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Methodological Lessons for Participatory Modeling: Simulating Energy Storage for the Ontario Power System

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Abstract: This paper focuses on the participatory modeling process in a study of compressed air energy storage for the power system in Ontario, Canada. The process began with discussions with the developer's team, followed by meetings with power systems managers and staff. The participating stakeholders grew in number, eventually represented generating companies, the system operator, regulators, energy ministry staff and advocates for utility customers and for the environment. Most of the stakeholders were accustomed to computer modeling, as the agencies use dozens of highly detailed models. But they were not accustomed to the system dynamics approach to tie the pieces of system together, nor were they accustomed to the participatory discussions which were enabled by the speed and clarity of the simulations. The key to speed was the use of separate, but interconnected models for short-term operations along side the model of long-term trends. The key to clarity was an interface designed for (1) clear displays of results in familiar formats and (2) convenient input controls and navigation to allow instant responses to suggestions. The stakeholders had many suggestions. Their improvements were quickly implemented, with new meetings following shortly thereafter. The modeling process led to increased understanding for both groups: the development team gained a better understanding of the power system, and the agency participants gained new understanding of the value of compressed air energy storage. They also learned the best strategy to sustain Ontario's success in limiting CO₂ emissions. The presentation concludes with live demonstrations of the methods used to achieve speed and clarity in the simulations.

Keywords: participatory modeling; system dynamics; electric power