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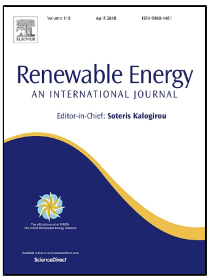

Exploring the impact of increased solar deployment levels on residential electricity bills in India

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Exploring the impact of increased solar deployment levels on residential electricity bills in India

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Abstract

In this study, the impact of increased solar penetration in the electricity generation mix on residential electricity consumer bills is explored. The study comprises of two sections: simulation of wholesale electricity rates and retail rate modeling. In the first stage, wholesale prices were modeled using a bottom-up long term unit commitment optimization model for different energy mix scenarios based on increased solar penetration, ranging from 5 to 40% on energy basis. The simulations indicated a fall in wholesale prices with increased solar penetration, a result of merit order effect. The simulated wholesale prices were then used to model retail rates for residential consumers. Four different types of retail rates were designed: flat rate, real time pricing, time of use and critical peak pricing. The impact of these retail rate mechanisms on electricity bills of residential consumers was analyzed and it was found that the bill savings achieved from time varying rates are greater than for time invariant rates. With increased solar penetration, customers with time varying rates are likely to benefit the most from electricity bill savings. Although consumers with flat rate gain bill savings with increased solar penetration, the savings are likely to be lower than with time-varying rates.

Keywords: Energy System Modelling, retail electricity rate design, Indian electricity market, grid integrated solar, Indian energy policy

Abbreviations:

AMI-Automated Metering Infrastructure

CAGR- Compound Annual Growth Rate

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