BACK TO BASICS IN ANALYZING THE FAILURE OF ELECTRICITY RESTRUCTURING ACCEPTING THE LIMITS OF MARKETS

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I. INTRODUCTION

The meltdown of electricity markets in California, the first state to take electricity restructuring to its logical (or illogical) conclusion, has voices raised and angry fingers pointing in every direction.[1] Two of the most important institutions in the electricity market in the state are in bankruptcy, and a third has been completely restructured. Half a dozen court cases have been filed, while an equal number of proceedings have been commenced at the Federal Energy Regulatory Commission (FERC). The response of the Federal Energy Regulatory Commission (FERC)[2] has been criticized by a number of stakeholders including the Governor of California and the Secretary of Energy,[3] and that was when they were in the same party as the majority. The newly formed California Independent System Operator (CAL-ISO), in the only detailed study of actual bidding behavior by every major player in the California market, charged that there had been either price gouging or physical withholding in virtually every hour between May and November (a total of 25,000 bid/hours).[4]

Amid this din, policy makers could use a little peace and quiet to reflect before having to make their next move, but that is not likely. In California the economic burden of a looming $50 billion increase in energy bills, not to mention dozens of blackouts, has created a frenzy of activity. Outside of California, because many states had started down the path of restructuring and advocates of deregulation will keep the pressure on to plow ahead, policymakers are forced to make some very tough decisions for very high stakes before the cacophony of conflicting messages abates.

This paper presents an explanation of the causes of this market failure that emphasizes the systematic and structural factors that have rendered the electricity market vulnerable to abuse and prone to volatility. The analytic framework draws from a leading liberal economics text to describe market structure,[5] but relies on a seminal conservative economic article for the analysis of market power.[6] Section II presents the analytic paradigm. Section III discusses the empirical data from California and elsewhere. Section IV discusses how California found itself in the midst of a "Perfect Storm" of market failure. Section V extracts some practical lessons for policymakers.

Refusal to address the systematic problems will prolong and frustrate any transition to an orderly market.[7] In fact, the failure to have a legitimate debate about which parts of the electricity market should have been deregulated in the first place has contributed to the fundamental problem because policymakers assumed the market would do things it could not.[8]

In the first round of electricity restructuring, policymakers seriously overestimated the ability of market forces to function in the electricity industry and underestimated the ability of large entities to take advantages of market weaknesses and flaws. When a coherent, theoretically based, empirically informed view of the electricity market is taken, as opposed to the ad hoc excuses offered by market participants, many of whom are profiting handsomely from the wild gyrations in the market, the need for fundamental policy changes becomes apparent.

II. ANALYZING MARKET STRUCTURE

A. THE SCP PARADIGM

In analyzing market structure and prescribing public policy to address the issue of market power, mergers and network access in network industries, we apply the structure, conduct performance (SCP) view of economic activity.[9] The SCP approach has been the dominant public policy paradigm in the United States for the better part of this century. The elements of the approach can be described as follows. Exhibit 1 presents the factors identified as playing an important role in the SCP paradigm.

In SCP analysis the central concern is with market performance, since that is the outcome that affects consumers most directly. The concept of performance is multifaceted. It includes both efficiency and fairness. The measures of performance to which we traditionally look are pricing, quality and profits. Pricing and profits address both efficiency and fairness. They are the most direct measure of how society's wealth is being allocated and distributed.

The performance of industries is determined by a number of factors, most directly the conduct of market participants. Do they compete? What legal tactics do they employ? How do they advertise and price their products? The fact that conduct is only part of the overall analytic paradigm is important to keep in mind.

Conduct is primarily a product of other factors. Conduct is affected and circumscribed by market structure. Market structure includes an analysis of the number and size of the firms in the industry, their cost characteristics and barriers to entry, as well as the basic conditions of supply and demand.

Regardless of how much weight one gives to the causal assumptions of the paradigm, giving more or less weight to basic conditions or market structure, the list of variables is important. These are the factors that make markets work.

The focal point of market structure analysis is to assess the ability of markets to support competition, which "has long been viewed as a force that leads to an ideal solution of the economic performance problem, and monopoly has been condemned."[10] The predominant reason for the preference for competitive markets reflects the economic performance they generate, although there are political reasons to prefer such markets as well.[11] In particular, competition fosters efficient allocation of resources, absence of excess profit, lowest cost production and provides a strong incentive to innovate.[12] Where competition breaks down, firms are said to have market power[13] and the market falls short of these results.[14]

Pure and perfect competition is rare, but the competitive goal is important.[15] Therefore, a great deal of attention has been focused on the relative competitiveness of markets, the conditions that make markets more competitive or workably competitive and reduce the threat of the abuse of market power. [16]

B. CONCEPTUALIZING AND MEASURING MARKET POWER

We are concerned about market power because of the harm it does to consumers. The primary measure of that harm is in the impact it has on prices. The conceptual depiction of the exercise of market power over price is presented in its simplest form in Exhibit 2. Market power allows a firm to set price above cost and achieve above normal profits.

> The profit-maximizing firm with monopoly power will expand its output only as long as the net addition to revenue from selling an additional unit (the marginal revenue) exceeds the addition to cost from producing that unit (the marginal cost). At the monopolist's profit-maximizing output, marginal revenue equals marginal cost. But with positive output, marginal revenue is less than price, and so the monopolist's price exceeds marginal cost. This equilibrium condition for firms with monopoly power differs from that of the competitive firm. For the competitor, price equals marginal cost; for the monopolist, price exceeds marginal cost...
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> [The] Figure.. illustrates one of the many possible cases in which positive monopoly profits are realized; specifically, the per-unit profit margin P_3C_3 times the number of units OX_3 sold. As long as entry into the monopolist's market is barred, there is no reason why this profitable equilibrium cannot continue indefinitely.[17]

The most frequent starting point for a discussion of the empirical measurement of the price impact of monopoly power is the *Lerner Index.* The *Lerner Index*, is defined as

$$M = (\text{Price} - \text{Marginal Cost})/\text{Price}.$$

> Its merit is that it directly reflects the allocatively inefficient departure of price from marginal cost associated with monopoly. Under pure competition, M=0. The more a firm's pricing departs from the competitive norm, the higher is the associated Lerner Index value. A related performance-oriented approach focuses on some measure of the net profits realized by firms or industries.[18]

Returning to Exhibit 2, the Lerner Index represents the ratio of the monopoly overcharge (P_3 - C_3) divided by the total price (P_3). The total value of the overcharge is derived by multiplying the per unit overcharge times the total number of units sold (OX_3). This is equal to the area of the rectangle P_3 BA C_3.

Landes and Posner offer a similar concept (see Exhibit 3).

> Our concept of market power is illustrated in [Exhibit 3] on the next page, where a monopolist is shown setting price at the point on his demand curve where marginal cost equals marginal revenue rather than, as under competition, taking

the market price as given. At the profit-maximizing monopoly price, P^m, price exceeds marginal cost, C', by the vertical distance between the demand and marginal cost curves at the monopolist's output, Q^m; that is, by $P^m - C'$.[19]

Both Shcerer and Ross and Landes and Posner note that direct empirical measurement of the Lerner index is difficult. Because of the lack of cost data and concerns about price and profit data, economists transform these price cost analyses into other economic measures for which they have data or which they can estimate. Scherer and Ross describe a series of profitability measures. The measures of profitability include profit margins, return on equity and return on investment.[20]

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As a surrogate, researchers have chosen diverse profitability measures that can be used, with varying degrees of reliability, as proxies for the evaluation of price above marginal cost.

A good long-run approximation to the Lerner index is the ratio of supra-normal profits to normal cost. This is approximated by the ratio:

$$\pi_S = \frac{\text{Supra-normal profit}}{\text{Sales revenue}}$$

where supra-normal profit = sales revenue – noncapital costs – depreciation – (total capital x competitive cost per unit of capital).
second-best surrogates falling into three categories.
One is the accounting rate of return on stockholders' equity:

$$\pi_E = \frac{\text{Accounting profits to stockholders}}{\text{Book value of stockholders equity}}$$

Or on capital:

$$\pi_E = \frac{\text{Accounting profits + interest payments}}{\text{Total Assets}}$$[21]

Landes and Posner take the discussion in a different directly. The price cost margin is converted to the reciprocal of the elasticity of elasticity of demand. They transformed the index into an expression that used the market share of the dominant firm and decomposed the elasticity of demand into two components.

We point out that the Lerner index provides a precise economic definition of market power, and we demonstrate the functional relationship between market power on the one hand and market share, market elasticity of demand, and supply elasticity of fringe competitors on the other.

$$L = \frac{(P - C)}{} = \frac{1}{} \qquad \frac{S}{d \quad s}$$

$$P \quad E \quad e + e (1 - s)$$
$$d \quad m \quad j \quad i$$

where:

S = the market share of the dominant firm

e_m^d = elasticity of demand in the market

e_j^s = elasticity of supply of the competitive fringe

s_i = market share of the fringe.[22]

In words this formula says that the markup of price over cost will be directly related to the market share of the dominant firm and inversely related to the ability of consumers to reduce consumption (the elasticity of demand) and the ability of other firms (the competitive fringe) to increase output (the elasticity of this supply).

An improvement was immediately suggested for this formula.[23] It can be adjusted to take into account the key factor of strategic interactions. A term can be included which adjusts for the special impact of the market shares of other firms.

$$L = \frac{(P - C)}{P} = \frac{S(1 + k)}{e_m^d + e_j^s (1 - s_i)}$$

where k = the effect of strategic interaction

If the likelihood of strategic interaction will reinforce the efforts of the dominant firm to raise prices, then k can be set positive. If there is likely to be a uniquely vigorous competitive response, then k can be set negative. When k equals zero, there is no strategic interaction effect. Estimating the value of k is a subjective process, but it does add an important element to relating market structure to performance through conduct.

