

**Advanced Workshop in Regulation and Competition**

# **31st Annual Eastern Conference**

**Shawnee Inn & Golf Resort, Shawnee on Delaware, Pennsylvania, May 16-18, 2012**

The Conference features some of the latest developments in the telecommunications and energy sectors, including:

- Policy and Regulatory Issues
- Postal and Telecommunications
- Market Structure & RTOs
- Performance & Reliability
- Demand Response

Who should attend:

- Industry Economists, Attorneys and Consultants
- Marketing and Regulatory Managers
- Regulatory Commission Staff

Dinner Speakers: David C. Williams, Inspector General, USPS-OIG & Mary Anne Gibbons, General Counsel and Executive VP, USPS

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## WEDNESDAY, MAY 16, 2012

- 3:00 - 6:00 Registration *Waring Room*
- 4:00 - 6:00 Welcome to Conference: Michael A. Crew *Waring Room*  
**James Reitzes, Brendan McVeigh, Nicholas Powers & Samuel Moy:** Competitive Effects of Exchanges or Sales of Airport Landing Slots  
**Marc Ivaldi, Daniel Coublucq & Gerard McCullough:** The Static-Dynamic Efficiency Tradeoff in the US Rail Freight Industry: Impact for Open Access Policy  
**Todd Schatzki & Paul Hibbard:** Reliability and Resource Performance
- 6:00 - 7:00 Cocktail Hour *Worthington Ballroom*
- 7:00 - 9:00 Dinner & Keynote Speech: **David C. Williams, Inspector General, USPS-OIG** *Worthington Ballroom*

## THURSDAY, MAY 17, 2012

- 8:00 - 9:40 **Concurrent Sessions**
- |  |                     |  |                    |
|--|---------------------|--|--------------------|
| <b>MARKET ADAPTATION</b><br>Chair: Ann M. Daley<br>Discussants: Larry Buc<br><b>JP Klingenberg, Lyudmila Bzhilyanskaya &amp; Michael Ravnitzky:</b> Optimization of the United States Postal Retail Network by Applying GIS and Econometric Tools<br><b>Matthew Stirling, Steven Baumert &amp; Jeffrey Colvin:</b> Toward an Optimal Delivery Network for a New Retail World<br><b>Toufic M. El Masri:</b> Firm Survival and Competition in the Postal Sector: Empirical Evidence from Germany | <i>Payette Room</i> | <b>ENVIRONMENTAL</b><br>Chair: Mark Freise<br>Discussants: Parviz Alivand & David Lamont<br><b>Robert Stoddard, Richard Tabors &amp; Scott Englander:</b> The Confluence of Utility Regulation: Water, Electricity and Natural Gas<br><b>Dipti Ranjan Mahapatra &amp; Ravindra Dholakia:</b> Natural Gas Pricing in India – An Economic and Marginalist Analysis<br><b>Robert H. Patrick, Janie Chermak &amp; James Crafton:</b> Shale Gas, Competition and Regulation | <i>Waring Room</i> |
|--|---------------------|--|--------------------|
- 9:40 - 10:00 Coffee Break
- 10:00 - 11:55 **Concurrent Sessions**
- |   |                     |   |                    |
|---|---------------------|---|--------------------|
| <b>FUTURE USPS</b><br>Chair: Emil Dzuray<br>Discussants: Edward Pearsall & Mohammad Adra<br><b>Michael A. Crew, Richard R. Geddes and Paul R. Kleindorfer:</b> Privatization of Postal Service: Providing a Role of POs in the Communications Revolution<br><b>Kelly Eakin &amp; Michael M. Kubayanda:</b> Parallel Tracks? Lessons Learned from Railroad Industry Restructuring and Their Applicability to the U.S. Postal Service<br><b>Robert A. F. Reisner:</b> Adapting Postal Practice to the Changing Marketplace: Prospects for a Postal Chief Innovation Officer | <i>Payette Room</i> | <b>WHOLESALE</b><br>Chair: Alan E. Finder<br>Discussants: Todd Schatzki & Wesley Allen<br><b>Hung-po Chao and Mario DePillis:</b> Economic Evaluation of Baseline Design for Demand Response Policy in Wholesale Markets<br><b>Howard J. Haas:</b> Up to Congestion Bids: A Discussion of Spread Offers in the PJM Energy Markets<br><b>Mark J. Niefer:</b> Information and Competition in Wholesale Power Markets: A Survey of the Policy Issues | <i>Waring Room</i> |
|---|---------------------|---|--------------------|
- 11:55 - 1:00 Lunch *Worthington Ballroom*
- 1:00 - 2:30 **Concurrent Sessions**
- |   |                     |  |                    |
|---|---------------------|--|--------------------|
| <b>DEMAND/PRICING</b><br>Chair: Robert Sidman<br>Discussants: Menahem Spiegel<br><b>Victor Glass &amp; Stela Stefanova:</b> Estimating Price Elasticity of Demand for Bandwidth: Do “Data Hogs” Care About Price?<br><b>Elena S. Patel, Margaret M. Cigno &amp; Edward S. Pearsall:</b> Estimates of U.S. Postal Demand Elasticity’s Derived from a Random-Coefficients Discrete Choice Normal Model<br><b>Philip E. Schoech, Mark E. Meitzen &amp; Michael M. Kubayanda:</b> Revisiting the CPI-based Price Cap Formula for the United States Postal Service | <i>Payette Room</i> | <b>SMART GRID</b><br>Chair: Catherine McDonough<br>Discussants: Hendrik Finger<br><b>Sanem Sergici and Frank Graves:</b> Unlocking the Value of Distributed Generation<br><b>Glenn R. George &amp; Arwen Kandt:</b> Functional Unbundling of Smartgrid Equipment: A Regulatory and Financial Framework for Smartgrid Investments<br><b>John Caldwell &amp; David Roth:</b> The Smart Grid Business Case Revisited: A Meta-Analysis | <i>Waring Room</i> |
|---|---------------------|--|--------------------|

## THURSDAY, MAY 17, 2012 (CONTINUED)

2:30 - 4:00 **Concurrent Sessions**

### **BROADBAND**

Chair: Saikat Sen

Discussants: Carl Peterson

**Menahem Spiegel**: Competition at the Wholesale Internet Markets

**Steffen Hoernig**: Asymmetric Broadband Wholesale Regulation

*Payette Room*

### **EFFICIENCY**

Chair: Michael A. Crew

Discussants: Malcolm Ainspan & Walter Poor

**Tim Brennan & Karen Palmer**: Energy Efficiency Resource Standards: Economics and Policy

**Richard Stevie & Raiford Smith**: The Economics of Utility Energy Efficiency: A Different Perspective

**Lide Li**: Daily Options and Load Options in Electric Power Market

*Waring Room*

4:00 Exercise Break

6:00 - 7:00 Cocktail Hour

*Worthington Ballroom*

7:00 - 9:00 Dinner & Keynote Speech: **Mary Anne Gibbons, General Counsel and Executive VP, USPS** *Worthington Ballroom*

## FRIDAY, MAY 18, 2012

8:45 - 10:30 **Concurrent Sessions**

### **REGULATION**

Chair: David Sappington

Discussants: Alan E. Finder

**Darryl Biggar**: The Transaction Cost Approach to Public Utility Regulation in Australia – A New Paradigm in Regulatory Thinking?

**Julie Kelly, Laurina Prantil & Dale Schoenberger**: The Challenges of a Regulated Marketplace: Lessons from the Department of Defense

**Karl A. McDermott**: History of Cost of Service Regulation: Adaptation and Evolution

*Waring Room*

### **COST OF CAPITAL**

Chair: Dylan W. D'Ascendis

Discussants: Kevin Bassler

**Kurt G. Strunk**: Optimal Capital Structures for Regulated Public Utilities -When Does an Imputed Debt Ratio Make Sense for Ratemaking Purposes?

**Richard Michelfelder**: The Asset Characteristics of Environmental Benefits: Solar Renewable Energy Certificates

**Victor Glass, Stela Stefanova & Roman Sysuyev**: The Paradox of Advancing Universal Broadband Availability through Competition

*Payette Room*

10:30 - 11:00 Coffee Break

11:00-12:45 **Concurrent Sessions**

### **CLEAN ENERGY?**

Chair: Sheldon Switzer

Discussants: Arwen Kandt & Andrew Lemon

**Wesley W. Wilson & Kenneth Train**: Coal Demand and Transportation in the Ohio River Basin

**Colin J. Loxley & Frank A. Felder**: The Implications of a Vertical Demand Curve in Solar Renewable Portfolio Standards

**George R. Pleat**: Allowing for Off-Peak Price Incentives to Reduce Electric Vehicle Distribution Grid Congestion

*Waring Room*

### **TRANSMISSION**

Chair: Menahem Spiegel

Discussants: William J. Deehan & Pradip Chattopadhyay

**Seth Blumsack & Mostafa Sahraei-Ardakani**: When is Transmission Not Transmission: Regulating Flexible Electric Transmission Architecture

**Tim Mount, Wooyoung Jeon, Alberto Lamadrid & Hao Lu**: Is Deferrable Demand an Effective Alternative to Upgrading Transmission Capacity?

