EMS Annual Meeting Abstracts
Vol. 13, EMS2016-654, 2016
16th EMS / 11th ECAC

How Much Can Demand Side Management Contribute to Balance a Fully Renewable European Power System?

Alexander Kies (1,2), Bruno Schyska (1,2), and Lueder von Bremen (1)

(1) ForWind - Center for Wind Energy Research, Oldenburg, Germany (alexander.kies@uni-oldenburg.de), (2) Institute of Physics, University of Oldenburg, Oldenburg, Germany

The importance of renewable power generation around the world keeps growing. However, electricity generation and consumption need to be in balance at all time. Thus, the weather driven nature of wind and solar power generation resulting in intermittent feed-in profiles makes their system integration difficult. Several solutions to this were proposed. Among them are storages, backup, a reinforced transmission grid and overinstallation. Demand side management (DSM) is considered another technological option allowing to shift electricity consumption and thus reducing the need for balancing.
We used ten years of weather data with a spatial resolution of 7×7 km and an hourly temporal resolution [1] to simulate generation from the sources wind and photovoltaics. Together with historical load data and a transmission model, the European power system was simulated. Demand side management has been treated as a storage equivalent in dependency on the load patterns with time dependent constraints [2]. The remaining need for backup or storages is quantified, depending on the renewable share.
It is demonstrated that demand side management can contribute significantly to balance a fully renewable European power system [3]. Furthermore, the impact of DSM on the transmission grid in dependency of the utilisation rate is investigated.

References

[1] Kies, A., Nag, K., von Bremen, L., Lorenz, E., and Heinemann, D.: Investigation of balancing effects in long term renewable energy feed-in with respect to the transmission grid, Adv. Sci. Res., 12, 91-95, doi:10.5194/asr-12-91-2015, 2015.

[2] Kleinhans, D.: Towards a systematic characterization of the potential of demand side management, arXiv preprint arXiv:1401.4121, 2014

[3] Kies, A., et al.: The Demand Side Management Potential to Balance a Highly Renewable European Power System, Manuscript in preparation, 2016