

AN EFFICIENT BILATERAL MARKET NEEDS A POOL

CPUC Hearings, August 4, 1994, San Francisco, CA

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SUMMARY

The Commission through its "Blue Book" proposals has launched a process moving with breathtaking speed to completely restructure the electricity industry. The call to mark "the end of one era and the beginning of another" has been heard, and the participants are fully engaged in looking ahead and rethinking the most fundamental aspects of the structure of the market. The Commission can observe the remarkable impact of its initiative. For example, the idea of customer choice and direct access is now conventional wisdom, with the debate already having moved from policy to implementation.

The focus of this hearing on the operation of the wholesale market addresses a central part of the puzzle. Here too there has been a stunning innovation. The Poolco proposals offered by San Diego and Edison mark a major break with the past of vertically integrated, cost-of-service regulated utilities. As of yet, there is still a great deal of misunderstanding about the scope and fundamentals of this revolution. However, as the process unfolds, and if there is a serious attempt to evaluate these and competing proposals on their merits, Californians will come to appreciate that the innovations set a new world standard for both speed of development and strength of concept. The "level playing field" has become the goal of the incumbents as good policy and to avoid the cost-shifting that would otherwise occur. Faced with the requests of third parties and new entrants for true open access to the essential facilities, the strategy of the incumbents is to "just say yes."

Surprisingly, in these early stages the big winners seem not to recognize or believe their good fortune. Perhaps a history of dispute and confrontation may justify their caution. However, there is an equally good chance that further interaction and examination of the common requirements of the alternative proposals, as well as the few differences, will reveal that this truly is a great opportunity to fashion a much better electricity market system that can handle most or all of the legitimate interests. The participants are much closer than appears on first impression.

The San Diego-Edison Poolco model has much in common, and a few differences, with the Bilateral model of a transmission operating company (Opco) that adapts the experience of the natural gas industry. Despite the early reactions, close examination of the principal features of the alternative approaches, as in the accompanying table, reveals more in common than in conflict. The differences in emphasis do not suggest a stark choice, and the common requirements point to the value of the Competitive Power Market Working Group to explore the many new issues essential in the development of the competitive market.

COMPARING ALTERNATIVE WHOLESALE MARKET MODELS		
	San Diego-Edison Poolco Model	Bilateral Opco Model
System Operator Required	Yes	Yes
Operator Independence Required	Yes	Yes
Operator Dispatch of Flexible Plants	Most Plants	Few Plants
Quantity Nominations	All Plants	All Plants and All Contracts
Reservation Price Bids	For Flexible Plants	For Flexible Plants
MW Usage Pricing	Spot Prices	Spot Prices
Ancillary Service Charges	Yes	Yes
Tradeable Transmission Rights	Yes	Yes
Balancing and Settlements	Gross Loads and Generation	Loads and Generation Net of Contract Nominations
Commercial Bilateral Contracts	Yes	Yes
Interconnection Agreements	Yes	Yes

There is a deal here. A true open access, non-discriminatory, competitive power market with real customer choice is within sight. The principles and criteria that are receiving growing acceptance for such a market describe a dramatically new structure. Developing and implementing this new market framework require a fundamental rethinking of the basics of the electricity system and the operations of markets. Given the unusual nature of the highly interdependent pieces of the complex electricity system, it is particularly important to invest the effort to examine the alternatives, test them against detailed examples, and compare them against the accepted principles. The Competitive Power Market Working Group has launched a process that should be supported and allowed to examine the details that can later be reviewed by the Commission. The transition will be faster and better if it is headed in the right direction.

AN EFFICIENT BILATERAL MARKET NEEDS A POOL

Comments on the "Blue Book"¹ Regarding
Competitive Wholesale Electric Markets:
Role, Structure and Efficacy

Hearings, August 4, 1994
San Francisco, CA

William W. Hogan²

INTRODUCTION

The California Public Utilities Commission (Commission) through its "Blue Book" proposals has launched a process moving with breathtaking speed to completely restructure the electricity industry. The call to mark "the end of one era and the beginning of another" has been heard, and the participants are fully engaged in looking ahead and rethinking the most fundamental aspects of the structure of the market. In discussing the many issues, the Commission can observe the remarkable impact of its initiative. For example, the idea of customer choice and direct access is now conventional wisdom, with the debate already having moved from policy to implementation.

The focus of this hearing on the operation of the wholesale market addresses a central part of the puzzle. Here too there has been a stunning innovation. The Poolco proposals offered by San Diego Gas & Electric (San Diego) and Southern California Edison (Edison) mark a major break with the past of vertically integrated, cost-of-service regulated utilities. As of yet, there is still a great deal of misunderstanding about the scope and fundamentals of this revolution. However, as the process unfolds, and if there is a serious attempt to evaluate these and competing

¹ California Public Utilities Commission, Order Instituting Rulemaking and Order Instituting Investigation: on the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry and Reforming Regulation, R. 94-04-031 and I. 94-04-032.

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proposals on their merits, Californians will come to appreciate that the innovations set a new world standard for both speed of development and strength of concept.

By all available evidence, the Poolco proponents have embraced the view of the inevitability of an open access, competitive market. With this new conviction, the Poolco fundamentals completely recast the nature of the market structure to make real the principles of non-discrimination and comparability. The "level playing field" has become the goal of the incumbents as good policy and to avoid the cost-shifting that would otherwise occur. Faced with the requests of third parties and new entrants for true open access to the essential facilities, the strategy of the incumbents is to "just say yes."