**Beverly A. Brereton**: Environmental Offsets, Renewable Energy Credits and Liquidity in Organized Electricity Markets

*Payette Room*

12:45 - Lunch

*Worthington Ballroom*

## SPEAKERS DISCUSSANTS & CHAIRS

**Mohammad Adra**, Economist, USPS-OIG  
**Dylan W. D'Ascendis**, Associate, AUS Consultants  
**Malcolm Ainspan**, Economist, Israel Public Utilities Authority-Electricity  
**Parviz Alivand**, Senior Analyst, ISO New England, Inc.  
**Wesley Allen**, Chief Executive Officer, Red Wolf Energy Trading  
**Kevin Bassler**, Senior Financial Analyst, Southern Company Services Inc.  
**Darryl Biggar**, Economic Consultant, Australian Competition and Consumer Commission  
**Seth Blumsack**, Assistant Professor, Pennsylvania State University  
**Tim Brennan**, Professor of Policy & Economics, University of Maryland Baltimore County & Senior Fellow, Resources for the Future  
**Beverly A. Brereton**, Economist, ISO New England  
**Larry Buc**, President, SLS Consulting, Inc.  
**John Caldwell**, Director of Economics, Edison Electric Institute  
**Pradip Chattopadhyay**, Regional Energy Analyst, New Hampshire Public Utilities Commission  
**Michael A. Crew**, Director and CRRP Professor of Regulatory Economics, Rutgers University  
**Ann M. Daley**, Vice President, Pitney Bowes Government & Regulatory Affairs  
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**Alan E. Finder**, Managing Director, Global Regulatory Advisors LLC  
**Hendrik Finger**, Research Staff Member, TU Dortmund, Germany  
**Mark Freise**, Reliability Contract Manager, ISO New England, Inc.  
**Glenn George**, Partner, Bates & White  
**Mary Anne Gibbons**, General Counsel and Executive Vice President, United States Postal Service  
**Victor Glass**, Director of Demand Forecasting and Rate Development, National Exchange Carrier Association, Inc.  
**Howard Haas**, Chief Economist, Monitoring Analytics, LLC  
**Steffen Hoernig**, Universidade Nova de Lisbon  
**Marc Ivaldi**, IDEI - Universite des Sciences Sociales  
**Arwen Kandt**, Consultant, Bates White Economic Consulting  
**Julie Kelly**, Research Staff Member, Institute for Defense Analyses  
**Paul R. Kleindorfer**, Professor Emeritus, University of Pennsylvania and Distinguished Research Professor, INSEAD  
**J.P. Klingenberg**, Economist, U.S. Postal Regulatory Commission  
**Michael Kubayanda**, Public Policy Analyst, USPS Office of the Inspector General  
**David Lamont**, Research Senior Associate, The Regulatory Assistance Project  
**Andrew Lemon**, Senior Economist, COMPASS LEXECON  
**Lide Li**, Technical Fellow, Exelon Corporation  
**Colin Loxley**, Director – Resource Planning, PSE&G  
**Karl A. McDermott**, Ameren Professor of Government and Business, University of Illinois-Springfield & Special Consultant, NERA Economic Consulting  
**Catherine McDonough**, Ph.D. Principal Analyst, Market Development, ISO New England, Inc.  
**Dipti Ranjan Mahapatra**, Brookhaven National Laboratory  
**Richard A. Michelfelder**, Clinical Associate Professor of Finance, Rutgers University, School of Business - Camden  
**Timothy D. Mount**, Professor, Cornell University  
**Mark J. Niefer**, Attorney, Antitrust Division, U.S. Dept. of Justice  
**Elena S. Patel**, Staff Economist, U.S. Postal Regulatory Commission  
**Robert H. Patrick**, Associate Professor, Rutgers University  
**Edward S. Pearsall**, Consultant, U.S. Postal Regulatory Commission  
**Carl Peterson**, Assistant Professor, University of Illinois-Springfield and Special Consultant, NERA  
**George R. Pleat**, Principal Pricing Analyst, Baltimore Gas & Electric Company  
**Walter Poor**, Manager of Regulated Efficiency Programs, Vermont Department of Public Service  
**Robert A.F. Reisner**, President and CEO, Transformation Strategy Inc.  
**James D. Reitzes**, Principal, Brattle Group  
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**Saikat Sen**, Executive Director - Public Policy AT&T  
**Sanem Sergici**, Associate, The Brattle Group  
**Robert Sidman**, Attorney, Postal Regulatory Commission  
**Menahem Spiegel**, Associate Director – CRRP, and Associate Professor of Economics, Rutgers University  
**Richard Stevie**, Chief Economist, Duke Energy  
**Matthew Stirling**, Operations Research Analyst Office of Inspector General, USPS, RARC Group  
**Robert Stoddard**, Vice President & Practice Leader Energy & Environment, Charles River Associates

**Kurt Strunk**, NERA Economic Consulting, Senior Consultant  
**Sheldon Switzer**, Manager, DSM Evaluation, Measurement and Verification, Baltimore Gas & Electric Company  
**David C. Williams**, Inspector General, USPS-OIG  
**Wesley W. Wilson**, Professor of Economics, University of Oregon

# 31st ANNUAL EASTERN CONFERENCE

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Sufficient Rooms are reserved at the Shawnee Inn and Golf Resort for all of the Conference participants. Participants are required to make their own reservations with the hotel by calling 1-800-742-9633 extn:1414 and identify the CRRRI Conference. All reservations must be made by April 16, 2012.

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## CONFERENCE STAFF

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**Competitive Effects of Exchanges or Sales of Airport Landing Slots**  
**James D. Reitzes, Brendan McVeigh, Nicholas Powers, Samuel Moy**  
**The Brattle Group**

**Abstract:** We investigate the competitive effects of exchanges or sales of airport landing slots. In our model, airlines with potentially asymmetric slot allocations must decide upon which routes to use their landing slots. When all airlines serve the same routes in a slot-constrained Cournot-Nash equilibrium, small changes in slot allocations among airlines do not affect the overall allocation of slots across routes or air fares. In a symmetric equilibrium where slot-holding airlines have the same number of slots, we find that an increase in the number of slot-holding airlines leads to higher social welfare and consumer surplus, although the number of served routes may decline. Under asymmetric slot allocations, larger slot holders serve “thin” demand routes that are not served by smaller slot holders. In this situation, transfers of slots from larger to smaller slot holders increase social welfare and consumer surplus, even though fewer routes may be served. More generally, our results suggest that increases in slot concentration are harmful to consumers and social welfare, although consumers on relatively thin routes may gain air transportation service as a result.

# **The Static-Dynamic Efficiency Tradeoff in the US Rail Freight Industry: Impact for Open Access Policy**

Daniel Coublucq<sup>1</sup> - Marc Ivaldi<sup>2</sup> - Gerard McCullough<sup>3</sup>

December 17, 2011

## **ABSTRACT**

This paper is aimed at evaluating the impact of an open-access market structure policy in the US railroad industry, characterized by integrated firms providing freight services on their own tracks. While this policy could foster competition and increase static efficiency, opening the rail network to competition might decrease the incentives to invest in the network. To sustain innovation, and thus support dynamic efficiency, investment requires a rate of return obtained through above-marginal cost pricing over time.

Although it leads to some allocative inefficiency, it is required for the firms recoup their fixed cost of investment. Now, sharing a network might lead to less rail freight volume for the incumbent. Then, the smaller the proportion of train traffic operated by the owner of the infrastructure, the weaker the incentives to carry out such investment as the benefits of investment are shared by other independent train operating companies. To analyze the potential effects of opening the network to entrants on prices and investment incentives, i.e., to analyze the tension between static efficiency and dynamic efficiency, we propose a structural framework where the investment behavior results explicitly from a dynamic model where the current investment depends on the expected future profits. We also estimate the cost of investment and a demand model which are used to simulate the anticipated future markups under an open-access market structure. We find that, under such a policy where an entrant uses the network of an incumbent, the investment in network infrastructures decreased by 10% per year. On a long period, the consequence on the network quality might be severe. Despite the increase in price competition, the decrease in network quality leads to a fall in consumer welfare. Hence an open-access policy might have significant impact on the long run performance of the US railroad industry.

## Reliability and Resource Performance

Todd Schatzki, Paul Hibbard

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A combination of factors, including new EPA regulations and changes in natural gas markets, have created the expectation that extensive quantities of power generation will retire in the coming years. This threat has raised a variety of concerns about system reliability given varying levels of anticipated retirements and the different characteristics of each system's transmission and generation infrastructure. Given these concerns, along with the recent imposition of enforceable NERC reliability standards, many regions have begun to renew their focus on how best to maintain system reliability.

Reserve markets, designed to ensure sufficient resources to respond to unanticipated contingencies, are an important tool used to maintain system reliability. Some regions have begun to identify the performance of generating units within these markets as a challenge to maintaining reliability. For example, ISO NE identifies "Resource Performance and Flexibility" as one of five risks in its on-going Strategic Planning Discussion.<sup>1</sup> We review challenges affecting the responsiveness of generators in reserve markets and metrics to analyze whether responsiveness is below levels that would be suggested by other metrics (e.g., forced outage rates.)

We also examine mechanisms aimed at improving the reliability of reserve response during contingencies. New England's markets already use some tools to properly align incentives, including mechanisms to eliminate incentives for generators to *withhold* output during shortages (e.g., peak rent reductions) and mechanisms to encourage better performance during contingencies (e.g., penalties where resources that are procured in Forward Reserve Markets fail to be available or perform when called upon for reserves.) While we focus on mechanisms to improve the performance and efficiency of incentives provided in reserve markets, we also discuss alternatives to increase reserve supplies, including market designs aimed at ensuring that a diverse mix of resources types (fuels, technologies) is available.

Although much of the current discussion regarding reliability is focused on appropriate reserve margins and how to maintain such reserve margins, our analysis shows that increases in resource quantity are not the only alternatives for maintaining and improving reliability.

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<sup>1</sup> ISO New England, "Strategic Planning – Risk Summary," June 14, 2011.



## Optimization of the United States Postal Retail Network by Applying GIS and Econometric Tools

JP Klingenberg, Lyudmila Bzhilyanskaya, and Michael Ravnitzky

United States Postal Regulatory Commission<sup>2</sup>

Recently the United States Postal Service (Postal Service) has discussed its intention to reduce the number of Postal Service operated retail outlets by 50 percent over the next 5 years.<sup>3</sup> As part of its long term strategy, the Postal Service envisions that 60 percent of retail revenue by 2020 will be generated through “alternate retail access channels,” i.e. facilities not owned or operated by the Postal Service. The U.S. Postal Service currently operates a larger fraction of its retail access points than many other national postal operators, such as Australia Post, Itella (Finland), Deutsche Post (Germany), Posten AB (Sweden), and La Poste (France). These countries maintain universal geographic access while allowing the national posts to operate fewer than 20 percent of the postal retail facilities.<sup>4</sup>

The governments of these countries have established statutory proximity constraints to ensure that the post maintains a national presence sufficient to provide universal access. These constraints allow posts to sub-contract a large portion of the retail component of postal services and thus minimize costs while providing broad geographic coverage. A rough analysis of the U.S. postal retail network shows that 80.1 percent of the U.S. population resides within 4.83 km (3 mi.) of a Post Office and 6.2 percent of the population resides farther than 8.05 km (5 mi.) from a post office<sup>5</sup>.

Potential retail networks can be evaluated for geographic proximity of access and predicted cost/revenue by using the following information: population and employment data; postal retail facility operating cost, revenue and location data. This paper applies Geographic Information System (GIS) and econometric modeling tools to analyze the following:

- 1) The coverage, operational expense and revenue of both the current U.S. postal retail network as well as a network after the reduction of 15,000 locations;
- 2) The operational expense/revenue of a U.S. retail network that would comply with the geographic proximity requirements of international posts and correspond to the socio-economic characteristics of the market areas served by each retail facility in the network.

This paper will develop and discuss retail location solutions optimized for:

- 1) Access Approach, a solution which will minimize the average distance to postal retail facilities for different population density strata, using GIS modeling tools.