C. GUIDELINES AND THRESHOLDS

Measuring concentration for purposes of market structure analysis has received a great deal of attention. Market structure analysis is used to identify situations where a small number of firms control a sufficiently large part of the market as to make coordinated or reinforcing activities feasible. Through various implicit and explicit mechanisms a small number of firms can reinforce each other's behavior, rather than compete.[24] The opening section of the Department of Justice Merger Guidelines states the issue as follows:

> Market power to a seller is the ability profitably to maintain prices above competitive levels for a significant period of time.*/ In some circumstances, a sole seller (a "monopolist") of a product with no good substitutes can maintain a selling price that is above the level that would prevail if the market were competitive. Similarly, in some circumstances, where only a few firms account for most of the sales of a product, those firms can exercise market power, perhaps even approximating the performance of a monopolist, by either explicitly or implicitly coordinating their actions. Circumstances also may permit a single firm, not a monopolist, to exercise market power through unilateral or non-coordinated conduct --conduct the success of which does not rely on the concurrence of other firms in the market or on coordinated responses by those firms. In any case, the result of the exercise of market power is a transfer of wealth from buyers to sellers or a misallocation of resources.
>
> */ Sellers with market power also may lessen competition on dimensions other than price, such as product quality, service or innovation. [25]

Identification of when a small number of firms can exercise this power is not a precise science. Generally, however, when the number of significant firms falls into the single digits, there is cause for concern.

> Where is the line to be drawn between oligopoly and competition? At what number do we draw the line between few and many? In principle, competition applies when the number of competing firms is infinite; at the same time, the textbooks usually say that a market is competitive if the cross effects between firms are negligible. Up to six firms one has oligopoly, and with fifty firms or more of roughly equal size one has competition; however, for sizes in between it may be difficult to say. The answer is not a matter of principle but rather an empirical matter.[26]

The clear danger of a market with a structure equivalent to only six equal sized firms was recognized by the Department of Justice in its Merger Guidelines. These guidelines were defined in terms of the Herfindahl-Hirschman Index (HHI). This measure takes the market share of each firm squares it, sums the result and multiplies by 10,000.[27]

A market with six equal sized firms would have an HHI of 1667. The Department declared any market with an HHI above 1800 to be highly concentrated. Thus, the key threshold is at about the equivalent of six or fewer firms.

Another way that economists look at a market at this level of concentration is to consider the market share of the largest four firms (called the 4-Firm concentration ratio). In a market with six equal sized firms, the 4-Firm concentration would be 67 percent. The reason that this is considered an oligopoly is that with a small number of firms controlling that large a market share, their ability to avoid competing with each other is clear.

Shepherd describes this threshold as follows:[28]

> Tight Oligopoly: The leading four firms combined have 60-100 percent of the market; collusion among them is relatively easy.

While six is a clear danger sign, theoretical and empirical evidence indicates that many more than six firms are necessary for competition – perhaps as many as fifty firms are necessary. Reflecting this basic observation, the Department of Justice established a second threshold to identify a moderately concentrated market. This market was defined by an HHI of 1000, which is equivalent to a market made up of 10 equal sized firms. In this market, the 4-Firm concentration ratio would be 40 percent.

Shepherd describes this threshold as follows:

> Loose Oligopoly: The leading four firms, combined, have 40 percent or less of the market; collusion among them to fix prices is virtually impossible.[29]

Shepherd also notes that a dominant firm – "one firm has 50-100 percent of the market and no close rival"[30] – is even more of a concern.[31]

Even the moderately concentrated threshold of the Merger Guidelines barely begins to move down the danger zone of concentration from 6 to 50 equal sized firms. The figure of 6 or more firms plays an important role in the electric utility industry. The FERC has adopted a rule in which it will allow market-based rates where it finds that concentration is less than the thresholds of five equal sized firms.

Interestingly, the point of the Landes and Posner article was to argue against the rote use of market shares in market power analysis. This has recently become a major focal point of debate in the electric utility industry.[32]

> Market Share Alone Is Misleading. -Although the formulation of the Lerner index in equation (3) provides an economic rationale for inferring market power from market share, it also suggests pitfalls in mechanically using market share data to measure market power. Since market share is only one of three factors in equation (2) that determine market power, inferences of power from share alone can be misleading. In fact, if market share alone is used to infer power, the market share measure in equation (2), which is determined without regard to market demand or supply elasticity (separate factors in the equation), will be the wrong measure. The proper measure will attempt to capture the influence of market demand and supply elasticity on market power.[33]

Once one brings these elasticities into play in an industry like electricity, the analysis become extremely troubling. Landes and Posner point out that when demand elasticities are low, market power becomes a substantial problem – the formula comes apart.[34]

> [T]he formula "comes apart" when the elasticity of demand is 1 or less. The intuitive reason is that a profit-maximizing firm would not sell in the inelastic region of its demand curve, because it could increase its revenues by raising price and reducing quantity. Suppose, for example, that the elasticity of demand were .5. This would mean that if the firm raised its price by one percent, the quantity demanded of its product would fall by only one-half of one percent. Thus its total revenues would be higher, but its total costs would be lower because it would be making fewer units of its product.

Raising price in these circumstances necessarily increases the firm's profits, and this is true as long as the firm is in the inelastic region of its demand curve, where the elasticity of demand is less than 1.

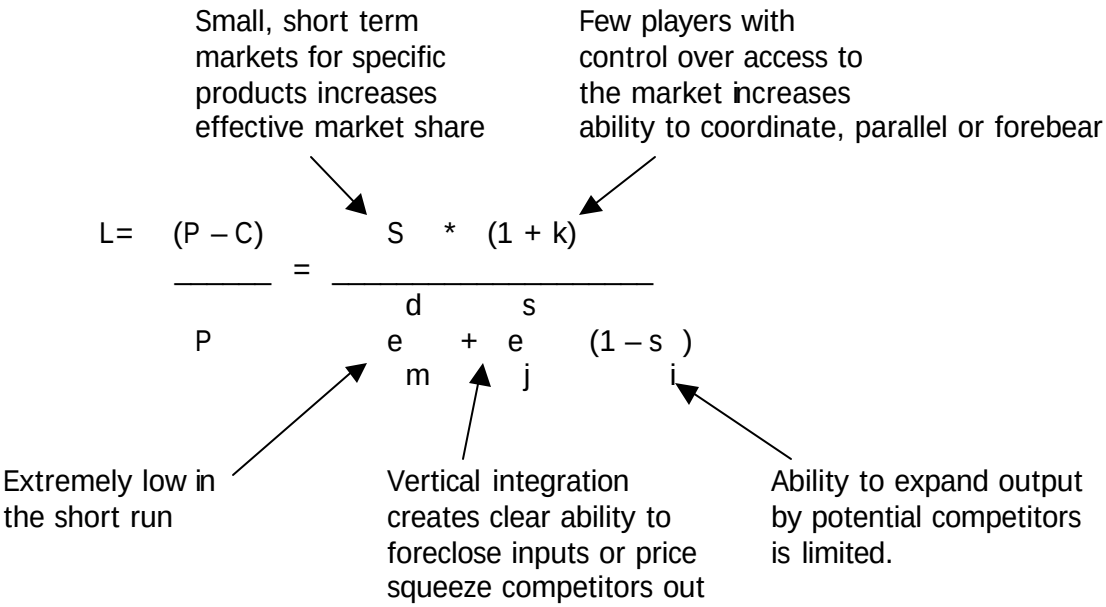
If the formula comes apart when the elasticity of demand facing the firm is l or less, it yields surprising results when the elasticity of demand is just a little greater than 1. For example, if the elasticity of demand is 1.01, equation (la) implies that the firm's price will be 101 times its marginal cost. There is a simple explanation: a firm will produce where its demand elasticity is close to one only if its marginal cost is close to zero, and hence a relatively low price will generate a large proportional deviation of price from marginal cost.[35]

In simple terms, when we talk about market forces, we mean the ability of consumers to cut back or shift their demand and the ability of producers to increase their output in response to price increases -- we mean supply and demand elasticities. If these elasticities are too small, market forces are weak and the exercise of market power will take place. The formula "comes apart" because real world markets with elasticities this low cannot work well. Firms raise prices to increase their profits because they do not lose enough sales to competitors, or because consumers lack alternatives.

Landes and Posner also argued that the size of the market at issue should be considered, "if very high market shares are required to justify a finding of monopoly power in a small market, then a lower market share should suffice in a large market."

D. QUALITATIVE DESCRIPTION OF RESTRUCTURED ELECTRICITY MARKETS

The economic characteristics of electricity and the behavior of electricity markets that have led to the severe outcome in California and problems elsewhere can be readily placed in the analytic framework as the following schematic shows



Inflexibility of demand and its sensitivity to weather renders the market volatile and vulnerable to abuse. The elasticity of market demand is very low in the short-term and low in the long-term. The demand side cannot be counted on to discipline abusive pricing behavior. Demand characteristics create critical problems. Demand is highly seasonal, driven by the weather, and geographically focused. Typically, a lot of consumers can be affected by the same factors that increase demand at the same time. This makes the demand on local and regional networks and commodity markets extremely "peaky." Institutional barriers make it difficult for consumers to self-supply. Economic and institutional factors make it difficult for consumers to bargain effectively for supplies.

Inflexibility of supply renders the market volatile and vulnerable to abuse. The elasticity of supply is low. Short-term supply responses are constrained by the difficulty of storing electricity. Significant additions to supply require substantial lead times, making the supply-side "lumpy" and slow. Provision for reserve margins is uncertain in a competitive market because the provision of reserves is unattractive to business interests, unless peak prices are extremely high. Consequently, markets may be chronically tight or subject to extreme price volatility.

On the supply side, because of the nature of the underlying molecules, the transportation and distribution networks for these commodities are extremely demanding, real time systems. They require perfect integrity and real time balancing much more than other commodities, particularly in the case of electricity. The commodities are expensive to transport and store. In the case of electricity it is impossible to store at reasonable economic cost. Distribution infrastructure is extremely capital intensive and inflexible. It is an expensive network that is sunk in place with limited ability to expand in the short and medium term.

