



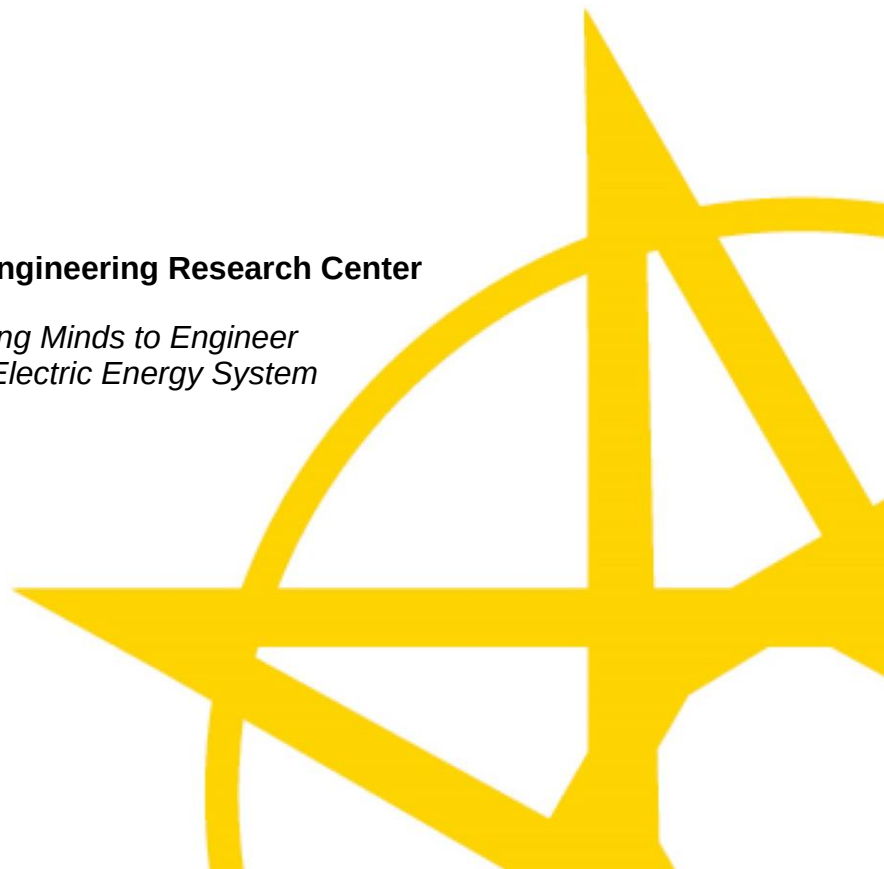
Development of Expansion Planning Methods and Tools for Handling Uncertainty

Final Project Report

M-37

Power Systems Engineering Research Center

*Empowering Minds to Engineer
the Future Electric Energy System*



Development of Expansion Planning Methods and Tools for Handling Uncertainty

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Power Systems Engineering Research Center

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Executive Summary

Reliable transmission expansion planning is critical to power systems development. To make reliable and sustainable transmission expansion plans, numerous sources of uncertainty including demand, generation capacity, and fuel cost must be taken into consideration in both spatial and temporal dimensions. This paper presents a new approach to selecting a small number of high-quality scenarios for transmission expansion. The Kantorovich distance of social welfare distributions was used to assess the quality of the selected scenarios. A case study was conducted on a power system model that represents the US Eastern and Western Interconnections, and ten high-quality scenarios out of a total of one million were selected for two transmission plans. Results suggested that scenarios selected using the proposed algorithm were able to provide a much more accurate estimation of the value of transmission plans than other scenario selection algorithms in the literature.

Project Publications:

- [1] Faezeh Akhavizadegan, Lizhi Wang, and James McCalley, “Scenario Selection for Iterative Stochastic Transmission Expansion Planning”, *Energies* 2020, 13, 1203.