TIME TO BRING BACK PUBLIC INVOLVEMENT? P. 32

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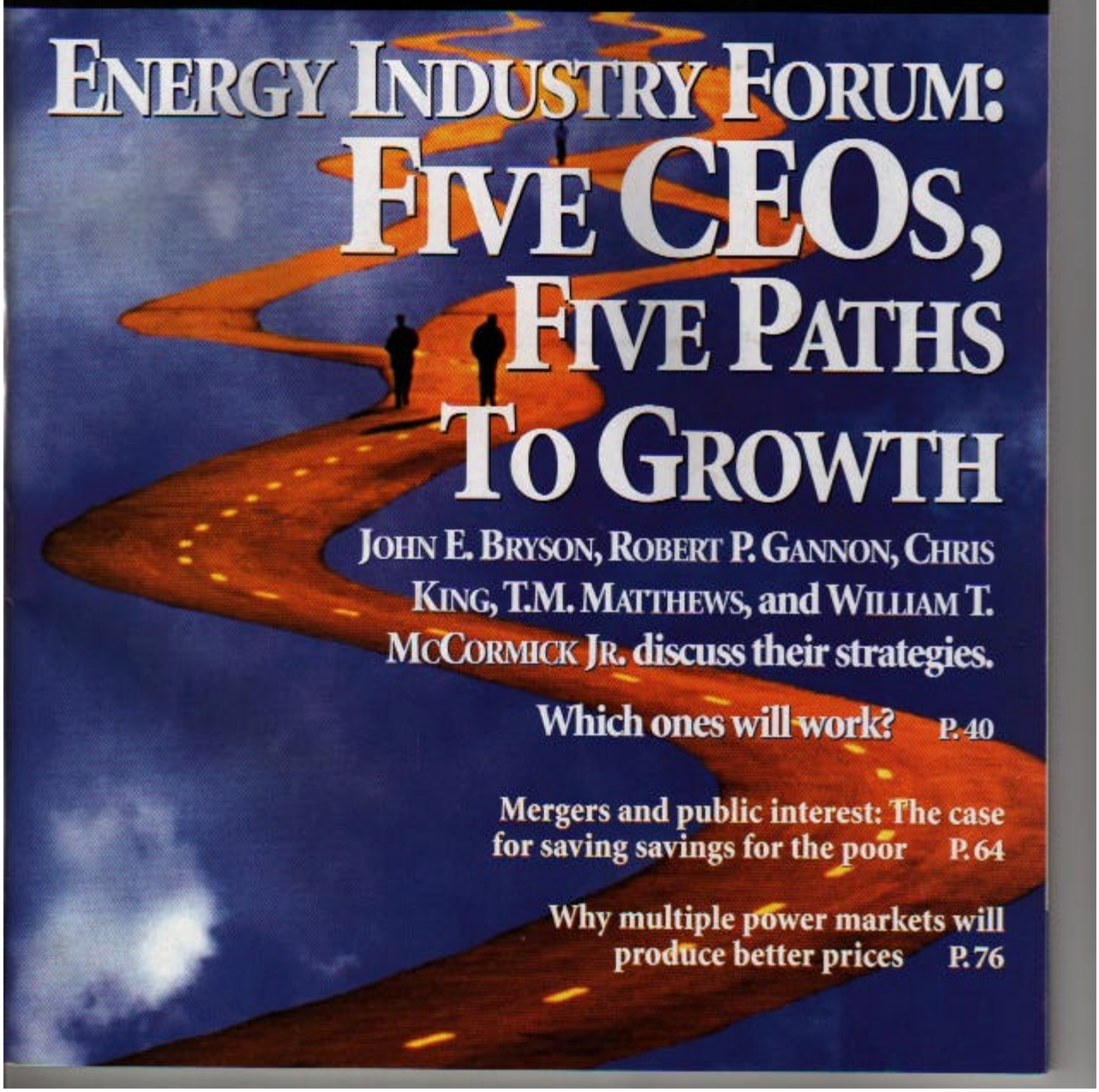

ENERGY INDUSTRY FORUM: FIVE CEOs, FIVE PATHS TO GROWTH

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Five CEOs, Five Strategies for Growth

"[The energy business] is not going to be one that really rings any bells as far as future growth. ... Our way of addressing that is to get into telecom."
—Robert P. Gannon, Montana Power Co.