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<sup>2</sup> Any Opinions are exclusively the authors, and do not reflect the opinions or positions of the Postal Regulatory Commission

<sup>3</sup> <http://www.gao.gov/products/GAO-12-100>

<sup>4</sup> <http://www.gao.gov/assets/520/511482.pdf> at 19

<sup>5</sup> See PRC Docket No. N2011-1 PR-T-2

- 2) Net Revenue Approach, a solution which will maximize revenue in comparison with costs for postal retail facilities, using econometric modeling tools.
- 3) Hybrid Approach, a solution which will maximize net revenue with respect to market areas with access constraints (i.e., statutory constraints for other national posts).

Although the paper will use data specific to the United States, the techniques developed are applicable to other postal networks as well.

References:

Postal Regulatory Commission Docket No N2011-1 Testimony of John P Klingenberg on Behalf of the Public Representative (PR-T-2)  
Postal Regulatory Commission Docket No N2011-1 Testimony of Nigel Waters on Behalf of the Public Representative (PR-T-1)  
The Conflict about Preserving Small Rural Post Offices: Difference in the Distribution of Pharmacies and Post Offices, Cohen et al. (2006)  
Barriers to Retail Network Optimization, USPS OIG, RARC-WP-11-005 (2011)  
Analyzing the Postal Service's Retail Network Using an Objective Modeling Approach, USPS OIG, RARC-WP-10-004  
U.S. Postal Service: Action Needed to Maximize Cost-Saving Potential of Alternatives to Post Offices, US GAO, GAO-12-100  
Foreign Posts' Strategies Could Inform U.S. Postal Service's Efforts to Modernize, US GAO, GAO-11-282

## **Toward an optimal delivery network for a new retail world**

Matthew Stirling, Steven Baumert, and Jeffrey Colvin

The complexity of the postal network is generally acknowledged, but the complex relations between elements of the value chain can be surprisingly subtle. For example, a topic of continuing interest in postal economics has been the number and placement of retail units (see Borsenberger, Joram and Roy 2011). Moreover, the size of the retail network has been an important factor in the cost of the universal service obligations (see Cohen, McBride and Panzar, 2010). Additionally, the general nature of the relation between USO constraints and cost has been investigated (see Bradley, Colvin, Nieto and Tobias, 2010). However, the relation between the retail network and the cost of delivery has not always been fully understood.

In this paper, the authors develop a model of the delivery distribution network using USPS operational data. As the model illustrates, relaxation of the constraint on retail closings reveals the possibility of rational organization of delivery unit locations, as well as the cost saving available from such reorganization, asserts itself. To the extent that delivery unit numbers and location are tied to the uneconomic organization of the retail network, inefficiencies will appear in the delivery function. The cost of such inefficiency is a part of the service obligation ultimately linked to retail.

The traditional postal model combined retail and delivery functions at post office locations to meet the needs of decentralized, manual mail sortation. As the postal network has moved to centralized, automated processing, the traditional delivery distribution model has largely remained despite less of an operational need for combining these functions. While the retail function might reasonably be designed to maximize net revenue via convenience and availability, the delivery function seeks to minimize the operational, overhead, and transportation costs. The cost minimization solution at the heart of the model is then used to compare the costs of various national retail options.

The paper uses various economic costing and operations research methodologies to develop a cost minimization algorithm. The paper identifies the overhead, operational, and transportation costs inherent to the delivery network using actual USPS data and some economic costing methods. The model then minimizes those delivery network costs using operations research cost minimization methods. Lastly, the authors consider the impact that different retail network scenarios will have when overlaid on top of the optimal delivery network. The scenarios include partial reductions of facility overhead costs, the movement of retail to other USPS locations, and also the

introduction of alternative retail channels.

Historically, little, if any, operations research cost minimization has been performed for the USPS national delivery network. The size and scope of the problem is immense, but the paper tackles these issues by using creative “looping” optimization methods. This type of model could be used to analyze many theoretical scenarios. These include de-coupling the delivery and retail functions as mentioned, the impact of a national clusterbox delivery method, and various other scenarios. Although this paper does not explore all these options, the paper’s model can provide new practical information for the discussion of the future of USPS.

Currently, the USPS is in dire financial condition. The delivery network remains one of the last largely untouched operational costs. The USPS recently put forward a number of proposals to close delivery and retail units and restructure other major portions of its business. The model developed in this paper will serve to better identify cost savings available from a variety of alternative network arrangements, as the conversation continues on how best to structure the USPS for the new Internet age.

**Abstract for the Eastern Conference 2012**  
**“Firm Survival and Competition in the Postal Sector:**  
**Empirical Evidence from Germany”**

Toufic M. El Masri\*  
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Although the exclusive license of the former monopolist Deutsche Post AG has not been renewed and thus the market has completely been opened up to competition in 2008, different statistics, especially regarding the revenue distribution, indicate that the competitive environment in the German postal market has not yet proceeded as desired by the government. Indeed, the former monopolist still has a market share of more than 90%. Moreover, statistics of the Federal Network Agency confirm a striking number of market exits in previous periods.

In this paper, I investigate firm survival and the potential for competition in the German postal market. For this purpose, I analyze the key success factors focusing on the competitors of the market leader. The analysis is based on data from a survey which I have conducted in 2010 for the German postal market. Within the framework of the survey, all licensees (except the market leader) have been sent a questionnaire. In addition to the theoretical and the descriptive analyses based on the collected data, I run a probit regression model to analyze the major success determinants in this market. Moreover, the analysis is further supported by 9 case studies based on expert interviews and plant visits at the interviewees' locations, which I have conducted in 2011 in order to have a closer look on the industry.

I find that the state of competition in the German postal market did not develop as desired, because it is too difficult for many competitors of the DPAG to survive in the postal market under the current market conditions. Furthermore, I identify these difficulties and the specific key success factors of the postal market. In general, I find that successful postal service providers either specialize on single postal operations providing a higher-quality service or have the possibility to exhaust scope economies through combining the postal service with another already existing business area, e.g. publishing business. Finally, the paper addresses policy implications which shall help to create the necessary framework for competition in the German postal market.

**Keywords:** Postal Sector, Success, Competition, Germany

**JEL-Classification:** D24, L51, L97, L22

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## ABSTRACT

### The Confluence of Utility Regulation: Water, Electricity and Natural Gas

Robert Stoddard

Richard Tabors

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Although the water, power, and natural gas industries are among the most heavily regulated industries in the country, and despite the many linkages—at least at the margin—between these industries operations, their regulation is largely unlinked or, even worse, in conflict. The last few years, however, have brought a dramatic increase in the level and intensity of the interactions among the water, power, and natural gas sectors; how long, then, can their regulation remain disconnected?

The developments that have knit these three industries more closely together are well known individually but not always appreciated as a group. The ability to tap massive natural gas reserves with the development of horizontal drilling techniques and hydro-fracturing (“fracking”) has revolutionized the gas industry, turning the U.S. from a net importer to, potentially, a net exporter of LNG. This impact of this technical advance has not only reshaped the gas sector, though; it has raised profound questions in both the water and power sectors. Fracking takes in tremendous amounts of water and requires disposal of a similar volume of waste water, raising novel ethical, regulatory and legal issues. The influx of low cost gas has brought development of large-scale renewable energy projects to a near stand-still in many parts of the country, derailed several nuclear projects, and poses serious challenges to the financial statements of independent power producers. Separately, new restrictions on water use by power plants—either to comply with environmental regulations or because of severe droughts—are likely to lead to large-scale retirements, particularly of older, gas-fired plants that are often uniquely capable of providing flexible operations required to integrate renewable energy sources on the grid.

Water, power and natural gas are now inextricably intertwined; their regulation cannot remain separated for long. This paper evaluates the temporal and spatial dynamics of the requirements for integrated policy and regulation in these three critical areas, with a particular emphasis on identifying the current mismatches in the span of control by local, state, and federal regulators. We identify the questions and point to answers in regulatory and economic policy that are needed to coordinate the markets and physical operations. These findings will almost certainly dismay regulators, as they will need to share and coordinate control, diluting existing powers.

# **Natural Gas Pricing in India – An Economic and Marginalist Analysis**

**By:** Dipti Ranjan Mahapatra & Ravindra Dholakia

Abstract:

New domestic finds and LNG imports have pushed natural gas's emergence as an alternative source of energy in India - from less than 1 per cent in the Indian primary energy basket until 1980s to around 10 per cent in 2010. However, pricing of natural gas in India suffers from asymmetry because of the presence of multiple suppliers having multiple contracts resulting in suboptimal solutions. Till recently, the pricing mechanism exhibited a dual pricing regime resulting in two distinct gas markets. In one market, gas produced by PSUs (public sector undertakings) is sold under the Administrative Pricing Mechanism (APM), while gas produced by JVs (joint ventures) or private companies sold at prices agreed according to the production sharing contracts (PSCs). Government's intrusive regulations both in pricing and production allocation on a regular basis under the pretext of fixing market failures and addressing the national priorities have further exasperated the complexity and have been a deterrent for NOCs from making investment in their blocks. The objective of this research is to contribute to the ongoing discussion of energy pricing by examining the economics of natural gas pricing in India. We argue that for the sake of long-term development of and optimally planned system such as natural gas sector in a growing economy like India, the long-run marginal cost (LRMC) seems the most suitable pricing policy. In line of price discovery at Henry Hub in USA, we recommend that two hub prices reflecting availability of natural gas, i.e. Kakinada Hub and Hazira Hub, be established in India. Finally, we conclude that pursuance of economic efficiency should take precedence over others such as profitability, environmental sustainability, and income distribution to maximize social welfare by ensuring allocation of scarce resources.

## **Shale Gas, Competition and Regulation**

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An objective of energy regulation has normally been efficiency of production, which can be impacted by market structure as well as producer choices. Effective regulation of shale gas production, which has rapidly become a factor in the US energy industry, may require additional insights into this nascent industry.

Reserves that were unrecoverable in the 1990s have, through the advanced drilling technology and hydraulic fracturing become feasible. US shale gas production has increased from about 0.4 trillion cubic feet (Tcf) in 2000 to roughly 4.8 Tcf in 2010

(~23% of US gas production). These reserves have the potential to alter the market structure within the natural gas producing industry and extend the life and competitiveness of the domestic US energy industry. However, in many cases the actual performance of shale gas wells has been less than expected, with significant production declines in the early periods, leading to smaller ultimate recoveries and higher costs than originally forecast. In addition, environmental concerns about the impact of hydraulic fracturing and the adequacy of regulations have been raised.

