Actuator Line Simulations of a Field Scale Cross Flow Tidal Turbine

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ABSTRACT

Cross flow turbines are a promising technology for tidal energy applications. However, very few full scale devices have been built and tested to date and variations in key parameters make it difficult to compare existing data [1]. Despite advances in available computational power, the complex flow features governing the power output and drag of such turbines are still prohibitively expensive to simulate in 3D using geometry resolving methods for field scale applications and industrial problems like blockage or array optimisation [2–4].

Figure 1: Deployment of the ORPC cross flow turbine in Strangford Lough in 2024, UK.

This paper presents simulation results using a coupled Actuator Line and Finite Element toolbox ALFEA [5] and validations against data gained from recent tank and field testing of a full scale commercial cross flow turbine. Power output, blade loading and deformation are compared and deficiencies of the numerical model discussed.

References

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