Surprisingly, in these early stages the big winners seem not to recognize or believe their good fortune. Perhaps a history of dispute and confrontation may justify their caution. However, there is an equally good chance that further interaction and examination of the common requirements of the alternative proposals, as well as the few differences, will reveal that this truly is a great opportunity to fashion a much better electricity market system that can handle most or all of the legitimate interests. The participants are much closer than appears on first impression. There is a deal within reach, but there is a much work left ahead. In the subsequent pages, I argue that crafting a new consensus is possible, with the support of the Commission. The best approach for the Commission would be further elaborating the principles and providing strong support for efforts such as the Competitive Power Market Working Group through which the participants can pursue the many complex but essential details that make up the interdependent pieces of the larger puzzle.³

WHOLESALE MARKET STRUCTURE AND EFFICIENT DIRECT ACCESS

The Commission's order in these proceedings emphasized that "[i]n invitees should specify whether they believe a mature wholesale market is a necessary precursor to direct access and workable retail competition. They should also specify whether the existing wholesale market is sufficient to meet the objectives the Commission articulated in the rulemaking, and if not the further developments that must be undertaken to promote maximum competition." In previous comments, I discussed a mechanism for providing *Efficient Direct Access*,⁴ and the Commission plans to return to the topic of direct access in later hearings. Under this approach, the structure of the wholesale market and the operation of direct access can be largely separated. Despite a

³ Launched through the initiative of San Diego, who invited participation from all those commenting on the "Blue Book" proposals, the Competitive Power Market Working Group is chaired by Charles Stalon and is pursuing a line of investigation to examine the requirements for the market and the possibility of finding common ground. The well attended organizing meeting was on July 29 in San Diego, and a program of work has been started.

⁴ W. Hogan, California Public Utilities Commission Order Instituting Rulemaking and Order Instituting Investigation: on the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry and Reforming Regulation, R. 94-04-031 and I. 94-04-032, Comments, Los Angeles, CA, June 15, 1994.

confusion apparent in the perceptions of some respondents, but as I made clear in my earlier comments, providing real customer choice through Efficient Direct Access does not depend critically on how the wholesale market develops. All that is required is an arm's length spot price against which all generators can sell. Once this spot price is available, time-of-use (or real time) rates can be instituted to provide customers direct access to the wholesale market spot price. With this rate structure based on the spot price providing effective access to the wholesale market, customers could choose to enter into contracts with any third party to obtain price certainty, interruptible service, or any other arrangement that they can negotiate.

The necessary competitive wholesale market with a transparent spot price is not available today. However, such a spot price may emerge well before resolving all the issues in the operation of the wholesale market. Hence, Efficient Direct Access can begin sooner than the arrival of a fully "mature" wholesale market. The goal should be to move as quickly as possible to a workable wholesale market that meets the minimal tests, but not to assume that a swift transition can be navigated without any vision as to the intended destination. Assuring reliability, open access, nondiscrimination, comparability, and commercial flexibility in the wholesale market in a competitive environment is a separate subject, and that is the focus of these comments. Such a market is not guaranteed, but it is achievable.

POOLCO VS. BILATERAL DEBATE

The issues surrounding the structure of the wholesale market are new and challenging. The Commission has sparked a vigorous debate that is in its early stages. In part, this debate over the institutions for the wholesale electricity market has been characterized as though California faces a stark choice between either sole reliance on bilateral transactions or a mandatory Poolco model. Given the pace of change and the stakes, perhaps the early disagreement should be expected. The stakeholders may slip unwittingly into such an all or nothing view of the options, as can happen when the stakes are so high. However, maintaining this stark dichotomy is unhelpful and wrong. This early divergence, I hope, can be explained as a product of initial confusion about both the likely nature of the future competitive electricity market and the characteristics of the bilateral and Poolco proposals. On closer inspection, we will find that there is less of a difference than appears on first impression.

The difficulties with each approach are real and serious enough that neither should be accepted on blind faith. Rather, all the proposals should be subjected to scrutiny with enough testing against detailed examples to make sure that we are clear in understanding what differences remain. This process of trial by example is relatively inexpensive and should not take too long. It should precede experimentation or implementation, which would be premature when we are still "talking past" each other. The debate has moved far and fast, but we do not yet have a collective agreement even on what is being said. It is time to stop and take stock of the real choices.

Without being fully described, the bilateral model has been depicted as feasible and

with the necessary elements in place now. The emphasis is on negotiations between buyers and sellers, based on familiar models of trade in many other commodities, with frequent and special reference to the natural gas market. Given enough freedom and the right incentives, the invisible hand of the marketplace can work through bilateral transactions to resolve any problems, create new products, and achieve an efficient outcome that both enhances value and lowers the overall cost of supplying power. There is no need to design any new procedures or institutions, natural evolution will work out any problems that are encountered.

The Poolco proponents emphasize the high degree of interaction in the electric power grid and the complications created by the need to maintain instantaneous balance throughout the system. Transmission is more than a connection to the wires. Providing transmission services includes automatic generation control to maintain frequency, reactive power support to maintain voltage, spinning reserve management to provide emergency power surges, constrained dispatch to protect against contingencies. The complex interactions in the network, and the great range of costs of available power plants, create a need and an opportunity for coordinated facilitation of trades.

The bilateral model is popular and appealing. It was once my own assumption about the preferred approach. It has been the Federal Energy Regulatory Commission (FERC) view, expressed most often implicitly in the analogies to the natural gas market. In the California context, two of the three large investor owned utilities, San Diego and Edison support the Poolco approach, but my sense is that they and others who have encouraged the Poolco idea remain a (growing) minority of the commenters. Representatives of large customers, important new electricity suppliers, and market makers have so far explicitly rejected the Poolco model and embraced a bilateral alternative.

Critics fault the Poolco model as unnecessary, undesirable, and unattainable.

In the critics' view, a Poolco is unnecessary because everything that is needed to obtain a workably efficient competitive market would be available through bilateral transactions. Reference to the technical problems of electricity grids is a "red herring" that will be proven false just as in the case of natural gas. New entrants, especially brokers and market makers, will achieve any real efficiencies that can be gained, coordinating supply and demand through the myriad transactions among eager entrepreneurs finding and exploiting any opportunities for mutually advantageous trades.

In the critics' view, a Poolco is undesirable because it would impose standardized terms and conditions that foreclose the kind of commercial flexibility so necessary for a vibrant competitive market. The objections hint at experiences with other power pools in operation in the United States with years of accumulation of complex regulations and requirements. In the worst case, Poolco would be a device for central control and manipulation of the market, perhaps for the benefit of the existing utilities.