This research focuses on factors affecting early period production, including the characteristics of the well and completion and production choices made by the producer. We develop a theoretical model of capital investment and production, followed by an empirical analysis of completion and early period production employing data from 120 wells. Reservoir characteristics are statistically significant in the productivity of these wells, as are producer decisions. We explore the implications of these impacts on competitiveness in the industry and on effective regulation. While resource regulation objectives include conservation, we find some completion and production choices may in fact reduce recoverable reserves. Additionally, there are tradeoffs in completion choices and cumulative production that suggest profit and environmental goals may coincide to some degree.



Abstract: Privatization of Postal Service: Providing a Role of POs in the Communications Revolution

Authors: Michael A. Crew, Richard R. Geddes and Paul R. Kleindorfer

Postal service and telephony played a vital role in the Industrial Revolution and long afterwards. The “Communications Revolution” is now taking place at far greater speed than the Industrial Revolution. The telecommunications sector has addressed this revolution far more successfully than the postal sector. Telecommunications has been innovative and responsive, in a manner that would have not been possible had it been organized as a public enterprise. By contrast the postal sector has done very little to come to terms with the new world of electronic communications. Major reform in the postal sector is long overdue. If the postal sector is to thrive in the Communications Revolution, further significant transformation of the sector, driven by commercialized and privatized POs will be required to integrate various elements of traditional postal communications with the new communications infrastructure of the Internet and wireless technologies. The form this transformation will take, and the role of private capital in this transformation, requires a careful analysis. This will involve weighing the consequences of various forms of restructuring, including privatization, on fulfilling the PO’s traditional role, together with potential expansions of this role to integrate the activities and resources of the PO with broader communications and logistics markets.

Government can produce public goods, which will not be produced by market process. Public enterprise is a form of government activity, which may be superior to private enterprise where the output has some element of the qualities of a public good. Postal Service has an element of a public good in that it provides universal service, which would not be provided under a market system. However, the process of supporting the public mission is now under severe threat because of the impact of electronic competition. Currently, the prospects for mail look bleak. Government lacks ability to shield POs from electronic competition. The plight of POs is most visible in the case of USPS. It is shielded by a monopoly in letters but this provides little help in face of electronic competition. Indeed, USPS, because of its enabling legislation and Congressional oversight is paralyzed. This paper argues that freeing USPS from Congress by privatization will provide the best opportunity for it to become more innovative, which is vital if it is to find viable place in the communications revolution.

Details of how privatization would be brought about are intended to be the subject of another paper. This paper is concerned with a critique of the current situation and a discussion of the potential of privatization. While recognizing the flaws of corporate governance this paper regards the problems of public governance as being much more damaging in the current situation.

## **Parallel Tracks? Lessons Learned from Railroad Industry Restructuring and Their Applicability to the U.S. Postal Service**

**Kelly Eakin, Senior Vice President, Christensen Associates**

**Michael M. Kubayanda, Public Policy Analyst, US Postal Service Office of the Inspector General**

This paper investigates parallels between the U. S. railroads' experience and the Postal Service's current situation to inform policy strategies for the Postal Service's financial recovery. Today's vibrant railroad industry looks very different than it did in 1950, when it faced seemingly insurmountable financial challenges. Mapping the changes in industry structure, production technology, service lines, and product mix into the railroads' recovery provides insights into how the Postal Service might evolve.

The paper begins by examining the railroad industry over the last sixty years – investigating how public infrastructure investment facilitated the rise of competitive alternatives, how the railroads responded, and how the regulatory environment impeded the railroads' recovery and consequently led to regulatory reform. The paper analyzes the recovery of the railroad industry, noting the importance of pricing flexibility and ease of network optimization. The strong railroad productivity growth since the Staggers Rail Act of 1980 is described, emphasizing the crucial roles of economies of density and decreases in labor employment.

The paper then brings the Postal Service into the discussion, developing applicable parallels between the railroad experience and current Postal Service situation, while carefully delineating the appropriate caveats and distinctions. The pricing flexibility that the Staggers Act provided the railroads is compared to the Postal Service's pricing flexibility under the Postal Accountability and Enhancement Act. Similarly, a comparison is made between the railroads' and the Postal Service's abilities to optimize network.

Finally, drawing from the applicable parallels, plausible scenarios for a financially sustainable Postal Service are put forth. Issues and parallels related to the Postal Service's Universal Service Obligation are discussed throughout the paper.

# COMPETITIVE INNOVATION

## Adapting Postal Practice to the Changing Marketplace: Prospects for A Postal Chief Innovation Officer

Robert A. F. Reisner<sup>6</sup>

Along with the stress and trauma that financial crisis and technology change has inflicted on the posts worldwide, these difficulties have been accompanied by significant opportunities for innovation in traditional practices. Postal leaders have been forced to reinvent postal services, business practices and operating principles. Throughout the world there are discussions underway today to explore new business models, new service delivery methods, technologies and processing platforms.

Yet even though this has been a time of change in the postal world, few posts have reached the level of intensity of focus on innovation that is typical in the private sector today. As the postal monopolies are undermined by continuing technology change and the migration of transaction mail to the Internet, the resulting mail marketplace will be increasingly competitive. Private sector best practices in innovation will have even greater interest to the posts in the future. Yet the process of “postalizing” private experience to adapt it to the regulated operating environment of the posts will raise important issues for the future of postal innovation.

This paper will explore the issues that are raised as private sector best practices are adapted by the regulated posts. Recent USPS experience with marketing initiatives and operating models will be discussed.

To offer a framework for discussion of innovation and performance, the approach of one of the global leaders in Strategy consulting and innovation is introduced. The innovation diagnostic framework of the Monitor Group of Cambridge, Massachusetts, is used to highlight the challenges that the posts will face in adapting private sector best practice. Monitor has developed a methodology for diagnosing an enterprise’s success with 10 types of innovation. Monitor’s model<sup>7</sup> divides ten types of innovation into elements of organizational configuration, service offering and customer experience. By exploring USPS experience in these ten categories, the paper will seek to highlight issues of regulatory practice that might be reconsidered in this time of reconsideration of postal reform.

Analyzing the USPS experience and evaluating multiple types of innovation highlights the point that successful change initiatives are often multidimensional and the high performing companies in the private sector are investing in innovation in multiple areas at the same time. The discussion will highlight potential opportunities for future postal innovation and priorities for making current initiatives successful.

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<sup>6</sup> Robert Reiner is the former Vice President for Strategic Planning of the USPS and is the author of “When a Turnaround Stalls” *Harvard Business Review*, 2002 as well as eight papers presented at CRRI conferences. He has participated in postal innovation for nearly two decades. Ideally he will be joined in this paper before April by other authors from the USPS and private sector experts. Negotiations for permission to join are underway. Even if permission is not granted, Mr. Reisner will develop this paper individually in consultation with USPS managers and IG staff.

<sup>7</sup> See <http://www.monitor.com/TabId/67/L/en-US/pgndx/2/Default.aspx> for more on Monitor and innovation.

# **Economic Evaluation of Baseline Design for Demand Response Policy in Wholesale Markets**

## **Hung-po Chao and Mario DePillis**

### **Abstract**

Recently issued U.S. FERC regulations require comparable treatment of demand reduction and generation in the wholesale electric market so that they are compensated at the same market clearing price. Demand reduction is measured as a reduction from a “customer baseline”, which is interpreted as the expected consumption. In general, the design of the baseline creates economic incentives that influence the consumption behavior. Specifically, an administrative baseline design creates incentives for a customer to maximize the baseline in order to increase the demand response compensation. This paper presents an economic framework for assessing the impacts of baseline design on economic incentives and efficiency results. A reference model is used to establish prices and social welfare absent the new demand compensation rules. Several baseline designs of the U.S. wholesale markets are formulated mathematically so that comparisons can be made of their efficiency under the new compensation rules. Some examples are solved numerically to illustrate the framework.

## ABSTRACT

### Up to Congestion Bids: A Discussion of Spread Offers in the PJM Energy Markets

Dr. Howard J. Haas

PJM markets provide the means for buying and selling wholesale electricity within the PJM footprint. The PJM energy market is made up of a day ahead and a real time, or balancing, market. The day ahead market is a financially binding market used by participants to lock in prices for the purchase and sale of energy. The real time, or balancing, market is the market for energy differences between day ahead and actual real time system positions and conditions. The operation of the markets respects the physical requirements of a least cost, security constrained solution.

While the PJM markets are fundamentally about the efficient scheduling and pricing the delivery of physical power consistent with physical limitations of the system, the PJM nodal day ahead energy market includes a number of financial (or “virtual”) products: Increment Offers (INC), Decrement Bids (DEC) and up to congestion bids (Up To Bid). INCs, DEC and Up To Bids all provide a means for participants to lock in nodal sell and buy positions in the PJM day ahead market. INCs are virtual sources of power (generation or sell offers) in the day ahead market that clear the market if the nodal price meets or exceeds their strike price. DEC are virtual sinks of power (load or buy bids) that clear the market if the nodal price meets or is lower than their strike price. Up to Bids are a matched INC (source) and DEC (sink) bid set that clear if the sink node price minus the source node price is less than or equal to a pre-specified dollar amount in the day ahead energy market.

Cleared INCs, DEC and Up To Bids affect the day ahead market optimization in terms of unit dispatch, unit commitments and nodal prices. Cleared day ahead nodal virtual positions are settled, like any other day ahead position, against the participant’s real time nodal positions. Under current PJM market rules INCs and DEC are subject to deviation charges due to their impacts on system dispatch, while Up To Congestion Bids are not, despite their similar effects. Virtual products can be used to hedge or leverage other positions or they can be used independently. On their own, INC and DEC positions are profitable when the difference between the day ahead position and the real time position, minus transaction and deviation fees, results in the participant having “bought low” and “sold high” at the nodal position. To the extent that the availability of INCs and DEC facilitate “arbitrage” opportunities created by differences between node specific prices in the day ahead and real time market is credited, in part, with facilitating convergence between PJM’s day ahead and real time markets. On their own, Up To Bids are profitable when the net of the day ahead sink minus source price difference and the real time sink minus source price difference is positive. Although profitable INC and DEC positions are generally seen as efficiency improving in the day ahead and real time markets due their role in helping to force the convergence in price between the Day Ahead and Real Time markets, the same is not necessarily true of profitable Up To Bids.

Virtual products play a significant role in the PJM market. INCs make up more than one third of day ahead generation and DEC make up more than a third of day ahead demand. Up To Bids have historically been insignificant, but their use has increased substantially in the last three years. In 2011 cleared Up To Bids represented almost half of the total day ahead load and generation in the day ahead market.

The significant expansion in Up To Bid activity, as a result of recent rule changes, has raised a number concerns with the product with regard to their potential effect on market efficiency, cost allocations and gaming opportunities. This paper explores the causes for the expansion in Up To Bid activity, the gaming concerns with Up to Bids, the potential efficiency effects of Up To Bids and recommended modifications to market rules to address the issues raised by Up To Bids.

