The Impact of Carbon Cap and Trade Regulation on Congested Electricity Market Equilibrium

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Abstract Greenhouse gas regulation aimed at limiting the carbon emissions from the electric power industry will affect system operations and market outcomes. The impact and the efficacy of the regulatory policy depend on interactions of demand elasticity, transmission network, market structure, and strategic behavior of generators. This paper develops an equilibrium model of an oligopoly electricity market in conjunction with a cap-and-trade policy to study such interactions. We study their potential impacts on market and environmental outcomes which are demonstrated through a small network test case and a reduced WECC 225-bus model with a detailed representation of the California market. The results show that market structure and congestion can have a significant impact on the market performance and the environmental outcomes of the regulation while the interactions of such factors can lead to unintended consequences.

Keywords Power market modeling · Electric power markets · Cap-and-trade programs · Carbon dioxide emissions · Market power.

JEL Classification

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