

HARVARD UNIVERSITY
JOHN F. KENNEDY SCHOOL OF GOVERNMENT

Harvard Electricity Policy Group



*Center for Business and Government
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**HARVARD ELECTRICITY POLICY GROUP
SECOND PLENARY SESSION**

**Taubman Center, 5th floor
John F. Kennedy School of Government, Harvard University
October 26-27, 1993**

MEETING SUMMARY

Tuesday, October 26th

Morning session: TRANSITION COSTS

The session began at 10:00 with an introduction by Bill Hogan and a welcome from John White. The morning session was devoted to a discussion of transition cost issues. Bill Hogan presented Richard Pierce's paper, Gas Industry Transition Costs and Their Allocation. (Dr. Pierce was unable to participate himself because of teaching conflicts) After the discussion of the gas experience, another participant presented recent work on assessing the potential exposure of muting generation investments and supply obligations of companies in a power pool in the case of competition-driven restructuring in the electricity industry.

Natural Gas Restructuring

It is important to distinguish a discussion of transition costs from a discussion of the net benefit of such a transition - FERC estimates that the net benefit of the transition in the natural gas industry was about \$2-6 billion per year. Assessments of transition costs for the most part do not have anything to do with the incremental costs to society as a whole. They are rather an evaluation of the exposure of particular parties in a transfer of obligations to pay costs that have already occurred or for which commitments have already been made. Pierce estimated that in the case of natural gas the bulk of these transition

costs came from take or pay contracts requiring the pipeline companies to buy expensive gas that was no longer expensive in a deregulated market, and that the settlement and realignment of these contracts cost roughly \$20 billion. About 50% of this was borne by producers, about 20% (\$3-4 billion) to the pipeline company shareholders, and the rest to LDCs and end users. The book value of the pipeline companies at the time was about \$23 billion. As with the transition estimates for electricity which follow, these numbers are only a rough estimate - the important thing to concentrate on is the order of magnitude.

Pierce drew seven "lessons" from the gas industry transition. Many of them stressed that there were things that could be done to *ease* the transition. In the case of natural gas, according to Pierce's analysis, the problems that were dealt with quickly were dealt with better, but the effort to construct a coherent policy for dealing with transition costs is a very difficult one. The lessons he noted from the experience with natural gas transition costs were:

- Regulators can affect the magnitude of transition costs.
- Regulators can affect the ease of the transition.
- Firms can affect the magnitude of transition costs.
- Firms can affect the ease of the transition.
- Some firms and managers will not survive the transition.
- Allocation of transition costs produces intense political and legal controversy. Allocation of transition costs takes many years.

A participant with gas industry experience mentioned that the transition costs had actually been on the order of \$100-200 billion if you counted gas and oil reserves that had been in development under pre-restructuring price scenarios. The presenter pointed out that it was difficult to say how much of that bigger number was because of the regulatory transition and how much was due to the collapse in oil prices.

Transition Costs

Rating agencies, investment banking firms, etc., are beginning to do studies of transition exposure and all have tended to underestimate transition costs so far.

The legacy of the vertically integrated electricity industry is that it includes more sources of potentially stranded assets. Take or pay contracts were the bulk of the exposure for pipeline companies (plant closing costs, for instance, were minimal), and they had a single regulator - FERC - to deal with. By contrast, electricity has many sources of transition costs and 50 more sets of regulators. The presenter's analysis divided assets at risk into 4 categories: fossil and nuclear generation, non-utility generation contracts, and "regulatory assets" such as decommissioning accounts and flow-through accounting for taxes that would be at risk in a deregulated industry.

In each category, the presenter estimated stranded costs by the total costs above the levelized market price line. In contrast with the gas analysis above, the total estimated exposure for the electric utilities studied was from 75% to 125% of book equity - much higher than it was in natural gas. One of the factors that seems to differentiate the exposures of different companies is percentage of industrial base. Another is how capital intensive the supply base is. The four categories were analyzed as follows:

