A Reference Economic Model for Airborne Wind Energy Systems

Rishikesh Joshi[1], **Filippo Trevisi**[2], **Roland Schmehl**[1], **Alessandro Croce**[2], **Carlo E.D. Riboldi**[2]
[1] Wind Energy Section, Delft University of Technology, The Netherlands
[2] Department of Aerospace Science and Technology, Politecnico di Milano, Italy

Rishikesh Joshi

Wind Energy section
Faculty of Aerospace Engineering
Delft University of Technology

Kluyverweg 1
2629 HS Delft
The Netherlands

r.joshi@tudelft.nl
www.tudelft.nl

TU Delft

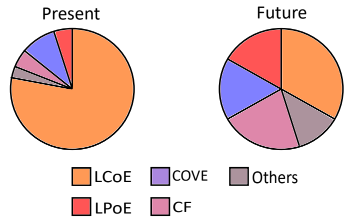
POLITECNICO
MILANO 1863

The IEA Wind Task 48 [1] about airborne wind energy (AWE) has been kicked off in 2022, aiming at building a strong community that can identify and mitigate the barriers to the development and deployment of AWE systems. Among the planned research activities, WP-1 focuses on determining economic metrics which will be relevant for the deployment of systems in potential markets, considering different penetration scenarios. On the other hand, WP-2 involves, among other activities, the development of reference models and metrics.

The present work aims at developing a reference open-source economic model, which researchers and companies can use to asses the performances of their AWE concepts. On top of describing the cost of systems, this work aims at introducing reference business cases and value-based market driven performance metrics for the future systems. Few of these metrics are levelized cost of energy (LCoE), cost of valued energy (COVE), levelized profit of energy (LPoE), capacity factor (CF) etc. This is by taking inspiration from the conventional wind industry which is moving towards beyond LCoE metrics [4].

The model shall be as general and comprehensive as possible, so that different concepts can be analyzed. Moreover, the model aims to provide cost functions capturing the main trends, so that it can be used for analysis [2] but also in design and optimization frameworks [3].

A report is being produced and will constantly be updated. In parallel, a code in one or more programming languages is being developed and will also be constantly updated with the new models proposed in the report. Even if the first version of the model is produced by the authors, the updates can be carried out by anyone who wants to contribute to the development, upon fulfillment of prescribed guidelines regarding documentation and publication.



Representation of the performance metrics of the AWE systems

References:

[1] https://iea-wind.org/task48/task-48-activities/

[2] Joshi R, Schmehl R, Kruijff M, Von Terzi D. Techno-economic analysis of power smoothing solutions for pumping airborne wind energy systems. Submitted to Journal of Physics: Conference series. TORQUE22: Delft, The Netherlands (2022).

[3] Trevisi F, Croce A, Riboldi CED. Sensitivity analysis of a Ground-Gen Airborne Wind Energy System Design. Submitted to Journal of Physics: Conference series. TORQUE22: Delft, The Netherlands (2022).

[4] Dykes K. Optimization of Wind Farm Design for Objectives Beyond LCOE. Journal of Physics: Conference Series, 1618(4):042039 (2020).