Complementarity of Iberian offshore wind farm potential sites using COSMO-REA6 high-resolution reanalysis

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1. BACKGROUND AND AIM

- High offshore wind potential in Spain and Portugal
- Floating wind turbines necessary
- Recent definition of areas where offshore wind farms can be installed
- Semi-closed power system in the Iberian Peninsula (IP)
- Already high share of renewables (nearly 50% in Spain, 60% in Portugal)
- High summer power demand
- Is there an added value of offshore wind energy for the Iberian power system, beyond the high resource amount?
- Aim: analyse variability and spatial complementarity of the potential areas for the installation of offshore wind farms around IP.

2. DATA & METHODS

- Wind energy capacity factor (CF) calculated from hourly wind fields at 105 and 150 m height from COSMO-REA6 high-res. reanalysis (0.05°) for 1995-2018 period
- 15 possible location areas based on the publicly available planning information given by Spanish and Portuguese government:
  - Aggregated wind energy CF for combination of possible areas that minimizes the variability
  (Reichenberg et al., 2014. Dampening variations in wind power generation-the effect of optimizing geographic location of generating sites. Wind Energy, 17(11), 1631–1643)

3. RESULTS

- High CFs, but large summer decrease at northern coast
- Lower CFs, but small summer decrease at western and southern coasts

- High and nearly constant seasonal CF at northeastern coast
- Lower summer hourly variability near Lisbon and at the northeastern coast

- Higher complementarity for eastern and western sites
- Outstanding complementarity near Lisbon
- Higher complementarity than over the North Sea
- High summer complementarity

4. CONCLUSIONS

- Low winter-summer variations of capacity factor for several areas: good adaptation to demand
- Complementarity depends not only on distance, but also on coastal orientation
- Optimal spatial combination of sites can reduce variability strongly: stable aggregated contribution to power system with much lower seasonality than onshore wind energy
- Auctions should include non-price criteria in order to harness the added-value for the power system

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