- *Existing Utility Power Plants (Fossil and Nuclear)*. The problem of high capital costs on the books and low prices for electricity in a competitive market is most serious for the most capital intensive plants, e.g. nuclear plants. Comparing the lower range of competitive market price estimates to the cost of running various plants, most of the fossil pants are economic to operate, but in virtually every case, nuclear plants appear unable to recover their historical costs. Depending on the mix of fossil and nuclear at a given company, the approximate range of potential stranded assets for these generating plants is from 65% to 125% of the value of the companies' present book equity.
- *NUG Contracts*. Some states have, through legislation or regulatory decision, developed non utility generation with contracts in excess of market price. NUG payments in excess of marginal cost for one of the companies studied was approximately equal to the book equity of the firm.
- *"Regulatory Assets and Liabilities"*. Regulatory assets are accounting concepts, the value of which rests on the ability to recover certain costs from ratepayers. Examples include capitalized demand-side management expenditures, deferred taxes, and

capitalization of retirement obligations. (When USWest went off regulatory accounting it wrote off \$3.2 billion, mostly having to do with shorter depreciation times.) There are also "regulatory liabilities" that may not necessarily be on the books, such as the cost of decommissioning nuclear plants in excess of payments into deferred accounts. Estimates of the magnitude of these assets for one large utility were approximately equal to the company's current book equity.

There was some discussion of timing issues. The presenter's analysis shows that the longer a transition takes (e.g. the slower you give customers competitive access), the smaller your transition costs are. On the other hand, the longer you put off the beginning of the transition, the greater the gap gets between regulated and market prices, and therefore the more painful it will be when you DO change to a competitive market. This suggests that the most attractive scenario for a utility would be to start as soon as possible to position itself to be competitively, while at the same time pursuing strategies which keep as many customers on regulated rates for as long as they can.

Conclusion (major points):

- Potential transition exposure is large: estimates are 100-200% of book equity.
There is not much value in improving the precision of this estimate.
- The major challenge is to develop strategies for addressing disposition of stranded assets.

Afternoon session - "VISION" PAPERS

The vision papers were commissioned at the July session as a way of stepping back and examining how more or less competitive versions of the electricity market might operate.

"Competitive Electricity Market Model" (POOL)

Why go to this model:

This model starts from the fact that pressure to move to a competitive electricity market has been growing, and that therefore a model of how such a market might operate is needed.

How this model would operate:

This model of how a competitive electricity market might operate is built around the notion of efficient pricing in the short run market, while making long-term contracts possible. It assumes that access to transmission and distribution facilities is open, and that dispatch, because of system control interactions unique to electricity, remains regulated. Under this model, the industry is no longer vertically integrated, and dispatch is a multilateral process where power is sold by a pool at a single short run marginal price. Customers can protect themselves from the volatility of the short run market through long-term contracts. (An executive summary of this model is attached.)

Response:

The respondent listed a series of "preconditions" that would have to be met to get to the competitive market outlined in this model:

- A resolution of jurisdictional disputes between the FERC and state regulators. A regional regulatory framework, suggested by some, does not yet exist.
- Breaking up the existing holding companies and at least some other facets of the integrated utility structure as we know it today.
- Restructuring of the current utility tax system, which differs widely from state to state - possibly, in this model, shifting the tax burden to the "disco" or "lineco" level to make sure all power producers were subject to the same tax system - one of the problems with the current system. The respondent noted that there is some opportunity to combine this with the need to rethink what's been done with regulatory handling of environmental externalities, although he felt it would be simpler to reflect these externalities on a national level.
- It is important to decide up front how stranded assets, etc. are to be recovered. A participant suggested that it will be very difficult, given different positions on social

programs by 50 different sets of state regulators, to get a level playing field on these programs.

- It is necessary to have the ability to conduct some kind of experiment with the "POOL" approach. His state has tried various innovations in the past - bidding, different types of contracts, etc. - with the ability to draw back if they didn't work. There are parts of the proposed system that would be very difficult to experiment with, and this might be a significant barrier. Studying the experience of other countries in changing their utility systems might be of use in providing some of this information.
- Finally, there is no provision made in this model for other services traditionally supplied by utilities, such as low income subsidies and taxes. It also doesn't provide any analysis of the impact on different customer classes, which will be important to legislators and regulators. (Order 636 had a mechanism for buffering rate impacts.) The presenter pointed out that these will be issues no matter what industry structure we end up with. In a competitive market, taxes and other non-electricity programs might be shifted to the remaining monopoly.

Discussion:

In response to a question from a participant about what his solution was to the transitional issues raised by the respondent, the presenter noted that these are issues that need to be solved in the transition to *any* future structure of the industry - his concern is that initial decisions about transmission and distribution rates not be made without considering the disposition of stranded assets - it will be very difficult to do after the fact.

A question was raised about the benefits of going to a competitive electricity market. The assumption of the paper is that some kind of competitive market will lead to some set of efficient results that will produce some net benefit to society as a whole. The participant said he thought some empirical analysis of this question might be in order - that took into account the questions people raise about the benefits of vertical integration, etc., and make a convincing argument that a competitive system will be more efficient when the electrical systems in so many countries have not been competitive all these years. This issue of a cost-

benefit analysis was flagged later as being a research interest of the group. A final participant said that it was solving the problem of the price differential between regulated and unregulated power that was driving the pressure for a competitive market.

