

Does risk aversion affect transmission and generation planning? A Western North America case study

EPRG Working Paper 1621

Cambridge Working Paper in Economics 1647

Francisco D. Munoz, Adriaan Hendrik van der Weijde, Benjamin F. Hobbs and Jean-Paul Watson

Abstract: We investigate the effects of risk aversion on optimal transmission and generation expansion planning in a competitive and complete market. To do so, we formulate a stochastic model that minimizes a weighted average of expected transmission and generation costs and their conditional value at risk (CVaR). We show that the solution of this optimization problem is equivalent to the solution of a perfectly competitive risk-averse Stackelberg equilibrium, in which a risk-averse transmission planner maximizes welfare after which risk-averse generators maximize profits. This model is then applied to a 240-bus representation of the Western Electricity Coordinating Council, in which we examine the impact of risk aversion on levels and spatial patterns of generation and transmission investment. Although the impact of risk aversion remains small at an aggregate level, state-level impacts on generation and transmission investment can be significant, which emphasizes the importance of explicit consideration of risk aversion in planning models.

Keywords: risk aversion, stochastic programming, transmission planning, generation planning

JEL Classification: C61, D80, L94, Q40

Contact h.vanderweijde@ed.ac.uk
Publication August 2016
Financial Support n/a