Accidents have a special role in networks such as these. Because of the demanding physical nature of the network, they are prone to happen. Because of the integrated nature of the network and demanding real time performance, they are highly disruptive and difficult to fix.

Incumbents utilities have not only failed to add generation and transmission capacity, claiming uncertainty, but they also refused to open their transmission systems to competitors, which has reduced the willingness of competitor to build power plants. Highly concentrated local markets enable large generators to drive up prices by withholding supplies. In these tight markets, collusion is not necessary to drive prices up, parallel actions by a small number of generators is sufficient. Even though peaks are short in duration, they impose huge price distortions.

The wires components of the industry – transmission and distribution, which are the highways of commerce over which electricity flows – are presently natural monopolies and are likely to remain so for the foreseeable future. Since generation assets are sunk and load is immobile, the transmission system stands at the intersection of many of the industry problems. The breakdown of coordination of an integrated, real-time network in the restructuring industry occurs because competition reduces the incentive for market participants to cooperate and makes it difficult for system operators to manage the electricity network. Inadequate transmission capacity and restrictions on access to transmission limit the ability of power to flow. Manipulation of access to the transmission system for self-interested profit motives makes

problems worse and frustrates the ability to expand supply. As a constrained bottleneck facility that restricts expanding supply, the transmission system facilitates this manipulation.

Because of the severe conditions that typify the electricity market, concentration must be considered in very narrow geographic and product terms. A number of different services are necessary to properly manage the grid. Each of these must be considered separately. The ability to move product into the market is restricted geographically, particularly in the short term. Consequently, economic impacts are severe and rapid. Therefore, economic markets must be considered based on the short term ability to raise prices.

III. EMPIRICAL EVIDENCE FROM ELECTRICITY MARKETS

The mounting empirical evidence from California and elsewhere indicates that electricity markets are quite severe.

A. THE ELASTICITY OF SUPPLY IS INADEQUATE TO PREVENT THE ABUSE OF MARKET POWER

The facts on the ground in California indicate very little supply elasticity. The price of electricity paid in the wholesale market increased from just under $40/MWh (megawatt hours) for the month of November 1999 to about $160/MWh for the month of November 2000[36] and to over $360/MWh in February 2001.[37] All indications are that it has remained at that level or higher in recent month. In other words, in less than two years the price of electricity in California has increased almost ten-fold.

In spite of these stunning price increases, supply has not been adequate to meet demand. There have been more black outs and brown outs in California over the past few months than took place in several years prior to restructuring. The crowning irony of is that the highest prices and most severe supply interruptions to date have occurred during the relatively slack season of winter, although much worse is projected for the summer peaks of 2001.[38]

The econometric evidence in California also indicates that the supply is very inelastic. The supply curve is very steep, indeed (see Exhibit 4). The best evidence from California is that the short run supply elasticity is considerably less than 1. In fact the supply elasticity is probably less than .2 on the basis of 1999 prices.[39] This is probably a higher price elasticity than observed in 2000-2001, which suggests a supply elasticity considerably less than .1 for the peak of 2000 (demand of 35000 MW to 45000 MW) and in the range of .1 to .15 for shoulder periods (demand between 25000 MW and 35000 MW).[40] In fact, even at moderate levels of demand (in the 300th highest capacity hour of December), substantial market power is a threat.[41] These results demonstrate the need for substantial reserve capacity to prevent the abuse of market power.[42]

The empirical reality of the supply-side in California has been in evidence in other markets as well.[43] The evidence also shows that market power is being exercised exists across the country. In one week in 1998 in the Midwest, $500 million changed hands,[44] well over a billion dollars of rents was collected in California before the summer 2000 problem,[45] and $70 million was collected in New York in one day.[46] The New England power pool experienced price run-ups,[47] which may have been driven in part by capacity withholding.[48] PJM is now afflicted

with the same problems.[49] PJM, the poster child for deregulation has suffered similar near vertical supply (see Exhibit 5) and the exercise of market power that parallels the problem in California in its early days.[50]

B. THE ELASTICITY OF DEMAND INDICATES MARKET FORCES ARE INADEQUATE TO PREVENT THE ABUSE OF MARKET POWER

The best evidence from California is that the short run elasticity of demand is considerably less than 1. In fact, it is even less elastic than the supply curve. In San Diego, where prices did vary at the meter last summer, it was less than .03.[51] Long run elasticities may be somewhat higher, but they are generally considered to be considerably less than 1.[52]

A recent study finds that elasticities of demand exhibited in programs targeted at demand reduction are quite low.[53] The model programs achieve elasticities in the range of .03 to .1 on the Georgia Power system[54] and .04 to .1 on the Duke power system.[55]

The severe market conditions on the demand side shed a very stark light on claims that demand-side management programs can discipline market power.[56] This approach seems to be based on the premise that if it hammers consumers with large enough price increases,[57] it will be able to drub the market into a sufficiently responsive region on the demand side to make up for the failure of the supply-side.[58] There is a serious question about whether such programs can work for market disciplining purposes,[59] although they certainly should be pursued as public policies in a public good sense because of the immense external value they produce for consumers.[60]

C. EXCESS PROFITS AND THE ABUSE OF MARKET POWER

The California Independent System Operator (CAL-ISO), the sole entity to produce a detailed analysis of bidding behavior, estimated that approximately half of the price increase through November 2000 is attributable to price gouging (offering prices far above costs) or capacity hoarding (physical withholding of supply). The CAL-ISO has asked for refunds of over $6 billion,[61] although a more detailed analysis would certainly find a higher number.[62]

For the purposes of empirically demonstrating the failure of the California market, we commence with an analysis of FERC's ceiling prices. The FERC establishes a ceiling price at the cost of the least efficient generator using the most expensive inputs (like natural gas and NOx emission credits) that would be called on to balance supply and demand. Under the FERC proposal, all producers are allowed to charge this price before it will exercise oversight over the prices. Because of the market conditions in California, this approach allows the vast majority of producers to charge prices that are far above their costs. We analyze evidence in the record for January 2001 (See Exhibit 6).[63]

Assuming a least efficient generator using the most expensive inputs for January 2001, FERC's methodology establishes a ceiling price (or market clearing price) of $273/MWh. Since all generators are allowed to charge up to that level without scrutiny, it appears they fully exploited the artificially high benchmark in determining what to charge in California's dysfunctional market. The average wholesale price in January 2001 was $307.[64]

However, 99 percent of the generators did not incur costs at that level, since they are much more efficient than that. Consequently, and inevitably the prices they receive are far above their costs. At the average level of efficiency known to exist in California, the actual costs incurred, even assuming the high cost inputs, would have been half the ceiling level.[65] In other words, not only are virtually all generators more efficient than FERC's benchmark, but also the average generator is twice as efficient. While the FERC methodology would allow them to charge $273/MWh without any scrutiny, the actual costs would be about $150/MWh. The difference, equal to about $120/MWh, constitutes a huge windfall and unreasonable level of profit.

The CAL-ISO has estimated that a new generation unit being brought on line with heavy capital costs would be paid off in less than two years. The implicit return on equity would be approximately 85%.[66] Similarly, the County of San Diego calculated a cost of $120/MWh for a new generation plant. At the FERC authorized ceiling prices, which are not subject to scrutiny, the plant would be paid off in one year.[67] Such rates of return are historically unprecedented and patently unreasonable.

The above analyses still assume that all producers pay the high, spot price for natural gas and air emission credits. In fact, there are many longer-term contracts for gas at much lower prices and the typical generator in California does not require emissions credits. This creates an even larger gap between actual costs and the FERC's ceiling price benchmark (as shown in Exhibit 6). Using an average cost of gas (assume $6.25 per MCF [thousand cubic feet]) and assuming the average generator does not pay emissions credits would increase the estimate of overcharges and windfalls by about one third.

The patently unreasonable rates of profit are not simply a one-month aberration. The CAL-ISO analysis shows that by February 2001, even assuming the spot market price of gas and NOx credits were paid by the generator, the costs of a new plant brought on line when the restructured market commenced in May 1998 in California would have been fully recovered in just three years.[68] The implicit return on equity would be in the range of 30 to 60 percent.

More to the point, perhaps, the total estimated revenues above costs, even using spot prices for gas and NOx costs, for Non-Utility Distribution Company generators subject to FERC jurisdiction since the start of restructuring in May 1998, is approximately $3.1 billion.[69] This is approximately equal to the total capital paid by merchant generators to acquire the fossil plants of the utilities.[70] In other words, by abusing their market power, these entities have, at a minimum, recovered all of their capital in approximately three years. If actual input costs were used, the full cost recovery would have occurred even earlier. The return on equity based on actual costs would fall in the range of 40 to 80 percent.

These direct estimates of price cost margins are confirmed by the bottom line profit figures of the power generators who are selling into California. Comparing the first quarter of 2001 to the first quarter of 2000, just prior to the meltdown of the California market began; we observe a tripling of operating profits for the largest fossil fuel generators and marketers.[71] Although the companies do not break their profits down by state, there is no doubt that California and the western United States are primarily where the profits accrued.

By most accounts, this "short-term" problem will last for several years. However, even if it were only a one-year problem, the magnitude of harm is sufficient to require immediate and

vigorous action by the FERC. Under the FERC ceiling, pricing abuse in California will exceed several billion dollars per month. Landes and Posner point out that the size of the abuse matters. In their examples, they concluded that pure inefficiency or waste (deadweight loss) of $25 million (no more than $100 million in 2001 dollars) is sufficiently large as to be of public policy concern.[72] Based on the economic characteristics of the California market, a 10 percent market share for fossil fuel generator and a .03 percent demand elasticity, using a one-year time frame and 1999 as the base, the deadweight loss would be over $1 billion.[73]

D. AFTER THE FACT JUSTIFICATION FOR ABUSE OF MARKET POWER

Generators now try to justify their outrageous increase in profits by arguing that because bankruptcies have occurred and bills have not been paid in a timely fashion, there is a great deal of risk in the market. That argument is absurd on its face. Having used their market power to drive entities into bankruptcy, the abusers now claim they must raise prices because of the added risk that they have created. If there had been no pricing abuse, there would have been no bankruptcies and no increased risk. To allow the abuse of market power to be a self-justifying, self-fulfilling prophecy thoroughly contradicts the public policy concerns of market structure analysis, not to mention the purposes of the Federal Power Act.

