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1 Semi-analytical estimate of energy production from a
2 tidal turbine farm with the account of ambient
3 turbulence

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7 **Abstract**

8 This paper presents the influence that ambient turbulence has on a tidal
9 turbine farm. Firstly, the analytical model developed by Bahaj & Myers in
10 2004 is used and modified in order to incorporate the ambient turbulence
11 effects. Ambient turbulence is taken into account via the experiments of
12 Mycek et al. 2014, where two levels of turbulences were tested, namely 3%
13 and 15%. Modifications in wake velocity deficit are treated. However, the
14 influence that ambient turbulence has on the power coefficient of downstream
15 turbine(s), which is usually neglected, is taken into account. For the lower
16 level of turbulence, three scenarios for the downstream turbine(s) behaviour
17 are considered.

18 This enhanced model is then tested on a given site in the Alderney Race
19 (Raz Blanchard). Yearly energy productions depending on ambient turbu-
20 lence, turbine layouts and proposed scenarios are evaluated and compared.
21 A technico-economical analysis is also carried out. Finally, the tidal turbine
22 farm profitability highly depends on ambient turbulence and turbines layout.

23 *Keywords:* tidal turbine, interaction, ambient turbulence, power
24 coefficient, velocity deficit, energy production

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