"The Great Retail Wheeling Illusion - and More Productive Energy Futures" (SERVICE)

Why go to this model:

The presenter stressed that his vision of the future, like the previous model, provides a role for both competition and for regulation, and acknowledges that there will be significant changes to the current system - his is not a "status quo" model. A distinction is made between "retail competition", where competitive choices are currently being made through the development of independent power production, new energy services, and alternative fuel equipment, and retail wheeling. The retail market, unlike the wholesale market, is not a commodity market but a service market. He also makes an argument that the electricity industry, unlike other industries, has a significant component of public interest because of its environmental and social impact, and that this "portfolio" of services should be preserved. Competition will not, for instance, provide us with the incentive to develop things like renewables or invest as much as we should in energy conservation.

How this model would operate:

The presenter did not give specifics as to the operations of this version of the electricity market, but since he recommends that regulators not introduce retail wheeling, regulation of the retail market presumably continues in a form similar to its present one. He stressed that he is not against wholesale competition, but that investment in efficiency should be balanced with investment in generating capacity.

Response:

This model assumes that a retail competition model would involve some systematic under-investment in certain social goals in the absence of regulation. But there are ways

to achieve the goals of low income subsidies and environmental protection, etc., without necessarily keeping them bundled into electricity rates as they are now. For instance, funding for investments in conservation, efficiency, low income, etc., programs could be provided through a special charge which everyone on the system has to take. These programs, for instance, could be funded through a surcharge on transmission service and be run by a separate "service" company. The presenter agreed, except that some of the investments he was talking about came as part of the "portfolio management" function, and that cannot be unbundled.

Discussion:

The portfolio of services that this model presents is very attractive - it deals with quality of power, with conservation, etc. - but if you look at the gap that we now have between the market and existing price of power, you've got to think that that portfolio is worth an awful lot for society to buy into it. This is a trend set in motion by large industrial customers, not by regulators or utilities. It will take an intervention with a fair amount of proactive vision, which can be embraced as a viable alternative by a majority of state regulators and legislators to turn this aside. States are very worried about economic development right now - they are packaging very competitive deals to lure industry that include five-year contracts for electricity at variable cost, tax waivers, etc.

Another participant noted that we have to come up with a solution to the problem that is leading customers to want to escape from the current system, without doing away with the parts of regulation that deal with genuine market imperfections like those associated with the provision of energy efficiency.

It was also noted that the large price differentials between the regulated price of power and the marginal price offered by a new generator were not caused by DSM programs and low-income subsidies - they were caused by expensive nuclear plants, etc. Any solution to the problem of customers trying to leave the system would have to solve this one first.

A regulator noted that this model prejudgets what the best retail service might be. The current industry and regulatory structure has been in place so long, and so many

technological and social changes have taken place in the meantime, that perhaps we need to "re-reveal" what the optimal structure is. One of the advantages of competition is that it will reveal what the best service is - bundled or unbundled, etc.

"Bilateral Trading Approach with Limited Retail Competition" (BILATERAL)

Why go to this model:

The goal of this model was to find a middle ground that preserved the current industry structure with all the advantages of social programs, etc., while solving the problem of industrial customers demanding access to low-cost power. The likelihood of being able to go overnight to a competitive market is slim, anyway, given the multitude of jurisdictions, companies, etc. The presenter said he tried to find a way to offer the most price-sensitive customers marginal cost pricing while everyone else paid the whole sale cost, and couldn't find a way to make it stable, even in the short term. Utilities, in response to the threat of retail wheeling, loss of large customers, etc. are changing the way they do business, but not as much as they would given the discipline of a competitive market.

How this model would operate:

The key to the operation of this model is the creation of more incentive regulation. The presenter stressed that this model calls for incentives which add value -- carrots rather than sticks. He also said that the DSM experience shows that a little incentive will produce a lot of change. The unit commitment dispatch currently used in power pools is at least as efficient a short-term optimization of generation dispatch as could be reached in a bidding system. It also allows for a coordinated maintenance schedule. The "bilateral" model proposes incentive regulation for development with regard to acquisition of resources, to avoid the chronic excess capacity problem - he did not go into detail at this time regarding how this would be done.

