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Vita

Alexander Kies, born 1986 in Bremen, heads the research group FIAS Renewable Energy Systems and Artificial Intelligence (FRESNA, http://fiasresna.github.io) at the Frankfurt Institute for Advanced Studies (FIAS) since the beginning of 2019. He obtained his B.Sc. and M.Sc Physics at the University of Bremen with a focus on theoretical semiconductor physics. Afterwards, he obtained his PhD in physics at the University of Oldenburg with a thesis on energy system analysis. He has been employed at the FIAS since 2016 and performs research on energy system modelling, energy markets and artificial intelligence.

Research topic

Long-term energy scenarios under consideration of meteorological boundary conditions

Climate changes makes the decarbonisation of energy systems necessary. Large shares of the future energy supply will be provided by renewable energy from wind and solar photovoltaics. However, wind and solar energy are weather dependent and not dispatchable. This makes the redesign of central elements of the energy system necessary as well.

Among solutions to integrate renewables into power systems are, for instance, demand side management, energy storage or coupling of the sectors electricity, transport and heating and using their flexibility potentials.

Planning the energy transition strongly depends on accurate and reliable input weather data from meteorological models. Commonly reanalysis data is used, that combines measurements and numerical models to reconstruct the past state of the atmossphere. However, different reanalysis datasets often show significant differences in the data, which in turn has a strong influence on the results of energy system models.

In the framework of this research, new methods are to be developed to quantify the uncertainty of energy system models caused by input data uncertainties. In addition to conventional methods, machine learning methods should be included as well. Generative adversarial networks, for instance, will be used to generate and train weather data for certain events or characteristica such as changes in radiative forcing.

Keywords

Energy system transition, Renewable energy, Energy scenarios, Weather data, Artificial intelligence

Chosen publications

Schlott, M., Kies, A., Brown, T., Schramm, S., & Greiner, M. (2018). The impact of climate change on a cost-optimal highly renewable European electricity network. *Applied energy*, *230*, 1645-1659.

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