**INFORMATION AND COMPETITION IN WHOLESALE POWER MARKETS:  
A SURVEY OF THE POLICY ISSUES**

**Mark J. Niefer\***

The collection and dissemination of information regarding wholesale power markets can enhance or diminish competition. It may facilitate competition by sending price signals to sellers and buyers, permitting markets to clear more efficiently. It also may permit market participants and regulators to more effectively monitor markets for the exercise of market power by buyers or sellers, and to more effectively remedy market power. On the other hand, it may undermine competition in wholesale electricity markets by facilitating collusion among sellers. It also may result in disclosure of proprietary information or alter the relative bargaining strength of market participants, which may undermine competition.

The Federal Energy Regulatory Commission and Regional Transmission Organizations have grappled with the competition reducing and enhancing effects of information in several recent proceedings. In these proceedings, it has generally been agreed that the collection and dissemination of *some* market information enhances competition; at the same time, however, it is generally agreed that the collection and dissemination of *all* market information – including detailed firm-specific data – will inhibit competition. Identifying the optimal level and form of information collection and dissemination, however, has proven to be extremely difficult for FERC and RTOs.

In this article, I identify and discuss the key competition enhancing and reducing effects of the collection and dissemination of wholesale power market information, drawing examples from recent FERC and RTO proceedings. I then draw on the relevant legal and economic literature to offer guidelines for determining when the collection and dissemination of information is likely to enhance or diminish competition in wholesale power markets.

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Estimating Price Elasticity of Demand for Bandwidth: Do “Data Hogs” Care About Price?  
By Victor Glass and Stela Stefanova

Knowledge of price elasticity of demand for different broadband speed tiers is an important planning tool for Internet Service Providers as they search for more effective ways to manage traffic loads and future network expansion. Price elasticity of demand estimates for broadband speed tiers may also prove beneficial as the Federal Communications Commission evaluates whether end users, content providers, or both should contribute to the newly established Connect America Fund, designed to foster universal broadband connectivity. Research in the two-sided market literature shows that if subscribers to higher speed tiers are price elastic, it may be beneficial for content providers that do not enter in direct contractual relationships with end users to subsidize prices for high speed offerings through the public support system. Unfortunately, the empirical economic literature offers mixed results for price elasticity of demand for broadband. Estimates vary from highly elastic to highly inelastic depending on data and modeling strategies used. One simple explanation for this variation in estimates is that broadband is a differentiated service, which is captured to some extent by speed tiers. Subscribers may have different price sensitivity for access to the Internet related to expected usage. Even a low speed tier connection can be used for video, but customers that are heavy video users are far more likely to purchase a high speed tier. We use demand and price data collected in 2009 to estimate a novel demand model based on choice theory for Internet speed tiers offered by rural Internet Service Providers (ISPs) and use the parameter estimates to calculate price elasticity's of demand for different speed tiers. We define several differentiated speed offerings ranging from offers with downstream speeds up to 768Kbps to offers of downstream speeds above 10 Mbps providing for a wide variation in quality of broadband connections.

## Estimates of U.S. Postal Demand Elasticity's Derived from a Random-Coefficients Discrete Choice Normal Model

Authors: Margaret M. Cigno, Elena S. Patel and Edward S. Pearsall

Reliable estimates of structural demand parameters, particularly price and cross-price elasticities, are essential for forecasting mail volumes and for most practical applications of economic theory to issues of postal regulation. However, conventional econometric approaches have generally failed to produce useable estimates of postal cross-price elasticities for reasons that are all-too-familiar to researchers. Postal price indices contain observation errors and tend to be highly correlated over time; the equations commonly used to model demand are overly-restrictive with respect to prices; and, the number of possible cross-elasticities becomes large relative to sample size for models that differentiate between more than a very small number of services.

Random-coefficient discrete choice logit models were designed to provide a practical solution to all of these difficulties. The past decade of empirical demand research in the industrial organization literature has been dominated by the estimation of such models following the methods of Berry, Levinsohn and Pakes (BLP)<sup>8</sup>. Following BLP, these models can be fit with only market-level price and quantity data in combination with observable product characteristics, population-level demographics and an effective set of instrumental variables. The BLP estimation methodology applies the Generalized Method of Moments to obtain a consistent estimate of the asymptotic normal distribution of the logit model's parameters. Price elasticities and cross-price elasticities can be derived from the parameter estimates and subjected to several large sample tests for significance and consistency.

Although these models and methods are now routinely employed to obtain realistic demand elasticities and cross-price elasticities for closely-related products in many industries, to our knowledge this approach has never been attempted in the postal sector. In this paper, we apply a variant of the BLP estimation methodology using U.S. postal time series for volumes, revenues, weights, other observable characteristics of the mail, demographic information and a set of instruments to obtain estimates of price elasticities, cross-price elasticities and other parameters of the demand functions for related postal services.

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<sup>8</sup> Berry, S., J. Levinsohn and A. Pakes, 1995, "Automobile Prices in Market Equilibrium", *Econometrica*, 63, 841-890. For a more accessible description of the models and estimation methods see Nevo, A., 2000, "A Practitioner's Guide to Estimation of Random-Coefficients Logit Models of Demand", *Journal of Economics and Management Strategy*, 8, 513-548.



## Revisiting the CPI-based Price Cap Formula for the United States Postal Service

The Postal Accountability and Enhancement Act of 2006 imposed a price cap on the Postal Service's market dominant products. This price cap allows postal rates to increase with the Consumer Price Index (CPI). The CPI price cap seemed like a reasonable regulatory approach when it was first introduced in 2006 at the peak of mail volume growth, but it has contributed to significant financial losses as mail volume per delivery point has declined rapidly. These financial losses are tied to Postal Service economies of density and its pricing structure, which includes free delivery to all addresses.

A revenue cap is an alternative incentive regulation mechanism that would help insure financial stability under declining mail volume per delivery point. In the context of the Postal Service, the revenue cap would cap the growth in revenue per delivery point by an index such as the CPI. However such a cap would potentially "over-recover" lost revenue when mail volume per delivery point declines.

In this paper we propose a third approach, a "hybrid cap," which combines elements of a price cap and a revenue cap. We lay out the structure of the hybrid cap and show how such a cap could be applied to the Postal Service. We conduct a historical analysis that compares Postal Service finances with a counterfactual situation where a CPI-based hybrid cap is used instead of a CPI-based price cap. We also conduct a forward-looking projection of Postal Service finances under both the CPI-based price cap and the CPI-based hybrid cap. Finally we consider other possible refinements of the Postal Service incentive regulation mechanism.

Authors: Philip E. Schoech and Mark E. Meitzen (Laurits R. Christensen Associates); Michael M. Kubayanda (US Postal Service Office of Inspector General, Risk Analysis Research Center).

## **Unlocking the Value of Distributed Generation**

**(Abstract)**

Sanem Sergici and Frank Graves

*The Brattle Group*

Distributed generation (DG) is defined as an electric power source connected directly to the distribution network or on the customer side of the meter. Increased integration of the DG resources to the grid may deliver substantial benefits. These benefits include avoided transmission and distribution investments, increased system reliability, increased power quality, avoided lines losses, and improved environmental impacts.

As of 2007, there were about 12.3 million DG units installed across the United States, with a total capacity of 234 GW. The vast majority of these DG units are non-utility owned/operated and primarily used for emergency purposes. The remainder is made up of combined heat and power units (CHP) and micro combustion turbines. Surprisingly, only less than one percent of this capacity was connected to the grid, again as of 2007.

In this paper, motivated by the strikingly small DG capacity that is connected to the grid and the extent of the potential benefits, which has since become especially pronounced due to the developments in the Smart Grid technology, we seek answers to several key questions: (i) what is the source of discrepancy between the DG potential and actual penetration?; (ii) under which conditions the DG resources are valuable and should be promoted?; (iii) what are the barriers that impede the development of *economic* DGs; (iv) what kind of regulatory policies would address these barriers and foster the development of economic DGs?

We also discuss an efficient distribution planning process that would accommodate large quantities of installed DG resources at customer sites. Encouraging the DG deployment without location optimization and distribution planning could exacerbate the conflict between DG developers and utilities, if net benefits of DG are not maximized for the utilities.

## **Abstract Proposal for CRRI Eastern Conference, May 16-18, 2012**

### ***Functional Unbundling of Smartgrid Equipment:***

#### ***A Regulatory and Financial Framework for Smartgrid Investments***

**Glenn R. George, Ph.D., and Arwen Kandt, Bates White Economic Consulting**

Although there is some degree of confusion over what Smartgrid encompasses, the reality for the moment is that Smartgrid is primarily a set of technologies enabled and attached to the local electric power distribution system. Over time, Smartgrid will become a key enabling technology for “Smarthome” services, Distributed Generation, load control, and Electric Vehicles (EVs). The potential benefits from Smartgrid are significant. These include improved reliability, better balancing of supply and demand, enhanced demand response, and higher energy efficiency.

However, utilities have many other competing priorities for capital, including retiring or upgrading high-emission coal plants, adding additional renewable generation in response to mandates, investing in replacements for an aging transmission system, maintaining reliability, and a host of others—all without significant rate hikes (ideally).

Moreover, there has been significant customer pushback to Smartgrid, deriving in part from disputes over who has the right to choose to install a meter, immediate costs but deferred benefits, concern about effects of radio frequency exposure, and an aversion to higher rates.

As a consequence, some PUCs are skeptical about the value of Smartgrid investments and ratebase treatment of them. This reflects ratepayer and political pressure to avoid higher rates; mixed results from pilot programs in Virginia, Maryland, North Carolina, and elsewhere; and lack of clarity around the benefits of Smartgrid, particularly for residential customers.

A concept the author has developed, Functional Unbundling of Smartgrid Equipment (FUSE), offers utilities a way out of this conundrum. FUSE involves disaggregation of Smartgrid installations into regulated (ratebase) and non-regulated (“enterprise”) elements. The disaggregation is conceptual, not physical. Utility customers pay only for well-accepted, basic metering functions through their rates. Utilities own and operate only those systems that are easy to justify as ratebase. Third parties—possibly non-regulated affiliates of the same utilities—own the truly “advanced” capabilities. The third party earns non-regulated returns on its investment through use of the customer data available through the Smartgrid system. A variety of companies will pay for insight into detailed consumption patterns, and other habits, of electricity users, and use the data to create and sell value-added services, including Smarthome concepts, shopping, EV services, etc.