Response:

We have a disjunction in the present system - we have a pricing problem - we have an access problem. We have undertaken many measures to try to extend the usefulness of the current system - a system which has the advantage of a wealth of experience, and, as the presenter points out, has other advantages like diversity of generating assets which we should try to preserve. But there are certain critical discontinuities if we continue to try to make the current system work. There is no longer any particular reason to have New England generation exclusively in new England, unless it makes economic sense. The forces of competition encouraged by the Energy Policy Act will create other incentives to subvert the existing system.

While retail wheeling is far from inevitable, it would be foolish to assume that it is not. There are outcomes to be avoided as we make this change. We must avoid competition for transmission and dispatch services. We need to avoid inefficient pricing of transmission services.

Discussion:

In response to a request for a specific example of what type of incentive the presenter was talking about, he mentioned the recent Ocean State Power regulation that provides a varying return on equity depending on availability of the unit - they make more money when they run the plant well.

There was some discussion at this point about the possibility of putting some of the assets stranded by going to a competitive generation market on the transmission and distribution system. The idea is that transmission and distribution is significantly undervalued at present (based on replacement value), and since it would be the remaining monopoly, it provides an opportunity, as was done with natural gas, to recover some part of stranded costs. A participant noted that the electric industry was not under a single jurisdiction, as natural gas was, so that this scheme might founder between jurisdiction boundaries. One of the things a group like this might do would be to think about some mechanism that would allow the states to decide whether and how to create a way to recover transition costs.

A participant from the gas industry, commenting on the issue of fundamental versus incremental change, said that it turned out to be an exercise in redesigning a house that was on a rotten foundation. He said it turned out that the real problem was that they had been input-oriented, and hadn't been thinking about customer needs. Modifying regional service definitions, etc., that aren't customer-focused at all but are utility-focused is not going to do any good. He also pointed out that pipeline companies had originally thought that it would be necessary to consolidate the transmission system, but that fell apart right away.

In response to a question about his objections to the "POOL" model, the presenter said he felt it wasn't politically viable - that the industry's boom-and-bust cycle would mean that the government would step in at the first sign of a shortage.

Wednesday, October 27th

Morning session - CASE STUDY PRESENTATIONS

Brief summaries of the case studies were presented:

Competition - "Fighting for Customers: Atlantic Bluffs Confronts a Competitive Challenge"

A utility's largest industrial customer proposes to leave and become the steam host for a very large QF. What are its options to respond? This case explores the ramifications of competition in terms of changes it brings to a utility's business and regulatory strategies.

Transmission Line Construction - 'The California-Oregon Transmission Project: The Quest for Transmission Access"

A consortium of municipal power agencies, denied access to a utility-owned transmission system, builds a transmission line to reach cheaper hydro power from the Northwest.

Retail Wheeling - "Competing for Electrons: The Public Service Company of New Mexico and the City of Albuquerque"

A utility is faced with retail wheeling legislation, and must develop plans for financial restructuring, especially the treatment of investments that will be "stranded" by the shift to competition.

Afternoon session - REPORT OF DISCUSSION GROUPS & DEFINE HEPG RESEARCH PRIORITIES

After lunch, the group broke up into three groups to discuss the case studies and vision papers and come back with recommendations for further work by the group.

Group I

This group recommended that the HEPG look at the Scandinavian experience of trying to integrate very different national systems and see what lessons it had for solving our inter-state puzzles.

It was also recommended that the group concentrate on gaining understanding of what we mean by wholesale competition, with the idea that we can answer 17 out of the 20 questions about retail competition by looking more closely at wholesale competition. What is the wholesale market for electricity? Is it short-term or long-term? What is the appropriate role of regulatory agencies and other institutions of government in a competitive wholesale market? What are the consequences to date of wholesale competition? Who are the perceived winners and losers? Is there a possibility that the development of a competitive wholesale market will be able to relieve some of the pressure currently on the retail market?

Group II

This group concentrated on synthesizing the issues that had come up during the course of the whole session.

- What are the benefits of retail competition?
- On what level is it appropriate to coordinate the whole system? Do we need a "Super regulator"?
- What changes in the regulatory system will logically accompany the competitive trends we observe?
- What happens to IRM in a competitive market?

In studying the issues of stranded assets, market operation, jurisdictional questions,

etc., we have to consider a "How To" continuum that runs from some sort of regulatory reform to vertical disintegration of the industry, and a "How Much" continuum that runs from limited competition to full retail wheeling. The simultaneity of all these variables makes it very hard to envision the future.

Group III

How are these issues likely to manifest themselves initially? Group III felt that they were cropping up first at the state regulatory level. If that's the case, then they're going to be coming up in 50 different locations with 50 different energy mixes. There are also a range of alternatives, but all of them have to deal with some degree of competitive pressure these days - all of them will have to give some thought to stranded investment, to institutional change, etc.

