B.F. Hobbs, J. Ho, E. Spyrous, P. Donohoo, Q. Xu, J. Ouyang, R. Johnson, and O. Ozdemir, 'Which Oversimplification is the Worst Sin? Lessons from Large Scale Transmission Planning for Renewables Using Optimization in the Eastern and Western Interconnections of the US', wholeSEM Annual Conference 2015: Hybrid Energy Modelling – Linkages and Interdisciplinarity, 2nd Annual Conference, July 6-7, 2015

ABSTRACT

Uncertainties in market fundamentals profoundly impact the economic value of transmission for accessing inexpensive resources, diversifying supply sources, and enhancing competition. Long planning and construction times mean that commitments to reinforce the high voltage power network are made long before the uncertainties are resolved, meaning that there is a risk of building the wrong type of facility in the wrong place at the wrong time. Over the last year, the ECN market model COMPETES [1] and the two-stage stochastic programming planning model JHSMINE (based upon van der Weijde and Hobbs [2] and Munoz et al. [3]) have been subjected to large scale tests in the Eastern and Western Interconnections of North America [4] and Europe. These models are co-optimization models that anticipate how generation siting and operations responds to network expansions. Stochastic models can assess how alternative investments add, or subtract, from the network's ability to adapt to changing technology, policy, and fuel prices. We assess the insights that can be gained from using stochastic programming on a continental scale. Sensitivity analyses assess the planning and economic impacts of simplifying assumptions such as the number and types of scenarios, the use of DC linearization versus transportation models, inclusion of nonlinearities resulting from demand response and resistance losses, and the representation of thermal generator inflexibility (including start-up, ramp, and minimum output constraints).

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[4] R. Johnson, A. Baechert, S. Koppolu, E. Spyrou, J. Ho, B.F. Hobbs, J. McCalley, A.Figueroa, and S. Lemos-Cano, *Co-optimization of Transmission and Other Resources Study*, National Association of Regulatory Utility Commissioners, Jan. 2015, www.naruc.org/Grants/Documents/NARUC-EISPC%20Co-Optimization%20Final.pdf