



Keynote Presentation

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## Renewable energy technologies for a sustainable future: innovative applications for solar and wind power generation

Technologies for renewable energy are gaining popularity as the world tries to reduce its reliance on fossil fuels and lessen the effects of climate change. Wind and solar energy are two important sources of renewable energy that are gaining popularity due to their environmental benefits. Morocco is aware of the importance of increasing investments in renewable energy. The Kingdom shows its willingness to increase the share of wind and solar energies through various projects intending to raise the installed capacity of renewable energies from 42% in 2020 to 52% in 2030 [1]. In solar energy, the capacity production will increase to reach 4560 MW. On the other hand, wind energy program intends to expand installed wind power capacity to 2,600 MW by 2030 [2]. Within this context, wind turbine generation have been improved through turbine blade design and hence, the efficiency and the performance of the optimized system were increased. Flow control techniques were used to modify the turbulent airflow over the blade to improve its performance. The vortex trapping cavity (VTC) and trailing edge serrations were tested on a wind turbine, and the results showed that both devices led to an improvement in the generated torque and power. The vortex trapping cavity was found to increase the torque by a maximum of 10% for high wind speeds up to 13m/s. In this case, the flow is highly separated and the VTC reenergizes the boundary layer

leading to a delay in separation. Bio-inspired trailing edge serrations were optimized for use on a wind turbine and the results are evaluated in terms of yearly power generation for the wind distribution of three Moroccan cities: Laayoune, Essaouira, and Dakhla. To maximise the power generation an optimal combination was found using the Taguchi L9 plan of experiment. The findings indicate that serration can increase annual electricity power generation in all cities by 12% for the optimal case. In conclusion, the development of new wind turbine blade designs and the use of green energy sources is important in creating a more sustainable and environmentally friendly future.

**Biography:** Dr. Elhachmi Essadiqi, is currently Dean of Aerospace and Automotive Engineering school at the Université Internationale de Rabat (UIR), Morocco and adjunct professor at Mississippi State University, in the USA. His main research interests are in the area of lightweighting materials for aeronautics and automotive applications (e.g. Al – Li, composites), alloying and process design for casting and thermo-mechanical processing and additive manufacturing; microstructure and properties relationship in materials. He is now working on Seawater Desalination using solar energy, and GHG reduction.

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