Key issues that must be addressed include the privacy concerns of users: Who owns the data? Can retail customers opt out or block access to the data? Other issues revolve around data security: How will data be controlled to avoid copying, file sharing, other unlawful use, and any potential operational risk? Still other questions revolve around the division of costs/benefits between the utility and third-party investors, including who pays what costs, who reaps what benefits, and who bears what risks. These issues are the subject of ongoing research.

# **The Smart Grid Business Case Revisited: A Meta-Analysis**

John Caldwell, Edison Electric Institute

Modernization of the U.S. electricity grid continues to be a topic of dominant interest throughout the industry. As a result of the economic stimulus package in 2007, investments in smart grid infrastructure totaling over \$1 billion have been spent by over three dozen utilities. During this time, dozens of utilities have also prepared business cases for their state regulators quantifying the costs and benefits of prospective infrastructure upgrades. Meanwhile, to facilitate the evaluation of investments undertaken in response to the stimulus grants, the Department of Energy has developed a prototype of a standardized methodology for tracking costs and benefits. Together, these activities illustrate the fact that over the past three years the industry has come a long way in its quest to understand the real inherent value proposition (to consumers, to investors, and to society as a whole) of grid modernization. This paper will summarize industry developments in attempting to standardize the business case methodology. Then, building upon data collected by the DOE, a meta-analysis will be performed of actual business cases conducted by twenty-three utilities for smart grid infrastructure investments. The purpose of the analysis will be to identify the categories of benefits included among the studies for each major type of investment, the degree of consistency in benefits selected, and the range of estimation which exists for each benefit type. Estimates will be compared with those provided in recent industry studies which have attempted to quantify the incremental costs and benefits at a higher level. For benefits classes which exhibit a high range of estimates and/or significant inconsistency with figures in industry studies, an attempt will be made to account for the differences in a systematic way, for example by fitting a relationship between underlying characteristics of the utility and the quantity of the respective benefit. The paper will conclude with a qualitative assessment of the state of business case development, and highlight particular areas that continue to exhibit weakness or the potential for significant improvement.

## **Competition at the Wholesale Internet Markets**

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### ABSTRACT

Internet is the main mode of transportation of large volume of information services of many different types like commercial, educational, entertainment, business, social and many more. Most of the information is generated by the “creators of contents” (i.e., owners of websites’) for the use of their customers and/or visitors.

In order to facilitate the undisturbed flow of information (transactions) between the end users of the internet a non-trivial structure of network components must be in place ready to serve the user’s needs. Currently, most of the components of this network is privately own by profit maximizing firms.

Unlike many of the traditional network industries, the “output” (information) produced and consumed is done by the end users of the network. The owners of the network provide the delivery platform. Currently, most of the income source to the providers of the network infrastructure is from consumers of the internet contents and less from the producers of content.

In this paper we will explore the pricing methods used by the different providers of the network services. In addition we plan to explore the competitiveness at the different level of the network provision.

# Asymmetric Broadband Wholesale Regulation\_

Steffen Hoernig

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09 December 2011

Abstract

Due to technological convergence, multiple infrastructures can now offer broad-band or triple-play services, while the existing access regulation is based on a single essential network. We show that continued asymmetric access regulation of one only network does not control sufficiently for market power and benefits the unregulated network and that symmetric regulation would lead to higher consumer surplus.

Furthermore, the philosophy of access regulation may not be viable in the long run if regulatory constraints provide strong first-mover advantages to the unregulated network: The regulated network and its access seekers may lose so many customers that the threat of infrastructure monopoly reemerges.

JEL: L51, L96

Keywords: Access regulation, copper, cable, convergence

# **AN ASSESSMENT OF PRIVATE AND PUBLIC IMPACTS OF BROADBAND POLICIES ON NEXT GENERATION BROADBAND DEPLOYMENT IN THE U.S.**

**DAVID L. WARING<sup>9</sup>, STUART SHAPIRO<sup>10</sup>**

Next Generation Network (NGN) broadband has begun initial roll out, characterized by heavy investment in fiber optic facilities that support access speeds of 100 megabits per second and above. A benefit-cost analysis for U.S. NGN broadband deployment is conducted based on a previous empirical study which found that the use of industrial policy and loop unbundling increased the availability of first generation broadband.

The analysis uses predicted increases in NGN availability to drive the compilation of costs and benefits. If industrial policy is applied, public funds are directed toward building broadband infrastructure. These investment costs are compared to the benefits of the additional broadband produced. To monetize these benefits, private producer and consumer surpluses are estimated. Benefits to the economy by virtue of the network effect are also included. Additional positive externalities can be optionally added in the areas of healthcare and the environment.

Similarly, if unbundling is applied, there will be associated enforcement costs at the FCC, as well as overhead costs on the incumbent operator. These costs are compared to the benefits of predicted increased broadband availability.

A number of different scenarios are run in order to get a sense of the impact of the two broadband policies and the sensitivity to different study parameters. The results show that both policies have the potential to be justified on the basis of a benefit-cost analysis. The more positive externalities that can be quantitatively attributed to a modern, high speed broadband network, the more potential there is to justify policies which promote and invest in broadband.

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# Energy Efficiency Resource Standards: Economics and Policy

Timothy J. Brennan and Karen Palmer \*

May 25, 2012

Abstract

Twenty-four states have adopted energy efficiency resource standards (EERS), broadly regarded as standards or policies that require a minimum reduction of energy use, particularly through energy efficiency (EE) programs. Some, including Maryland, specify not just reductions in overall electricity use, but also reductions in peak demand. EERS programs can cover natural gas and electricity; we focus here primarily on the latter. These programs vary greatly in their percentage reductions, dates by which they would nominally be achieved, and baselines or reference cases—what energy use would have been absent the EERS. They can also differ in a number of aspects of implementation, including the identification of responsible parties, methods of verification, incentives, and penalties for noncompliance.

Because an EERS is typically a target for reductions, and not a cap on use, one must have some way to estimate what the use would have been if the supporting EE programs had not been in place to see whether the absolute or percentage reduction goals were met. The energy savings that count are those that can be attributed to the EE programs rather than to independent factors, such as mild weather, economic downturns, or higher energy prices.

Moreover, whether an EERS is a “policy” alternative or an aspirational goal depends on whether the EERS has independent penalties for failure to comply. If it does, those charged with compliance will treat the EERS as a policy in and of itself; if it is a goal, then the primary focus should be on the policies that an EERS engenders, rather than the EERS itself. Justifications for EERS programs usually appeal to factors beyond energy use directly; these include mitigating emissions and reducing electricity use during expensive peak demand periods. States may also institute EERS programs to encourage energy efficiency investments when the benefits from reduced spending on

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energy exceeds their up-front costs, but consumers nevertheless fail to take advantage of them. Other rationales include promoting economic development and employment (“green jobs”) and addressing energy security.

We begin by examining how an EERS compares to policies designed to address those specific justifications. We then turn to how an EERS would be designed if energy use reductions were the objective, to reach the level of energy use where its marginal value—willingness to pay less marginal cost—equals its marginal external harm. Using that framework, we identify conditions under which an EERS, specified by an absolute amount of energy reductions or an amount based on a percentage of business-as-usual (BAU) use, could lead to an optimal amount of energy use reductions as the underlying demand for energy changes. When the change in underlying demand is the result of increased investments in energy efficiency, the resulting reduction in the elasticity of demand for energy implies that an EERS leads to an optimal outcome only if the marginal external harm falls the more energy is used. This may well be the case when, for example, marginal megawatt-hours of electricity are generated using natural gas, which pollutes less than using coal to generate inframarginal megawatt-hours.

Author(s): Richard Stevie and Raiford Smith  
Title: The Economics of Utility Energy Efficiency: A Different Perspective

Embedded-cost rate-making sets electricity prices below the marginal cost of production, artificially increasing customer demand for electricity. This justifies the implementation of cost-effective energy efficiency programs (EE) to reduce customer demand to an economically-efficient level. Many electric utilities have included EE into their planning process, and some utilities are required to achieve certain levels of EE to comply with state mandates or EE portfolio standards. However, implementation of EE in lieu of traditional investments in supply-side resources raises questions about the financial impact on the utility. Critics of EE programs highlight three financial issues that arise from the implementation of EE: EE is less profitable for the utility than comparable supply-side investments, EE undercuts utility revenues over the short run, and EE diminishes the utility's long-term growth prospects. As a result, utilities and regulators must balance EE with notions of cost recovery, incentives, and lost revenues. This has led to a variety of regulator-approved EE recovery mechanisms which include cost recovery only, shared savings, earnings as percent of program costs, and revenues as a percent of avoided costs. Each of these mechanisms may or may not include recovery of lost margins and vary dramatically as to the utility's earnings incentive. Using a financial model for a hypothetical utility, this paper examines the theoretical conditions which equalize earnings across each of these regulatory recovery mechanisms. Additionally, this paper compares the earnings potential from implementing EE to the earnings a utility could achieve if it only added supply-side resources. This paper also reviews the implications of recovering lost margins over the short-run. Lastly, given embedded-cost rate-making, this paper examines the long-term ability of the utility to actually implement all cost-effective energy efficiency to reduce customer demand.

## Daily Options and Load Options in Electric Power Market

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### Abstract

One of the most significant characters of electric power price is that it could go to extremely high, and typically last for few hours. Some instruments particularly targeting these hours then has emerged, either for speculating or hedging. Although they are available in the markets, the valuations are not well known. Super-peak option is no different from daily peak option, except the hours in the contracts are those “super peak hours,” for example, 6 hours with highest prices. Suppose the normal peak option and its valuation are available in the market, we introduce two methods to calculate the super-peak options, the closed form and simulations. Super-peak options are good hedge tools for fixed volume sellers, but not good enough for one who has load commitment due to the volumetric risks. One type of options toward this approach and has been contracted in the bilateral market is called load option (or load derivative). The payoff of this options (call) can be defined as  $\max(0, L - K_1) \max(0, P - K_2) rh$ , or,  $\max(0, LP - K) rh$  alternatively, where  $L$  and  $P$  are average hourly load and price in predefined hours,  $K$  is the strike,  $r$  is the percentage of the system load and  $h$  is the number of hours. While there is no well-known closed form for this option, we provide in this paper a simulation model which is based on the load and the random factors to estimate the option fair values. The key step in simulation process is the calibration and how to adjust parameters with efficient algorithms is the major concern. We propose in this paper effective ways to calibrate major targets such as the monthly means and the daily options.

**Title: The Transaction Cost Approach to Public Utility Regulation in Australia – A New Paradigm in Regulatory Thinking?**

**By:** Darryl Biggar

**Abstract:**

The first step in any public policy problem is a clear understanding of the problem to be solved. When it comes to natural monopoly industries, the textbook neoclassical approach asserts that price regulation is necessary to control market power to reduce the deadweight loss. But this approach does not fit the facts: it does not explain the range of monopoly policies that we observe in practice, the design of regulatory institutions and processes, or the decisions of regulators themselves.

