Aerodynamic Optimization of Vertical Axis Wind Turbine with Trailing Edge Flap - DTU Orbit (08/11/2017)

Aerodynamic Optimization of Vertical Axis Wind Turbine with Trailing Edge Flap

Vertical Axis Wind Turbines (VAWT) are competitive concepts for very large scale (10-20 MW)floating ofshore applications. Rotor circulation control (loading control) opens a wide design space to enhance the aerodynamic and operational features of VAWT. The modied linear derivation of the Actuator Cylinder Model (Mod-Lin ACM) is used as the aerodynamic model to assess VAWT performance throughout the work. As the rst step, optimum aerodynamic loadings of a VAWT with innite number of blades are studied. Next, for the case of nite number of blades, direct and inverse optimization approaches are used. The direct method is coupled with a hybrid numerical optimizer to serve as a global method for designingap sequences. The efectiveness of trailing edgeap on VAWT is investigated for three aerodynamic objectives which lead to improved power effciency, rated power control and peak load control. The aerodynamic gains for various solidity, tip-speed ratio, maximum ap defection and ap size are quantifed in inviscidow. This extensive work presents new insights on the performance of a VAWT with innite number of blades as well as it provides a solid foundation forap usage on a real VAWT rotor to enhance its capabilities.

General information

State: Published
Organisations: Department of Wind Energy, Aerodynamic design, Delft University of Technology
Authors: Ertem, S. (Ekstern), Ferreira, C. S. (Ekstern), Gaunaa, M. (Intern), Aagaard Madsen , H. (Intern)
Publication date: 2016

Host publication information

Title of host publication: Proceedings of the 34th Wind Energy Symposium
Publisher: American Institute of Aeronautics & Astronautics
Article number: AIAA 2016-1735
Main Research Area: Technical/natural sciences
Conference: 34th Wind Energy Symposium, San Diego, CA, United States, 04/01/2016 - 04/01/2016
DOIs:

10.2514/6.2016-1735
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016