"I like to say that we have all the downside of the utility business and all the upside of the Internet."
—Chris King, Utility.Com

"We intend to build on [regional generation systems] that we have established and round them out."
—John E. Bryson, Edison International

"We are happy that we have broken out of the pack ... since we trade more like a technology company."
—T.M. Matthews, Avista Corp.

"If the electric market is growing here at 3 percent, in [industrializing economies], the growth rates can be double and triple that level."
—William T. McCormick Jr., CMS Energy

See story, P. 40.

Cover image courtesy of The Stock Market

Pools, Auctions, and Power Prices:

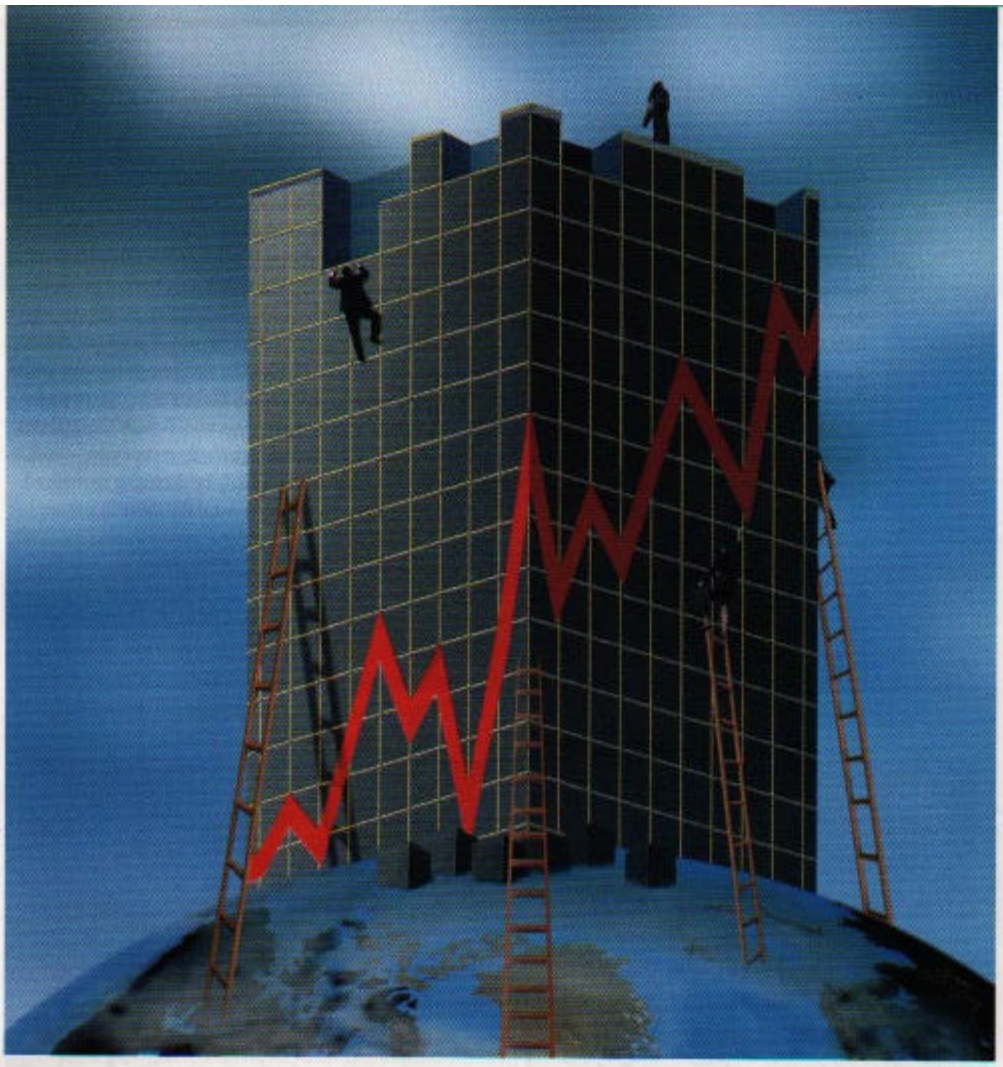
In Defense of Multiple Markets

Why the ISOs are having so much trouble and why a bilateral model might work better.

By Robert Blohm

ELECTRICITY MARKET STRUCTURE LOOMS again as a hot issue. With its collaborative workshops on regional transmission organizations (RTOs), the Federal Energy Regulatory Commission has started the industry thinking once more on how electric power markets should be organized and monitored. But much of the impetus comes from the markets themselves. Everywhere you look, they are in turmoil. In the regions that have set up independent system operators (ISOs) and single-price power exchanges, allegations are flying this way and that about anticompetitive bidding practices, price manipulation, and trading distorted by market power. Concerns about looming summer power shortages can be attributed to power exchanges that overblow spot markets to the detriment of long-term, bilateral contracts for new supply.

