Geophysical Research Abstracts
Vol. 20, EGU2018-2552-1, 2018
EGU General Assembly 2018

Natural wind variability triggers German redispatch volume and costs

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Avoiding dangerous climate change necessitates the decarbonization of electricity systems within the next few decades. In Germany, this decarbonization is based on an increased exploitation of variable renewable electricity sources such as wind and solar power.

Although renewables supply roughly one third of electricity consumption today, system security has not been degraded. However, the integration of renewables causes additional costs. The costs of grid management saw a strong increase in 2015 when they reached € 1 billion. Despite further additions of renewable capacity, these costs dropped substantially in 2016. Understanding the recent cost evolution is fundamental for the success of the energy transition as further strong increases might question its economic viability.

We hypothesize that natural climate variability caused the sharp increase in 2015 and the decrease in the year after. In order to test the hypothesis, we focus on redispatch as a main cost driver. Based on the ERAINT reanalysis dataset, we show that the 2016 decline is indeed triggered by natural wind variability. In particular, we find that 2016 was a weak year in terms of wind generation averages and we show that a simple model based on the wind generation timeseries is skillful in detecting redispatch events on timescales of weeks and beyond.

As a consequence, alterations of annual redispatch costs in the order of hundreds of millions of euros need to be understood and communicated as a normal feature of the current German electricity system.