Power Systems Engineering Research Center

Simulation Modeling of Power Plant Emission Regulations: Why a Detailed Economic-Engineering-Environmental Model is Needed

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PSERC Public Webinar
Tuesday, March 4, 2014
2:00-3:00 p.m. Eastern Time (11:00-12:00 p.m. Pacific)

Description: The consequences of environmental and energy policies in the U.S. can be severely constrained by physical limits of the electric power grid. Because of the complexity of power grid operation, computing limitations have until very recently made it impossible to solve a policy analysis or planning model that combines realistic modeling of flows with a detailed transmission system model and the prediction of generator investment and retirement. We construct and solve a model of the eastern US and Canada that combines these characteristics. Then, because a smaller model might be for some additional purposes, we explore the effects of transmission model simplification on the accuracy of simulation results. To evaluate the amount of detail necessary, we simulate the short- and long-term effects of imposing a price on the carbon dioxide emissions from the power plants in nine northeastern US states, as the Regional Greenhouse Gas Initiative does. We consider three grid models that simplify the actual 62,000-node system to varying degrees. Our 5000-node model matches the 62,000-node model very closely. We use it as the basis for evaluating the more simplified models: a 300-node model and a model with just one node, i.e. no transmission constraints. With each of the three models, we predict the carbon dioxide emission impacts, electricity price impacts, and generator entry and exit impacts of the emission price, over the next 20 years. We find that most of the impact predictions produced by the 300- and one-node models differ from those of the 5000-node model by more than 20%, and some by much more.

This research is one of the PSERC projects coordinated by the Consortium for Electric Reliability Technology Solutions (CERTS) with funding provided by the U.S. DOE.

Registration for Webinar Participation: None required. There is no charge for participating!

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PSERC's Webinar Coordinator: Venkataramana Ajjarapu, Iowa State University, vajjarap@iastate.edu.

Professor Ajjarapu welcomes feedback on the webinars and suggestions for future ones.