It wasn't supposed to be this way. The market-structure issue supposedly was settled back in the mid-1990s when California required its investor-owned utilities to buy electricity only through the California Power Exchange. ISOs in the



Northeast United States then reinforced the idea by each creating a single agency charged with both grid control and price discovery by centralized auction. Yet I felt at the time that the debate was not over. I vented some of those doubts three years ago on the editorial page of *The Wall Street Journal*, where I was joined by Cal-Berkley engineering professor Shmuel Oren, my philosophical ally, in an impromptu virtual debate with Harvard professor William Hogan over the relative merits of bilateral trading vs. "centralized electricity." Excerpts from that give-and-take appeared afterward in *Public Utilities Fortnightly*, in May 1997, and might well bear revisiting.[1]

But let's jump ahead to the present.

As this issue was going to press, the California PUC, as I hear it, was about to extend mandatory buying on the California PX, for another year at least, for the investor-owned

Indeed, better and smoother prices should emerge in a region in which no one market structure is favored.

utility distribution companies—even as they have recovered their stranded cost ahead of schedule.[3] In the Northeast (except for Ontario), default service is subject to a regulated energy price, and whether to base that figure on a PX price (like Ontario and, still, California) or on a competitively bid fixed price will be decided there once stranded cost is paid off. Meanwhile, pricing intervention by NEPOOL recently has raised concern, as has the apparent failure of its mandatory capacity market. The FERC seems to be pressuring California's ISO to subject congestion to mandatory pool pricing, as it is priced in the Northeast (that is, with the market cleared by trades conducted by the ISO, rather than third-party scheduling coordinators). Single-price pool regimes for ancillary services are wreaking havoc on ancillary services markets in California and New York.

(Even in natural gas, the FERC recently considered ordering mandatory auctions for available short-term natural gas pipeline capacity, but fortunately backed off from that idea.)

In these processes, we should beware of public or private entities aspiring to be monopolist auctioneers over the entire energy dispatch or transmission allocation in a given jurisdiction. Beware the monopoly auction. Beware the textbook idea that a market is naturally perfectly competitive—or that it can be made that way artificially by decreeing centralized, marginal-cost pricing. Markets naturally move in a more competitive direction if prices for a moment's physical commodity can be revealed at as many moments out into the future as possible.

Indeed, as will be shown below, better and smoother prices should emerge in a region in which no one market structure is favored. Think of the model as a "market of markets," covering as much as possible the full "term structure"

Table 1: Multiple Markets Allow Price-Trend Discovery and Clearing Across the Term Structure for the Physical Commodity

The physical energy price is the average price of the purchase portfolio. The financial concept of "term structure" is closely linked to a "purchase portfolio," which is a strongly physical concept.

Consumed at \ Bought at	t - n*	...	t - 3	t - 2	t - 1	t
t - n	•					
...	•	...				
t - 3	•	...	•			
t - 2	•	...	•	•		
t - 1	•	...	•	•	•	
t†	•	...	•	•	•	•

