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Developing a Reference Economic Model for Airborne Wind Energy Systems

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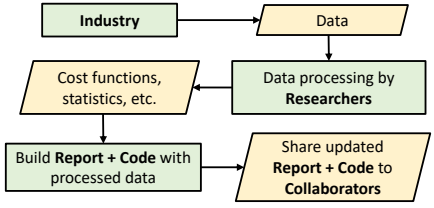
For a successful diffusion of airborne wind energy (AWE) in the energy sector, the development of the technology should be aligned with the needs dictated by the market. Every market has different characteristics which can be suitable for different AWE concepts. For example, Soft-wing and fixed-wing systems, depending on the wind and site requirements, replacement costs, operation & maintenance costs, etc., could be suitable for different markets. Such trade-offs could only be evaluated by employing an economic model along with a performance model.

The IEA Wind Task 48 [1] aims at building a strong community that works together to accelerate the development and commercialisation of AWE technology. This work falls under Work Package 1, which focuses on identifying economic drivers and the potential of deploying AWE in different markets. We aim to develop a reference open-source economic model, which researchers and companies can use to assess the performances of their AWE concepts for different market scenarios. This was first introduced in [2].

The primary aspect of the economic model is the cost modelling of different concepts where we build cost functions parametric to key design parameters such as the kite wing area, span, aspect ratio, tether force, generator characteristics, etc. The process of developing this model is shown in the associated Figure. Airborne Wind Europe [3] acts as an intermediary to host the data collection, storage and dissemination.

The developed report and the code [4] can be used to perform techno-economic analysis, in system design optimisation studies, and to evaluate business cases for specific market scenarios. The model will also provide input to technology development roadmaps and inform policy-makers, organisations like the IRENA or the IEA, as well as the industry.



Flowchart showing the adopted process to build a reference economic model for airborne wind energy systems

References:

[1] IEA Wind Task 48. https://iea-wind.org/task48/

[2] Joshi R, Trevisi F, Schmehl R, Croce A, Riboldi CED. A Reference Economic Model for Airborne Wind Energy Systems. 9th International Airborne Wind Energy Conference (AWEC 2021), Milan, Italy, 2022. doi:h3c2

[3] Airborne Wind Europe. https://airbornewindeurope.org/

[4] Joshi R, Trevisi F. Reference economic model for airborne wind energy systems. IEA Wind Task 48, 2024. doi:10.5281/zenodo.8114627

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