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POWER notes

P R O G R A M O N W O R K A B L E E N E R G Y R E G U L A T I O N

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POWER RESEARCH CONFERENCE ON ELECTRICITY INDUSTRY RESTRUCTURING

On March 15th of this year, POWER held its first research conference on electricity industry restructuring. The Berkeley conference provided a forum for the presentation of current research on many aspects of electricity industry restructuring. Participants included industry practitioners, regulators, and academics. The second annual conference will be held in Berkeley on March 14, 1997. The 1996 conference was sponsored by Pacific Gas & Electric, Southern California Edison, and the Sacramento Municipal Utilities District, with additional support provided by PacifiCorp and Consolidated Edison. The day's presentations were grouped into two sessions. The morning session focused on the efficiency of performance-based regulation and competitive price formation in electricity markets in the US and abroad. The afternoon session focused on the short and long term incentives provided by various proposals for the organization of markets for electricity transmission.

David Newbery of the University of Cambridge began the first session, providing an overview of the restructuring in the electricity power sector of England and Wales. Among the points he discussed were the impact of vesting contracts, capacity payments, and price regulation on the exercise of market power in the UK. Many of his conclusions were reinforced by the empirical studies presented by Catherine Wolfram of Harvard University on the exercise of market power in England and Wales. Frank Wolak of Stanford University, the discussant for the first session, offered his support for the results of Wolfram's studies, but pointed out that the question of *how* market power was being exercised was at least as important as how *much* market power was indicated by Wolfram's results. Wolak indicated that the lack of real-time price responsiveness on the part of most electricity customers in the UK exacerbated the potential for market power abuse in peak load hours.

In the second morning session, Claude Crampes of the University des Sciences Sociales de Toulouse presented a paper (co-authored with Jean Jacques Laffont, University des Sciences Sociales de Toulouse) in which he discussed the transfers and incentives, both explicit and implicit, that have been created by the performance based regulatory scheme recently adopted for the Spanish electricity sector. Richard Gilbert of UC Berkeley then discussed this incentive scheme in the context of four general regulatory approaches. Shmuel Oren of UC Berkeley wrapped up the morning half of the conference with his presentation (a joint paper with Raymond Johnson and Alva Svoboda, Pacific Gas & Electric) on the equity and efficiency issues that stem from unit commitment decisions in a competitive electricity market. Oren presented simulation results indicating that non-transparent aspects of system dispatch computer programs can have significant impact on the profits earned by individual generators.

The afternoon sessions began with a presentation by UCEI's James Bushnell (a joint paper with Steven Stoft, UCEI) on the incentives for the investment in transmission assets that are provided by Transmission Congestion Contracts, a form of transmission network property. Bushnell presented conditions under which no investor may have an incentive to make harmful changes to the grid -- a problem that has been a concern for TCCs and other forms of transmission property. In discussing the paper, Steven Walton of PacifiCorp added his belief that the institutional barriers currently in place are sufficient to deter any potentially damaging investments in a transmission network.

The final session of the conference featured three proposals for rationing transmission access in a "decentralized" fashion. These proposals have been stylized as alternatives to the pooling approach that is currently favored by the California Public Utilities Commission. Pravin Varayia of UC Berkeley discussed many potential shortcomings of the pooling approach (in work co-authored with Felix Wu of UC Berkeley), claiming that pooling stifled the creative potential of alternative market innovations. Hung-Po Chao of the Electric Power Research Institute (co-authored with Stephen Peck, Electric Power Research Institute) presented an alternative proposal for rationing transmission that involved creating markets for transmission paths. To be dispatched, each power transaction would be required to purchase capacity along the paths that would be impacted by that transaction. Bart McGuire of UCEI closed the session by asking the question, "What is the difference between a transmission line and a railroad?" McGuire concluded that the answer was "nothing," and argued that a process of iterative transmission price-setting by the system operator and quantity adjustment by electricity traders could efficiently clear a market for electric transmission, just as such processes clear many other markets. In discussing these proposals, James Kritikson of Southern California Edison thanked the researchers for their work in developing alternatives to the then-dominant paradigm, but expressed concern about the timing and communications needs presented by such schemes as well as highlighting the need for long-term hedging of "access" risk by users of the network. POWER Director Severin Borenstein acknowledged the potential shortcomings of pooling raised by Varayia, but claimed that most, if not all of these shortcomings, would also exist under other transmission market schemes. Borenstein concluded that there was merit to the argument that different schemes should be tried simultaneously in order to determine experimentally which theoretical claims were most significant. 