In recent years, an alternative rationale for utility regulation has been proposed. Drawing on transaction cost economics and Goldberg (1976), this approach argues that the central problem of natural monopoly is the protection of sunk relationship-specific investments of the *customers* of the monopoly service provider. This approach explains the range of public policies towards monopoly services which we observe in practice, including (on the ownership side) the use of club or joint-ownership, co-operatives, and government ownership of monopoly facilities and (on the contractual side) the use of private long-term contracts, public-private partnership contracts, alliance contracts, franchise contracts, and concession contracts. Importantly, this approach views public utility regulation as a form of long-term contract designed to protect and promote the sunk investment of the customers.

This approach explains key features of public utility regulation, such as the close parallels between the content of long-term contracts and utility regulation; similarities between the role of a utility regulator and a dispute resolution institution, and the common focus by regulators on price stability, cost-reflective pricing, and the rejection of forms of price discrimination. This approach is also consistent with historical approaches to monopoly industries and the emergence of regulation-by-commission. This paper describes the economic foundation of this approach, highlights where it has influenced regulatory thinking in Australia, and draws out the implications for future reforms.

# The Challenges of a Regulated Marketplace: Lessons from the Department of Defense

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## Abstract

National defense is a well-recognized public good featuring nonrivalrous consumption and nonexcludability. Because the market economy is not well-suited to the provision of public goods, national defense is the mission of the Department of Defense (DOD), which operates its own command economy. This paper will review the economics of the regulated DOD marketplace, with particular focus on the telecommunications and information technology services provided by the Department. Rather than allowing a market economy to determine telecommunications prices, DOD both sets internal prices and controls supply, making decisions about the use of resources. Acting as a single buyer of services that are internally priced and consumed within the Department offers several advantages: economies of scale and scope are achieved, better contract terms are negotiated than could be done by individual buyers, a spectrum of services may be bundled, and the asymmetry of information is lessened. However, such an approach is not without disadvantages, most significantly inefficient resource distribution and a separation between the commercial providers of goods and services and the end users. The unintended consequences of DOD's command economy and methods for adapting to those will be examined, as will product pricing and other mechanisms that move the Department's command economy closer to achieving policy goals.

## History of Cost of Service Regulation: Adaptation and Evolution

By

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Cost of Service Regulation (COSR) or traditional regulation has served as a stable platform that has been resilient in the face of technological, economic and financial shocks in managing the relational contract between society and the utility industry governing the provision of reliable electric service since the Hope Decision in 1944. The Hope Decision established the regulatory bargain between society and the utility involved a set of mutual rights and obligations where both sides to the bargain gave up certain rights in order to meet societies need for reliable service. The bargain was structured where stockholders gave up the right to high levels of return, while customers bore the actual costs of ensuring reliable service, inclusive of the risks associated with ensuring the obligation to serve. The utility was allowed to recover its actual prudent cost of service inclusive of the cost of capital under the bargain's structure. The regulator served both the role of the overseer of the bargain and as the replacement for the discipline of the competitive market. The mechanism of COSR served as an administrative tool to implement or operationalize the implementation of the bargain. In this respect COSR can be viewed as a flexible mechanism for implementing the long run relational contract that is represented by the regulatory bargain. COSR has been successful in implementing the bargain, not because it was rigid in its application of the original model, but because regulators were flexible in their response to changing market conditions that undermined the fundamental assumptions supporting the original model. This paper will first lay out the structure of the original COSR model and its underlying assumptions, we will then examine how the model was modified to address the series of shocks that arose from 1973 through today, which nullified; on a permanent or temporary basis, a number of the original models assumptions. In some respects the evolution of regulatory method has been intentionally or unintentionally designed to make the regulatory process responsive to the needs of customers and stockholders by attempting to preserve the original terms of the regulatory bargain. The model has evolved to more effectively serve all parties and promote the public interest. We will conclude by examining the electric utility industry's claim that "new regulatory frameworks" are needed to meet the needs of utilities and their customers in today's environment.

**Optimal Capital Structures for Regulated Public Utilities  
When Does an Imputed Debt Ratio Make Sense for Ratemaking Purposes?**

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This paper examines the theory and practice of capital budgeting decisions for public utilities. It begins by examining the traditional factors considered by financial theorists and practitioners to determine an appropriate capital structure for investor-owned firms. It then reviews the Federal Energy Regulatory Commission's policies on capital structures permissible for ratemaking purposes, including the *Ozark* precedents applicable to project-financed pipelines. It puts the *Ozark* precedents into the context of financial market conditions that prevailed in the 1980s when they were established, and evaluates their continued applicability today. The paper concludes with an analysis of when regulatory policy should look to imputed debt ratios instead of actual debt ratios.

## **The Asset Characteristics of Environmental Benefits: Solar Renewable Energy Certificates**

Solar renewable energy certificates (SREC's) are an environmental asset that began to be publicly traded. Therefore, the renewable energy environmental benefits from photovoltaics (PV) are monetized. The asset characteristics of SREC prices that reflect environmental benefits are investigated and compared with other traditional financial assets. This is the first study of its kind. Currently, traders of SREC's are the creators of SREC's, i.e., the owners or developers of photovoltaic projects and buyers, mainly electric utilities that need SREC's to meet their renewable portfolio standards. This leads to a thinly-traded market and potential problems for efficient price discovery as potential side-line investors as non-participants in the energy market do not invest in this form of asset. Additionally, large buyers and sellers can easily and materially impact the movement of market prices in a transaction. A recent developed generalized consumption asset pricing model from Michelfelder and Pilotte (2011) is empirically estimated with the GARCH-in-Mean method for SREC's and other financial assets to understand and compare the valuation properties of SREC's with other assets. These include their returns, risk premiums, long-term volatilities, past and ex ante volatility patterns, probability distribution(s) of prices and returns, and their ability to hedge the business cycle. The contribution of this investigation is to increase the understanding of the asset characteristics of SREC's and potentially lead to a more liquid market, efficient pricing and allocation of capital to PV.

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## The Paradox of Advancing Universal Broadband Availability through Competition

By Victor Glass, Stela Stefanova, and Roman Sysuyev, NECA

The cost of capital for rural local exchange carriers (RLECs) is extremely difficult to estimate. RLECs operate in thin markets, where government support is necessary to build a business case for operating in these territories. They face competition in the more heavily populated parts of their serving areas but are required as “Carriers of Last Resort” to provide service to customers throughout their service territories. Most don’t have their debt and equity traded on public financial exchanges. They have limited access to credit, and the credit comes mainly from a limited number of lenders, including the U.S. Department of Agriculture’s Rural Utility Service (RUS). RLECs require a large amount of fixed plant unique to the telecommunications industry. With the packet revolution, copper plant is being supplanted by fiber, switches by routers, and SONET and other TDM network equipment by Ethernet equipment. Without a developed aftermarket, these legacy investments are largely sunk costs that have limited value as collateral for a loan. If an RLEC fails, its legacy assets in the ground will pay cents on the dollar to the lending institution. We show that a technique based on free cash flow multiples produces cost of capital estimates in line with the risk profile of RLECs while traditional weighted cost of capital techniques produce counterintuitive results such as increasing the estimated value of the typical RLEC at a time when its value is declining sharply.

**COAL DEMAND AND TRANSPORTATION  
IN THE  
OHIO RIVER BASIN:  
ESTIMATION OF A CONTINUOUS/DISCRETE DEMAND SYSTEM  
WITH  
NUMEROUS ALTERNATIVES<sup>11</sup>**

By

Kenneth Train and Wesley W. Wilson

Coal fired electricity plants account for over 50 percent of all electricity produced and over 90 percent of all coal consumed in the US. Concern over environmental damage led to the Clean Act in 1970, and amendments in 1990. These established standards for emissions that had to be met by a subset of firms by 1995, and by the whole of the industry by 2000.

Based on personal interviews with electricity companies and available data, we model the decision as a sequential process in which firms forecast power needs and allocate the needs to a specific plant. Given the power needs allocated to a specific plant, they choose where to procure the coal. Coal has many attributes of import e.g., mine-price, delivered price, sulfur content, ash content, and BTUs. These attributes vary over time and across different mines and sources from which coal can be purchased.

Theoretically, the model is a constrained optimization problem. Empirically, the firm has a large number of options, but only a handful are chosen. The data cover 149 electricity plants with observations that cover 1991-2008, with over 1000 different sources of coal, and up to five different transport modal options (over 5000 options). We estimate the quantity chosen from each location (inclusive of zero and all) in terms of the cost of the coal (minemouth and transportation) and attributes of the coal (sulfur, ash and BTUs). We find that each has a statistically important effect on the decisions which vary over different Clean Air Act regulatory regimes (1995-1999 and after 2000). We also simulate the effects of the Clean Act amendments and find that the 1995 changes, while important, are dominated by the 2000 amendments. Our simulations, if these amendments had not been passed, suggest that 13.3 percent more sulfur would have resulted.

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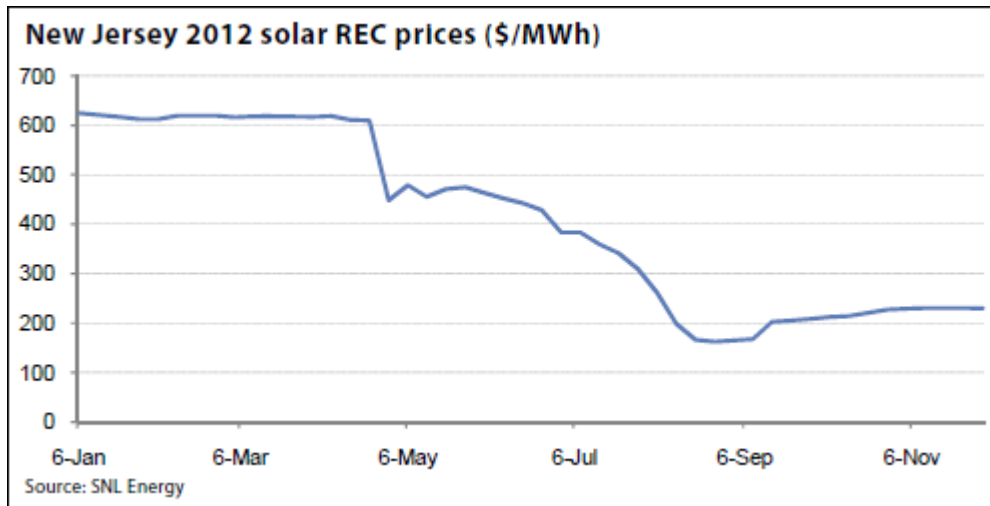
## The Implications of a Vertical Demand Curve in Solar Renewable Portfolio Standards

**Authors:** Dr. Colin J. Loxley & Professor Frank A. Felder

**Paper to be submitted for the Center for Research in Regulated Industries, 31st Annual Eastern Conference, Shawnee on Delaware, Pennsylvania, U.S., May 16-18, 2012**

### ABSTRACT:

Recently the prices of Solar Renewable Energy Credits (SRECs) in New Jersey have been extraordinarily volatile, with prices in the 2011 auctions (for 2012 SRECs) dropping from over \$600 to under \$200:



Given that this market is a construct of regulation and public policy, should NJ policymakers respond and if so, what are their options and the likely impacts?

