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A Thorough Validation Framework for Electricity Market Models used in Policy Assessment

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Extended Abstract

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Abstract Summary

Governments worldwide have set goals to achieve net-zero emissions to limit climate change. Electricity plays a crucial role in this transition, because many processes currently consuming fossil fuels are expected to electrify, or can be replaced by technologies using fuels produced from electricity. For this reason, many governments are designing and implementing policies to stimulate the production of renewable electricity and electrification.

Electricity market models are an important tool for assessing the functioning of (future) electricity markets, and for designing such energy system policies. However, models may suffer from shortcomings derived from their implementation or their input data. Indeed, their mathematical nature is generally complex, and input data and assumptions have a large impact on outcomes. It is therefore important that electricity market models' functioning is validated as their output forms the basis for policies affecting many people and costing large sums of money.

However, there currently exists no consensus on how such validation efforts should be designed. Here, we propose that an adequate validation of an electricity market model should constitute three classes of accuracy measures: one representing overall (average) accuracy, one reflecting the agreement between distributions, and one exploring concurrency of trends and peaks. Many modeling studies only consider the first type of accuracy measures, while considering the other two becomes increasingly important in an electricity market rapidly decarbonizing through investments in variable renewable energy sources. Hence, by calculating different accuracy measures for distinct types of modeling results (prices, generation mix, imports, and exports), researchers can assess which model outcomes are fit-for-use in policy assessments.

Presenting Author Biography

After completing his PhD on validating large-scale brain models at Forschungszentrum Jülich, dr. Justin Domhof started his career in energy research at the Energy Statistics department of Statistics Netherlands, where he contributed to an energy balancing model. Afterwards, he went to work at PBL, where he currently studies electricity market models. He investigates how models can be constructed flexibly, so that they may be easily adjusted for use in studies assessing the impact of various policies. In his research, he uses his experience in model validation, so that the forthcoming models can indeed be used to answer specific policy questions.