POWER ANNOUNCES
A CALL FOR PAPERS
FOR ITS
SECOND ANNUAL
RESEARCH CONFERENCE
ON ELECTRICITY INDUSTRY
RESTRUCTURING



POWER invites interested researchers to submit papers for a one day conference to be held in Berkeley on March 14, 1997. The purpose is to bring together outstanding scholars from around the country to exchange ideas and research results on topics related to electricity industry restructuring.

Papers are invited on any relevant analytic question associated with electricity industry restructuring including, but not limited to, the following subjects:

- Transmission access
- Stranded cost recovery
- Market structure
- Conservation, R&D, and low income programs after restructuring
- Performance based ratemaking in restructuring
- Market power
- Political economy of restructuring
- International comparisons
- Future role of regulation in electricity

Draft papers should be sent by November 30, 1996 to:

POWER Research Conference
University of California Energy Institute
2539 Channing Way #5180
Berkeley, CA 94720-5180

Authors will be notified concerning acceptance for the conference by December 15, 1996.

Final papers will be due by February 15, 1997.

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Energy Views

by Severin Borenstein and Steven Stoft

A CHEAPER WAY TO CLEAN GASOLINE

California gasoline prices have declined from their summer peaks, but they remain well above the rest of the country. Historically, our gas prices have been about the same as the national average (excluding taxes), but recent figures indicate they were as much as 25 cents per gallon higher than in the rest of the country during the early summer. Some might blame California's use of a less-polluting reformulated gasoline (RFG) for our misfortune. But the problem is not the new gasoline standard, rather it is the bureaucratic rigidity with which the standard has been implemented.

The strict requirement to sell only RFG in California decouples our market from the rest of the country. Furthermore, not all of California's refining capacity has been retrofitted to produce RFG, so the state has very little excess refining capacity. These factors combined make California prices extremely sensitive to any disruptions in RFG supply and prevent the normal cushioning effect of trade with neighboring states.

The California Air Resources Board (CARB), which designed the RFG standard, has expressed concern about the recent increases in gasoline prices. Some consumer groups have suggested that CARB suspend the RFG standard temporarily to bring down prices. Such a suspension is opposed by environmentalists as well as refiners in California who have made huge investments to produce RFG.

We also oppose suspension, not because it would be worse than continuing the RFG standard as currently implemented, but because there is a far better policy which would smooth out the price increases without punishing refiners of RFG and have negligible environmental impact.

Rather than rigidly prohibit the sale of standard non-reformulated gasoline regardless of how expensive RFG gets, the state should simply require sellers of standard gasoline to pay a surcharge. An extra 15 cents per gallon would be sufficient. This would effectively put a cap on how much California gasoline prices could exceed those in the rest of the country. If the price of gasoline here were more than 15 cents above the price in other states (plus the cost of transportation), suppliers of standard gasoline would start shipping gasoline into the state. In normal times, a 15 cent surcharge on standard gasoline would enforce CARB's RFG rule just as effectively as a rigid regulation because RFG costs only 8-12 cents more than standard gasoline to produce.

Even in times of short supply, the surcharge would not cause a major switch to the more-polluting standard gasoline. Whatever the reason for the shortage — an unexpected demand surge, a refinery outage, or a delivery problem — the surcharge would only encourage use of standard gasoline up to the point where the California price was driven down to within fifteen cents of the price in other states. In nearly all cases, a small inflow of standard gasoline would be sufficient to have this effect.

During a shortage, the state would receive modest revenues from the surcharge which would be collected only on the standard gasoline sold in state. Even including this surcharge, gasoline would cost consumers less than they would have been paying if the RFG standard were enforced rigidly. Thus both consumers and the state win. The producers of standard gas, who bear the surcharge, also win by being allowed to sell in California. The only losers are the suppliers of RFG who can no longer profit excessively from the temporary shortage. After the shortage has passed, RFG prices would again drop to be less than 15 cents above out-of-state standard gasoline prices, sales of standard gasoline in California would cease, and so would collection of surcharge revenues.

This approach offers three advantages over either a complete ban on standard gasoline or occasional suspensions of the ban by CARB:

- Unlike a ban on standard gasoline, the proposed surcharge would limit the price volatility of RFG.
- Unlike occasional suspensions of the RFG requirement, a surcharge would not require a lengthy, politically-charged debate before it starts working. The option to sell standard gasoline and pay the surcharge would automatically trigger sales of standard gasoline as soon as an RFG shortage developed.
- Unlike occasional suspensions of the RFG requirement, a surcharge would not punish refiners who have invested in producing RFG by allowing a sudden flood of lower-cost standard gasoline.

