

Mapping Energy Futures: The SuperOPF Planning Tool

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1. Project objective: Given that the electric power system is central to the US energy future, the project objective is to develop an open source planning tool that can demonstrate the impact of various policies and regulations on electricity prices, emissions, fuel use, renewable energy use, etc. This tool currently optimizes investment in generation and uses a model of the US electricity network that includes all high voltage lines.
2. Major technical accomplishments that have been completed this year: The model has been successfully run for both the Eastern Interconnection and ERCOT to examine the impact of high and low future natural gas prices and with and without the proposed 1000 pound CO₂ per MW-h limit for new fossil fuel power plants. A complete set of runs for 2012, 2022, and 2032 takes around 16 hours.
3. Deliverables and schedule for activity: Additional runs will add a detailed reduction for WECC and examine the cross state air pollution rule as well as the impact of existing subsidies for nuclear, solar and wind that may expire. Runs will also be conducted that optimize generation and investment where each generator is charged for marginal environmental damages. Papers describing these scenarios will be written and submitted for publication. We will also begin to incorporate contingencies into the analysis rather than prescribe a predetermined reserve margin.
4. The addition of contingencies will greatly increase solution times and the ability to develop representative contingencies that drive optimal investment is an open question.
5. The major new proposed direction is optimization of the capacity of selected lines. This changes the problem from a piecewise continuous linear program to a quadratically constrained mixed integer programming problem. We believe that it will be possible to optimize the capacity of specific projects such as the proposed new line tying Hydro Quebec to NYC to back up wind and examine its benefits to the system.