Claims that the market needs electricity priced in the hundreds of dollars per MWh to elicit efficient supply-sided responses are absurd on their face.[74] Neither empirical reality nor economic theory supports this claim. Hundreds of power plants were financed and placed under construction across the country (including California) long before anyone dreamed that prices would rise so high. Payback periods of a couple of years for facilities with useful lives that are decades long are unprecedented and unnecessary in a workably competitive market to create adequate supply.

It is well established in economic analysis that the ground rents can be eliminated without detracting from economic efficiency[75] and monopoly rents should be eliminated to promote economic efficiency.[76] Indeed, when windfalls become as massive as they have been in California, they distort economic incentives. Producers make more by withholding supplies (exhibiting a backward bending supply curve) than by increasing output.[77]

IV. CALIFORNIA: CHARGING INTO THE PERFECT STORM

While the above discussion demonstrates that the market structure problem exists in many electricity markets, it is also clear that California has not happened elsewhere. In order to not overstate the broader problem, we must also understand how these weak market forces converged in California to create the "Perfect Storm." Three factors intersected in California, greed, irresponsibility and mismanagement.

A. PROFIT MOTIVATION REDUCES SUPPLY

The fact that no one added much capacity in California is well known, but over stated substantially.[78] California supply-demand developments are not that different from the rest of the country, which has contributed to the presently tight markets and growing concerns about future tight markets from coast-to-coast.[79] What receives less attention are all the other things that did or did not happen in California to make the matters so bad. The issues here are not

the hot weather and lack of rain, about which we hear so much – for responsible public policy cannot allow the health and welfare of its citizens to rely on the luck of weather – the issues are the things that market participants did and policymakers let them do to protect their private interests at the expense of the public interest.[80]

Not only did utilities refuse to build power plants, they actively prevented as much as 4,000 megawatts of long-term resources from entering the system and failed to provide an equal amount of short term resources.[81] Utilities cut back on their spending on conservation, which led to a shortfall in demand reduction of a couple thousand megawatts. In defense of their distribution assets, they also fought steadfastly against distributed generation, which could be bringing substantial capacity on line, in addition to relieving demands on transmission assets.[82] Citing the impending competitive market, utilities refused to buy about a thousand megawatts of renewable energy that they were supposed to. Utilities failed to produce spot and interruptible contracts for large quantities of additional capacity to which they were committed.[83] When they were given the opportunity to enter into long-term contract, they failed to fully avail themselves of the hedging opportunities to mitigate the exposure to price run-ups.[84]

The independent power producers also did not build any power plants. Instead, they bought the existing ones. They immediately began running plants less than the previous owners.[85] On any given day during the recent price spikes these plants were producing between 2000 and 6000 megawatts less than their historic average.[86] The same independent generators also opposed long-term contracts, which would have kept utilities out of the volatile spot market.

The disappearance of these assets is part of a pattern of resource denial that has the effect of driving up the price of electricity.[87] Whether it is purely strategic, or illegally manipulative, or even collusive, remains to be seen,[88] but there is no doubt that the pursuit of private interests has denied the electricity market in California substantial resources.[89] This profit driven denial of resources equal to between 10 and 20 percent of peak demand had a substantial impact on price and performance.[90] As a result, the public welfare was placed at the mercy of the weather, the ability of producers to game the market and the inability of regulators to prevent that gaming.

B. REGULATORY IRRESPONSIBILITY THAT HARMS THE PUBLIC

For its part the Federal Energy Regulatory Commission (FERC) prematurely deregulated price over the objection of many in California. In fact, FERC fought California authorities to assert control over the Independent System Operator (ISO) and then deregulated the price of energy in the California wholesale market, even though its market analysis was fundamentally flawed. This enabled private interests to take advantage of the bad situation that they had helped to create.

FERC failed to reasonably analyze the market before it deregulated. It treated the state as one big market, when it is evident that there are distinct and separate north-south markets because of a capacity constraint.[91] It failed to identify load pockets that would be constrained at peak times.[92] It deregulated ancillary services, even though it was told market power existed

in these markets.[93] It accepted on faith that "must run" plants would mitigate market power, without any concrete plan to do so.[94]

Consider the following example based on the Landes and Posner discussion and the empirical evidence from California. Assume a generator with a 10 percent market share in a market with a demand elasticity of .03 and a supply elasticity of .2. Assume the rest of the market is a "competitive fringe," which could expand its output subject to the elasticity. The Lerner Index would be .48, prices would be marked up 48 percent above costs, a very substantial mark-up. This is far larger than the threshold that Landes and Posner considered a problem.[95]

The 10 percent market share in the example above approximates the size of the smaller of the out of state generators who have been abusing their market power in California. In fact, this example underestimates the potential for the exercise of market power since the state is not one big market and the inability of some utility plants, which were run at all times regardless of price (must run plants), to expand output in response to market needs.[96] Thus, the "market" is frequently defined as only the fossil generators and the competitive fringe could be considered only the fossil generators. Either the numerator of the Landes and Posner formula would be twice as large or the denominator would be half as large. Either way, the Lerner index would be substantially larger. This is roughly what we observe in the real world.[97]

More generally, FERC has rubber stamped industry rules on transmission capacity availability and transmission load relief that simply cannot ensure open transmission networks or prevent manipulation of transmission capacity availability.[98] It has wasted years on voluntary approaches to forming independent, responsible transmission organizations that must be a cornerstone of the interstate market. The FERC has also pursued a remarkably permissive merger policy.[99] As a result, national and regional markets have become much more concentrated.[100]

FERC refuses to responsibly police the markets it has irresponsibly deregulated.[101] It has defended the secrecy of spot market bidding, which appears to have the effect of allowing tight oligopolies of bidders to play their games behind closed doors.[102] It refused to requisition and study bidding records for abusive patterns after the first price spikes in 1998,[103] and the second price spikes in 1999,[104] which emboldened strategic bidders for the really big killing of 2000.

FERC approves rates without subjecting them to refund, so that market manipulators know they will never have to disgorge their ill-gotten gains.[105] It even rushed in to allow a hasty reorganization of one of the California utilities to shield its assets from its creditors.[106] As the only dissenting Commissioner put it, if the FERC had exercised more responsibility earlier, "capping spot market prices at variable operating costs plus a capacity adder... there is reason to believe that applicants would not be in such dire straits now."[107]

C. REGULATORY MISMANAGEMENT MAKES MATTERS WORSE

Things would have been bad no matter what the California market institutions looked like, but the institutions certainly did not help matters and made them worse in a number of ways. The California Independent System Operator (CAL-ISO) adopted a one price auction,[108] which pays the highest price to everyone in an industry that is just dripping with scarcity

(ground) rents.[109] It failed to impose a reserve requirement.[110] Different rules between the PX and the ISO resulted in considerable underscheduling and drove up prices.[111] The Market Surveillance Committee immediately and repeatedly found market power in its general studies, [112] but the ISO never sought to discipline those responsible.[113]

The California Public Utilities Commission adopted a prohibition on long-term contracts, which forced utilities into spot markets.[114] The ISO suggests that a large part of the responsibility for the failure of the demand side to respond in the short and long term rests with the CPUC and or the legislature.[115]

Remarkably, we can find a similar scenario simultaneously unfolding in natural gas. The CPUC let the electric utilities out of natural gas storage requirements because they are noncore customers, [116] which is an absurd misdefinition of core and noncore that exacerbated the problem. [117] Large corporate consumers got out from under their obligations to keep fuel in storage (including electric utilities) and the obligation to have alternative fuel capacity since all these contingencies cost too much in a competitive market. [118] Simultaneously, utilities fought against increasing pipeline capacity into the state. Firm transmission rights and gas brokering functions are transferred to unregulated affiliates, who have every interest in charging the utility sister companies the highest price possible. FERC deregulated a capacity constrained market with storage at unprecedentedly low levels. Then we get the inevitable accident. When the prices goes through the roof, the utilities blackmail consumers with threats of service cut offs, and the policymakers open the public's pocketbook. Given affiliate transactions from which parent holding companies profit, when their unregulated gas subsidiaries extract the highest price for gas from the sister utility subsidiaries, there are now serious concerns about the run up of gas prices.

V. ANALYTIC, POLITICAL AND POLICY LESSONS

A. ANALYSIS: EMPIRICAL REALITY NOT GROUNDLESS THEORY MUST BE THE BASIS FOR PUBLIC POLICY

Economic theory, whether based on market structure or auction theory, must recognize that deviations from theoretically optimal outcomes are a distinct possibility. The real issue is empirical and as we have shown, the empirical reality in California indicates a massive market failure. Economic theory can easily comprehend the market failure, if it is willing to examine the assumptions underlying the analysis.

Although it is obvious why the market in California has failed to produce prices that are reasonable, much of the debate over California has not been framed in terms of the market power/market structure analysis. Instead, much debate has been focused on the bidding mechanism and framed in terms of auction theory. In fact, there should be no conflict between these two economic paradigms and under a certain set of assumptions the structure of the auction does not matter.[119] This is the revenue equivalence theorem, which won the Nobel Prize.[120] Not surprisingly, the set of assumption are roughly equivalent to a perfectly competitive market made up of small competitors.

