Abstract

With the proposed Clean Power Plan for regulating carbon emissions from the power sector in the U.S, policymakers are likely to use a cost optimization framework to plan for future scenarios and implementation strategies. The modeling framework introduced in this paper would help such policymakers to make the appropriate investment decisions for the power sector. This paper applies an analytical model and an optimization model to investigate the implications of coimplementing an emission cap and a Renewable Portfolio Standards (RPS) policy for the U.S. Northeast. A simplified analytical model is specified and the first order optimality conditions are derived. The results from the analytical model are verified by running simulations using LP-CEM, a linear programming-based supply cost optimization model. The LP-CEM simulation results are analyzed under the recently proposed Clean Power Plan emissions cap rules and RPS scenarios for the U.S. Northeast region. The marginal abatement cost estimates, derived from a limited set of LP-CEM runs, are analyzed and compared to the theoretical results. For encouraging renewables generation, an RPS instrument is costeffective at higher policy targets, while an emissions cap instrument is cost-effective at lower policy targets. For CO2 emissions reduction, an emissions cap instrument is found be cost-effective for all policy targets. There is a trade-off between emissions levels and supply costs when the two instruments are co-implemented.

Citation

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