How Electricity Can Be Produced by Drones

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Courtesy of SynEvol
Credit:Kitemill

Drones may play a key role in helping the UK achieve its net-zero goals by collecting wind energy. The Engineering and Physical Sciences Research Council (EPSRC) has awarded a £375,000 grant to Dr. Duc H. Nguyen, a lecturer in flight dynamics and control at the University of Bristol, to further investigate airborne wind energy systems (AWES).

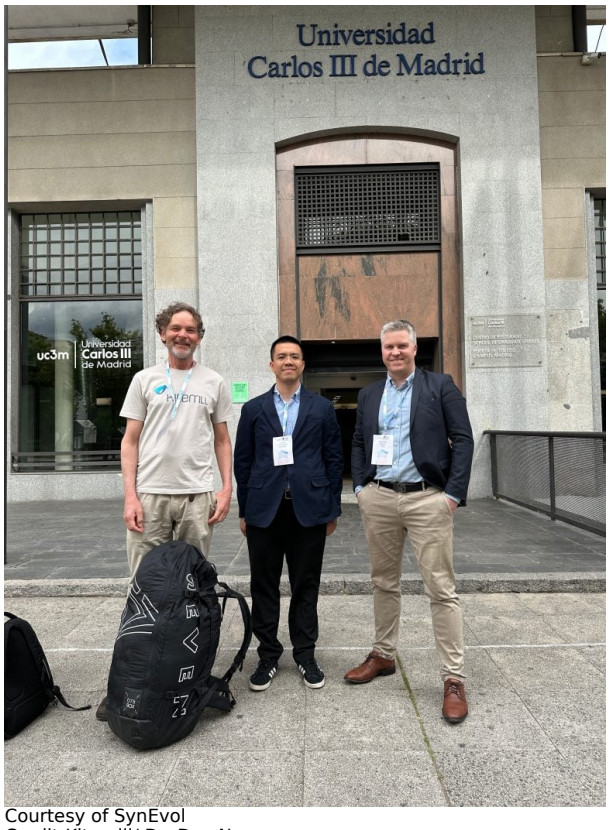
AWES collects wind energy at greater heights than traditional wind turbines by attaching a drone to a ground station. The generator is driven by the strong wind, which also produces electricity, as the drone is pulled away from the ground station.

The energy industry in the UK stands to gain from this technology by operating in remote places more effectively, lowering its carbon impact, and offering flexibility both onshore and offshore.

AWES must fly under intense aerodynamic forces in complex patterns in order to provide the maximum amount of power. This configuration results in a complicated system with sensitive handling qualities; even a small error in judgment could cause the drone to crash into the ground.

With this study, Dr. Nguyen and his partners intend to address this difficulty. He believes that by enhancing AWES efficiency and safety, the initiative will open the door for AWES commercialization.

Dr. Nguyen, of the School of Civil, Aerospace and Design Engineering, clarified, saying that by 2050, it is projected that airborne wind energy will produce €70 billion in electricity annually. It is still a developing technology, though. A trade-off has frequently been made: new designs have been quickly put into service for test flights before their flying characteristics are completely known. Due to this, several AWES prototypes have been unable to operate at full capacity, which has slowed down commercialization and caused the program to be terminated early. This project uses continuation and bifurcation techniques to try to solve this problem.



Courtesy of SynEvol
Credit:Kitemill/ Dr. Duc Nguyen

In aircraft dynamic investigations, these numerical algorithms have shown effective in forecasting hazardous behaviors like spin, flutter, and pilot-induced oscillation.

"AWES can achieve significant cost savings and improved performance by replacing existing techniques with bifurcation methods, which will ultimately bring this technology closer to commercialization," Dr. Nguyen said.

Apart from the EPSRC financing, the initiative gains from partnerships with two prominent entities in the industry: University Carlos the III of Madrid

and the Norwegian firm Kitemill.

"The initiation and successful funding of this AWES project is an important development in the renewable energy sector," stated Thomas Hårklau, co-founder and CEO of Kitemill. With its superior material efficiency and increased energy yields, AWES technology has the potential to take the lead in the energy sector. We are thrilled to work on this project in partnership with Bristol University and Duc Nguyen. This project ensures British competency in this developing sector while simultaneously advancing the UK's net-zero aim. By working together, we want to overcome present obstacles and open the door for AWES to be commercialized.