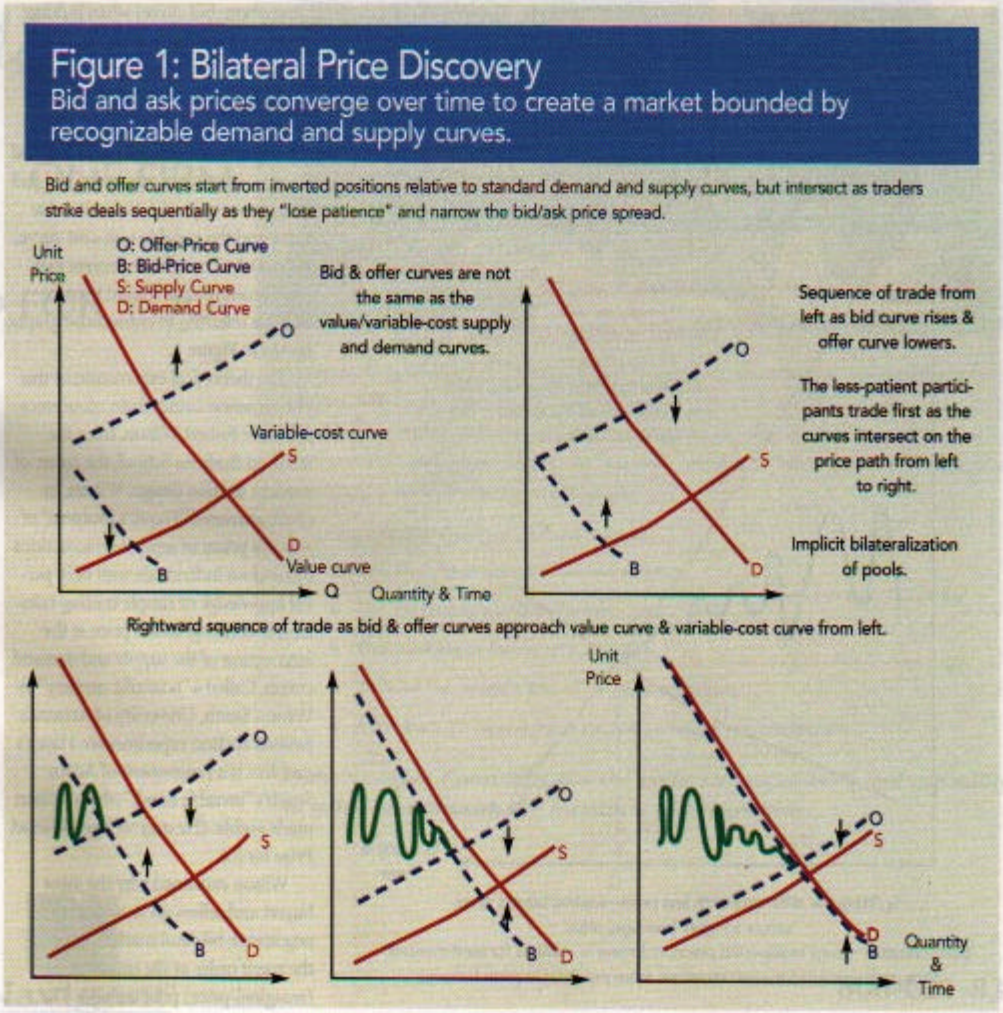
† Row t: (Pre-) purchase portfolio for consumption done at time t
* Column t - n: Term structure of purchases made at time t - n

from spot transactions to long-term and forward contracts. Pure financial, or "derivative," markets are no substitute for absent physical markets because they add transaction costs and pricing ambiguity in favor of the physical spot market. The auction now under study and proposed by the North American Electric Reliability Council, to allocate constraints under its program for transmission loading relief (TLR), marks only the first step in the emergence of full-fledged markets over the full term of physical transmission rights. Such rights, in turn, would enable energy to be traded freely in a multiplicity of physical markets.

In fact, one of the keys to understanding the failure of centralized, single-price electricity auctions and the benefits of a bilateral model lies in understanding how individual bids and offers are introduced into the market and how they slowly converge to create clearing prices. It doesn't happen instantaneously. The time period required to complete the process plays a crucial role. The timeline reflects the relative "impatience" of buyers (and sellers)

Figure 1: Bilateral Price Discovery

Bid and ask prices converge over time to create a market bounded by recognizable demand and supply curves.



with the bargaining position of the counterparty. It forms an important element of price discovery and has a bearing on how buyers and sellers ultimately share what economists call the "consumer (or producer) surplus." (The term denotes the savings enjoyed by the buyer [or revenues to the seller] when the units changing hands are priced at levels that may be lower [or higher] than the buyer [or seller] would otherwise have been willing to pay [or receive].)