- How do we manage this progression of competition, recognizing the diversity of the system? What differences in these different systems make the transition more or less likely or more or less susceptible to intervention?
- What are the 17 questions that a regulator would like to know the answer to? One former regulator said he'd like a menu of scenarios, with the implications and uncertainties of each. What tools are available to regulators in dealing with these scenarios?
- What are the criteria for determining the benefits of each alternative? How do you handle the costs inherent in each alternative?

The group recommended that we look at these questions in the context of two specific cases. The first is the state regulator - how are regulators presented with these issues and what options do they have for dealing with them? What questions do they need answers to? The second is the utility executive - what options do companies have to deal with issues like industrial customers, expensive generating capacity or NUG contracts, etc.?

Summary

Based on the work of the groups above, it was proposed that the HEPG look at the following issues for future sessions:

- Jurisdictional issues in the context of both wholesale and retail competition.
- The treatment of stranded investments under various competitive scenarios
- Lessons to be learned from natural gas market operations
- The recent Scandinavian experience of restructuring
- The future of integrated resource planning
- The costs and benefits of making the electricity industry competitive at a retail level

These recommendations were dealt with in more detail in our letter of November 8th, a copy of which is attached for reference.

Attachments to this summary:

- Post-plenary letter summarizing future HEPG research interests
- Executive summary, "POOL" model

Papers handed out at the plenary session:

These papers, with the exception of the Tranen paper, were also mailed out to all HEPG members prior to the session. A complete list of HEPG papers and related material to date is available from Connie Bums (617/495-1318). Please do not cite any of the 'Draft' papers without the author's permission.

- Anderson, Steven C., Graham, John G., and Hogan, William W., *Electricity Transition Costs*, Draft, October 22, 1993.
- CASE: Harvey Simon, with Steven Anderson, "Competing for Electrons: The Public Service Commission of New Mexico and the City of Albuquerque" October 1993
- CASE: Susan Rosegrant, with Tom Steinbach, "The California-Oregon Transmission Project: The Quest for Transmission Access" October 1993
- CASE: Pamela Varlet', with Carter Wall, "Fighting for Customers: Atlantic Bluffs Confronts a Competitive Challenge" October 1993
- Cavanagh, Ralph, *The Great 'Retail Wheeling' Illusion -- and More Productive Energy Futures*, Draft, 9/93
- Hogan, William, *A Competitive Electricity Market Model*, November 2, 1993.
- Pierce, Richard, *Gas Industry Transition Costs and Their Allocation*, Draft, September 1993.
- Tranen, Jeffrey, *Competition Within the Regulated Utility Industry* Draft, October 1993.

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Dear ...,

Following the plenary meeting of the Harvard Electricity Policy Group in Cambridge on October 26-27, we have been working to pursue the several ideas that were emphasized as priorities for the near term. The discussion at the meeting was vigorous and covered a number of important topics. In particular, the related analyses of the large potential for stranded assets and the associated transition costs motivated a thorough investigation of the organization of alternative market structures and the development of strategies for the "progression."

The common focus of the recommendations for immediate research attention was to concentrate on the several related issues raised in the analysis of the wholesale electricity market. Although retail competition will continue to be an important topic and will remain on the agenda for future discussion, the priority requirement is to develop a better understanding of the possible operations and implications of a more competitive wholesale market. The consensus was that most of the critical policy questions for companies, customers and regulators appear even in the context of the wholesale market. It is principally the scale of the transition problems that differs between the wholesale and retail competition cases.

Three broad themes among many emerged as priorities over the near term:

Jurisdictional issues. What are the gaps, overlaps and new boundaries of state and federal responsibilities that must be addressed as part of the progression to a competitive wholesale electricity market? What alternatives might be available and how can our research effort support the development of these alternatives?

Market operations. There is- a body of experience available on the operation of short-term markets in the open access, competitive natural gas industry. What lessons can be learned about market organization and operation, and how do these lessons translate to electricity?

Stranded assets. The Pierce paper and John Graham's presentation at the October meeting illustrated that the scale of assets stranded by competition is potentially very large - in many cases equal to book equity or more. Further refinements of the

estimates can be made, but the priority is to develop alternative strategies for dealing with assets stranded by competitive pressures in the electricity market.

The analysis of these topics will cover a number of individual topics, and the themes intertwine. To pursue these subjects, we have been identifying ad hoc subcommittees of the participants who are prepared to define and investigate these topics further. These activities will include one or more smaller working seminars intended to debate and develop the issues. We will keep you informed of the developing schedule and subjects of these seminars, to elicit your participation if you have a special interest in contributing to the investigations. We expect that these subcommittees will report on the status of their work at the next HEPG plenary meeting scheduled for January 13-14 in San Diego.