After a decade of debate over electricity markets between the auction theorists and the supply function theorists it is quite clear that the auction and supply function approaches lead

to the same conclusions.[121] The not so surprising conclusion is that inadequate market forces will frustrate any bidding mechanism and result in the abuse of market power.[122]

The problem is simply that those who have been concerned about efficient auction design have failed to ask the basic question, "does the empirical reality comport with the theoretical assumptions underlying the market?" The traditional market structure concern with the elasticity of supply and demand plays out in the auction literature as a "deviation" from the assumption that bidders in California face uncertainty.[123]

The empirical evidence from the United Kingdom, the oldest "deregulated" market, whether framed in terms of market structure or auction theory, [124] invariably and consistently demonstrates the exercise of market power.[125] The empirical evidence on the U. K. also shows that the bidding strategies fit his auction-theory based explanation.[126]

Needless to say, the evidence from California leads to the same conclusion and it is clear that the institutions chosen were particularly vulnerable to market power abuse. The California bidding certainly fits the pattern, although the detailed econometric studies will be published years after the disaster commenced.[127] This has been obvious from the early days of analysis of market structure in electricity.[128] . One of the most interesting hints is the CAL-ISO analysis of support prices (next highest and next lowest bid).[129]

Empirical and theoretical analysis of auction also identifies institutional problems that drive the result away from optimal, or competitive market equivalent outcomes. In particular, where participants enter repeatedly into auctions with multiple units the ability to game the process and earn excess profits is apparent.[130] Perhaps the clearest lesson to be learned from this literature is that given the vulnerability of these markets and the huge windfalls to be gained, market participants will devote a great deal of effort to developing strategies to game any system. With five or more electricity markets having to "clear" on an hourly or daily basis it is hard to see how the problem of repetition among a small number of generators will not be a problem, unless one requires them to be atomistically small or mandates very large quantities of excess capacity.

B. POLITICS: UNDERSTANDING AND CONTROLLING RENTS

The second lesson for public policymakers is that they must grapple with several different forms of rent in the electricity market. Consumers in California paid a heavy price in rents – economic rents, monopoly rents, and for lack of a better word, stupidity rents.[131] Since the existence of these rents is both an irritant to consumers and the diverse sources of rents makes solutions to problems complex and contentious, the issue must be confronted squarely. The consumer paying an extremely high bill may not care much about the details of the cause of the problem, but policymakers, who should have a desire to eliminate the rents, will need different policies to effectively address the each of the different rents.[132]

An economic rent is "a payment to a factor in excess of what is necessary to keep it at [133] More importantly, "in perfect competition, no rents are made by any factor, because changes in supply bid prices of inputs and labor down to the level just necessary to keep them employed."[134] Economic rents become severe when the supply curve is steep (see Exhibit 7).[135] Monopoly rents (already described in Exhibit 2)[136] have long been recognized in the economic literature. A third category of rents flows from (temporary)

imperfections in market responses (see Exhibit 8).[137] A single producer enjoys a substantial advantage that other cannot quickly copy. These have lately come to be associated with Schumpeterian market processes.

> A firm may develop product and process innovations and /or unique business routines (knowledge assets), but these eventually are imitated by competitors. However, there may be a period of temporary excess returns enjoyed by the developer/owner of the knowledge assets in question. These returns are once again not monopoly rents, but Schumpeterian rents.[138]

Devotees of Schumpeterian rents claim that they are necessary to reward innovation, although that view is not shared by all.[139]

The term stupidity rents (see Exhibit 9) is used to call attention to the fact that these rents are created by market imperfections that are the result of flaws in market design, not the result of entrepreneurial skills (although entrepreneurs may exploit these imperfections). Stupidity rents do no good, except in the perverse sense of demonstrating that the market does not work or results in higher costs.[140]

Consumers appear to have lost faith in the process and structure of utility markets for good reason. The combination of economic, monopoly and stupidity rents became intolerable (see Exhibit 10).[141] In the summer of 2000 consumers in California paid more in economic, monopoly and stupidity rents than the total economic cost of producing electricity in the previous eighteen months (the entire period of restructuring).[142] In the year between May 2000 and May 2001, the dysfunctional market will have generated more in economic rents than the total of stranded costs recovered by the utilities in the decade before the transition to restructuring. The idea that the <u>average</u> price of electricity should be 40 cents per KWh and must be sustain for months on end, with demand nowhere near historic peaks. in order for the market to work seems absurd.

Legitimate scarcity problems get lost in this massive transfer of wealth from consumers to producers. Until utility industry institutions demonstrate that they have wrung the stupidity and monopoly rents out of the system, consumers are unwilling to bear the burden of dealing with legitimate scarcity problems.

This resistance is reinforced when consumers discover that the solution now proposed is to use reserve margins, about equal to the regulated requirements, mandatory economic dispatch in transmission, long term contracts in supply, and vigorous interruptible to deal with short run market problems, while conservation programs deal with long term demand response. In other words, after wasting billions, we find that the old system works better. What has vanished, entirely from the deregulation discussion, are all the promises of efficiency gains and fanciful claims of 40 percent consumer savings.[143] Instead, consumers in California, who pay among the highest rates in the country,[144] are told that "California froze retail rates at low [145] When the prices in the wholesale market bear no relationship to anything that would reasonably occur in a workably competitive market, the advice loses all credibility.

C. POLICY: MARKETS ARE A MEANS TO AN END, NOT THE END ITSELF

Once policy makers accept the possibility that market can fail seriously in reality, they must adopt a much more cautious attitude to restructuring. A recent statement by the Chairman of the Texas Public Utility Commission, Pat Wood III, who has been nominated to the FERC, can be used to underscore the public policy responsibility of the FERC. Mr. Wood is quoted in the New York Times in a statement in reaction to his nomination as follows:[146]

> "On our best day as regulators, we cannot deliver benefits to customers as well as a functional market can," Mr. Wood said in a statement today, "but the market must work right first."

The statement is quite right, but California has taught us that the obverse is equally, if not more, true.

> **A dysfunctional market can impose infinitely more harm on consumers than regulators on their worst day.**

A dysfunctional market is doing its worst. Good public policy demands that policymakers really give the qualifier "the market must work first" a lot more credence and fully understand how difficult it is to make the electricity market "work right." In public policy analysis, and under the public interest standards of the legislation governing vital services such as electricity, the charge to "do no harm" takes precedence.

This is a classic problem in public policy analysis, which has its roots in an equally classic problem of statistical probability analysis. In evaluating a policy decision policymakers must decide which hypothesis to test and which risks to run. For matters of public health and safety, or, as we observe in the California electricity market, where the impact of a mistake can be economically devastating to consumers, the best principle to follow is do no harm. Policymakers should minimize the possibility of the harm from deregulating.[147]

By placing the goal of "creating" electricity markets above the delivery of a reliable supply of electricity at just and reasonable rates, no matter how blatant the market failure becomes, the policymakers have gotten it backward. By failing to recognize the fundamentals of the electricity market public policy has deregulated too much, too soon and responded with band-aids that are incapable of solving the problem.

Ironically, the Federal Power Act takes this view of how electricity markets should work, a view shared with the Natural Gas Act. Under both, the paramount harm that must be avoided is rates that are unjust and unreasonable, but that is the topic for another paper, and undoubtedly a great deal of litigation.

EXHIBIT 1:

CAUSES OF ELECTRIC UTILITY INDUSTRY MARKET FAILURE DEMONSTRATED BY THE FIRST THREE YEARS OF U.S. DEREGULATION

BASIC CONDITIONS: SUPPLY	
Technology	Long lead times 5(7) 6(1),Delayed replacement 6(16) 11(2) Inability to store electricity 5
Product durability	Generation Outages 1(2-11, 4-6) 3(15) 5(40) 10(1-2), Transmission shutdowns 1(4-10), Failures take time to repair 6(9) Summer impairment of performance 6(7, 18, 22)
BASIC CONDITIONS: DEMAND	
Price elasticity	Extremely low short run 2(24) 5(39) 11(2) Limited conservation 6(2,19, 23)
Substitutes	Lack of substitutes, Restriction on self-supply 8
Cyclical/seasonal	Weather-related demand 1(4-6) 2(37) 10(1-2), Inadequate reliability criteria 6(21)
Purchase method	Obligation to serve 1 (4-1) 2(25), Lack of incentive to cut back 1(4-4) 4(46)6(2, 19)
MARKET STRUCTURE	
Number of sellers	Few sellers 2(ii) 3(21) 4(49-56) 5(6,7) 7
Number of buyers	Constrained demand by utilities 1(4-1) 2(25) 5(30,31), Constrained distribution 6(30) Limited end-user choice 5(42,57)
Barriers to entry	Transmission constraints 1(2-15,5-7)5 (11,12) Load pockets, inadequate system 6(10,32) Self-supply blocked 8()Emergencies 1(2-15), Substation inflexible 6(31)
Cost structures	High fixed
Vertical integration	Affiliate relations distort market 2(38) 6(38), Integration restricts entry 11(3)
Diversification	Utilities Add Brokerage 2(24,28) Inadequate Planning/Spending for maintenance 6(29,34 - 37)
Inadequate Market	Lack of timely, objective 1(5-3) 2(ii), Load projections 6(8), Unit ratings 6(11)
Information	Planning tools 6(13), Cable condition, incipient failure 6(5,14) Refusal to share best practices 6(15), Forecasting 6(17, 28) Inadequate notice 6(20) Dispatch software 6(27) Inadequate coordination Breakdown of coordination 1(2-37, 3-3), ISO lacks authority 6(4), Lack of data 6(6)
CONDUCT	
Pricing behavior	Hoarding, gouging 4(65) 5(3,38) Above cost 10(1-4) 11(17) Reliance on nonfirm power 6(24) 10(2-1) 11(3)
Legal tactics	Defaults, abrogation of contracts, daisy chains, two-way deals1 (4-10, 5-2) 2(4) Refusal to provide market monitoring information 5(4) Inefficient short term sales 6(25), Records not preserved 6(33)
Regulation	Transmission rules create problems 1(4-40) 2(20) 11(3) Market rules not developed 6(3)

SOURCES:

The analytic categories are from Scherer, F. M. and David Ross, Industrial *Market Structure and Economic Performance* (Boston, Houghton Mifflin: 1990.

