The Marginal Effects of the Price for Carbon Dioxide on Rate Design

Presented at:
2nd FESC Summit
Orlando, Florida
September 28, 2010

Ted Kury
Director of Energy Studies
Public Utility Research Center
University of Florida
Public Utility Research Center

Research
Expanding the body of knowledge in public utility regulation, market reform, and infrastructure operations (e.g. benchmarking studies of Peru, Uganda, Brazil and Central America)

Education
Teaching the principles and practices that support effective utility policy and regulation (e.g. PURC/World Bank International Training Program on Utility Regulation and Strategy offered each January and June)

Service
Engaging in outreach activities that provide ongoing professional development and promote improved regulatory policy and infrastructure management (e.g. in-country training and university collaborations)
The Body of Knowledge on Infrastructure Regulation

Visit the new Body of Knowledge on Infrastructure Regulation Web site
www.regulationbodyofknowledge.org
Find fresh content, new references, more powerful search engines, revised self-testing and more!

Regulatory Challenges (FAQ)
Introduction
Overview
Foundations of Regulation
Market Structure
Financial Analysis
Price Level Regulation
Tariff Design
Quality, Social, Environmental
Regulatory Process

NEW!

Public Utility Research Center
UNIVERSITY of FLORIDA
“Leadership in Infrastructure Policy”

www.purc.ufl.edu
Acknowledgements

This presentation is based on material from my papers with Julie Harrington of the Florida State University and Hethie Parmesano of NERA.
Summary

- Modeling the effects of CO$_2$ pricing
- Marginal effects of CO$_2$ pricing on electric generation emissions, costs, and cost structure
Economic Dispatch Model

• Transparent framework and logic
• Quantify the balance between level of the carbon cap and the shadow (or market) price of carbon
• Quantify the impact of RPS, energy efficiency, carbon offsets, and generation additions
• Supply stack dispatch methodology
  – State-wide scope
  – Monthly resolution of hourly load
  – Individual generating units (over 500 in FL, AL, GA)
  – Key operating characteristics for each unit
  – Ability to shape load for growth or DSM
Marginal Effects of CO₂ Price

[3D graph showing the marginal effects of CO₂ price on millions of tons of CO₂ from 2011 to 2021, with CO₂ price per ton on the y-axis.]
Economic Benefits of Shifting Load

• Many technologies rely on the difference between on peak pricing and off peak pricing to derive economic benefit
  – Appliances that can delay their operating time
  – PHEVs that function as load or storage during the day and charge at night

• Because emissions prices affect certain types of generation more than others, emissions prices can alter this relationship
2011 Marginal Cost Duration Curves

$/MWh

$0/Ton  $60/Ton  $100/ton
July Peak/Off Peak Peak Differential
January Peak/Off Peak Peak Differential
Peak Differentials

• Emissions prices may tend to flatten out marginal cost duration curves
• The presence of peak differentials drives the economic benefits of technology that shifts load from one period to another
• The effect of emissions prices may be to decrease this differential, and thus decrease the economic benefit of these technologies
• Regardless, the behavior of these differentials will change over time and across emissions prices
Conclusions

• Marginal effects of CO$_2$ pricing are dynamic
  – Vary across years
  – Vary depending on price
  – Vary depending on generation mix

• CO$_2$ pricing can alter the relationship between on peak and off peak pricing and thus the economic benefits of technology that exploits this relationship

• Modeling needs to address these marginal effects
References


Contact Information

• Ted Kury
  
  ted.kury@cba.ufl.edu