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Diffuser shape optimization for GEM, a tethered system based on two horizontal axis hydro turbines

Domenico P. Coiro [a], Elia Daniele [b,*], Pierluigi Della Vecchia [a]

[a] University of Naples "Federico II", Via Claudio 21, 80125 Naples Italy
[b] Fraunhofer IWES, Ammerländer Heerstr. 136, 26129 Oldenburg, Germany

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ABSTRACT

This paper concerns the numerical shape optimization of the diffuser of a horizontal axis hydro turbine. The turbine is part of the tethered system GEM developed for harnessing ocean current energy. The applied methodology consists of two phases. Firstly, a diffuser optimization with axis-symmetric 2D CFD simulations has been performed, in which the turbine is modeled with a pressure drop across the actuator disk. Secondly, several 3D CFD computations for the original and optimized configuration have been performed and compared with experiments on the reference diffuser configuration. Results from both 2D CFD axis-symmetric model and experimental data show an increase for the power coefficient, while the 3D CFD model not fully confirms this advantage, even though computations are in good agreement with the reference GEM experimental tests.

1. Introduction

Nowadays, the utilization of renewable energy is not enough to satisfy the global energy requirements, but it is certainly necessary to support its demand with clean-source contribution [1]. One of

* Corresponding author.
E-mail addresses: coiro@unina.it (D.P. Coiro), elia.daniele@iwes.fraunhofer.de (E. Daniele), pierluigi.dellavecchia@unina.it (P. Della Vecchia).

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