The Temporal Dimension: How Bids and Offers Converge

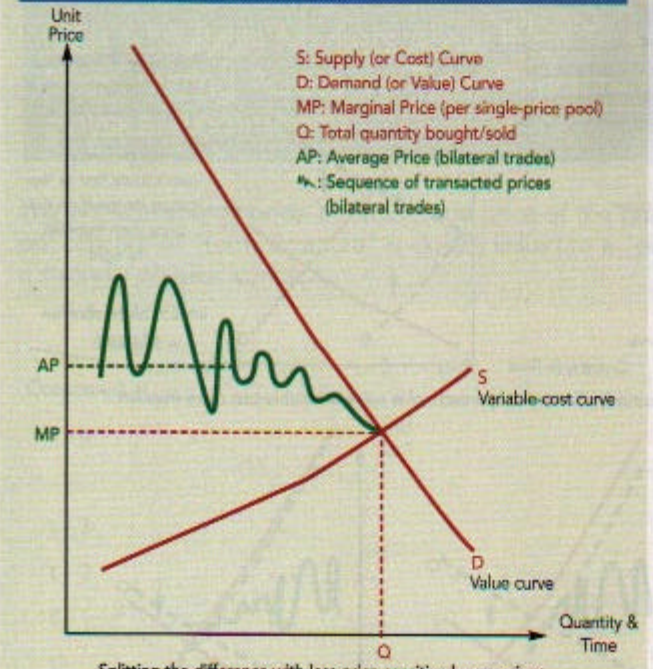
Transactions in negotiated markets get made at successive moments at different prices. Instead of a horizontal single-price line drawn at the price of the final unit sold, we can observe an actual (not derived) downward or upward trending curve of marginal unit-revenue, depending on the greater patience of sellers relative to buyers, or of buyers relative to sellers, in waiting until that party believes the price is right to act. That degree of patience is reflected in how "steep" the unit-value (demand) curve of buyers is, relative to the unit-cost (supply) curve of sellers. Indeed, actual bid and offer curves start in inverted positions (offer curve above bid curve) when bidding begins in a continuous auction. Unit transactions occur as the bid and offer curves intersect and work their way toward the "normal" positions generally thought of for supply and demand curves—in other words, as the bid and offer curves approach the unit-value curve and the variable unit-cost curve, respecively. Though the process may sound confusing, it should become clear on referring to consecutive graphs shown in Figure 1.

The theoretical explanation of this phenomenon comes from economics professor Robert Wilson, from the Stanford Business School, the father of modern auction design. Wilson, in effect, answered "Hayek's Problem" of why the prices of separate transactions by random individuals with only partial knowledge or simple trading rules tend to converge to the price at the intersection of the supply and demand curves. Called a "scientific mystery" by Vernon Smith, University of Arizona's famous auction experimenter, Hayek's problem is a restatement of Adam Smith's "invisible hand," which Wilson made visible. (He may well get a Nobel Prize for it.)

Wilson explained why the same buyers and sellers get matched up in negotiated, bilateral markets as do in the merit order of the single-price (marginal-price) pool auction. The

Figure 2: Masked Price Discovery

A single price pool sets a single marginal price, but masks the implicit sequence of prices (the average price) of bilateral deals.



Splitting the difference with less price-sensitive buyers gives sellers a higher (average) price.

Bilateralization means multiperiod precommitment in multiple forward markets; price-path revelation means smoother, more predictable price behavior.

"merit order" of unit valuations by participants in these fixed-price regimes is the same as the order of the participants' price sensitivity or "patience." Patience is the trader's aversion to revealing his valuation as too far off, making traders play a waiting game of substantial delay before the initial transaction and of many trades toward the end of the period as they head into a tunnel or funnel. The closer the bid and ask prices get, the more people jump in. Wilson described this with a mathematics so complex as to be unsolvable by numerical algorithms at the time, modestly implying that reality is better described than generated by complex mathematical models.

Further, Wilson proved that as the number of traders gets extremely high, all the negotiated prices will hover around a single price, but that they won't get there if a "linear" (i.e., single) price is imposed on all the trades before the market gets to that state. Meanwhile, negotiated-price auctions are known to converge to a final competitive equilibrium price with a minimal number of traders, unlike the fixed-price regime, which requires a huge number of traders.

Impatient Bidders: How a Single Marginal Price Regime Masks Market Interplay

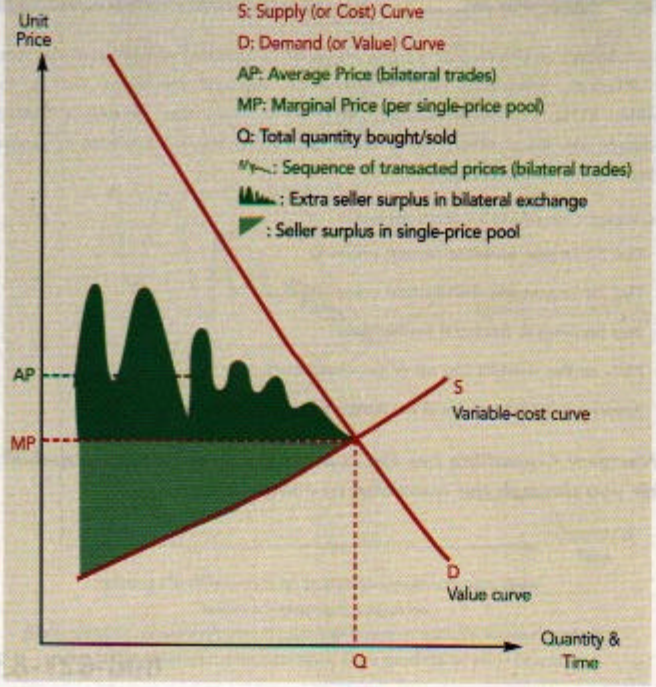
Figure 1 reveals more than how bids and offers converge to set market prices. As the intersections of the bids and offers slope from left to right toward convergence, it suggests the vertical distance at any given moment between the marginal unit-revenue curve and the single (marginal-) price line or between average price and marginal price (Figures 2-4), and between the marginal unit-revenue curve and the average unit-revenue curve. (See Figure 5.) This information is important because it reveals the relative patience (including market power) of buyers and sellers in an auction, since their value/cost curves are not visible.

