Increasing Clean Energy Generation using Diffuser Augmented Wind Turbines (DAWT) for Urban Cities

Dr Hassam Chaudhry
Director of Studies (Dubai) Architectural Engineering
School of Energy, Geoscience, Infrastructure and Society
Heriot-Watt University Dubai Campus
Dubai, UAE
H.N.Chaudhry@hw.ac.uk

Summary

This project has been funded by EXPO 2020 under the "Innovation Impact Grant Program" in 2019. Under the supervision of Dr Hassam Chaudhry, a PhD researcher: Arouge Agha and five of our UG Architectural Engineering students have worked on this project: Akshaya Sankaran, Rinku David, Shravan Venkatachalamapathy, Suvarna Sanal Kumar, Atheefa Jakir Hussain. As part of this project, a working model of a ‘Diffuser Augmented Wind Turbine’ (DAWT) for roof-top residential use has been developed and tested at Heriot-Watt University Dubai Campus. Using a Rutland FM910-4 Furlmatic Windcharger wind turbine, a light-weight diffuser made of Styrofoam was retrofitted to streamline incoming wind velocities and therefore increasing wind turbine efficiency by up to 71%. The DAWT provides an advantage over conventional wind turbines, as it can accelerate air movement over the rotor even while operating on low-rise structures, and low cut-in wind speeds normally found in urban areas.

Conclusions highlight

1. Computational Fluid Dynamic (CFD) modelling to successfully design the DAWT and investigate the wind and pressure profiles.
2. Full-scale commissioning of the DAWT using Styrofoam for real applications.
3. Wind speed augmentation of up to 71% when wind direction is perpendicular to the rotor.

Publications

2. A.Agha, H.N.Chaudhry, F.Wang, Determining the Augmentation Ratio and Response Behaviour of a Diffuser Augmented Wind Turbine (DAWT), Sustainable Energy Technologies and Assessment (2020) Article in Press