The first such working seminar will be held in Cambridge on November 30, 1993, to discuss the alternative views on market operations. Jeff Skilling of Enron is taking the lead in developing the gas industry experience, and we are now looking for one or two participants knowledgeable about electricity dispatch and operations who can address the possibilities and limitations of the short-run electricity market. If you have suggestions, or would like to join in this seminar, please contact us at your earliest convenience.

In addition to the broad themes mentioned above, we are developing additional papers and presentations on a number of subjects that have been identified by the group and where it is possible to make a significant contribution in the near term. A list of these research interests is attached. As part of your further background reading, two additional papers are enclosed. The first is a piece forwarded by Eileen Marshall on "Metering for the k Market," September 1993, which goes into greater depth on a practical topic in which many of the group expressed great interest at her earlier seminar. Second is a copy of the Hogan responses to the FERC questions on transmission pricing. These comments do not represent the views of anyone else, as noted in the filing, but the topic is so close to a part of our discussions that you might find it useful to have a copy for your own information.

A rapporteur's report from the October meeting is in preparation, and we will keep you advised of the schedule of working seminars over the coming weeks. Thank you for your participation.

Best regards,

Ashley Brown

William Hogan

HEPG RESEARCH IN PROGRESS

In addition to the broad themes of the ad hoc subcommittees, we are developing additional papers and presentations on a number of subjects that have been identified by the group and where it is possible to make a significant contribution in the near term. The current working list of topics includes:

- *Cost-benefit analysis of increased competition in the electricity market.* This topic has been requested frequently as an essential linchpin of any evaluation of how far it makes sense to go towards more competition, even in the wholesale market. We are looking for a good way to do an analysis along similar lines as that prepared for the case of natural gas open access.
- *Scandinavian innovations and experience in a more competitive electricity market.* Jim Booth and Dan Fessler of the CaPUC are preparing a document outlining major developments in Scandinavia, to draw what lessons we can from recent changes in the structure of their electricity industry. This could be expanded to include significant developments in Argentina, Chile, and New Zealand.
- *The role and nature of integrated resource planning in a more competitive electricity market.* Mike Schnitzer is working on a draft paper that addresses both the impacts of competition on IRP implementation and any changes in scope that will be dictated by the expansion of competition.
- *The limits of contracts as a partial replacement for vertical integration and regulation.* Contracts are an important implicit or explicit component of various competitive market proposals. Dan Fessler has agreed to expand his thinking along the lines of his recent piece in the Electricity Journal, where he raised a number of important cautions about the potential limits of contracting.
- *Environmental protection and interaction with the institutions and processes of a more competitive electricity market.* Henry Lee, working with the Environmental Protection Agency, is taking the lead on defining a major effort that will investigate the changes and opportunities created by a more competitive market.

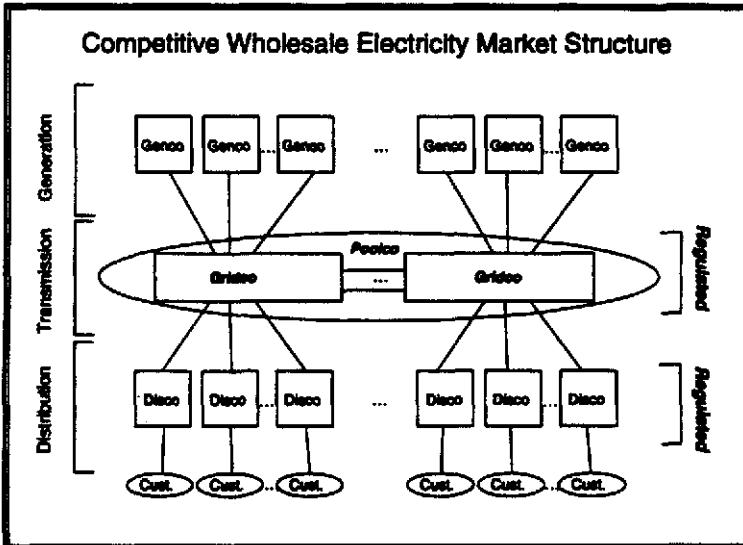
This list could be expanded, but these capture our sense of the immediate priorities. In addition to serving as the focus of our plenary discussions, these papers will contribute to a book which will be one of the products of the group. Our goal remains to develop a better understanding of the alternatives available for a more competitive electricity market, and to improve the public debate by defining and explaining principal alternative strategies for dealing with competitive pressures. The papers prepared to date have been consistent with that goal, as has been the high quality of the debate and discussion at our meetings. The group as a whole has adopted a serious problem solving mode of discourse and operation, and we will do our best to reinforce and advance that precedent.

