



Variability of combined wind-plus-solar power production in Europe under climate change conditions.

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The transition to renewables plays a key role in the climate change mitigation strategies. However a high penetration of renewables sources such wind and solar power, as proposed for future energy mix scenarios in Europe, increases the dependence of the power supply on weather and climate conditions. Several works have assessed the impacts of climate changes on energy production, however the behavior of the temporal variability of energy production has not been evaluated.

This work shows an assessment of climate change impacts on the temporal variability of the joint production of wind and solar photovoltaic (PV) power across Europe. The study treats several temporal scales (from daily to interannual), assumes regional and continental electrical grids and it bases on the state-of-the-art climate projections together with a climate-production model, assuming a future massive deployment of wind and PV installations.

Results support that the spatio-temporal complementarity between the wind and solar resources help to minimize the temporal variability of the combined production under both present (1971-2000) and future (2070-2099) climate conditions similarly, with thus the actual changes projected in this sense being basically negligible (well below 5%). However, a theoretical assessment yielded a significant potential increase in the stability of the joint production, ranging from 5 to 25% across regions, 15% at the continental scale, which would be subordinated to the feasibility of reaching, with the future deployment strategies, individual wind and PV power production series with a perfect temporal anticorrelation. These results encourage future research efforts in order to further help stakeholders to take holistically optimized decisions.