

Enerkite EK30 development platform during a rotational launch (May 2021)





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Concepts for Obstruction Marking and Demand-Oriented Obstruction Avoidance to Ensure a Safe Operation of AWE Systems

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Airborne Wind Energy Systems (AWES) operate at altitudes where collisions with other aircraft systems can occur. The application of the existing legal basis for marking of aviation obstructions for collision avoidance is contrary to typical kite operation for an efficient electricity production.

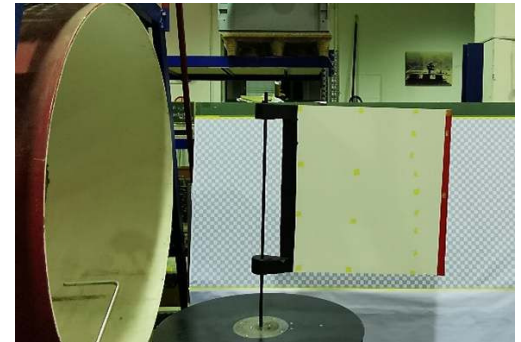
For this reason, dialogue is currently taking place between approval authorities and AWES manufacturers, in order to find a safe and economical solution. Several possible solutions emerge both from the legal situation and from the current state-of-the-art in the field of conventional wind power [1].

In this work, the current European and German legal basis is briefly covered, and several alternative concepts are investigated. The concepts can be reviewed and ranked regarding their technical and approval feasibility as well as their impact on the LCOE. Furthermore, changes to the current legislature are assessed to obtain permits for operation of each variant.

One such solution category is based on demand-oriented obstruction avoidance by aviation surveillance systems, such as radar or transponder systems. The differences between those systems, advantages, and disadvantages and the implementation in AWES are presented [1].

Another category contains obstruction marking and lighting of the tether and the kite. Tether marking solutions based on ball markers and flags are investigated. To identify the optimal flag material and elasticity several wind-

tunnel tests have been conducted. Furthermore, a mount for attaching markers to tether is presented. In the case of pumping operation the markers need to be removed before the tether is guided over the winch. Therefore, the mount is designed so that it can be easily attached and removed [1].



Wind-tunnel test to identify the flow resistance of various tether markers including mount.

References:

[1] N. J. Allgaier, „Theoretical elaboration of different concepts for obstruction marking of EnerKites and comparison of several variants for safe day and night operation in Germany“, Master-thesis, Mechanical Engineering - Renewable Resources, Berliner Hochschule für Technik, 2021.