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Comparison of Actual and Modeled Power Flows for the Eastern U.S.

Computational models are used for a variety of purposes in the electricity industry, including infrastructure planning. These models, necessarily, incorporate certain structural simplifications. For example, electricity flows over the system may be represented using transportation or DC power flow approximations. Models may only represent a few representative hour types over a year. Simplifications of this type in these models are generally necessary and, for many purposes desirable, but only if they are appropriate and maintain key features of the system characteristics and performance.

The purpose of this analysis is to quantify similarities and differences in modeled and actual transmission usage data, and to explore the reasons for them. Modeled data comes from the Eastern Interconnection Planning Collaborative resource expansion analysis, which divided the eastern interconnection into 26 regions connected through transmission paths represented as a transportation network, using a linear programming model. Actual flow data was organized along the same regional footprints and transmission linkages. Both modeled and actual data represent the year 2010.

Specifically, we are examining implications of two simplifications that were made in the resource expansion model: the first is that loop flow was not represented in the planning model; the second is that the entire year was represented by 20 load blocks. The impact of the first – transmission – simplification is explored by comparing modeled and actual flows on connections between regions, into each region, and over cut planes in the system. The impact of the second – temporal – simplification is examined by looking at the volatility of actual hourly flows sorted by modeled load blocks. Our analysis aims to characterize the implications of these simplifications on resulting modeled power flows vis a vis actual flows, specifically in the context of the planning questions the model was being used to explore.