In the critics' view, a Poolco is unattainable because it would require too many new

institutions and too many new agreements among too many new parties. A viable Poolco would require the full participation of everyone in the grid, extending its reach well beyond California and even the United States. Many organizations outside the jurisdiction of the CPUC would have to join. The administrative challenge would dwarf the requirements for establishing Regional Transmission Groups (RTGs). The regulatory process would be sure to produce a camel instead of the Poolco racehorse. Hence, those promoting a Poolco are really promoting delay.

So the argument goes, with more or less detail and more or less similar points. The limiting case is the assertion that market institutions can never be designed, that they must evolve organically with government asked only to ratify what works. The proactive Poolco model violates this laissez faire principle that is argued as being the norm in other markets.

Each vein of Poolco critique contains some true ore. The questions raised deserve to be answered, and the cautions treated with care. There is no guarantee that either the bilateral or the Poolco model will work as its supporters promise. However, the objections to the Poolco model overstate the differences with any reasonable bilateral model for the electricity market. In part, this may be a misunderstanding of the necessary role of Poolco and the necessary requirements of a bilateral market. An efficient bilateral market needs a Poolco. A reasonable design for Poolco could support anything that should be permissible in an efficient bilateral market.

ELECTRICITY IS DIFFERENT

The special characteristics of the electricity system should not be dismissed lightly. The Edison comments contain the most detail in describing the complications of the current system. Many of the problems are hidden from general view, but will necessarily surface through open access. Here the emphasis is on characteristics of the electricity system with important engineering and commercial implications.

- **Cost Diversity.** The short-term cost of operating existing power plants exhibits great heterogeneity across plant types and locations. There are always substantial gains from trade by using low cost plants that are available to substitute for higher cost plants. The cost penalty for inefficient trading can be considerable.
- **Load Uncertainty.** Load conditions change substantially over the day and season. Variations in load are difficult to predict and change differently at different locations.
- **Complex Control Requirements.** Operating conditions require close monitoring and control on very short time horizons. For many important decisions, operating conditions must anticipate emergency contingencies. These constraints can and often do limit the freedom to fix the running levels of individual power plants.

- **Network Interactions.** The interconnected network under current technology creates strong interactions across locations. Every power plant and load affects all others. The interactions with system constraints can be large and differ substantially by location.

In essence, the electricity system has to balance minute by minute, with very little in the way of inventories or acceptable "busy signals" that are so important in other markets. This combination of factors greatly complicates operation of a short-run bilateral market. It is difficult to specify and use decentralized information that would allow decentralized trades to approach the efficient short-run solution. These problems historically motivated the development of electricity power pools in many regions; and everywhere else these same problems have required close coordination across electricity control centers.

The technical characteristics of the electricity system must stand next to the commercial goals of a competitive market. Participants want flexibility in operation and the freedom to craft a wide variety of commercial bilateral arrangements. Transaction costs can be substantial, and market participants want to avoid unnecessary costs or cost shifting. Furthermore, an important public policy goal is to extend the benefits of competition to all participants, large and small.

Dealing with all these features presents a challenge that can be met, but one which is not trivial. An efficient structure for an open access electricity market must balance a number of competing objectives.

- **Reliability.** Engineering limitations on operations must be respected to preserve the stability and security of the electric power grid.
- **Efficient Dispatch.** The benefits of efficient dispatch should be preserved with appropriate pricing for the various services needed to support the associated power transmission.
- **Open Access.** Commercial functions must facilitate non-discriminatory, comparable open access and market operations in the competitive sectors.
- **Revenue Adequacy.** The pricing framework should accommodate recovery of legitimate costs incurred in creation of the existing generation and transmission system.
- **Efficient Trading and Investment.** Short-run trading in the market should be economically efficient and compatible with long-run efficient investments and associated contracts.
- **Practicality.** Transition steps should reflect and respect the jurisdictional responsibilities for the regulated elements of the system. Workable approximations should be available and robust.

To meet these objectives, both the coordination of a Poolco and the commercial freedom of the bilateral market must operate in complementary fashion. One cannot function well without the other, nor are they in conflict. Closer inspection finds that the Poolco model assumes the existence of a vigorous bilateral market, as will be easy to demonstrate. Less obvious, but equally true, an efficient bilateral market needs a variant of a Poolco.

AN EFFICIENT POOLCO NEEDS A BILATERAL MARKET

This is the easiest part of the argument. Those who state or imply that a Poolco is a monolith that will limit or foreclose bilateral arrangements have misread the core of the ideas in the Poolco variants that have been suggested. It is closer to say that the Poolco model assumes that virtually everything that happens in the competitive market happens through commercial bilateral markets, including virtually all investment decisions for new load, generation, and transmission facilities. This important point is discussed at length in the most recent San Diego and Edison comments prepared for this hearing.⁵ The exception and the focus of the Poolco is in the coordination of physical delivery and pricing of the associated services, over the very short term, say on a half-hourly basis. The Poolco operates only in the short-run to deal with system interactions and charge users for the real costs of using the system.

The details of the Poolco operation can and should be designed to impose virtually no constraints on the terms and conditions of commercial arrangements in bilateral contracts. A design objective of the Poolco is precisely to facilitate such freedom of commercial contracting. In the best case, the Poolco dispatchers do not need to know about the existence or the terms of the bilateral contracts. One reasonable test that could be applied to the design of the Poolco would be that it would be possible to implement *any economically efficient bilateral transaction*. This is not the same as any bilateral transaction, to be sure, because some transactions could create enough cost shifting in the network to make them truly uneconomic even though they might be attractive to the two parties of the deal. And other proposed bilateral transactions may not be physically feasible. However, such uneconomic or infeasible transactions should not be supported, and the criterion imposes a high standard on the Poolco design. Hence an efficient Poolco model is highly compatible with all justifiable bilateral transactions, and the Poolco relies on a bilateral market to handle most of the important decisions.

⁵ Comments of San Diego Gas & Electric Company (U 902-E) on Competitive Wholesale Electric Markets and Market Institutions in the Restructured Electric Industry, July 26, 1994, pp. 9-10, pp. 27-31. Comments of Southern California Edison Company (U 338-E) on Competitive Markets and Appropriate Market Institutions in a Restructured Electric Industry, July 26, 1994, pp. 3-4.

