

Competition in Electricity Markets with Renewable Energy Sources

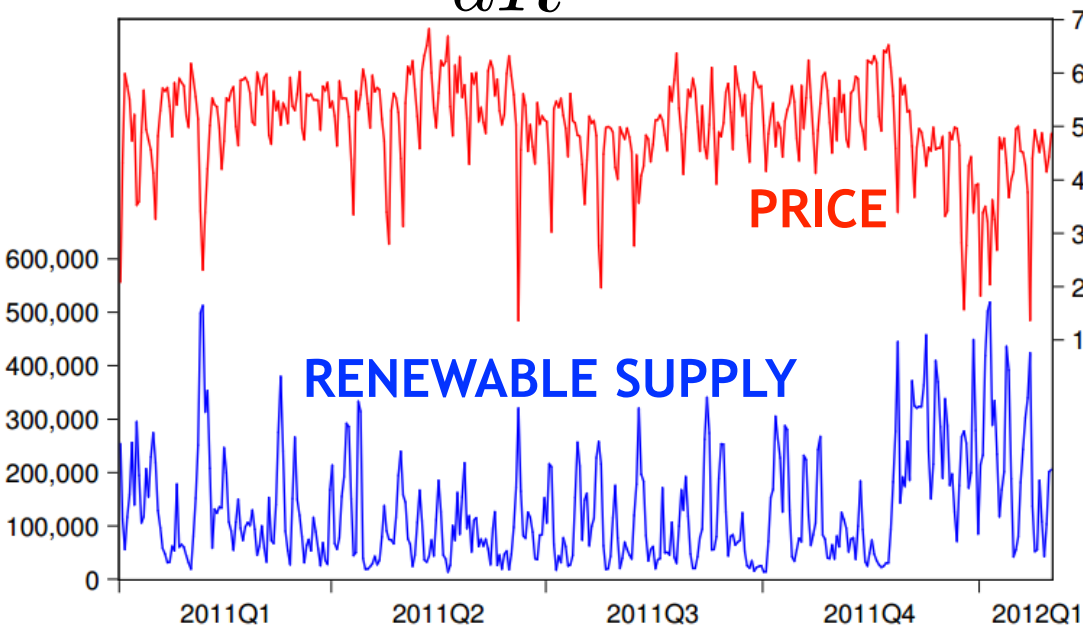
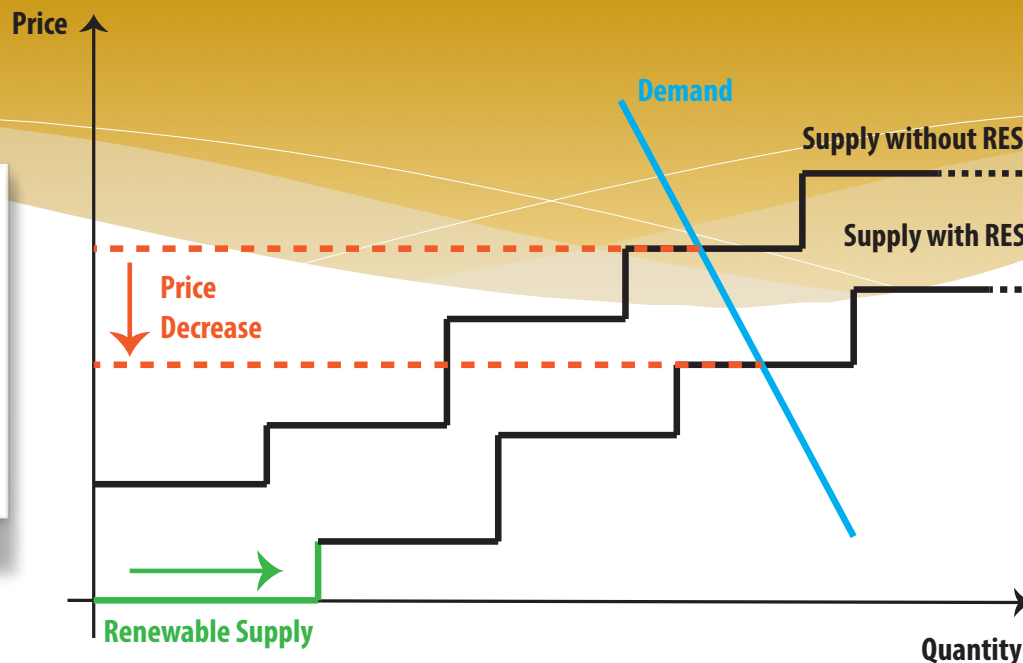
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Merit Order Effect: MOE describes the short term effect of adding large amount of renewable supply to a competitive market.

$$\text{MOE: } \frac{dp}{dR} < 0$$



Evidence: A strong negative correlation between prices (\$/MWh) in red and renewable output in blue (MWh) in Germany.

Our Contributions

- The key feature of our work is to study the *MOE when thermal producers have a diverse energy portfolio*. Diversification is natural (for example: Xcel and Alstom)
- **Result:** When thermal producers are diversified, the **merit order effect (MOE)** will be **reduced**.
- **Result:** Assume production cost (from thermal sources) is linear. Then, when diversification is full the **merit order effect (MOE)** is fully “**neutralized**” (this is not true for convex cost)

Full neutralization of MOE $\frac{dp}{dR} = 0$ \longleftrightarrow “Full” Diversification and “linear” cost

Robustness:

- A. **Result:** Full neutralization of the **merit order effect (MOE)** continues to hold **with forward contract**.
- B. **Result:** Full neutralization of the **merit order effect (MOE)** continues to hold **with (correlated) incomplete information**.
- **Result:** Price volatility **increases** when renewable plants are **far apart**.
- **Result:** Diversification can lead to an **increase** in the **welfare loss**.