Lunghammer – TU Graz

ERC Starting Grant for More Efficient Energy Systems

The aggregation of data for modelling highly complex power systems is usually carried out without a sound theoretical basis and leads to inaccuracies. With her ERC project, Sonja Wogrin wants to change this and make the planning of future energy systems much more efficient.

Philipp Jarke

Power systems in Europe will be expanded and rebuilt in the coming decades to make them stable and carbon-neutral at the same time. Complex optimisation models are employed to make the right decisions on the path towards decarbonisation. But there is a catch. Models of realistic power systems are usually so large that even supercomputers are pushed towards their performance limits. This means that much input data (such as time series of power demand or capacity factors of renewable energy sources) is aggregated, which makes the models numerically solvable but less accurate. Sonja Wogrin, head of the Institute of Electricity Economics and Energy Innovation at TU Graz, wants to change this with her five-year project "Optimisation and data aggregation for net-zero power systems", for which she secured a Starting Grant of almost 1.5 million euros from the European Research Council (ERC).

EXISTING AGGREGATION METHODS LEAVE MUCH POTENTIAL UNUSED

When creating optimisation models, traditional data aggregation usually focuses exclusively on the data itself, without taking into account the specifics of the optimisation model in question. This leaves a lot of aggregation potential unused, which affects the computing time and the quality of the optimisation results. As a result, investment decisions on power plant technologies, locations or grid expansion are suboptimal, so the restructuring of the energy system becomes more expensive. In her project, Wogrin wants to improve data aggregation and develop methods by which researchers can create more meaningful models with the same computing power and thus benefit society immensely.

TAKING INTO ACCOUNT DIFFERENT SUPPLY SITUATIONS

Wogrin's research approach does not simply focus on single representative periods where system data is similar. Within these periods you have to differentiate whether the power supply is temporarily guaranteed purely by renewable energy (hydropower, wind, PV), or whether thermal power plants have to be switched on, or whether there could even be situations with an overall loss of load. When the data of these time periods are looked at on average, situations of undersupply in the model can be completely overlooked – periods which are critical for reliable planning. Therefore, Sonja Wogrin would like to use her new method to combine situations with similar model outcomes in order to obtain compressed and yet differentiated model data. "If we want to plan the decarbonised energy system of the future properly, there is no way around reliable modelling. After all, we have to make wise investment decisions. These models and methods should then also be available to everyone," says Wogrin. "I am convinced that this new way of aggregating data is not only relevant to my field of research, but provides fundamental tools that can help scientists around the world." ■