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AWE Resources over Spain: Potential Added Value with Respect to Conventional Renewables

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In the way towards fully renewable power systems, the variability of conventional renewables represents a fundamental challenge. One of the options to tackle this issue is to exploit the complementarity between different renewable energy sources and technologies. The aim of this study is to analyse the potential added value of AWE resources over Spain, in terms of temporal complementarity to mainstream renewables (onshore wind and photovoltaic energies) or good adaptation to demand.

Using data from a high resolution reanalysis (CERRA, Copernicus European Regional Reanalysis) and the AWERA tool [1] for analysing AWE resources, complementarity between AWE resources and conventional renewables is evaluated using actual PV and wind energy production data from the Spanish Transmission System Operator (Red Eléctrica Española), while demand data from the same source are used to explore adaptation to demand.

We focus on the summer season. This season is associated to particular problems, due to the clear seasonal decrease of conventional wind energy and the simultaneous increase in power demand, which may even exceed

winter demand in the future due to climate change. Despite its summer production peak, PV energy covers only part of the day.

The high power demand in summer is associated with a particular seasonal low pressure system over the Iberian Peninsula, the Iberian thermal low [2, 3]. The corresponding wind fields show an interesting daily cycle, as well as a vertical distribution that might be advantageous for AWE in comparison to PV or conventional wind energy.

References:

- [1] Thimm, L., Schelbergen, M., Bechtle, P., Schmehl, R.: *The Airborne Wind Energy Resource Analysis Tool AWERA. 9th International Airborne Wind Energy Conference (AWEC 2021)*. Available at: <http://resolver.tudelft.nl/uuid:ba0c7fb2-baff-4110-9a51-c27a8498663b>
- [2] Gaertner, M. A., Fernández, C., Castro, M. (1993). A two-dimensional simulation of the Iberian summer thermal low. *Monthly Weather Review*, 121, 2740-2756.
- [3] Hoinka, K. P., Castro, M. D. (2003). The Iberian peninsula thermal low. *Quarterly Journal of the Royal Meteorological Society*, 129, 1491-1511.