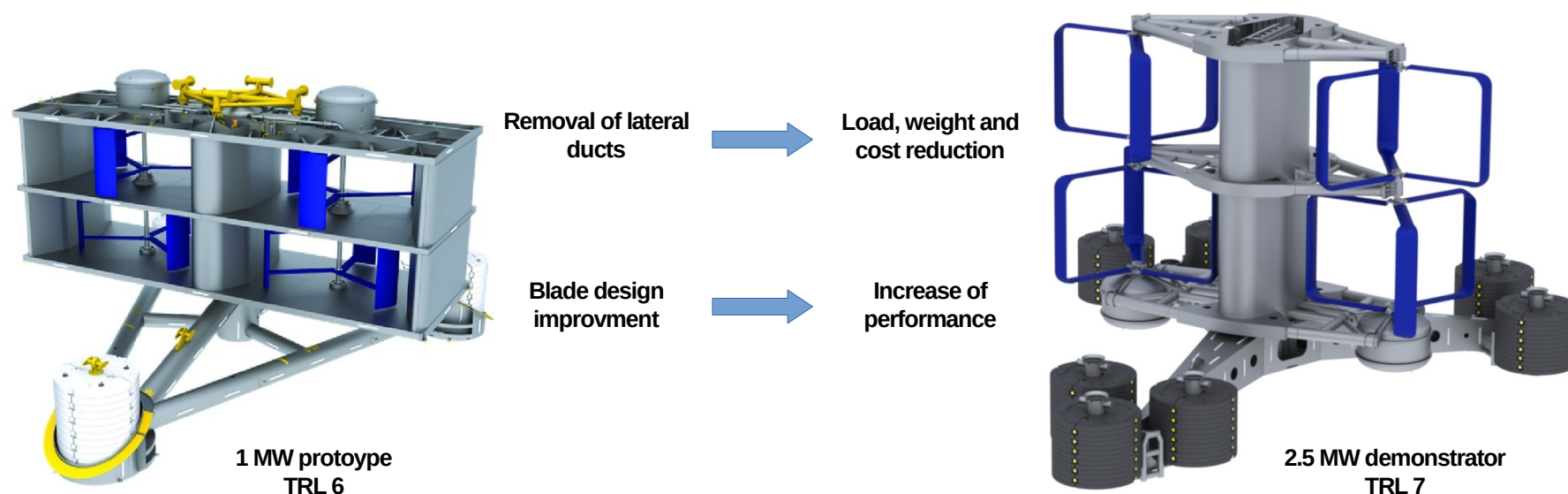
Experimental turbine performance evaluation at 1/20 scale [Moreau et al.]



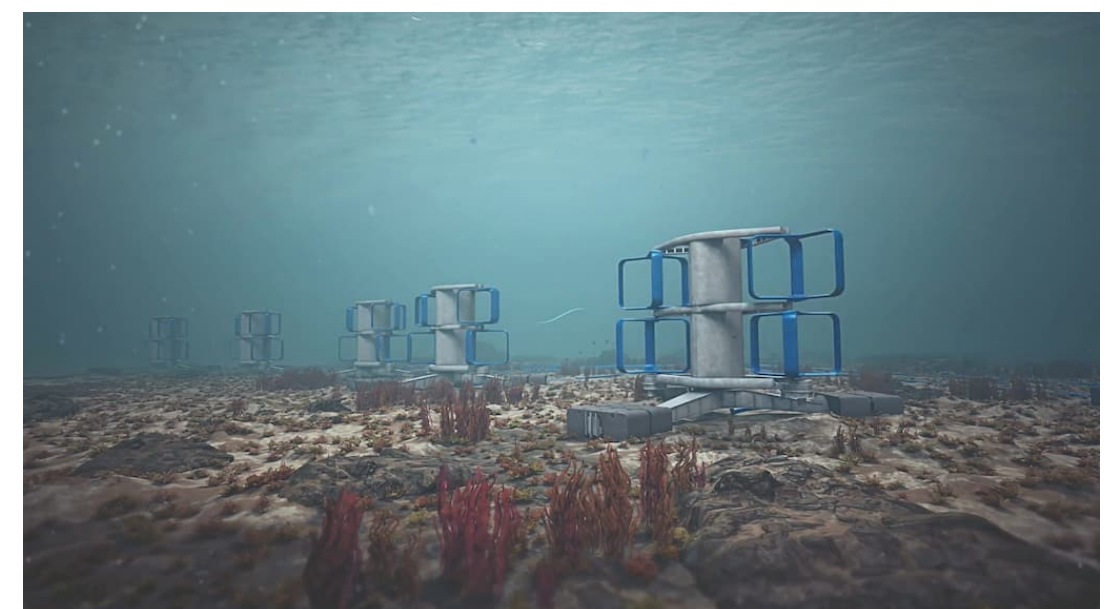
In-situ measurement points in the Alderney Race pilot farm site [Bennis et al.]



Local simulation of 1 MW turbine tested in Paimpol-Bréhat (Brittany, France) [Grondeau et al.]



Design evolution of HydroQuest's tidal turbine: from the 1MW to the 2.5 MW capacity bottom mounted twin vertical axis tidal turbine.



Artist's rendering of the pilot farm FloWatt project based on 2.5 MW capacity turbines deployment in the Alderney Race (English channel, France).

References

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