



The Marginal Effects of the Price for Carbon Dioxide: Quantifying the Effects on the Market for Electric Generation in Florida

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Constrained World

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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



Center for Economic Forecasting and Analysis

- **CEFA Mission**

The FSU Center for Economic Forecasting and Analysis (CEFA) specializes in conducting economic research and performing economic analyses to examine public policy issues across a spectrum of research areas. CEFA provides advanced research and training in the areas of energy, aerospace, and environmental economics, and economic development, among other areas. FSU CEFA also serves as a foundation for training students on applied economics, using modeling software and other econometric and statistical tools.

- **Key Areas of Expertise:**

- Sustainable Energy
- High Tech Economic Research
- Environmental/Natural Resources
- Economic Development
- Economics
- Economic Impact Analysis
- Econometrics





Acknowledgement

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Cap and Trade in the U.S.

- Governor Crist proposed reduction targets for Florida in 2007 Executive Order
- Regional Greenhouse gas Initiative (RGGI) began auctioning permits in September of 2008. Compliance began in January 2009.
- Chicago Climate Exchange is a voluntary GHG market with reduction standards and marketable credits
- Waxman-Markey Bill proposed the framework for a nationwide cap and trade program for CO₂
- Kerry-Boxer Bill refined the framework



Cap and Trade Emissions Targets

Florida Executive Order		ACESA		CEJAPA	
Year	Emissions Level	Year	Emissions Level	Year	Emissions Level
2012	2005 (100% of 2005)	2012	90% of 2005	2012	97% of 2005
2017	2000 (~95% of 2005)	2020	83% of 2005	2020	80% of 2005
2025	1990 (~70% of 2005)	2030	58% of 2005	2030	58% of 2005
2050	20% of 1990 (~14% of 2005)	2050	17% of 2005	2050	17% of 2005



Cap and Trade Analysis in Florida

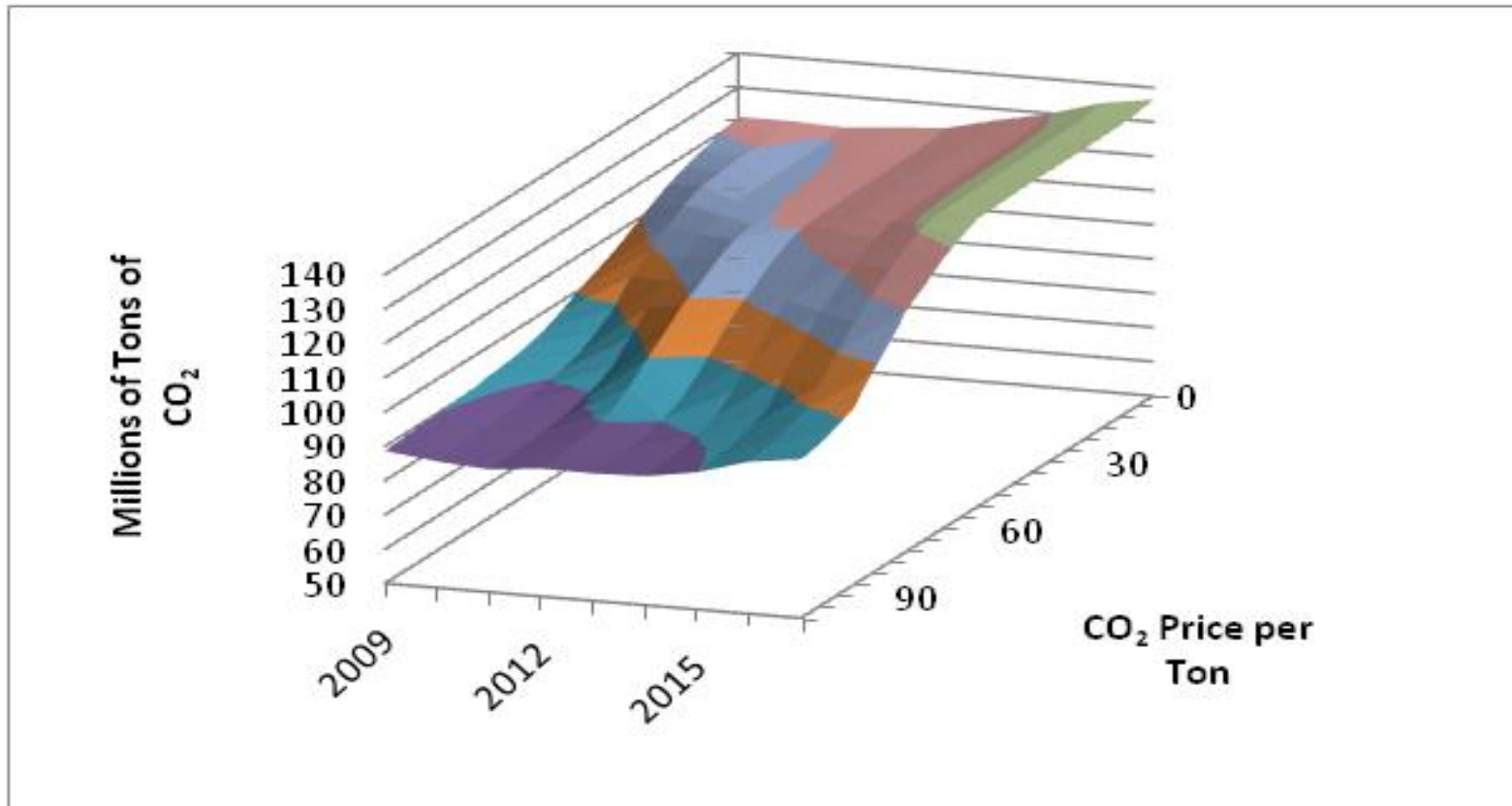
- Project for the Department of Environmental Protection under Florida's Energy Systems Consortium
 - Julie Harrington, FSU
 - Ted Kury, UF
- Quantification of the impact of meeting emissions goals in Executive Order
- Provisions of state cap and trade program
- Initial impact on electric generation, with expansion of scope to other sectors