A COMPETITIVE ELECTRICITY MARKET MODEL

Summary

The electricity market is moving towards greater reliance on competition. Changing technology, new entrants in the generation market, and a legislative mandate to provide access to the essential transmission facility have accelerated a process of competition that will require major changes in the institutions and operations of the electricity market. Because of the special features of electricity supply, however, there are natural monopoly elements in electricity markets. Complete laissez faire competition is not desirable, and in the strictest sense would not be technically feasible. Even though increased competition appears inevitable, therefore, the specifics of how to implement an efficient competitive market are neither inevitable nor obvious. This paper outlines such a competitive market model.

Industry Organization. The usual separation of the industry distinguishes among generation, transmission and distribution. The Figure illustrates the outlines of a competitive wholesale market structure that follows this traditional three-part segmentation and emphasizes competition in the generation market. The assumption here is that generation is a market with enough real or potential participants to enforce workable competition. Either there are enough separate generating companies to dilute any market power, or the individual generating units are under long-term contracts with many customers such that the economic interest in the plants is dispersed and there is competition in the short run. The need is to specify the minimum elements in the remainder of the system necessary to support competition in generation.



Essential Facilities. The competing generators must have access to the essential facilities that stand between them and their potential customers in the wholesale market. The thrust of the Energy Policy Act of 1992 is that transmission is this essential facility and open access to the transmission system is a necessary requirement for development and operation of a competitive market.

While there is no doubt that such access is required, there is more to transmission than simple connection to the wires. Here the analogy to the case of natural gas pipelines is instructive. There is far more to effective gas transmission access than simple connection to the interstate natural gas pipeline. Movement of gas from producer to consumer includes an array of services such as backup, storage, load balancing, scheduling, and so on. Access to these essential services is as important as physical connection to the pipeline in providing a competitive transmission opportunity for new entrants. If some participants in the market, such as the pipeline companies, have access to these services, while other participants, such as brokers, do not, then it is impossible to maintain the desired "level playing field" of competition. This reality led eventually to the natural gas open access rules in FERC Order 636 which required complete separation of the pipeline merchant function so that all participants in the market would have the same access to the many services that make up the essential monopoly facility.

Just as with natural gas, the essential facility of electricity transmission involves much more than simple connection to the wires. The least obvious feature is the separation of the transmission segment into Poolco and Gridco. The principal reason for the distinction is to accommodate the most important implication of the technical characteristics of electricity supply. In particular, the free-flowing grid requires coordination of short-term operations to maintain system stability and achieve least-cost dispatch. This coordination function operates most efficiently through a power pool which provides many services implicit in the economic dispatch. The dispatch provides an automatic source of backup supplies, short term excess sales, reactive power support, spinning reserve, and the many other services that are bundled in transmission. Without equal access to these many functions, new participants in the market will discover that they are at a competitive disadvantage relative to those who have access to the full array of benefits of a power pool.

Extent of Competition. Limitation of competition to include only the wholesale market is possible but is not necessary. Implicit in the Figure is a separation of the wholesale and retail markets, with regulated distribution companies purchasing in a competitive wholesale market but selling a bundled product to franchise customers. However, once the essential facilities of the pool and the grid are opened to all participants, the market could be extended to retail customers. In this case, the wires component of the distribution business would be recognized as a natural monopoly and an essential facility just as for the high voltage transmission grid. It would be less likely to find a similar dispatch function at the distribution level, and the other elements of the distribution function might be amenable to competitive market provision rather than bundled with wholesale electricity. This choice between wholesale and retail competition is a policy matter. There is no inherent feature of electricity supply that dictates the choice, and any of an array of combinations of open and restricted access would be possible.

Efficient Pricing. With all competing generators enjoying access to the pool dispatch, the natural requirement is for equal pricing for equal services. In the traditional pool with only the vertically integrated companies, average-cost pricing was consistent with the regulatory standard for cost recovery. In the competitive market with third-party access, opportunity-cost pricing provides the standard for consistent incentives and cost recovery in the short-run. Opportunity-

cost pricing in the short run is a natural byproduct of an economic dispatch and guarantees the most efficient use of the electrical system.

