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# The S2S4E project, sub-seasonal to seasonal climate predictions for energy

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The S2S4E project aims to bring sub-seasonal to seasonal climate predictions to the renewable energy sector. Raw climate predictions come with a set of challenges which require the deployment of a climate service in order to produce valuable information for users. This involves the development of robust methodologies to calibrate predictions, assess their quality, and effectively communicate the forecast products, as well as their expected added value. This work is done within the framework of the S2S4E project with focus on different areas of the energy sector; wind, solar and hydro power generation, and electricity demand. The main outcome of the project will consist in providing real-time forecasts of essential climate variables and energy indicators through a decision support tool that is being co-developed with users.

To illustrate the potential benefits of S2S predictions several case studies have been analysed, i.e. periods pointed out by the energy companies as having an unusual climate behaviour that affected the energy market. Two of these case studies will be presented to investigate how the climate predictions of each event would have helped stakeholders to take precautionary actions several weeks ahead. In the first case, a cold wave over France and Germany in January 2017 increased the electricity demand while low wind speeds limited the wind energy production. In the second case, a heat wave affecting Spain at the beginning of September 2016 increased the electricity demand. Sub-seasonal predictions from ECMWF monthly system issued from 4 weeks to 1 week prior to these events are used to provide calibrated predictions of the essential climate variables and produce estimates of country level electricity demand. Predictions are given with their associated level of skill, computed from the 20 year hindcast. Results show that S2S predictions have potential to anticipate episodes of high electricity demand a few weeks in advance although there is still limited skill in predicting the wind energy supply beyond week 2.