AN EFFICIENT BILATERAL MARKET NEEDS A POOLCO

The Poolco proposals are only beginning to be developed in sufficient detail to understand all that is required. The submissions by San Diego and Edison have substantially advanced the subject, and deserve close and extended scrutiny. It is clear from these submissions that much less is envisioned than other traditional power pools, which have many long-run investment responsibilities and operating requirements that can be left to markets. The Poolco is a device for efficient short-term operation and support of commercial bilateral transactions within the complex interactions of the integrated grid.

By contrast to Poolco, the bilateral model is less well specified at present, described primarily through general analogies to other markets. However, when considered within the context of the undisputed requirements of the integrated electricity system, the reasonable possibilities for the bilateral models point in roughly the same direction for the conduct of acceptable commercial transactions.

Strict Bilateral Model

A strict bilateral model would envision that a customer arranges a contract with a generator, and then it is the responsibility of the two parties to match loads and provide the other essential services to maintain electrical balance. Every bilateral contract would be managed and controlled separately. Hence, if the generator is not available or not producing at planned output, the customer must reduce its load. If the customer varies its load, the generator must track the change with its own output, all the while matching transmission capacity rights with the actual power flows. And so on.

The problems inherent in this version of a bilateral market are legion. Monitoring would be expensive, transaction costs large, and reliability threatened. In the face of nonperformance by either party, it is not clear how emergency support would be obtained or how damages could be mitigated and then assessed. This strict bilateral model deserves mention only because it is implicit in some of the discussions of an unfettered trading market without any form of a Poolco. However, it is unlikely that any proponents of bilateral markets would embrace this naive model, at least not for long. This is not even how the natural gas market works.

Operations Under a Bilateral Model

A more advanced version of the bilateral model recognizes the need for instantaneous balancing and close coordination. Just as in the gas industry, participants in the market make arrangements with a service provider to move power from source to destination through the integrated electrical grid. This system operator does not participate in the commercial arrangements between buyer and seller. Rather, the operator provides a type of common carriage service. It is the responsibility of the users to arrange for the necessary new transmission rights, for which they may pay a regulated price, or obtain such rights from others, and to notify the system operator only of the magnitude and timing of the contracted deliveries. The transmission

service fees, in addition to the cost of transmission rights, are limited to any direct variable costs of providing the service. The pricing details would have to meet the FERC tests of open access, comparability, and non-discrimination, but these requirements present no significant barriers.

This more sophisticated version of the bilateral market is like the system in the gas industry held up as a model by Enron Power Marketing, Inc. (Enron):

First, gas pipelines still serve as the central operator of the system. Information about the physical movement of gas comes to the pipeline in the form of nominations for service. The pipeline and its shippers then use a confirmation and scheduling process. At first, the pipeline required information several days in advance of delivery thereby limiting the portion of the market that could be served by third parties. With FERC Order 636, however, "no notice" or instantaneous transmission service is now available.⁶

To the extent that the actual deliveries, contracted amounts, and transmission capacity rights are all in balance under the contract, there may be nothing inherently difficult in this bilateral model. There is an open question about the ability to monitor and manage a large number of constantly changing bilateral transactions in the electric system, but for the moment assume that the proponents are correct and this is a manageable problem. However, the model would be incomplete if it did not address the essential requirement to define what happens in the case of mismatches in any of the quantity nominations and actual deliveries. There should be a mechanism for meeting the imbalances without curtailing a customer or a generator whenever one party to the contract is out of balance with the agreed contract terms and the associated nominations.

Again, under the Enron model:

Second, pipelines were allowed to retain certain operational controls--e.g., certain storage rights, the ability to issue "flow orders" requiring supply to be brought into the system at certain times and places, etc. Third, pipelines imposed balancing charges or penalties to ensure that the parties using the system did what they said they would do.⁷

Transferring the Enron model from the gas to the electric system would require some adjustments to honor the respective technical differences between gas and electricity. The first feature would be to recognize that over any very short operating horizon, transmission "service" and generation "dispatch" are intimately related. The principal tool available to the electric

⁶ Enron Power Marketing, Inc., Initial Comments of Enron Power Marketing, Inc., In Response to the California Public Utilities Commission's Order Instituting Rulemaking and Order Instituting Investigation, June 8, 1994, p. 17, emphasis in original.

⁷ Ibid.

system operators to control power flows is to control the dispatch of enough flexible plants to maintain system balance and respect short-term operating constraints. Just as with the gas "flow orders," it is necessary to have the ability to change the overall power plant dispatch at the margin. The Enron model would accommodate this essential control feature. The participants ("shippers") could nominate MWs of power rather than MCFs of gas, coupled with a transmission right. The system operator would accommodate all the nominations possible. Where necessary to maintain integrity, the system operator would adjust the dispatch of flexible plants and loads in order to maintain moment by moment balance and respect the contingency constraints that can restrict the overall system dispatch.

This balancing function of the system operator allows for actual generator deliveries and customer takes that deviate from the nominations. Hence, the system does not require that a customer curtail its load when a contracted generator is not matching its nomination. In effect, the system operator finds other flexible plants which can be adjusted to accommodate the imbalances. Reliability can be maintained and the system provides an automatic source of backup power. And the third step of the Enron model then calls for "balancing" charges to compensate for the inevitable deficits and surpluses. Again there will be an adaptation to account for the different conditions between gas and electricity.

Pricing for Imbalances

Presumably the system operators would be expected to perform the balancing function efficiently, employing the least cost dispatch of the flexible plants. Given this least cost dispatch of the flexible plants, there will be a corresponding system marginal cost of power or equivalent spot price determined for each location and moment in time. The natural standard for economic efficiency would call for charging these spot prices for the net imbalances from nominations. Charging any other prices would move away from the correct market signals consistent with the competitive market, and would result in cost shifting with incentives to game the system. Likewise, charging the spot prices provides compensation for those who may be required to adjust in order to accommodate the nomination imbalances.