The substantive references are as follows:

1 = Federal Energy Regulatory Commission, *Staff Report to the Federal Energy Regulatory Commission on the Causes of the Pricing Abnormalities in the Midwest During June 1998* (Washington, D.C.; 1998)

2 = Public Utilities Commission of Ohio Report, *Ohio's Electric Market: June 22-26, 1998, What Happened and Why: A Report to the Ohio General Assembly* (Columbus, Oh; 1998)

3 = Bohn, Roger E., Alvin K. Klevorick and Charles G. Stalon, Market Monitoring Committee of the California Power Exchange, *Report on Market Issues in the California Power Exchange Energy Markets* (August 17, 1998)

4 = Bohn, Roger E., Alvin K. Klevorick and Charles G. Stalon, Market Monitoring Committee of the California Power Exchange, *Second Report on Market Issues in the California Power Exchange Energy Markets* (March 9, 1999)

5 = Klein, Michael and Loretta Lynch, *California's Electricity Options and Challenges* (August, 2000)

6= Department of Energy, *Interim Report of the U.S. Department of Energy's Power Outage Supply Study Team*, January 1999; *Horizontal Market Power in Restructured Electricity Markets*, March 2000

7 = Department of Energy, *Horizontal Market Power in Restructured Electricity Markets*, March 2000

8= Alderfer, R. Brent, et al., *Making Connections: Case Studies of Interconnection Barriers and their Impact on Distributed Power Projects* (National Renewable Energy Laboratory, May 2000)

9 = Energy Information Administration, *The Changing Structure of the Electric Power Industry 1999: Mergers and Other Corporate Combinations*, December 1999

10 = Staff Report on the Federal Energy Regulatory Commission on Western Markets and the Causes of the Summer 2000 Price Abnormalities (November 1, 2000)

11= Wolak, Frank A., et al., "An Analysis of the June 2000 Price Spike in California ISO's Energy and Ancillary Service Market," *Market Surveillance Committee of the California Independent System Operator* (September 6, 2000)

EXHIBIT 2
SCHERER AND ROSS DEFINE MONOPOLIST PRICING

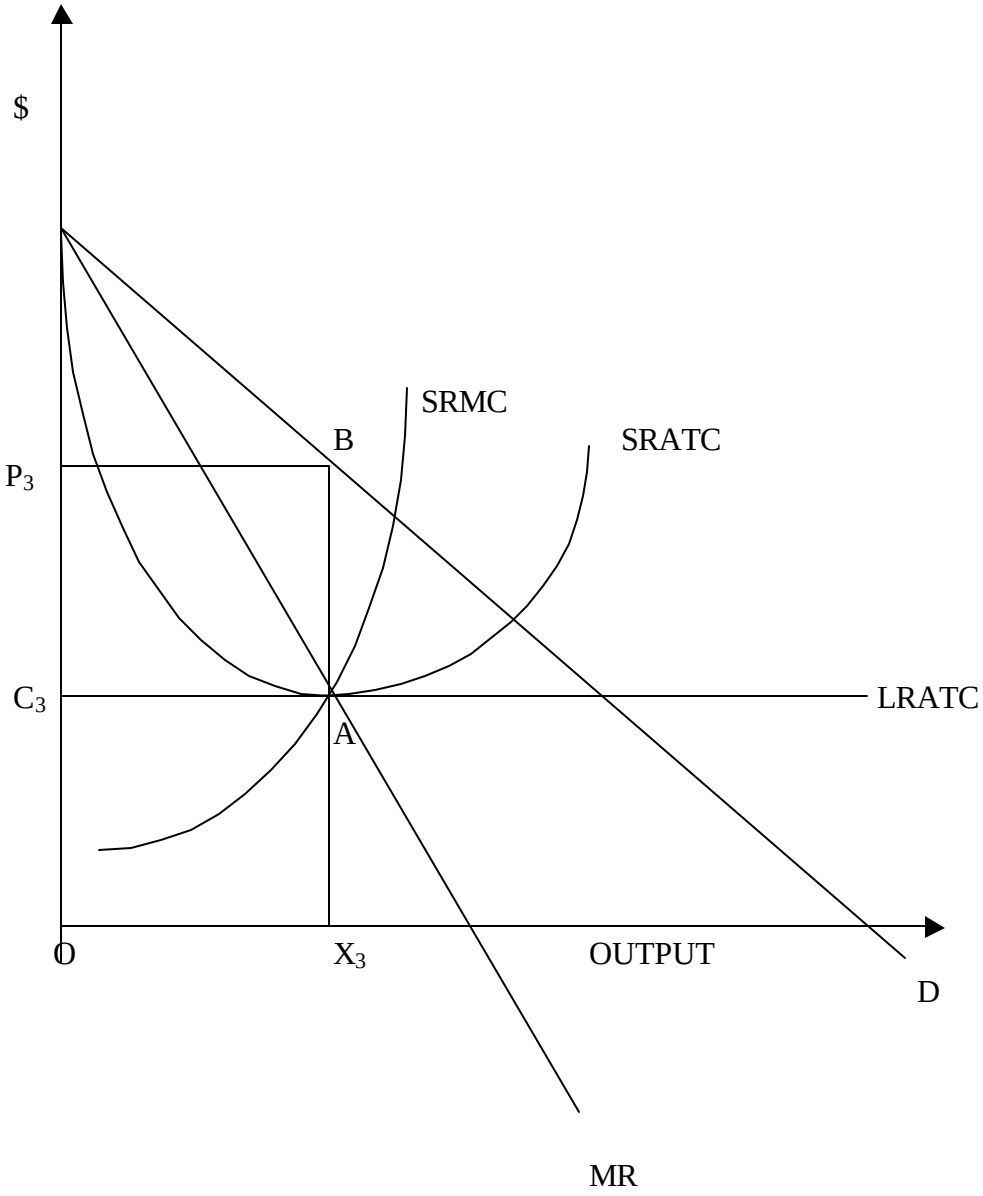
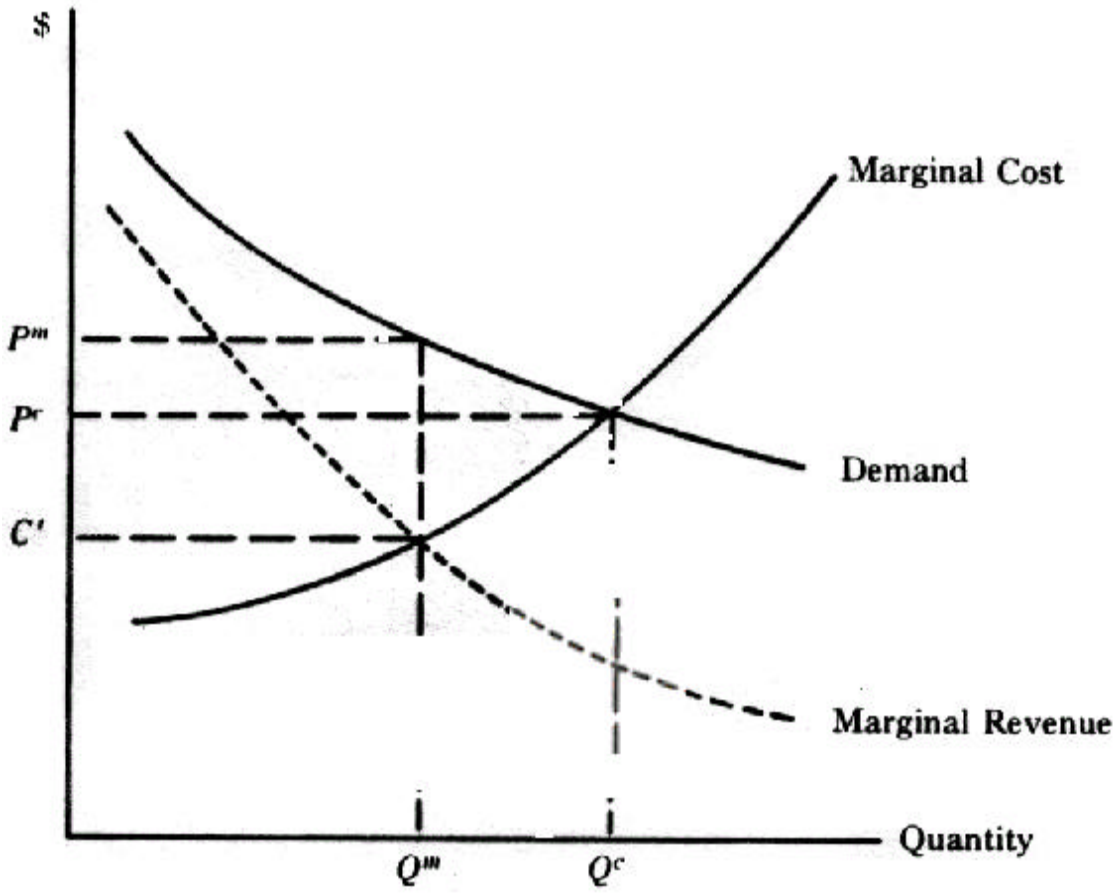


EXHIBIT 3
LANDES AND POSNER DEFINE MARKET POWER



Monopoly vs. Competitive Pricing

FIGURE 1

EXHIBIT 4

CALIFORNIA SUMMER 2000 SUPPLY CURVE

Figure 1:
Supply Curves for California Day-Ahead PX Market (cents/kWh)

