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Abstract: Minimizing the Cost of the PJM Electricity System

Large scale renewable energy systems are of particular policy and social interest, as they provide significant environmental and health benefits, despite additional costs in comparison to conventional energy sources. Previous studies have determined that there is enough resource potential, and that large scale renewable grid integration is plausible, at costs comparable to current electricity prices. One such study is Budischak et al. 2013, which cost minimized different electricity systems to cover a certain percent of generation, including 30%, 90% and 99.9% of hours. Though this project is based on the same model that was used in Budischak et al. 2013, this presentation will pose a different type of question: What is the least cost energy system to society, not constrained to meet a certain percentage of renewables? The model includes both the electricity system and light duty personal vehicles in the minimization. These two sectors comprise the majority of climate change emissions, and are connected by V2G storage. The presentation will include four different scenarios; the least cost systems exclusive of externalities, only including health externalities, two scenarios including both health and two levels of climate change externalities. The presentation will also include discussion of various cost and resource inputs to the model, as well as preliminary results. The preliminary results suggest several interesting points, including (1) that excluding externalities in energy policy decisions substantially changes the social optimal electricity generation mix, (2) monetizing health externalities are significant enough to incentivize substantial renewable energy, (3) even without inclusion of externalities, the socially optimal level of electric vehicles is incredibly high, and (4) without monetizing externalities, and even including the PTC, it is unlikely that any renewable energy will be built.