In addition to the arguments for economic efficiency, a little reflection will show that the FERC comparability and non-discrimination standards will require these spot prices for imbalances. In the anticipated market, any generator could offer a power plant as a flexible plant to be used at the discretion of the system operator. A corresponding customer load could also be treated as a flexible load. The generator then would be transmitting power to the customer. If the system operator is paying the flexible plant owners the spot price for their generation, at the margin, and charging the customer the corresponding spot price for the load, the essential nature of electricity transmission means that the owners of these flexible plants will necessarily obtain transmission service at these spot prices. If the transmission service is provided at this price for the participants in the flexible load and generation, the FERC standards will lead to the conclusion that the same price must apply to the bilateral transactions of third parties. This would be an economically efficient and nondiscriminatory model, and it is where the Enron bilateral analogy to the natural gas market leads.

An example can illustrate how the Enron model would operate. It will be necessary to decide on some unit of time and the definition of the locations. These details, which are essential to any model, will be driven by metering capabilities and the operating protocols. Suppose for simplicity that we are talking about a half-hour period over which a generator at location A has contracted to deliver 100 MWs to a customer at location B. The contract may cover many half-hours, weeks or years, with varying terms and conditions. The interaction with the system operator, however, takes place only in the short term. The generator has negotiated a price with the customer, but the price is known only to them. In addition, the generator has accepted the obligation to obtain a transmission capacity right for 100 MWs, presumably through an initial investment in transmission lines at a regulated rate, such as construction cost, or through purchase of such a right in a secondary market. With this capacity right in hand, the generator and the customer notify the system operator of the 100 MWs nomination for the half hour.

If the generator delivers 100 MWs and the customer takes 100 MWs for that half hour, nothing more is required. The system operator takes whatever action is necessary to deliver the 100 MWs, and except for a small charge for incremental losses and ancillary services, no further payments or dealings are required between the system operator and the participants in the bilateral contract. The system operator plays no role in setting the terms or conditions in the private negotiation for the bilateral transaction.

The example becomes more interesting, however, when we introduce the possibility of imbalances. Again for sake of illustration, suppose that the customer actually takes 115 MWs and the generators supplies only 90 MWs. The system operator now uses the flexible plants to make up the differences. Assume that the system operator does a good job, resulting in a spot price at A of 3 cents per kwh, and a corresponding price at B of 5 cents, with the 2 cents difference reflecting the limitations on the available transmission capacity and resulting system congestion. In this circumstance, the system operator would charge 5 cents for the 15 MWs of excess take over nomination at B, and would charge 3 cents for the 10 MWs of deficient supply at location A. In turn, the system operator would pay the flexible suppliers the same 5 cents for 15 MWs at B and 3 cents for the missing 10 MWs at A. The system operator would keep none of these payments.

Implicit in this example is a wide variety of physical possibilities. It may be that the 10 MWs and 15 MWs were generated at A and B, respectively, just covering their cost. Or it may be that the flexible generator at A had a 15 MWs transmission right to reach B and generated all 25 MWs at A, profiting from the transmission right. In the absence of the 15 MWs of transmission, the flexible generator at A would be paid 3 cents for the 25 MWs, with the customer at B paying 5 cents for 15 of those MWs, implying a transmission service charge of 2 cents for the 15 MWs, which would be used to compensate some other party who in effect would lease their 15 MWs transmission right. Hence the flexible generation and load can include transmission, and under the comparability standard the marginal cost prices for the flexible load must set the balancing charges for the parallel bilateral contract.

The Opco and Poolco Models

If we change the words slightly and refer to the system operators as the "Opco" and the flexible plants as the plants in the pool, we see that the Enron bilateral model with an Opco functions in harmony with the Poolco model, and that something like the Poolco function is required of the Opco. The same functions fall to the Poolco in the San Diego and Edison proposals. From this perspective, it is instructive to ask what difference there are between being inside and outside the pool.

Under the Opco model, the participants in a bilateral contract arrange for transmission capacity rights for the 100 MWs, and pay 3 cents for the 10 MWs of imbalance at A and 5 cents for the 15 MWs of imbalance at B, for a total of \$105 in variable charges other than for the transmission capacity right. In turn, the necessary flexible plants in the pool receive this \$105 variable payment. Everyone pays for other ancillary services, and the Opco keeps no generation revenues.

Under the Poolco model as described in more detail by San Diego, and with the same market conditions, if the contract participants choose they could declare their 100 MWs nomination as "must run." In the event, Poolco would settle three separate transactions. First, charge the customer 5 cents for the 115 MWs taken at location B. Second, pay 3 cents for the 90 MWs provided at location A. Third, pay the generator 2 cents congestion rental for the 100 MWs of transmission capacity right. The net variable payment is $5*115-3*90-2*100=\$105$, just as with the Opco model. In turn, the necessary flexible plants in the pool receive this \$105 variable payment. Everyone pays for other ancillary services, and the Poolco keeps no generation revenues.

What is the difference? Under the Opco model, the operator keeps track of the net inputs and outputs and compares them with the nominations, applying spot prices to the net imbalances. Under the Poolco model, the operator keeps track of gross inputs and outputs and applies the spot prices to the gross transactions. The net payments are the same, as they must be under the comparability and non-discrimination standards. In either case, the system operator plays no role in setting the terms or conditions in the private negotiation for the bilateral transaction.

The Poolco model offers the advantage of requiring metering and payments only on the gross transactions of a participant at a location. The bilateral Opco model requires either tracking each contract, which would seem cumbersome but should be possible, or aggregating the contracts for each participant and dealing only with the gross nominations, which comes even closer to the Poolco case.

Neither the Poolco or the Opco is likely to capture all the participants, at least in its early stages. Hence, as with the gas industry analog, interconnection agreements will be required:

Fourth, pipelines put agreements in place to govern the scheduling and

resolution of imbalances at interconnections with other pipeline systems. In short, pipelines are free to operate their systems reliably and are financially protected from shippers who fail to properly schedule their shipments. Further, pipelines now have access to a more flexible market which in turn enhances their ability to operate reliably.⁸

Under either the Poolco vision or the Opco vision, there will be great freedom to operate flexibly in the competitive market. If there is so much in common and not much difference, then we should be able to work out acceptable procedures that will accommodate all the legitimate needs of the market participants.

