SuperGen Marine Challenge
Numerical Modelling & Condition Monitoring

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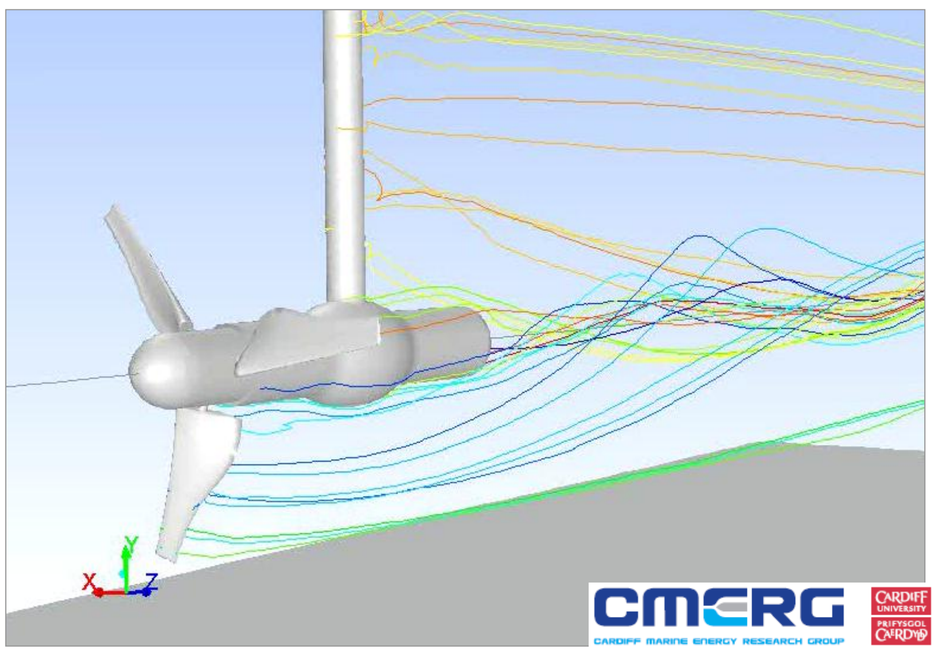
Introduction

This poster describes the work of CMERG within the research areas of CFD, FSI and Condition monitoring under realistic sea conditions.

Realistic Tidal Flow

• To date CFD models of a flume have been validated against experimental data. Future experimental work will provide data based on profiled flow, wave interaction and the effect of the average and extreme operating conditions.

• Planned CFD analysis will be undertaken using a VOF (Volume of Fluid) model of realistic sea conditions, including velocity profile, waves and sea bed topography.



Condition Monitoring & Life Fatigue Analysis

• A design study will be performed to allow for the manufacture of a refined TST/generator assembly and associated Condition Monitoring (CM) system.

• The effective CM approach will be adapted and potentially embedded within prototype TST to aid in condition based maintenance procedures and therefore reliability and survivability.

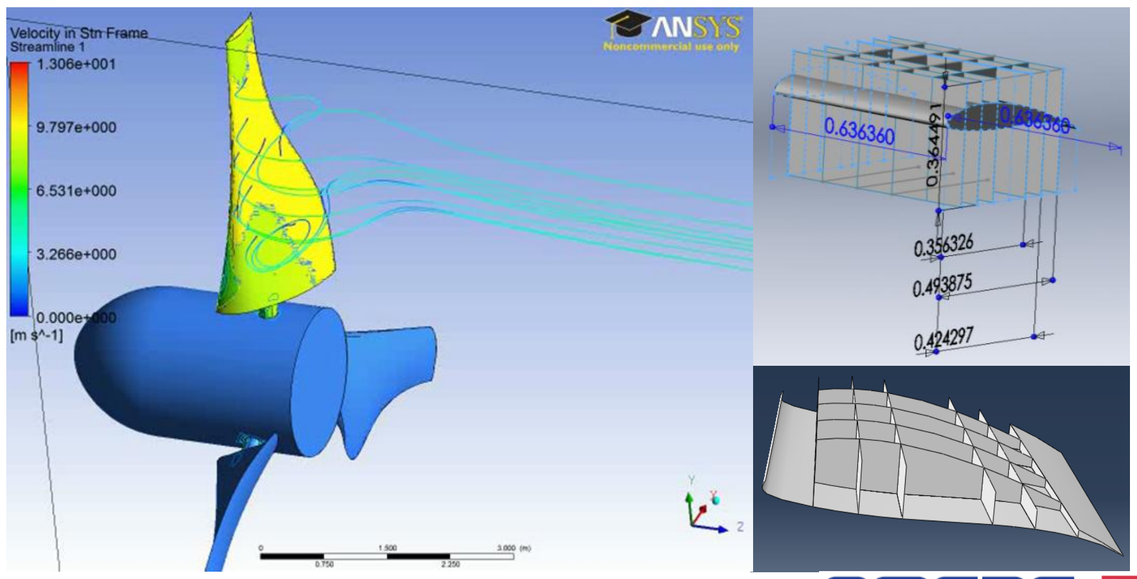
• Further work will be carried out to produce diagnostic and prognostic models to allow for optimal maintenance and efficient operation. This work will be used to determine the integrated power output of a full scale TST over the tidal range as well as quantifying the unsteady forces that can be expected on the structure.

• Data from CM system and CFD/FSI models will be used to conduct fatigue life analysis.

CFD & FSI

• An FEA study of the 0.5m turbine will be undertaken on blade deflection characteristics and will be validated against experimental data from Liverpool Univerdity.

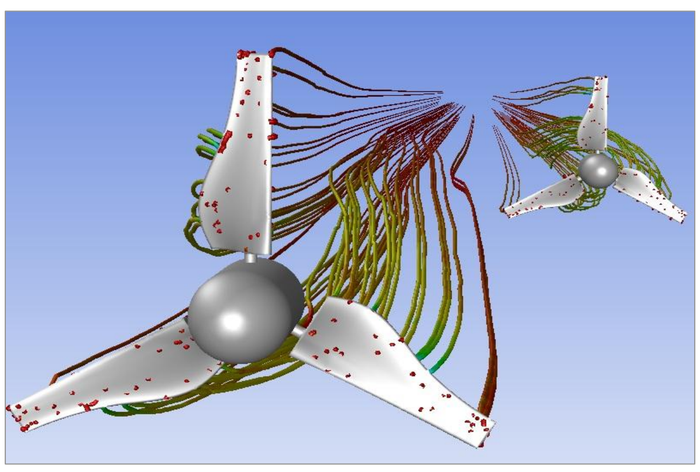
• A coupled FSI study of a full scale turbine will be undertaken that includes a full structural definition of the blades and supporting structure, when subjected to idealistic and actual conditions as defined by a full tidal cycle.



Array Analysis

• A CFD study of an array of up to 9 turbines will be conducted to predict the optimal lateral and longitudinal spacing between devices.

• The array results will then be compared with predicted data from a BEM model develped by Swansea University.



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