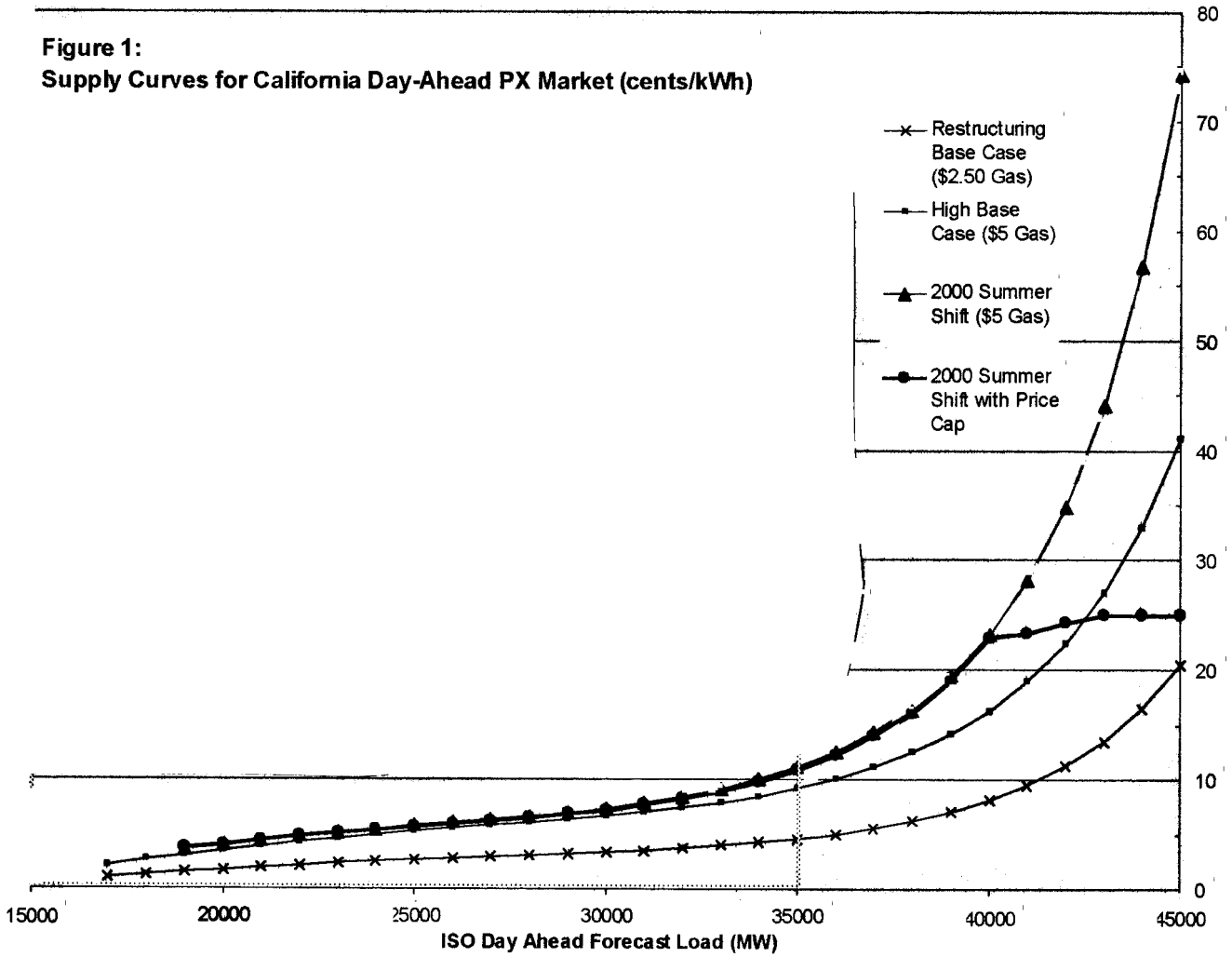


EXHIBIT 5
PJM SUMMER SUPPLY CURVE

PJM Interconnection, LLC

Supp y Curves

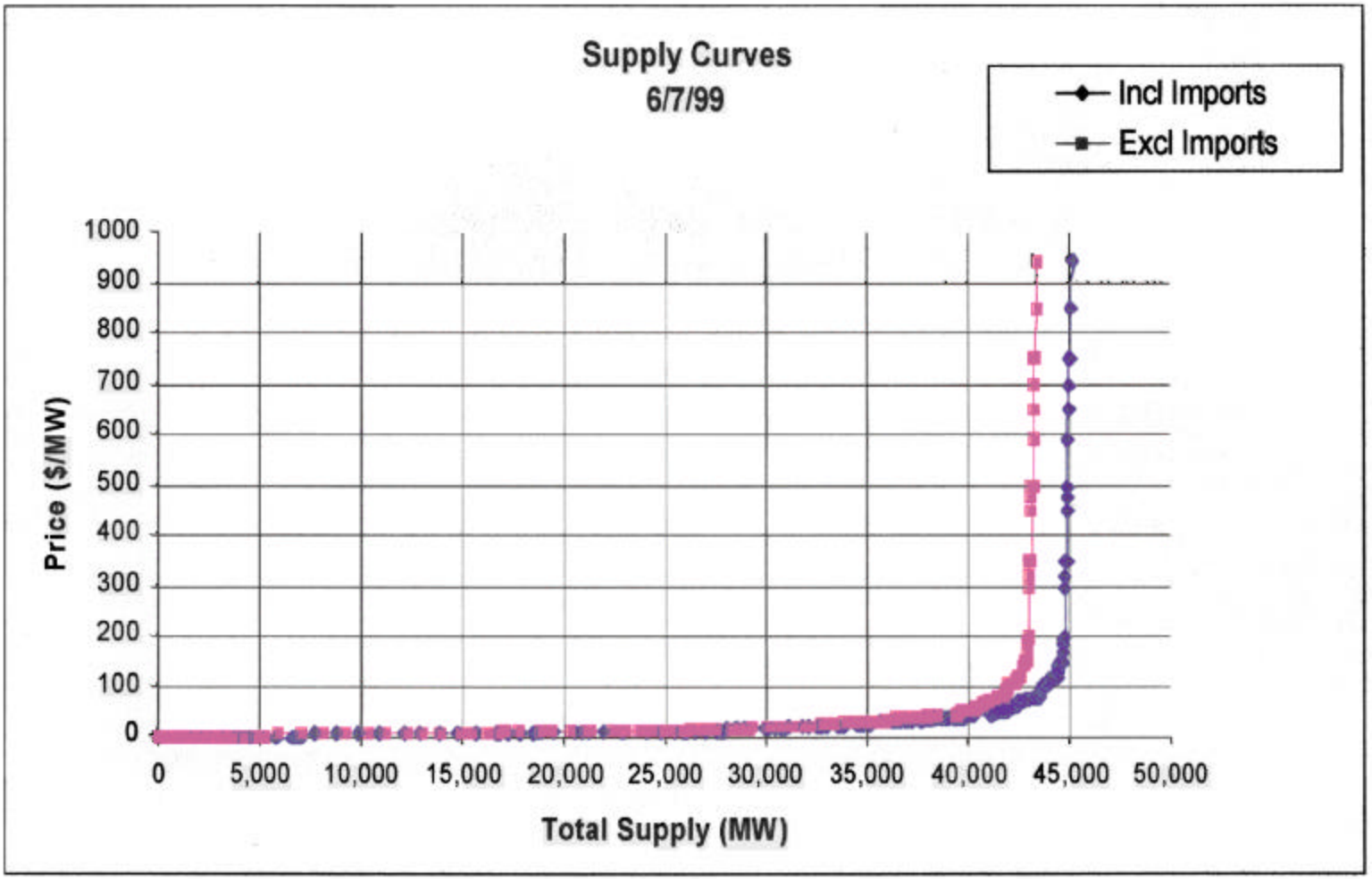
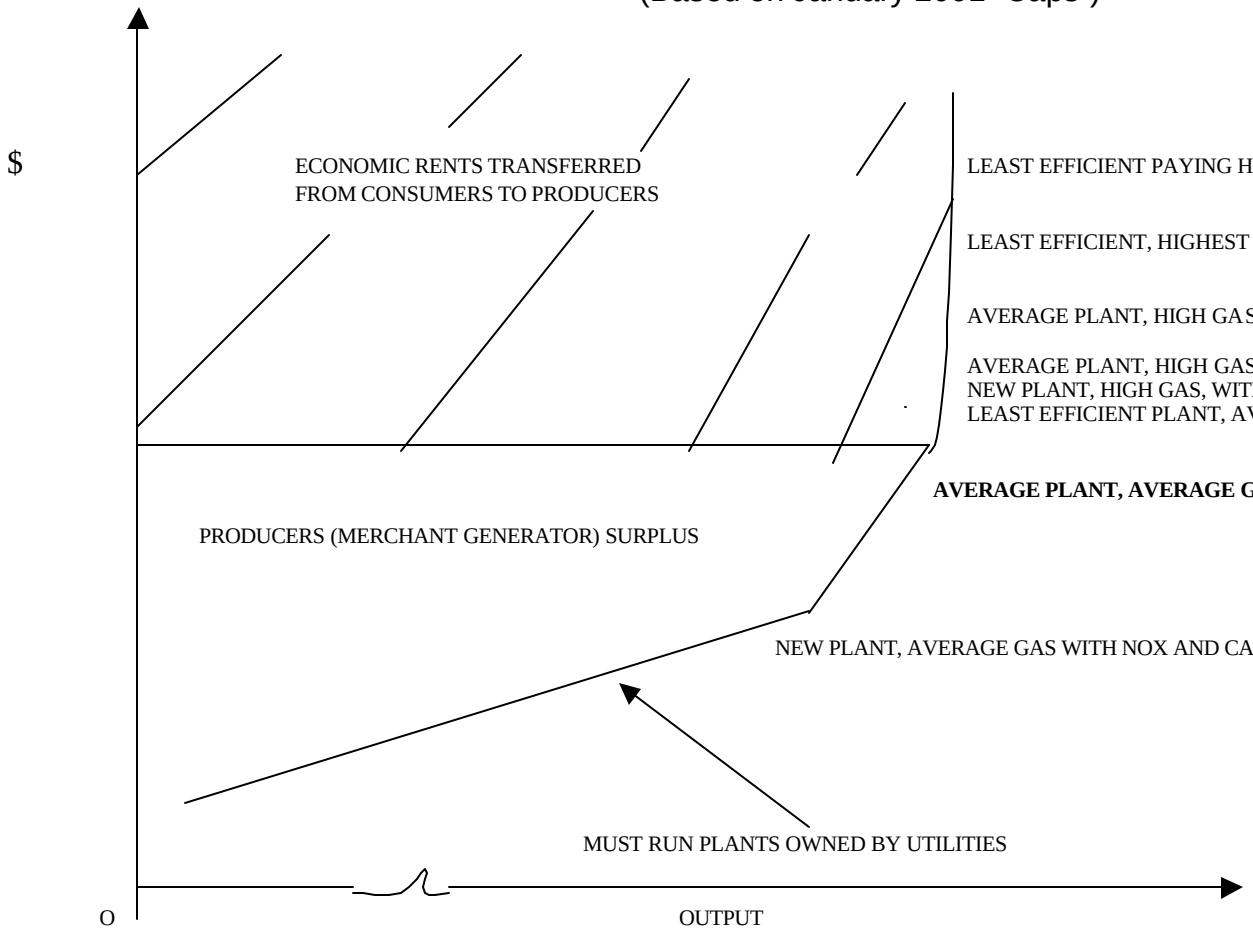
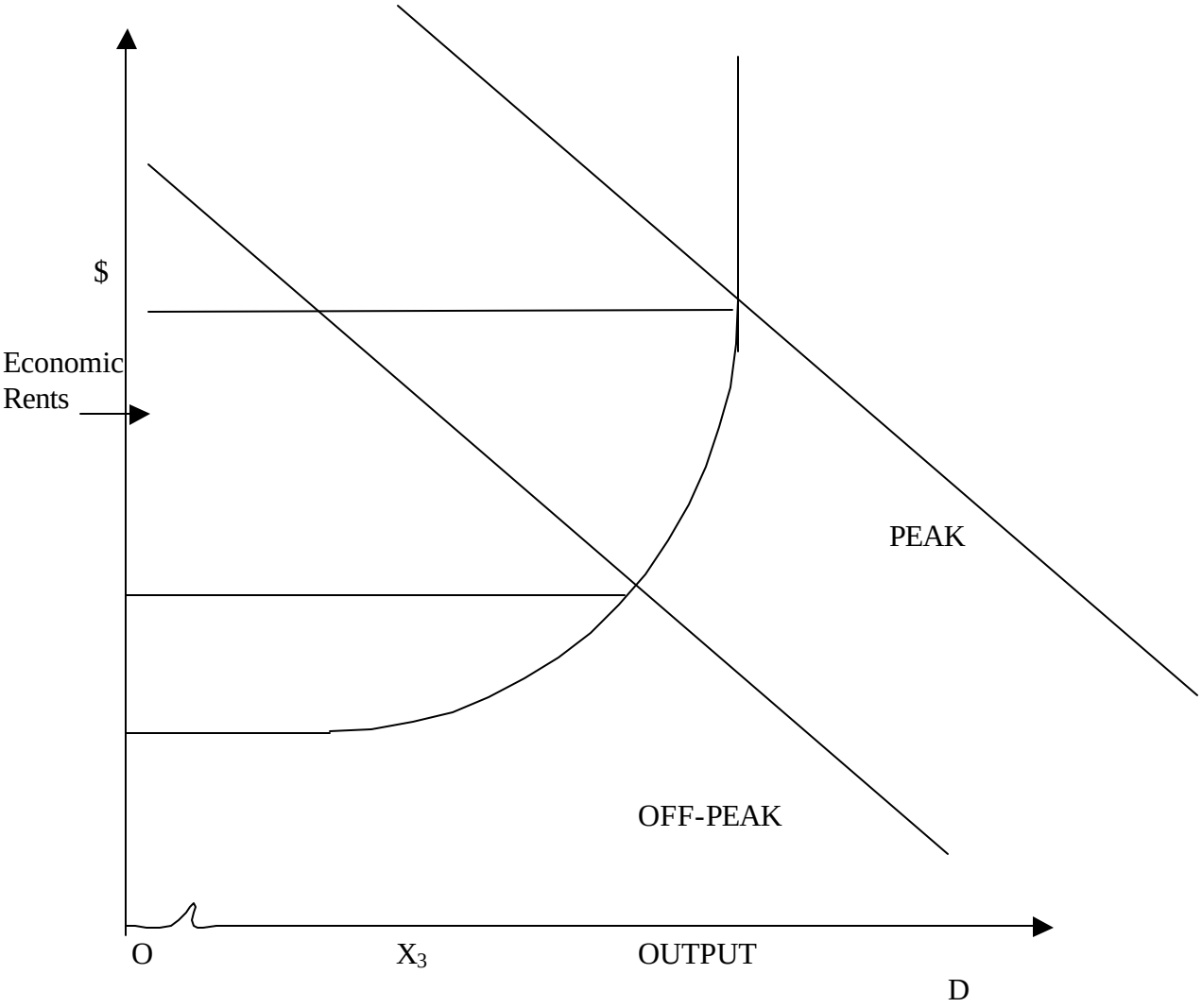