One misunderstanding of the Poolco model appears to be an assumption that bilateral traders would be required to reveal their contract prices to the system operator, and required to accept the dispatchers decisions on whether or not the plant is dispatched. Setting aside the non-controversial case when system constraints may make certain nominations infeasible, neither of these conditions is a necessary outcome of the Poolco operation. Participants may choose to assign their plants for flexible control by the system operators, setting a bid as a reservation price below which they will not operate, but agreeing in advance to receive the market clearing spot price at their location. Or they can insist that their plant be "must run," if necessary by the equivalent device of bidding a very low reservation price. As long as the payments for gross loads or net imbalances are made at consistent spot prices, and not at the reservation bids, anything that can be done in the efficient Enron Opco model can be done in the San Diego-Edison Poolco model.

The option to be treated as a flexible plant or load offers the generator or customer an additional advantage to buy power from the pool when it is cheaper than generating with the contracted plant under the nomination. However, without the option to be treated as a flexible plant, the generator in the pure bilateral model has a narrower range of choices. Contrary to the first impression of many, therefore, the Poolco model can be the more flexible system, with greater facilitation of the market. There is an automatic source of power, and commercial bilateral contracts develop independently of the Poolco. For this reason, my expectation is that the bulk of the market participants will ultimately prefer to be treated as flexible loads and generators in the Poolco model.

Hence, the differences between the Poolco and the Opco models are much less than they appear on first impression. As shown in the accompanying table, the major differences reduce to (i) the mechanics of handling a settlements process with a large number of individual contracts; and (ii) the number of plants that are in the category of flexible plants and loads included under the control of the system operator, and whose reservation price bids are used to set the market clearing spot prices.

⁸ Ibid.

COMPARING ALTERNATIVE WHOLESALE MARKET MODELS		
	San Diego-Edison Poolco Model	Bilateral Opco Model
System Operator Required	Yes	Yes
Operator Independence Required	Yes	Yes
Operator Dispatch of Flexible Plants	Most Plants	Few Plants
Quantity Nominations	All Plants	All Plants and All Contracts
Reservation Price Bids	For Flexible Plants	For Flexible Plants
MW Usage Pricing	Spot Prices	Spot Prices
Ancillary Service Charges	Yes	Yes
Tradeable Transmission Rights	Yes	Yes
Balancing and Settlements	Gross Loads and Generation	Loads and Generation Net of Contract Nominations
Commercial Bilateral Contracts	Yes	Yes
Interconnection Agreements	Yes	Yes

The table does not exhaust all the issues, but the basic point appears robust. There are differences between the Poolco and Opco models, but the choices are far from complete a rejection of one and acceptance of another. Neither the Poolco model nor the Opco model is unnecessary, undesirable or unattainable. More important are the hard, common problems that must be addressed before any further decisions can be made on the operation of the wholesale market.

COMMON REQUIREMENTS

There are a few differences between the two perspectives, but they have far more in common. In effect, the distinction reduces to not much more than a difference in the judgements about how large a fraction of the total load and plants must be included in the flexible category. *Clearly it is not possible to operate with no flexible plants dispatched by the system controller, and just as clearly it is not necessary that all plants be flexible, even though all plants have to be considered by the system operator.* The best approach is something that can be worked out over time. And no matter what view we may have on the best mix of flexible and (from the system operator's perspective) inflexible plants, there are many important and difficult problems that must be addressed as part of any competitive model.

These common problems should not be dismissed lightly or ignored under a misimpression that one approach to the market requires design and another does not. Any reasonable approach to pricing and access for the essential facilities requires design and oversight. Experience with other integrated electricity systems suggests the importance of understanding how all the major pieces fit together. And with the complex interactions of the integrated electrical network, most of the pieces are highly interdependent. It would be a serious mistake, for instance, to assume that economically efficient pricing of transmission use could be separated from the short-term spot prices of efficient generation. Hence, the participants and the Commission have a series of important tasks ahead, tasks that cannot be avoided. A partial list includes:

- **Nomination and Control Procedures.** In the competitive market, the participants will be removed at arm's length from the system operator. To preserve the flexibility needed in the market, there must be provision for frequent communication to nominate for transmission service or bid for load and dispatch. These nomination procedures must be consistent with the performance requirements for system control. The design of these procedures and the associated systems is a task that will occupy some time, but it is essential.
- **Marginal Cost Pricing Rules.** Traditional utility dispatch systems have all the information needed to produce marginal cost prices, but the information has not been used in the past for commercial transactions. New methods must be designed and implemented to integrate locational pricing with the nomination and control procedures. Although straightforward in theory, practical systems that deal with the realities of half-hourly locational pricing with contingency constrained dispatch under complex bids are not yet available and must be created. These locational marginal cost prices will play a critical roles in compensating bidders in the Poolco model and charging for imbalances in the Opco model.
- **Transmission Right Allocations.** A vibrant market will require well-defined and tradeable transmission rights. At present, transmission rights are frequently poorly defined, inconsistent, and typically not tradeable. New approaches that are

compatible with competitive pricing are available, but the hard work of turning theory into reality is ahead. And once defined, there will be a difficult process of allocating the transmission rights for the existing system.

- **Boundary and Interconnect Conditions.** It is unlikely that any new structure will be put in place soon that covers all interconnected systems. Hence the evolution of any competitive market model must develop standards and rules for the points of interconnection with those "outside" the system. The existing interconnection agreements were designed for a very different type of market, and may need redesign for support of a competitive environment.
- **Billing and Settlement Systems.** With many third party entrants and a rapidly disappearing willingness to absorb cost shifting, there will be a need for new billing and settlement procedures. The rules here depend on the design of the market institutions, with the possibility of different treatment for Poolco and bilateral transactions.

These new procedures and systems must be developed in parallel with a dramatic change in paradigm that should accompany the shift to a competitive market. Use of existing procedures and systems may be foreclosed by this change in perspective. For example, the long-standing and seemingly essential requirement for separate treatment of energy and capacity, with distinct pricing and regulation, may disappear. This change will be hard to accept, even though it will ultimately simplify the market. The process of adapting both our minds and our contracts to this new vision will require a great deal of inquiry by the market participants.

