Workshop on the Next Generation of Transmission Planning Models

Commission staff will convene workshop on the next generation of transmission planning models on March 20, 2012 at FERC Headquarters in room 3M-2.

Topics of Discussion

The workshop will consist of presentations and discussions on improvements to planning models and computational performance to increase economic efficiency of planning. Material discussed will be technical in nature, focusing on mathematical formulations and computational requirements. The workshop will discuss the challenges involved in transmission planning, specifically

- What challenges arise from software limitations?
- What challenges arise from data limitations?

Agenda

9:00 – 9:15 a.m. **Welcome and Introduction to the Workshop**

9:15 – 9:45 a.m. **Department of Energy Grid Modeling Initiative**

Jay Caspary, Sr. Policy Advisor, Department of Energy, Office of Electricity Delivery and Energy Reliability

The Department of Energy's Office of Electricity Delivery and Energy Reliability (OE) has a major effort underway now in terms of grid modeling. this presentation will describe the outreach and research results to date in his preparation of a white paper on grid analytics, framing DOE's strengths/weaknesses, addressing gaps and making recommendations on DOE's efforts regarding tools/skills, leveraging capabilities of the national labs and other agencies, e.g., FERC, DOD. to provide long term value in support of national needs. In his remarks, Jay will also discuss a $10 million funding request for FY13 to support advanced modeling grid research in OE. Data is a critical success factor for future grid modeling efforts not only at DOE, but throughout industry. The lack of understanding and transparency regarding existing assets are impediments to collaborative, coordinated and cost effective system planning and operations. Getting consensus on data and metrics is paramount to address the challenges of system expansion while leveraging the opportunities associated with replacement and rightsizing, where appropriate, of aging infrastructure in existing corridors.

9:45 – 10:00 a.m. **Discussion**

10:00 – 10:30 a.m. **Next Generation of Transmission Planning Models at New York Independent System Operator**

Henry Chao, New York Independent System Operator

Henry Chao will give a presentation on the evolution of planning models, high computing capability, centralized database management systems and IPSAC Activities in the effort of centralizing and coordination of data models.

10:30 – 10:45 a.m. Discussion
10:45 – 11:15 a.m. Integrated Transmission Planning Process
Charles Cates, SPP
11:15 – 11:30 a.m. Discussion
11:30 – 12:30 p.m. Lunch Break
12:30 – 1:00 p.m. Production Simulation and Weather Modeling with High Performance Computing
Thomas Edmunds, Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory and collaborators are conducting optimization algorithm research to explore the benefits of deploying production simulation codes on high performance computing platforms. Current projects include experiments with an aggregated planning model used by the California Independent System Operator to evaluate the impacts of the mandated 33% RPS. Monte Carlo simulation of the model and efforts to couple the production simulation model with a high resolution weather model are described. Other research efforts with Lagrangian relaxation and branching strategies for solution of large scale MIPS, and semidefinite programming for the solution of AC optimal power flow problems will also be discussed.

1:15 – 1:30 p.m. Discussion
1:30 – 2:00 p.m. Flexible Modeling of Transmission Systems
Bruce Tsuchida, Computing Research Association/Charles River Associate

Mr. Tsuchida will address current planning software and the flexibility of modeling topology changes. Topology changes may occur because of planned or unplanned line outages, and operator decisions, such as opening a lower rated line that is overloaded. Because planning models do not take into account transmission topology changes beyond n-1 type security constraints, a gap exists between planning and actual operations, when these topology changes do occur. Moreover, many of the market engines utilized today will account for planned transmission outages but not unplanned outages. The update to incorporate the unplanned outage currently requires an anticipated 15 to 20 minutes and therefore a market that clears every five minutes could result in a dispatch and market clearing based on the wrong topology for a few periods. Finally, several parties have proposed that structured transmission topology change will lead to significant economic benefits if done properly. The flexibility to model topology changes will be essential for these proposals as well.

2:00 – 2:15 p.m. Discussion
2:15 – 2:45 p.m. Probabilistic Modeling to Support Planning and Operational Decisions in the Power Industry
Alex Rudkevich, Newton Energy Group
Russ Philbrick, Polaris Systems Optimization

The presentation will address the challenges and opportunities of probabilistic modeling of major planning and operational decisions in the power industry. The primary focus of this presentation will be on problem formulation, basic properties and important economic and policy implications. Two applications will be highlighted: 1) a probabilistic approach to system expansion (e.g., resource adequacy problem) and 2) a probabilistic approach to procurement of operating reserves.

2:45 – 3:00 p.m. Discussion
3:00 – 3:30 p.m. Mapping Energy Futures: The SuperOPF Planning Tool

Ray Zimmerman, Richard Schuler, William Schulze, John Taber, Max Zhang, Jubo Yan, Charles Marquet, Kale Smith , Cornell
Dan Shawhan, Andy Kindle, RPI,
Dan Tylavsky and Di Shi, Arizona State University

Energy futures for the United States depend critically on the electric power system. Meeting goals of energy independence, as well as cleaner energy sources for industry, commercial, and residential uses, as well as transportation, depend on investment in the future power system. A planning tool that optimizes investment in generation is needed because the electric power industry faces the possibility of increased loads from plug-in hybrids, increased loads from other energy users trying to find cleaner sources of energy, renewable portfolio standards, and integration of a smart grid that allows for demand response. These challenges need to be met while maintaining reliability and with a $1000 bid cap for generators (in areas with markets) that defeats a free market solution for new investment in generation. Both reliability and investment require planning. This paper reports on an integrated engineering, economic and environmental modeling framework for the electric power system (the SuperOPF Planning Tool), developed with support from the Department of Energy CERTS program. The model maximizes the net expected benefits of electricity production, optimizes investment in new generation, and includes environmental and other regulations and impacts. This paper, presents the results of the first stress testing of the SuperOPF Planning Tool using a reduced network model of the Northeast for a number of policies: a base case, with no new environmental legislation; enactment of the Kerry-Lieberman CO2 allowance proposal in 2012; following Fukishima, retirement of all US nuclear plants by 2022 with and without Kerry-Lieberman; marginal damages from SO2 and NOX emissions charged to coal, gas and oil-fired generation; plug-in hybrid electric vehicle load filling; wind incentives in place; and two cases which combine these. The cases suggest that alternative policies may have very different outcomes in terms of electricity prices, emissions, and health outcomes. In all cases, however, new natural gas combined cycle plants are the dominant technology for future investment. Policies can change how much new generation is built, whether other types of plants are built, or what types of plants are retired. We are in the process of completing a detailed model for the Eastern Interconnection using a 4,400 node reduced network that retains all high voltage lines. Our research shows that this level of network detail is required since future investment in generation is driven in great part by line flow capacities. We plan to extend the model to the entire nation in the coming year.

Future Directions