The impatient buyers (those placing high value on the product) match with the impatient sellers (those with low costs, more willing to part with the product at a low price). Similarly, the patient (low-valuation) buyers match with the patient (high-cost) sellers. In this way, all single-price "pools" (of the type where participants do not "bid," but show only their unit values and costs) are implicitly bilateralized: Buyers and sellers are implicitly matched up from left to right.

Figure 3 shows the case of net demand impatience. It shows how a bilateral market with buyers more impatient than sellers will tend to generate extra surplus to sellers—extra

Figure 3: Net Demand Impatience, Seller Surplus

Steeper demand curve denotes impatient buyers, creating extra "surplus" for more patient sellers compared with single-price pool.



surplus represented by the difference between the area under the marginal unit-revenue curve and above the variable-cost curve and the area under the single (marginal-) price line and above the variable-cost curve. The extra surplus is masked by a single, centrally determined marginal price.

Similarly, Figure 4 shows the case of net supply impatience. With sellers more impatient than buyers, the buyers conducting bilateral transactions receive the extra surplus. Further, note that the comparative steepness of the demand (value) and supply (cost) curves indicate whether the market will be characterized by demand or supply impatience. Figure 3, where the value curve has greater slope, depicts net impatient demand. Figure 4, with its steeper variable cost curve, depicts net supply impatience.

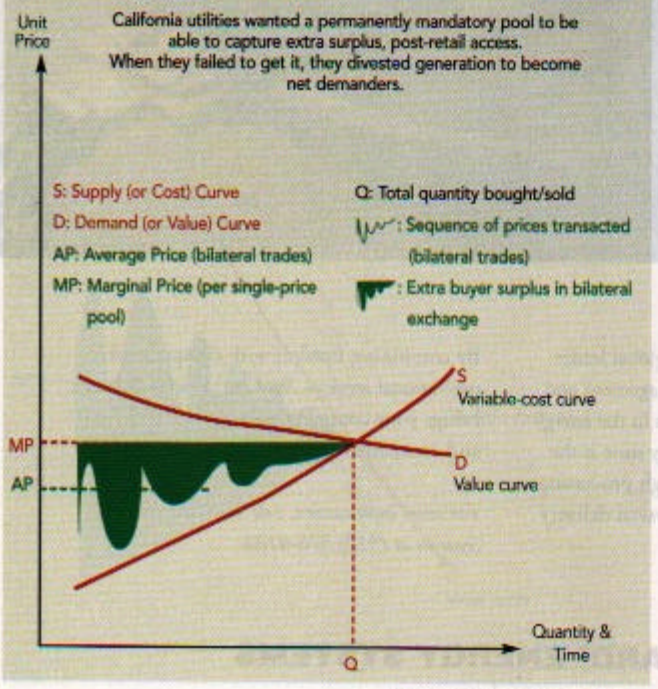
A single-price auction that imposes the last marginal price on too many previous transactions, or prevents or ignores individual, physical bilateral transactions for a given moment's commodity during a span of time sufficiently ahead, masks this information. It also perversely divides, in reverse proportion to the market power of the participants, the surplus that lies between the marginal unit-value curve and the unit variable-cost curve. Bilateralized trading divides the surplus more fairly and more closely to an equal division.

Charles Plott, CalTech economics professor and the father of experimental economics, told me that experiments repeatedly bear out a simple proposition. In bilateralized trading, prices approach the price of the final unit from the direction of the side of the market with the greatest surplus (the area between the horizontal line drawn through the final marginal price point and the value curve above or the cost curve below). In other words, bilateral trading gives fairer division of the surplus than single-price pooled-settlement of all transactions at the marginal price of the last unit. That is another way of saying what this article contends, namely that the price path trends from the direction of the steeper or more price-inelastic of the unit variable-cost curve or the unit-value curve. According to Plott, therefore, if you know something about the preferences of the participants, you can predict the direction from which prices will converge to the final unit's price.