This process of investigation, rethinking and redesign cannot be done solely through periodic presentations before the Commission. A more intensive give-and-take process of analysis and debate will be required. The recently organized "Competitive Power Market Working Group" is on the right track. This group, launched at the initiative of San Diego Gas & Electric, includes many of the key players, and others are likely to join in the effort to explore the alternatives and requirements for an efficient wholesale market. The first meeting of the working group, chaired by Charles Stalon, focussed on defining the needs and organizing the questions across the spectrum of interests. The results underscored two points that should guide and encourage the Commission. First, there is still a great deal of confusion about the respective views of the competitive market vision. Second, even a little discussion in this more informal setting went a long way to finding common ground. There is more work to be done, and more common ground to be uncovered. As summarized above, there may be a far greater possibility of finding a consensus view than would have been apparent on first impression, and the Commission would benefit greatly from supporting this effort and allowing the freedom for the process to go forward.

MARKET PRICING AND ACCESS PRINCIPLES

The process of the refining and moving towards the new vision would be enhanced by expanded public policy direction on the guiding principles. The FERC has been developing such principles for transmission, and the Commission outlined further criteria for expanded competition. A report from the POWER group of the University of California discussed principles under the categories of "economic efficiency, equity, technical efficiency of the transmission and distribution network, quality of service, and externalities/public goods."⁹ There is much in this discussion that goes beyond pointing to issues, by recommending actual criteria for comparing the proposals, with which I would agree, such as "Price transmission to reflect costs...The cost of transmission includes two components: line losses and congestion costs."¹⁰ But other parts of the POWER discussion, e.g. under "Obligation to Serve," are still in the mode of pointing to problems rather than defining the criteria for solutions. Elsewhere I have discussed such principles for the critical transmission function.¹¹

Examples of basic principles that have emerged with special importance in the case of electricity include:

- **Open Access, Non-Discrimination and Comparability.** The EPAct requirements and the FERC implementation emphasize the need to obtain access to the market under terms and conditions that support a competitive wholesale market. The "golden rule" of comparability is a common thread.
- **Extend Benefits to All Participants.** Market structure should facilitate extending the benefits of competition to everyone, not just larger players able to operate easily in the wholesale market.

⁹ POWER Working Group on Electricity Industry Restructuring and Regulatory Reform, "A Reader's Guide to the Blue Book: Issues in California's Electric Industry Restructuring and Regulatory Reform," University of California Energy Institute, Berkeley, CA, June 1994, p. 2.

¹⁰ Ibid., p. 4.

¹¹ W. Hogan, "Contract Networks for Electric Power Transmission," Journal of Regulatory Economics, Vol. 4, No. 3, September 1992, pp. 211-242. W. Hogan, "Markets in Real Electric Networks Require Reactive Prices," Energy Journal, Vol. 14, No. 3, 1993, pp. 171-200. W. Hogan, "Electric Transmission: A New Model for Old Principles," The Electricity Journal, March 1993, pp. 18-29. W. Hogan, "A Competitive Electricity Market Model," Kennedy School of Government, Harvard University, Draft, October 1993. W. Hogan, "Transmission Pricing in Support of a Competitive Electricity Market," Response to the Inquiry Concerning the Commission's Pricing Policy for Transmission Services Provided by Public Utilities Under the Federal Power Act, Docket No. RM93-19-000, Harvard University, November 8, 1993. W. Hogan, "Efficient Pricing and Transmission Rights in Support of a Competitive Electricity Market," Comments for Technical Conference on Responses to the Inquiry Concerning Commission's Pricing Policy for Transmission Services Provided by Public Utilities Under the Federal Power Act, Federal Energy Regulatory Commission Notice of Technical Conference and Request for Comments, (June 30, 1993), Docket No. RM93-19-000, April 15, 1994.

- **Separate Ownership from Use of Essential Facilities.** Everyone should have equal access to and use of essential facilities, particularly transmission, with the rights of ownership limited to compensation consistent with opportunity costs in a competitive market.
- **Separate Physical Delivery from Financial Transactions.** Market institutions and operations should allow for financial transactions that implement bilateral commercial arrangements while separately coordinating the spot market interactions of physical delivery of electricity in the transmission network. This will provide automatic sources of backup and easier resolution of contract disputes.
- **Coordinate Federal and State Regulation.** Pricing and access rules for the regulated monopoly essential facilities should be consistent between federal and state jurisdictions.

In the critical domain of transmission, viewed as the ultimate in essential facilities, there are continuing efforts to elaborate and refine principles that can be used to guide and test the development of the wholesale market. For example, FERC suggested several principles in its transmission inquiries:¹²

- Promote efficient use of and investment in the transmission grid and provide appropriate price signals to transmission customers. To the extent practicable, prices should accurately:
 - ▶ account for transmission constraints;
 - ▶ reflect any prudent costs incurred as a result of transmission service;
 - ▶ reflect the actual power flows of the transmission service;
 - ▶ reflect the distance- and location-sensitive costs of the transmission service;
 - ▶ reflect the prevailing direction of the flow, distinguishing between "with the flow" and "counter flow."
- Address any transition problems arising from the reform:
 - ▶ Balance equity considerations associated with any reform with the potential efficiency improvements;
 - ▶ Mitigate the hardships arising from any reform.
- Allow customers an option to have stable prices over time.

¹² Federal Energy Regulatory Commission, "Transmission Pricing Issues," Staff Discussion Paper, Inquiry Concerning the Commission's Pricing Policy for Transmission Services Provided by Public Utilities Under the Federal Power Act, Washington, DC, June 1993, pp. 7-8.

- Be simple to implement and administer.

Building on these ideas and further inquiry, a Massachusetts Task Force identified ten principles for transmission access and pricing:¹³

Transmission pricing and access should be designed to support operation of a competitive wholesale generation market compatible with customer choice, efficient incentives for both usage and investment, environmental protection, and non-discriminatory participation according to the principles articulated below:

1. Preserve System Reliability

Any transmission pricing and access rules must in the first instance preserve the reliability of the system. Pricing schemes that explicitly or implicitly increase the risk of outages or service failure or degrade the capacity of the system should be discouraged except for those cases where the costs and benefits of different levels of reliability can be assigned to individual users.