Long-Term Contracts. The availability of a transparent short-run market with opportunity-cost pricing furnishes the ingredients for bilateral contracts that allocate risk and provide price certainty. In the presence of the short-run market, many variations on the theme of contracts for price differences will arise naturally. Suppliers with generation can sign contracts with customers and provide any desired mix of fixed and variable prices over some extended period. In the day-to-day operation of the market, customers pay and generators receive the short-run opportunity cost. The obligations under the long-term contract are met through strictly financial exchanges that provide the economic equivalent of a specific supply from a specific source. But the contracts need not and do not constrain the operation of the efficient dispatch. And the generation price difference contracts do not require regulatory oversight.

The incentives of short-run opportunity costs and the protection of long-run contracts provide the ingredients for investment in new generation capacity. The price certainty under the contracts makes it possible to craft the protection necessary for long-term financing. In place of the central planners determining reliability standards and reserve margins, the market converts quantity reliability issues into questions of price volatility. The market allows customers to express and pay for their individual preferences for reliability without requiring regulatory supervision. New capacity comes on line as the opportunity cost and price volatility in the short-run market creates the needed economic incentives for building new plants and creating new price hedges.

Transmission Economics. In the face of transmission congestion, economic dispatch produces different short-run prices at different locations. These locational prices capture in a simple form all the complexity of transmission interactions. And just as for generation, these opportunity-cost prices provide the incentives for investment in transmission to relieve congestion and gain access to lower cost supplies. Unlike the case for generation, however, these locational prices do not create a plausible bilateral mechanism for long-term contracts that allocate price risk. Only the pool operator has the information necessary to create the corresponding long-term contracts for price differences across locations. The contracts are multilateral in the sense that all users of the pool affect transmission constraints, and everyone must make a partial payment to compensate those who have paid for the economic benefit of the grid. Fortunately, the payments and the information needed to provide such protection are available automatically as part of the efficient pool dispatch with short-run opportunity-cost pricing. Hence a necessary support for the full competitive market is to provide access to the pool and the grid, and for the pool to operate a system of long-term transmission contracts that protect customer investment in the grid. These transmission contracts are only for payment of price differences across locations, and carry no requirements for determining the actual use of the grid, which is left to the efficient dispatch.

Market Impacts. This outline of the competitive electricity market addresses most of the major economic concerns raised in the discussion of regulatory reform. By definition the system maintains economic dispatch and system stability. Access to the pool and short-run opportunity-

cost pricing guarantee comparable service. The obligation to serve changes from one of assuring average-cost supplies to assuring access to the grid and the pool dispatch. Reliability issues change from matters of central planning focussed on quantities to market choices based on prices. The services are not firm or interruptible, but vary depending on the choices worked out under market contracts. Opportunity costs are well defined and investment takes place when the opportunity costs provide sufficient incentives for the participants in the market. Investment decisions are made only in response to customer demands, and there is no regulatory requirement to make generation or network investments without contracts from customers. Transmission complexities are handled without appeal to contract paths, megawatt miles, or wheeling in or out. Secondary markets can operate to assure flexibility and efficiency. Long-term rights to the existing grid can be defined to assure protection of native load. And the system can operate with advances in real-time pricing or minor modifications of existing dispatch settlements systems.

In theory the competitive market outlined would continue to have problems with free-riders exploiting the economies of scale in the transmission grid. Furthermore, the design of the competitive market would not overcome any violations of the assumptions such as market power in generation. If there are social or environmental objectives that have been dealt with through public utility regulation, rather than through taxes or broader based environmental standards, then the competitive market model requires alternatives that focus on the reduced remaining monopolies of the wires and dispatch services.

Transition. The transition problems of moving from the traditional regulatory model to a more competitive market in electricity area subject for further study. Although the competitive model does not require a "big bang," certain features are essential. Access to the pool and opportunity-cost pricing seem to be minimal requirements. Price difference contracts for generation would arise naturally. With any significant congestion, the pressure would rise for accompanying price difference contracts for transmission, which would **have to** be created and administered by the pool under regulatory oversight. Allocation of costs and rights for the existing system will require creativity for equity, but with a secondary market there would be no significant impacts on efficiency. Jurisdictional oversight need not require any legislative change, although various existing authorities would have to agree de facto on the accepted framework.

Once the competitive market model is defined, it sets a target and a standard for designing changes from the traditional status quo. The transition problems include many elements that must be considered simultaneously as part of an implementation strategy. Consistency of the broad model and strategy will provide a framework that separates the few necessarily revolutionary elements from the many more evolutionary changes. Analysis of the transition alternatives should focus on open access and pricing rules that are essential for the competitive goal, are feasible as a technical matter in electric networks, and are practical in dealing with stranded assets and other changing economic impacts.