Invited talk (Mathematics in atmospheric science and Climate change))

Stochastic programming models for the energy transition

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Abstract

In this presentation we describe a framework for multiscale stochastic programming and demonstrate how it can be applied to energy transition problems. In the horizon towards 2050 we will see that the share of intermittent renewables in the energy system increases. That implies there are several long-term decisions to be made on how to design the energy system in terms of types of energy generation technologies, import/export capacities for energy (pipelines, cables, lines) and demand side technologies. At the same time, due to the intermittent and stochastic nature, it is important to model the short-term operation of these systems inside the long-term models with sufficient detail. We present examples of the use of multi horizon stochastic programming with both long-term and short-term uncertainty. The structures of multihorizon programming also invite for decomposition and we present examples on tailored Benders decomposition and Lagrangean decompositions. We show that it is possible to solve problems with more than a billion variables and hundreds of millions of constraints, in practical applications.

References

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