However, Wilson told me that in repeated observed auctions, where there is no change in circumstances between sessions, prices collapse to the final unit's price because the participants anticipate that price. Plott adds that shocks—changes in circumstances—so disorient participants as to put them back in a mode where prices converge again from above or below according to the relative surpluses, or steepness (elasticities) of the curves, of the supply or the demand side of the

Figure 4: Net Supply Impatience, Buyer Surplus

Steeper supply curve denotes impatient sellers, creating extra "surplus" for more patient buyers compared with single-price pool.



market. Plott notes that the division of the surplus between buyers and sellers can't be more exactly determined beyond being more equal in the bilateralized trading case than in the single-price last-marginal-price case. Inequality would persist, among other reasons, to the extent that participants are attempting to anticipate the final price outcome and are not purely driven by their impatience level.

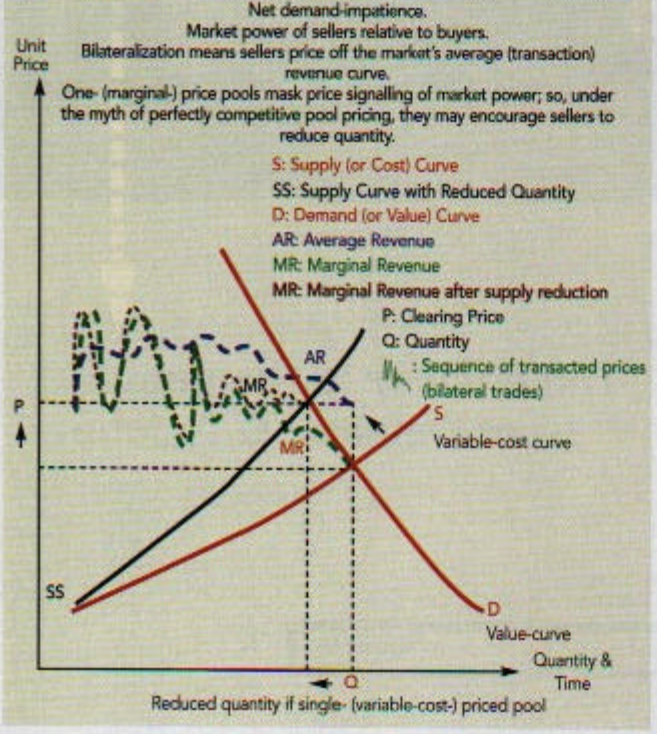
In our case, by imposing on all transactions the last marginal price as the would-be single price, a centralized auction can result in a situation where the relative market power is ultimately reflected in manipulation of the single marginal price to the level of what would have been the average price, to capture lost surplus. This idea is illustrated in Figure 5, which shows how supply is curtailed (say, by withholding cheaper units), causing the variable cost (supply) curve to rotate to the upper left, and raising the price so that marginal revenue rises and quantity transacted is reduced.

Plott has found that single- (posted-) price regimes are prone to higher prices and lower efficiencies due to the inherent rigidity, which negotiated-price regimes provide ample incentives and opportunities to defect from. To some extent, it even mirrors what has occurred in the United Kingdom, beginning with then-UK regulator Stephen Littlechild, and resulting in the closure of the mandatory UK electric power exchange pool by the Labor government.[3]

Moreover, imposing the single marginal price on all transactions suddenly makes marginal revenue less, and marginal cost greater, than marginal price by the amount the marginal change in price affects all the other transactions. That suggests a more efficient (albeit less socially optimal) lower quantity where marginal revenue equals marginal cost. Short of perfect competition, only bilateralization seems to allow equating marginal cost or revenue with marginal price.

Figure 5: Lost Surplus, Quantity Withheld

Single-price pool induces sellers to hold quantity off market to boost marginal revenue in attempt to regain lost surplus.



Multiple Markets: Revealing the True Price Path

Multiple markets provide the means of advance price discovery and clearing across the entire term structure for the physical commodity. No single market mechanism spans the entire term structure over which transactions for a given moment's commodity are naturally done a piece at a time ahead of time in a temporal portfolio. (See Table 1.) Such piecemeal, ahead-of-time procurement at distinct prices provides the advance price-trend discovery that ultimately makes for smoother behavior of the spot price or "marginal" price, the price of the very last unit sold.