This paper describes the history of NJ solar development, and analyzes the extent to which price volatility is inevitable given the nature of the “demand curve” created by the Renewable Portfolio Standard, which mandates a fixed annual demand for SRECs. We examine the short-run and long-run supply and demand conditions which can give rise to the volatility of such markets and prices.

Given the apparent success of NJ policy in rapidly deploying PV capacity, is the collapse in prices a policy problem?—or simply the natural working of a competitive market? Certainly the smaller ‘behind the meter’ solar installations are now facing a potentially bleak future, and their economic survival is at risk. This has implications for jobs and unemployment, particularly in installation work, which policymakers find troubling in today’s challenging economic environment.

In contrast, it appears that at least some of the larger Solar companies still find the prospective long-run returns sufficient to move ahead with large-scale “grid connected” solar “farms”, ironically using undeveloped farmland in some cases and ‘brownfield’ sites in others.

This paper weighs the pros and cons of further policy intervention in what is already a somewhat artificial, regulated market, and explores the different legislative and regulatory options that have been proposed or discussed. This leads us to some observations for policymakers to consider as they move forward and try to balance the electric price impacts of solar with the economic impacts and the policy of increasing renewables.

## **Allowing for Off-Peak Price Incentives to Reduce Electric Vehicle Distribution Grid Congestion**

Abstract of George R. Pleat for CRRRI 31<sup>st</sup> Annual Eastern Conference

Maryland legislators have sent in motion financial investments, tax incentives and Public Service Commission directives to encourage and accommodate electric vehicle (EV) market expansion in the state. Given this push, electric investor owned utilities in the state must brace themselves for the plug-in demand impact on residential neighborhood distribution grids --potentially EV charges, dispatched randomly and conveniently by ratepayers could increase significantly resident peak demand causing transformer, feeder and substation capacity shortages.

To combat these potential capacity shortages caused by EVs, electric utilities must begin to design price signals that will incentivize EV users to plug in their vehicles off-peak where demand congestions are least likely to occur. The pricing strategies will first involve reviewing when substation, feeders and transformers peak locally, establishing rating periods where demand congestion maximizes and least occurs. Next the strategy should establish price signals within the rating periods to capture when electric supply and distribution costs are caused by customers. Consequently the EV rate schedule peak to off-peak rate ratio will be wide; encouraging EV users to shift their EV demand levels to less congested time periods.

Electric utilities have to ensure that barriers to entry into an EV rate schedule are removed and important EV profile information is gathered for system planners, otherwise EV congestion degradation may not incur. Barriers to EV rate schedule customer entry can include failure to integrate billing systems with existing legacy TOU meters and smart meter technology; not offering EV load only metering rate schedule; nominal electric savings to the EV customer for load shifting; and TOU price complexity. Lack of important EV profile information from the customers such as charge level type could hinder planners from adding adequate capacity in areas where demand strains are prevalent.

## **When is Transmission Not Transmission: Regulating Flexible Electric Transmission Architecture**

*Seth Blumsack and Mostafa Sahraei-Ardakani*

*Leone Family Department of Energy and Mineral Engineering, Pennsylvania State University*

*Abstract:* Traditionally, electric system operators have dispatched generation to minimize total production costs, assuming a fixed transmission topology within the dispatch horizon. Implementation of smart-grid systems could allow operators to co-optimize transmission topology alongside generator dispatch; the technologies that would enable such co-optimization are still regulated as part of the monopoly transmission system. Recent work (Gribik et al., 2005; O’Neill, et al., 2008) has proposed mechanisms for compensating transmission owners based on flexible electrical characteristics and availability; and integrating transmission into “complete” real-time electricity markets. We study two different designs for the market-based operation of Flexible Alternating Current Transmission Systems (FACTS), which allows some control over the electrical topology of transmission lines. The first market design compensates FACTS devices based on differences in locational prices (effectively with Financial Transmission Rights), while the second allows FACTS devices to submit supply offers just as generators would, being paid a market-clearing price for additional transfer capacity provided to the system. The variable social costs of FACTS devices are modeled as the additional losses associated with changes in electrical characteristics of transmission lines.

Our problem formulation for a simple two-node system suggests a number of regulatory implications for flexible transmission architecture. First, we find that the marginal cost functions for FACTS device dispatch are increasing, suggesting that flexible transmission technologies may not possess the same natural-monopoly characteristics as the wires themselves. Second, the additional transfer capacity offered by FACTS devices may effectively clear the real-time market in some circumstances (i.e., the additional transfer capacity displaces higher-cost generation), suggesting that FACTS devices have the power to set prices. Third, if FACTS devices are compensated based on locational price differentials, the owners of such devices will not have incentives to offer the socially optimal amount of transfer capacity to the system operator.

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# Is Deferrable Demand an Effective Alternative to Upgrading Transmission Capacity?

by

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**Abstract**—With high penetrations of variable generation from wind turbines in remote locations, transmission capacity may be inadequate to transfer this relatively inexpensive source of generation to load centers. The major reason is that transmission corridors into load centers are often congested when the system load is high and additional wind generation is effectively shut out. In contrast, when the system load is low and the wind is blowing, wind generation may be able to meet most of the load throughout the network subject to the specific limitations of the network's topology. This paper compares the system costs of two very different ways of reducing congestion on the network to increase the annual amount of potential wind capacity dispatched. The first way uses the standard supply-side solution of upgrading transmission capacity on the network. The second way uses a demand-side approach in which deferrable demand shifts the system load from on peak periods to off-peak periods. In addition, the deferrable demand can be used to offset the inherent variability of wind generation and reduce the amount of reserve generating capacity needed to maintain Operating Reliability. In fact, reducing the total amount of conventional generating capacity needed to maintain System Adequacy for a given amount of installed wind capacity is a major source of cost savings with deferrable demand. The simulation is based on a multi-period (24 hours), stochastic, Security Constrained Optimal Power Flow (SCOPF) and a reduction of the NPCC network. This framework includes stochastic forecasts of potential wind generation at multiple sites as inputs as well as deferrable demand (e.g. thermal storage) at different load centers. It determines the optimum patterns of dispatch, reserves and ramping to maintain reliability over a set of credible contingencies. The results demonstrate that deferrable demand can effectively 1) lower the average wholesale prices for energy, 2) reduce the installed generating capacity needed to maintain System Adequacy, and 3) mitigate the ramping costs associated with wind variability. With a sufficient amount of deferrable demand, the typical daily pattern of load can be flattened and all of the variability of wind generation can be mitigated. The overall conclusion is that deferrable demand reduces the total annual cost of the conventional system substantially more than upgrading transmission capacity, and it is an effective alternative to the standard supply-side solution.



## **Environmental Offsets, Renewable Energy Credits and Liquidity in Organized Electricity Markets**

**Beverly A. Brereton**

With increased integration of renewable energy resources in organized electricity markets and the use of certain types of renewable energy technologies (for example, biomass and hydroelectric facilities) as suppliers of environmental offsets while the magnitude of virtual bidding declines, a liquidity problem is emerging in organized electricity markets. This problem is exacerbated by the willingness of conventional thermal generating plants to self-commit or self-schedule when released for shutdown in an effort to avoid shutdown costs and minimize the number of starts within any defined operating period.

Today, many renewable energy technologies deployed for electric production have resorted to either self-commitment or self-scheduling in the organized energy market to produce the renewable energy credits and environmental offsets needed to support the level of operation desired by assets owners of conventional technologies to satisfy their environmental obligations. As a result, combined cycle and simple cycle gas turbines used during peak periods experience fewer hours of economic dispatch despite the changed relationship between natural gas and fuel oil prices.

In addition, large conventional thermal plants utilizing coal, nuclear or petroleum-based feedstock with sizable presence in the electricity markets are characterized by electric production technologies that do not accommodate short startup intervals after plant shutdown. As a result, the owners decide to operate such plants on a continuous basis on consecutive operating days with forced and planned outages providing interruptions to this operating regimen. Often, periods of economic dispatch intersperse the operating days for these conventional technologies with only generating plants not operating at their maximum available capacity becoming eligible for dispatch when their supply offers are economic.

Although the price-taking role in organized markets by generating resources poses little threat to price discovery when the magnitude of the megawatts is less than typical energy consumption increments experienced during periods of peak energy consumption, the prevalence of this bidding strategy results in very limited price discovery during off-peak periods in the energy market in the absence of a negative pricing mechanism. In addition, when the magnitude of those self-scheduled and self-committed megawatts surpasses the energy increments typically experienced during peak periods of energy consumption, there is the suppression of hourly energy market clearing prices. Sustained market outcomes of this nature will result in premature retirements of generating plants as income transfers heighten among generators and between the supply and demand sides of the market as the footprint of demand response enlarges. Further, the blunt price signal that emanates from the equilibrium outcomes in the market fail to incent entry of appropriate generating technology with the desired operating flexibility the system operator wishes.

With a number of conventional thermal generating plants forward contracting their energy supply under long-term contracts, a subset of those assets engages in similar bidding strategies of self-scheduling and self-commitment in an effort to minimize basis risk in the financial markets. As the number of virtual suppliers decline in the day-ahead energy market, the convergence between spot and forward energy prices become less likely, though the influx of demand response is on the rise. These manifest interrelationships among the physical and financial energy markets with the emissions markets expose the need for a more holistic approach to market design in the financial and physical commodity markets for joint energy and emissions products rather than the persistent tendency to develop isolated market solutions with little or no acknowledgement of the interdependence of the markets. Energy and environmental policies have not embraced such interdependency with some policies undermining efficient market operation.

This paper offers exploratory evidence of the effects of self-commitment and self-scheduling among generating technology types and preliminarily considers possible energy market design solutions to this emerging problem in organized electricity markets in an effort to increase societal welfare. Though a negative pricing mechanism has been introduced in a number of markets in Europe and a few markets in North America, the unintended reinforcement of resource inflexibility detracts from its success and beckons the need for more resilient solutions.