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A Sociotechnical Approach and a Future Vision Proposal for AWE in the U.S.

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The beginning of the 21st century brought with it the exploration of Airborne Wind Energy (AWE). This innovative technology has caught the attention of several research institutes and visionary entrepreneurs who are currently developing different prototypes to harness these winds. An analysis of the current sociotechnical situation and future scalability of AWE technologies in the U.S. is carried out through a multilevel perspective. The application of the Functions of Innovation System (FIS) methodology is used to show the current drivers and barriers of AWE systems and a Backcasting approach (BC) is used to create a desired future vision for AWE and to define the institutional framework and the socio-economical context required to steer current actions.

The most relevant drivers for AWE systems in the U.S. are the high expectations supported by the potential of wind power at higher altitudes, the evolution and increase of entrepreneurial activities, the diversity in knowledge development and thus in number of future users, the annual networking events that have promoted technological development and attracted public funding and stronger private investors, and lower environmental impact in terms of wildlife, noise and visual pollution. In contrast, the lack of a constant financial support has made small teams split between R&D and funding tasks and has created a gap between well-funded and promoted companies and the ones that are not. The uncertainty associated with the take-off stage, prior to market development, sets a competitive atmosphere that conditions knowledge diffusion and decrease the effectiveness of lobbying for an advantageous legislation; this indirectly results in less resource mobility and knowledge development.

In our desired future vision, wind energy systems will become well established in the U.S. energy market and AWE systems will coexist with the ground-based technology to increase their share, reducing the influence of fossil fuels prices on the development of this technology. The different energy demands and environmental conditions will help maintain the diversity of designs, however there will be a leading AWE design. The other designs will also be commercialized but not at the same rate, granting this technology a wide diversity of applications and customers. AWE technology will provide electricity to off-grid areas and other services such as weather monitoring, communication, and will also act as a backup system after natural disasters.

A series of trend events and demands are proposed in order to steer current situation towards the desired future vision; these are: governmental support must be constant and immune to shift in political parties. Policies such as increased carbon taxes and creating incentives for renewable energy (RE) development must be consistent and applied nationwide. NGOs must continue exerting pressure for a shift into a RE based economy. The research, development and implementation of wind energy systems with higher capacity, performance and durability must be supported by a stable public and private economic investment. A clear policy framework that regulates the testing of AWE prototypes is required. Central actors of the AWE network would have to become more efficient at communicating the expectations and needs of all stakeholders and therefore be more effective in their lobbying efforts. Finally, the social resistance to this and other RE must be counteracted by an active user and societal involvement on RE projects at initial stages.