Wilson states this point eloquently

in his December 1998 market power study for the New England Power Pool conducted jointly with his student, professor Peter Cramton of University of Maryland. They call for multi-period auctions.[4]

The "price" in a market is the price of a moment's commodity relative to some prior span of time. The price is the average unit-price for a moment's commodity over the prior span of time, not the "marginal price" (or unit price) of the last unit traded. Short of the illusory and elusory world of perfect competition among firms, of perfect market-power balance between buyers and sellers, or of a static/repetitive market, price is not marginal revenue/price, especially in an industry like electricity or gas where individual participants' actions clearly affect others' and therefore price. Marginal price is meaningless if imposed on too big a history or "pool" of transactions for a moment's commodity. Efficient, profit-maximizing firms produce a moment's commodity until the marginal cost of a unit equals the marginal revenue, and charge the average price. Efficient markets trade a moment's commodity until the unit value equals the unit variable cost. Marginal price is not equal to "the price" in real, breathing markets.[5]

The price is equal to average revenue received for the moment's commodity which, in a market setting, is the historical average of marginal revenues or transaction prices generated by each unit of the moment's commodity. ❶

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1 See "Poolco vs. Bilateral," Public Utilities *Fortnightly*, May 1, 1997, p. 54. For the complete debate, see (a) Blohm, Robert, "Don't Give Utilities a Monopoly on Power," *The Wall Street Journal*, March 11, 1997, p. A23; (b) Hogan, William W., "A 'Stock Market' for Electricity," *The Wall Street Journal*, April 2,1997, p. A15; (c) Blohm, Robert, "The Case Against Centralized Electricity," *The Wall Street Journal*, April 21, 1997, p. A23; and (d) Oren, Shmuel, "The Case Against Centralized Electricity," *The Wall Street Journal*, April 21, 1997, p. A23.

2 On May 14, the Reuters news service reported that a ruling was due soon on whether the California PUC would extend the mandatory PX buy requirement, but it is believed the PUC postponed its ruling.
The case in question, known as the "PTR case," is Application 99-01-016 (PG&E's application to set ratemaking mechanisms for the "post-transition" ratemaking period), which has been consolidated with Application 99-01-019 (San Diego Gas & Elec. Co.) and 99-01-034 (So. Calif. Edison).
On March 14, administrative law judge Minkin issued a proposed decision stating that all three investor-owned electric distribution companies would be required to continue to buy power through the PX as long as any single utility of the three continued to collected generation-related stranded costs tied to the rate freeze period. ALJ Minkin added that "relieving the UDCs of the buy obligation is premature considering the PUC's ongoing proceedings to investigate broad market structure. Until we resolve these fundamental market structure issues, we will not allow the UDCs to become more entrenched in procurement risks."
By contrast, the "alternate proposed decision" issued by PUC commissioners Neeper and Bilas and mailed on April 20, recommended that the "buy requirement should be expanded to permit procurement from any qualified exchange."
Later, in comments, the California Energy Commission proposed using a set of six characteristics to judge whether an exchange would qualify: (1) open participation; (2) public access, independence, and nondiscrimination; (3) transparency; (4) depth of trading; (5) liquidity; and 6) having a mathematical market clearing mechanism.
On May 5, Automated Power Exchange CEO Edward Cazalet filed comments opposing the CEC's sixth characteristic, saying that it reflected only "one of a number of potential market design options."
Later, the PUC called for a new round of industry comments, due June 2. Sources at the PUC indicated informally that the commission might delay a ruling by another month or two after that.

3 See Frank Wolak's 1996 forensic econometrics study conducted with R. Patrick, "The Impact of Market Rules and Market Structure on the Price Determination Process in the England and Wales Electricity Market," constituting the New York Mercantile Exchange's filing to the California Public Utilities Commission in the proceeding for creating the temporarily mandatory California PX.

4 Cramton and Wilson, "A Review of ISO New England's Proposed Market Rules," Sept. 9, 1998, Exhibit A to a motion filed Sept. 14, 1998, by the New England ISO, in its proceeding for approval by FERC.

5 The third interim report (Oct. 8, 1998) by Ontario's Market Design Committee, advised by Bill Hogan's team at the former Putnam Hayes & Bartlett, contains such absurd statements as that forward and term prices "mask price signals to customers." It adds that since fixed temporal price options "may mask the price signal facing customers, it will be important to educate customers that the appropriate price signal they should be responding to is the spot market price for electricity."