2. Price Usage Consistently with Economic Dispatch

Transmission use should be priced in a manner that is consistent with economic or least-cost dispatch of the system.

3. Unbundle Transmission Rates and Services

Transmission rates and services should be unbundled and made transparent to all wholesale customers.

4. Regulate the Monopoly Facility

Transmission is a natural monopoly. Owners of transmission facilities should have the opportunity to earn a return on equity consistent with traditional rate-making approaches.

5. Provide Transmission Capacity Rights

Users (i.e., power sellers, buyers and brokers) should be allowed to secure and transfer long-term capacity rights for transmission services.

¹³

Massachusetts Electric Utility Market Reform Task Force, July 1994.

6. Develop Incentives for Efficient Expansion

Transmission pricing should allow for incentives that reward economically efficient expansion of the existing transmission network. Where transmission expansion represents a lower cost alternative to energy conservation or new generation, investors in the new transmission capacity should be allowed to acquire transmission rights equivalent to the incremental transmission capacity added.

7. Allow for Recovery of Sunk Costs

Utilities should be allowed to collect a charge that would be designed to recover costs prudently incurred for previously bundled transmission, generation, or other assets. The charges would be independent of the source of wholesale power.

8. Ensure Equitable Treatment of Public Policy Goals

To the extent not covered in retail rates, costs associated with programs related to demand-side management, environmental protection, and low-income support -- which might not be recoverable at market prices for energy -- should be funded through charges applying to all users.

9. Promote Regional Consistency

Access to and pricing of transmission facilities and services should be developed and implemented consistently within a region, coordinated with both federal and state jurisdictions.

10. Allow for a Transition Period

Implementation of a new pricing and access structure should provide for a period of time to allocate costs and capacity rights, and adjust to a new system. Transmission rates for the transition period should be designed to support the development of a competitive market.

These statements of principle can serve as a starting point for further development and implementation in California through efforts such as the Competitive Power Market Working Group.

QUESTIONS FROM THE COMMISSION'S HEARING ORDER

The Commission's hearing order listed of detailed questions. Most of the issues have been addressed above. For completeness, brief summary answers follow.

What functions do the different market models provide?

The models must support the complex operations of the integrated electric power system and the commercial requirements for trading and investment. See above for a discussion of many of the details.

How is price set?

Contract prices for long-run investments and protections are set in the bilateral market through negotiations among the parties. Transmission investment prices are regulated under performance based ratemaking or cost-of-service principles. Prices for tradeable transmission capacity rights are determined in the secondary market. Prices for physically delivery and imbalances are determined through a spot market coordinated by the dispatch system operator.

How is reliability ensured if a generator fails?

The system operator maintains control over enough flexible plants and load to ensure reliability and provide an automatic source of backup power.

How is information about price, quantity, and available buyers and sellers shared or disseminated?

The spot price is determined in the physical dispatch and made transparently available to all participants in the market as part of the normal operations of the system dispatcher. Contract prices are private, but information will emerge as in other markets through the development of analytical and data services.

What is the governing structure? Are there entry/exit requirements and what purpose do they serve? Is dispute resolution a function of the model?

The key requirement is that the Poolco or Opco system operators be independent of and insulated from the economic interests of any particular participant. The organization could be as a non-profit entity, but there are many equally acceptable structures. There will be minimal entry and exit provisions. A principal function of the Poolco, providing reliability and backup power, must happen automatically, but will follow agreed upon principles. Other disputes would require some process, but this is not a major issue.

Who participates in the wholesale market? What are the criteria for participation?

Anyone who meets the FERC criteria participates in the wholesale market. Changes in rate design to implement Efficient Direct Access provide all customers with access to the wholesale market spot price and customer choice.

What products (commodities and services) are traded in this wholesale market? Is transmission among them?

It is difficult to describe the great variety of products and services that will develop. There is no limit in either the Poolco or Opco models to any economically justifiable and physically feasible product or service.

Does the model have a dispatch function? Describe it. If not, how is dispatch managed and what relationship does dispatch have with the wholesale market model?

Dispatch of flexible plants is an essential requirement in maintaining operational reliability in any electric transmission system. With reservation price bids for the flexible plants, the least-cost dispatch process yields the efficient spot prices for the wholesale market in the Poolco model and for imbalance charges in the Opco model. The dispatch function and associated pricing are critical, but still little understood, in accommodating the complex interactions in the electric power system.

How should the wholesale market model be modified, as a transitional tool, to serve retail customers?

With a spot price available to all or most generators, Efficient Direct Access can begin to provide access for retail customers. In the absence of such a spot price, it is difficult to envision another direct access system that would not run a high risk of cost-shifting and uneconomic bypass.

Identify any shortcoming in these existing models today, and what would persist or develop in a more inclusive wholesale market.

The existing system has no economically efficient pricing system for imbalances, no clear definition or assignment of tradeable transmission rights, and discriminatory procedures that exclude many third parties. The present system was built assuming that the participants were a few regulated utilities, not a large number of strong competitors. Many of the fundamentals must be revisited and changed.

If further development of a wholesale market is needed, what role should the Commission play in assisting such development before, coincident with, or instead of a move to customer choice?

The Commission should support and allow the time for operation of collaborative

efforts such as the Competitive Power Market Working Group. This group should be charged to develop both a consistent vision of the structure of the market and a transition strategy that emphasizes early trading to begin establishing a transparent, arm's length spot price. Once such a spot price is available, Efficient Direct Access can be implemented.

CONCLUSION

A true open access, non-discriminatory, competitive power market with real customer choice is within sight. The collection of principles and criteria that are receiving growing acceptance for such a market describe a dramatically different structure from the system now in place. Developing and implementing this new market framework require a fundamental rethinking of the basics of the electricity system and the operations of markets. Given the unusual nature of the highly interdependent pieces of the complex electricity system, it is particularly important to invest the effort to examine the alternatives, test them against detailed examples, and compare them against the accepted principles. The Competitive Power Market Working Group has launched a process that should be supported and allowed to examine the details that can later be reviewed by the Commission. The transition will be faster and better if it is headed in the right direction.