Renewable electric energy integration: Quantifying the value of design of markets for international transmission capacity

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Abstract-

Integrating large quantities of variable renewable electricity generation remains a political and operational challenge. One of the main obstacles in Europe to installing at least 200 GWs of power from variable renewable sources is how to deal with the insufficient network capacity and the congestion that will result from new flow patterns. We model the current methodology for controlling congestion at international borders and compare its results, under varying penetrations of wind power, with models that simulate an integrated European network using nodal/localised marginal pricing. The nodal pricing simulations illustrate that congestion and price patterns vary considerably between wind scenarios and within countries, and that a nodal price regime could make better use of existing network capacity, introducing substantial operational cost savings and reducing marginal power prices in the majority of European countries.

Index Terms- Congestion management; Power market design; Renewable power integration; Transmission economics

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