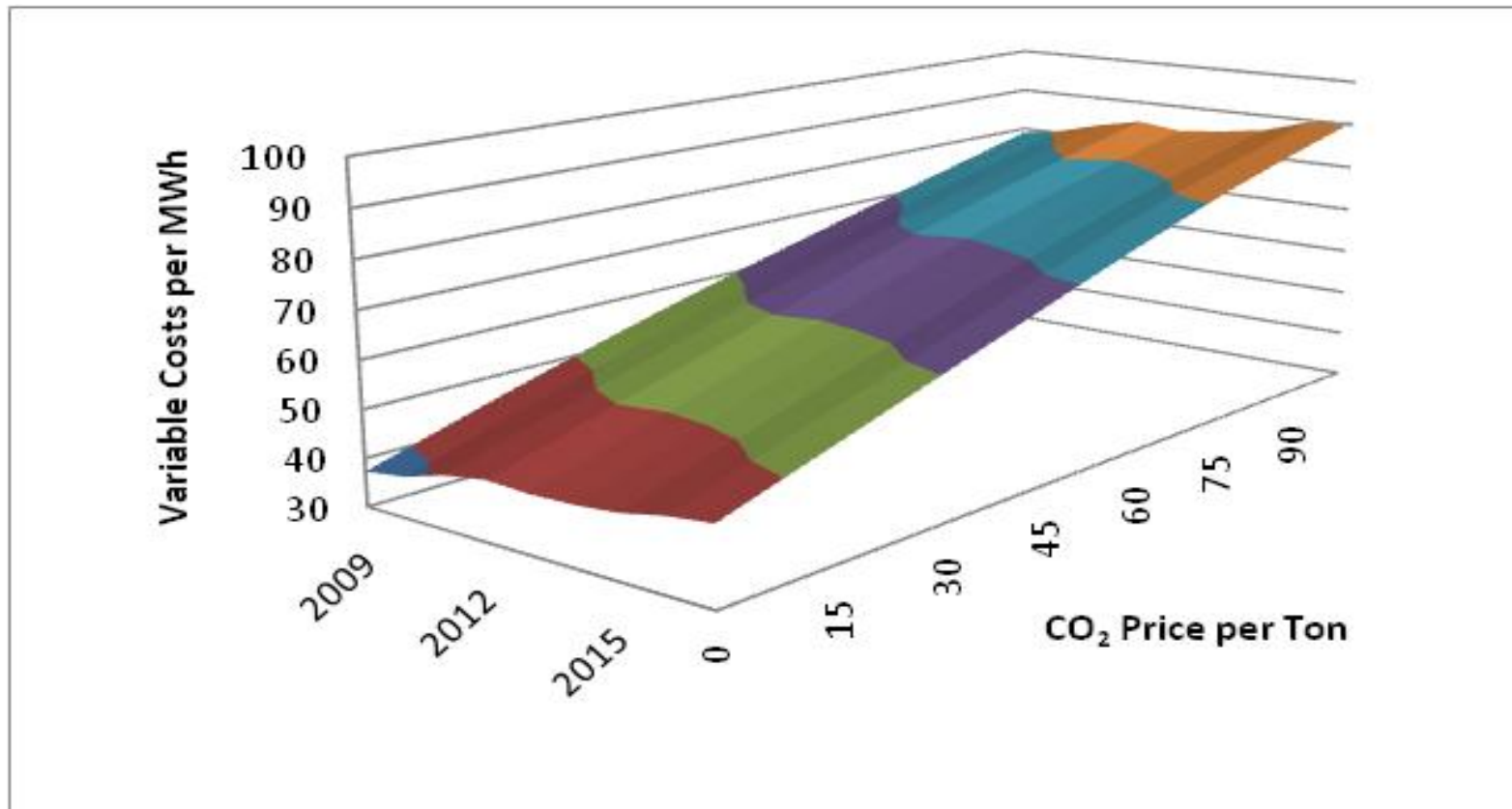
Economic Dispatch Model

- 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

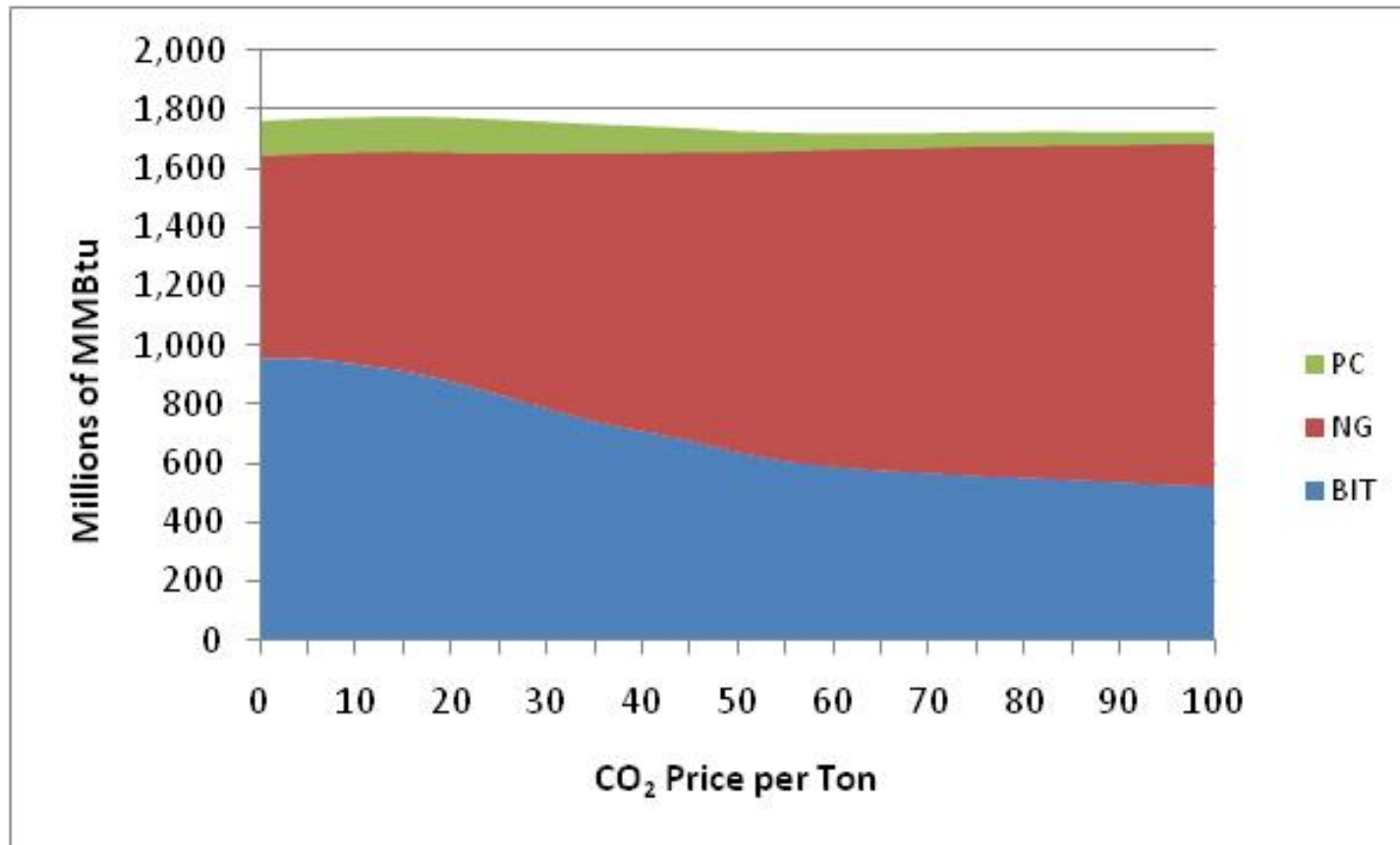
Marginal Effects of CO₂ Price



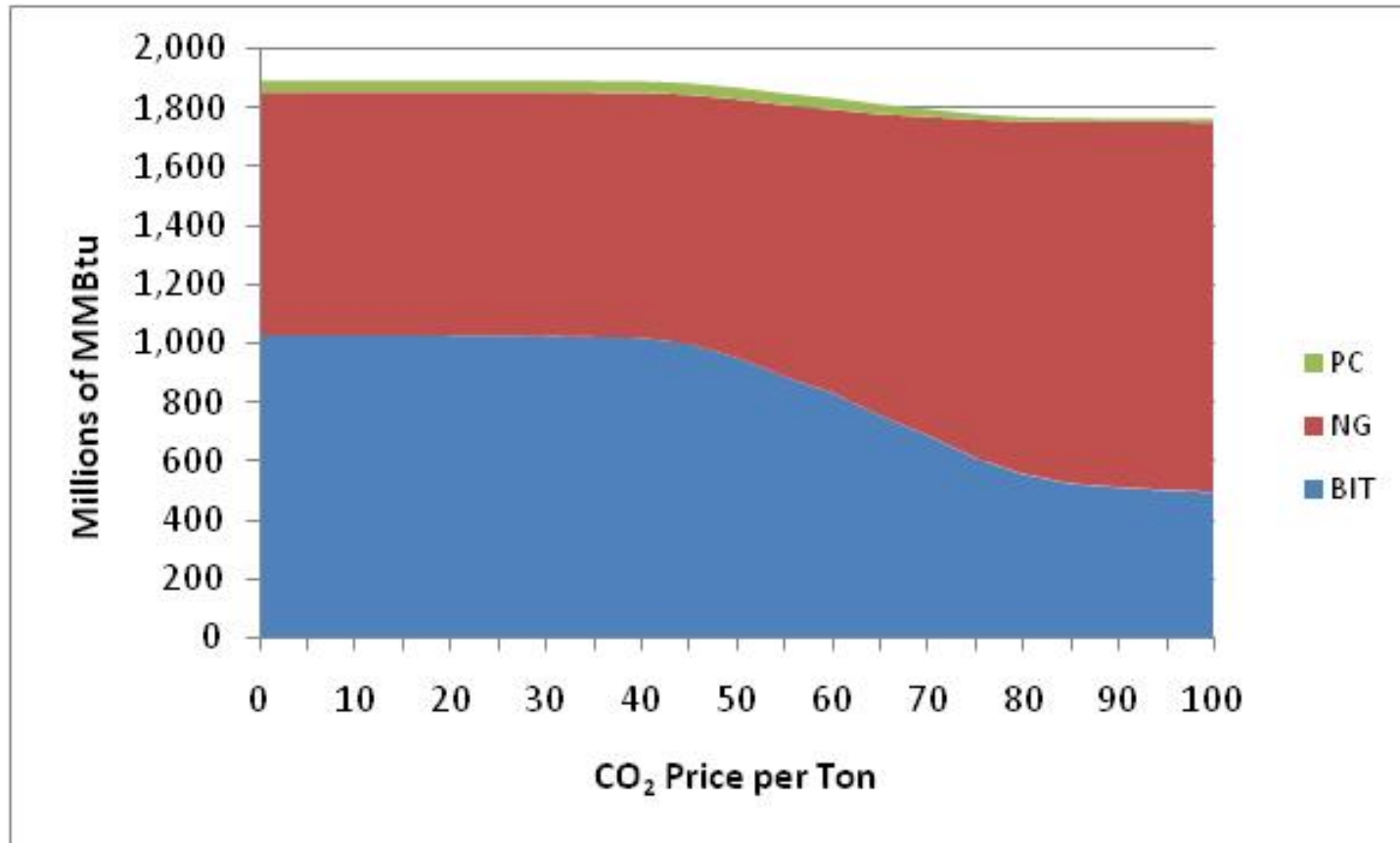
CO₂ Price and Energy Costs



2009 Fuel Mix



2012 Fuel Mix





Next Steps

- Scenarios for future policy and market uncertainties
 - Fuel prices
 - Load growth
 - Generation restrictions
- Statewide macro-economic modeling of scenario results and policy variables
- Report of results to state



Conclusions

- Still much uncertainty surrounding climate and energy legislation
- Marginal effects of CO₂ pricing are dynamic
 - Vary across years
 - Vary depending on price
 - Vary depending on generation mix
- Modeling needs to address these marginal effects



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