Our proposal, however, would require more flexible and creative thinking than state regulators often display. Rigid regulation has cost consumers at the pump and could harm the environment if it resulted in a suspension of the RFG standard. We think it's time to use more imagination, and by doing so, to serve both consumers and the environment.



POWER WORKING PAPER ABSTRACTS

Most POWER working papers are now available on the Energy Institute website:

<http://www.ucenergy.eecs.berkeley.edu/ucenergy>

Working papers are posted in PDF format for viewing and printing with Adobe's Acrobat Reader. Acrobat reader is available at no charge from Adobe's website:

<http://www.adobe.com>.

Market Power in California Electricity Markets by Severin Borenstein, James Bushnell, Edward Kahn, and Steven Stoft (UCEI) **PWP-036**

As the electricity industry in California undergoes a process of fundamental restructuring, important new products and markets will be created while others will lose significance. In PWP-036, Borenstein, Bushnell, Kahn, and Stoft make an initial survey of the products and markets that will be prominent in the emerging new electricity industry. They describe approaches to analyzing the prospects for, and the impacts of, market power abuse in these various product markets. The key product markets that are discussed include the market for spot electrical energy, markets for pool-based and physical power contracts, and markets for grid services such as load balancing and spinning reserve. The authors caution that structural measures of market power, such as the Hirschman-Herfindahl Index (HHI), have certain general shortcomings that are exacerbated when applied to restructured electricity markets. Fortunately, the direct estimation of competitive equilibria, such as a Cournot oligopoly equilibrium, appears to be more feasible for this industry than is generally the case.

Sticky Prices, Inventories, and Market Power in Wholesale Gasoline Markets by Severin Borenstein (UCEI) and Andrea Shepard (Stanford) **PWP-037**

In PWP-037, Borenstein and Shepard present and test an explanation for lags in the adjustment of wholesale gasoline prices to changes in crude oil prices. Their simple model with costly adjustment of production and inventories implies that output prices will respond with a lag to cost shocks even in the absence of menu costs, imperfect information, and long-term buyer/seller relationships. The model predicts that future prices for gasoline will adjust incompletely to crude oil price shocks occurring close to the expiration date of the futures contract. Borenstein and Shepard test and confirm this implication. The model also predicts that firms with market power will choose a different price adjustment path than would perfectly competitive firms. The authors examine the responses of prices in 188 local wholesale gasoline markets and find evidence that greater market power leads to slower output price adjustment.

Stimulating Electricity Restructuring in California: Interactions with the Regional Market by Edward Kahn, (UCEI), Shawn Bailey (Southern California Gas Company), and Luis Pando (Henwood Energy Services) **PWP-038**

This paper presents some simulations of the proposed California power exchange, or pool, as it might interact with the regional market in the Western US. Pooling will increase interdependence with the regional market. We study this using a multi-area chronological production simulation model. We find that overall operating economies resulting from pooling are small. Physical changes in the dispatch of the electrical system, however, are rather large in comparison with the economic effects. The two driving forces for the physical changes are the reduced unit commitment resulting from pooling and transmission pricing policy. As a result of increased regional trade, transmission

congestion increases. The costs of congestion appear small, however, since marginal costs in the region are quite close to one another. Within the California pool, marginal cost pricing will produce economic rents for the generating companies. These rents are not particularly large, especially in light of the fixed operating and maintenance costs of the plants that must be covered by those rents. Finally we examine the potential for new entry into the market. Entry conditions in the near term do not appear particularly favorable. If the fixed costs of new supply are sufficiently low to allow entry, regional economics show no clear preference for siting within California versus more remote locations. The trade-off between moving gas versus transmitting power do not show a clear trend. These results are quite preliminary, but suggest that quantitative modeling of electricity restructuring can yield useful insights.


Equity and Efficiency of Unit Commitment in Competitive Electricity Markets by Raymond Johnson (Pacific Gas & Electric), Shmuel Oren (UC Berkeley), and Alva Svoboda (Pacific Gas & Electric) **PWP-039**

In PWP-039, Johnson, Oren, and Svoboda examine the effect of competition and decentralized ownership on resource scheduling in a pool-based electric power system. They show that centralized scheduling of multi-owned resources under imperfect information may face difficulties that do not arise when resources are centrally owned. The authors perform a simulation case study using a lagrangian relaxation-based unit commitment algorithm modified to simulate proposed uniform-price pool auction procedures. This algorithm is based on the Hydro-Thermal Optimization (HTO) program used in short-term resource scheduling at PG&E. They demonstrate, for a benchmark system, that variations in near-optimal schedules that have negligible effect on total system cost can have significant consequences on the total payments by customers to generators and on the distribution of profits among the generators. Thus, a system operator charged with making efficient central unit commitment decisions is in a delicate position of making distributional decisions among customers and resource owners with no economic rationale to back these decisions. These effects are inherent in unit commitment optimization problems because of the presence of many near-optimal solutions. The authors argue that these results highlight potential pitfalls in central management of dispatch constraints specified by bidders, and they support more decentralized approaches to unit commitment.

