

## **An Enhanced Benders Decomposition Approach for Large-scale Transmission Planning Under Market and Regulatory Risk**

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There is a growing need for tools to help decision makers to proactively plan for transmission infrastructure to accommodate renewables under gross market and regulatory uncertainties. We describe a two-stage stochastic transmission planning approach that considers transmission lumpiness, generators' response, and Kirchhoff Voltage Law. For networks that extend over wide areas, we discuss the implementation and performance of Benders decomposition as an alternative approach to accurately represent the variability of demand and intermittent resources. We find that the convergence of the traditional decomposition algorithm can be significantly improved by including a reduced representation of the operations (i.e. sub-problems) into the investment problem (i.e. master problem). Finally, we discuss the possibility of combining Benders with Lagrangian Relaxation/Progressive Hedging decomposition methods for planning problems with multiple scenarios.