

Review of:  
The Distributional and Environmental  
Effects of Time-Varying Prices in  
Competitive Electricity Markets

Prepared for  
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## Title:

The Distributional and Environmental Effects of Time-Varying Prices in Competitive Electricity Markets

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# Approach Highlights

- Evaluated 3 methods for reducing peak demand:
  - Primary focus was RTP
  - Also analyzed flat rates that vary monthly and TOU
- Analysis used PJM price & load data for Apr 1998 – Mar 2000
- Created dispatch curve based on published power plant performance for 392 fossil units
  - Used actual fuel cost for NG and oil, a fixed price for coal price, SO<sub>2</sub> and NO<sub>x</sub> permit costs
  - Assumed nuclear and hydro power are inelastic and hence do not vary between scenarios
- Demand elasticity = 0.1 and initial average price = \$79/MWh
- Demand equals load reported by PJM: 29,400 MW ave / 17,461 MW min / 51,714 MW max
- Wholesale electricity prices ranged from slightly negative to the price cap of \$999 (+\$40 T&D)

# Key Findings/Conclusions

- Adoption of RTP by one-third of customers yielded savings for all customers:
  - On July 23, 1999, peak price drops from \$999 cap to \$164
  - Peak demand drops 1.4% and min load increases 0.8%
  - Average annual price paid by non-adopters drops slightly (<0.1%)
- Free riders receive 90% of benefits at no cost
- Putting all customers on a flat rates that vary monthly or on TOU provide peak reduction & price benefits comparable to putting one-third of customers on RTP
  - These comparison are relative to an annual flat rate
- Generator profits drop substantially with RTP – 3% for coal, 26% for NG, and 47% for oil when one-third switch to RTP

# Key Findings/Conclusions (continued)

- RTP yields an increase in SO<sub>2</sub> and NO<sub>x</sub> but a decrease in CO<sub>2</sub> emissions
- Putting one-third of customers on RTP:
  - Increases coal generation by 0.4%
  - Decreases NG generation by 0.9%
  - Decreases oil generation by 3.0%
- Sensitivity analysis showed basic trends were consistent across the ranges evaluated
  - Varied demand elasticity, base demand level, import elasticity; also considered random generator outages
  - Increasing demand elasticity yields stronger price & load effects from RTP adoption

# Recommended Message to Steering Committee

- While additional work is needed to refine the quantitative estimates, the study clearly shows that reducing peak demand provides financial benefits to all customers
- Free riders receive 90% of the benefits that participants receive
  - Net benefits to participants are relatively low which discourages participation
  - Some type of incentive needed to increase participation
- Lowering peak demand provides significant environmental and economic benefits
  - Reduces use of dirtiest, least-efficient oil and natural gas generators – which reduces consumption of these critical fuels
  - Defers need for generation and T&D capacity