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Life-Cycle Analysis of an Airborne Wind Energy System

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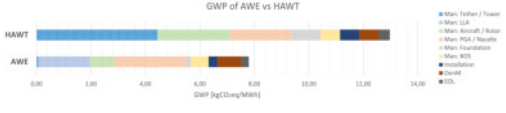
One of the key advantages of AWE is the low material use which should lead to a further reduced carbon footprint of renewable electricity, and also when compared to Horizontal Axis Wind Turbines (HAWT).

The goal of this research was to assess the environmental performance of a future multi-megawatt Airborne Wind Energy (AWE) system by quantifying its Global Warming Potential (GWP) and material intensity, and by comparing it with the impacts of a HAWT system. The study is based on an MSc thesis carried out at TU Delft and which had been commissioned under the Interreg NWE MegaAWE project. The LCA study compares two hypothetical onshore wind farms of ten units totalling 50 MW with the same farm layout, one consisting of hypothetical commercial fixed-wing 5MW AWE systems and the other of recently optimised 5 MW NREL reference HAWT. The AWE system is based on the Ampyx technology which uses a catapult to launch the fixed-wing aircraft.

The analysis found that AWE requires 70The actual mass reduction of AWE vs. HAWT will strongly depend on the AWE type and further developments. Therefore, it is also important to further investigate how materials can be reused or recycled. Notwithstanding the lack of detailed design data and assumptions, this LCA concluded that AWE systems have an even lower environmental impact in terms of GWP than HAWT – which already have very low impacts among electricity generating technologies. AWE applies consequently the “reduce” rule which is one of the most valuable Circular Economy options. Offering a significant mass reduction for energy generation from wind, AWE represents a step-change and fundamental re-design of wind energy technology. Applying the LCA method provides most benefits to OEMs at early stages of development. It also serves to make policy makers and other stakeholders aware of the large potential of AWE to further improve the carbon footprint of renewable energy technologies.



Global warming potential of AWE vs. HAWT

References:

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