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Sub-seasonal forecasts of demand and wind power and solar power generation for 28 European countries

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Abstract. Electricity systems are becoming increasingly exposed to weather. The need for high-quality meteorological forecasts for managing risk across all timescales has therefore never been greater. This paper seeks to extend the uptake of meteorological data in the power systems modelling community to include probabilistic meteorological forecasts at sub-seasonal lead times. Such forecasts are growing in skill and are receiving considerable attention in power system risk management and energy trading. Despite this interest, these forecasts are rarely evaluated in power system terms, and technical barriers frequently prohibit use by non-meteorological specialists.

This paper therefore presents data produced through a new EU climate services programme Subseasonal-to-seasonal forecasting for Energy (S2S4E). The data correspond to a suite of well-documented, easy-to-use, self-consistent daily and nationally aggregated time series for wind power, solar power and electricity demand across 28 European countries. The data are accessible from https://doi.org/0.17864/1947.275 (Gonzalez et al., 2020). The data include a set of daily ensemble reforecasts from two leading forecast systems spanning 20 years (ECMWF, an 11-member ensemble, with twice-weekly starts for 1996–2016, totalling 21 210 forecasts) and 11 years (NCEP, a 12-member lagged-ensemble, constructed to match the start dates from the ECMWF forecast from 1999–2010, totalling 4608 forecasts). The reforecasts contain multiple plausible realisations of daily weather and power data for up to 6 weeks in the future.

To the authors' knowledge, this is the first time a fully calibrated and post-processed daily power system forecast set has been published, and this is the primary purpose of this paper. A brief review of forecast skill in each of the individual primary power system properties and a composite property is presented, focusing on the winter season. The forecast systems contain additional skill over climatological expectation for weekly-average forecasts at extended lead times, though this skill depends on the nature of the forecast metric considered. This highlights the need for greater collaboration between the energy and meteorological research communities to develop applications, and it is hoped that publishing these data and tools will support this.

Please note the remarks at the end of the manuscript.

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