The Competitive Effects of Transmission Capacity in a Deregulated Electricity Industry by Severin Borenstein, James Bushnell, and Steven Stoft (UCEI) **PWP-040**

In an unregulated electricity generation market, the exercise of marketpower will be limited by the number of actual and potential competitors that a firm faces. The degree to which generators in different locations compete with one another will be greatly determined by the capacity to transmit electricity between the locations. Unlimited transmission capacity would imply a nationwide (or larger) market, while more limited transmission capability may lead to some generators facing limited competition for serving certain locations. In PWP-040, Borenstein, Bushnell, and Stoft study the impact of transmission capacity on competition among generators. They show that there may be no relationship between the effect of a transmission line in spurring competition and the actual electricity that flows on the line. The authors then investigate the equilibria that are likely to result as transmission lines between previously unconnected locations are built and expanded. Their results indicate that relatively small investments in transmission may yield surprisingly large payoffs in terms of increased competition.

EDWARD KAHN LEAVES POWER

In March 1996, Ed Kahn resigned his positions as co-director of POWER at the Energy Institute and leader of the Utilities Policy and Planning Group at Lawrence Berkeley National Laboratory. Kahn has moved on to National Economic Research Associates in San Francisco, where he is a Vice-President and will continue to work in the electric power industry. Ed had been a researcher at the Energy Institute since 1987, and had been the co-director of the POWER program for the last two years. His experience, wisdom, and wit will be missed. 


VISITORS TO POWER

POWER is fortunate to have two distinguished visiting scholars during the 1996-1997 academic year. Ross Baldick of the University of Texas at Austin visited during the summer of 1996 and Frank Wolak of Stanford University will be visiting in the Spring of 1997. Baldick, a Professor of Electrical Engineering, has been a frequent collaborator with POWER's Ed Kahn and spent the summering on electric transmission pricing and system dispatch issues. Wolak, who will be visiting from the Economics Department at Stanford, has been studying aspects of the electricity market in the United Kingdom. He was a discussant in the session on the United Kingdom's electricity industry at POWER's research conference on electricity restructuring last March. Wolak's paper with Robert Patrick of Rutgers University on market power in the UK electricity industry has been widely cited in relation to the filing of the Western Power Exchange (WEPEX) with the Federal Energy Regulatory Commission.

POWER TALKS TO POLICY MAKERS

As they have since the beginning of the electricity restructuring process, POWER researchers continued to interact with policy makers in several different forums over the last year. In March 1996, Severin Borenstein and Carl Blumstein testified before the California State Legislature's Little Hoover Commission. Borenstein summarized for the committee several recent developments in the electricity industry while Blumstein focused on issues relating to public goods research & development in a post-restructured industry. In April, Steven Stoft spoke before the Western Regional Transmission Association (WRTA) about proposals for allocating electricity grid resources in a competitive market.

POWER also continued several projects in conjunction with the California Energy Commission, including an investigation of market power issues in a competitive electricity market (see PWP-036). In June, Borenstein, Jim Bushnell, and Stoft presented this analysis to staff at the California Public Utilities Commission.

In July, Borenstein spoke before the New York Public Service Commission about market power issues. He stressed the importance of price-responsive demand in a competitive electricity market and warned against over-reliance on historical data when analyzing the potential for market power in electricity markets. Borenstein believes that many electricity suppliers will have dramatically different incentives after the restructuring process is complete, therefore historical data on the actions of those suppliers may not be very informative. 

CALL FOR PAPERS *UTILITIES POLICY*

Utilities Policy is an international journal published quarterly by Elsevier Science Limited. Contributions are invited on any aspect of utility policy and utility planning; utilities covered include electricity, gas, oil, coal, telecommunications, water and waste, and urban transport in developed, newly industrializing and less developed countries. The journal aims to be cross-sectoral in focus; articles that cover methodologies or approaches to issues of interest and application to the broad range of utilities are therefore especially encouraged.

Articles should be 6000-8000 words in length, and are refereed before publication. Three copies should be sent to either the North American Editors or the European Editor.

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