EXHIBIT 6
ABUSIVE PRICING OF ELECTRICITY OCCURRING IN CALIFORNIA UNDER THE FEDERAL ENERGY REGULATORY COMMISSION PRICE CAP PLAN
(Based on January 2001 "Caps")



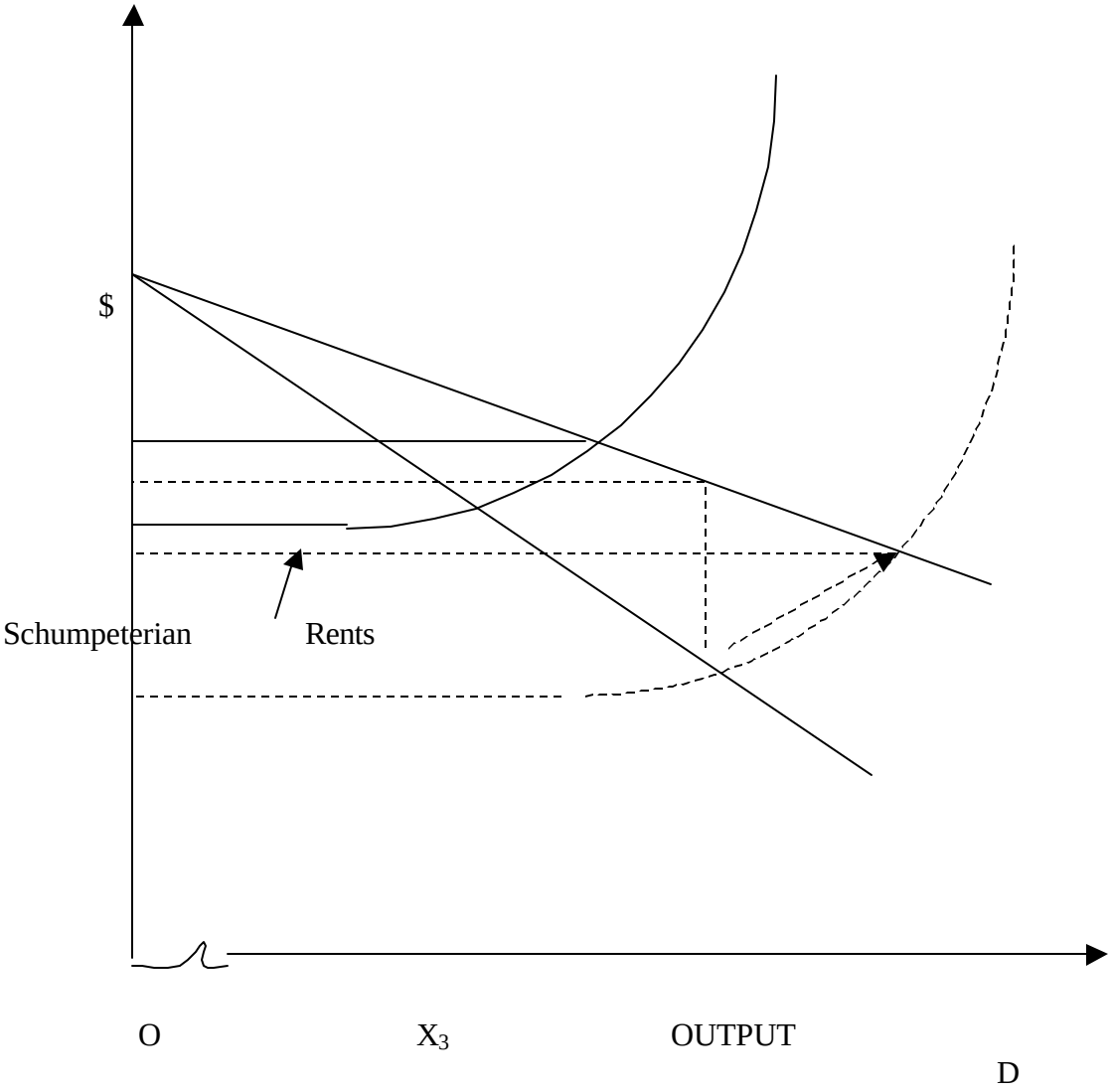
SOURCE: Request for Rehearing on Behalf of The County of San Diego, Comment of the California Independent System Operator Corporation on Staff's Recommendation on Perspective Market Monitoring and Mitigation for the California Wholesale Electric Power Market, San Diego Gas & Electric Company v. Seller of Energy and Ancillary Service Into Markets Operated by the California Independent System Operator and the California Power Exchange, Docket No. EL00-95-017, March 22, 2001.

EXHIBIT 7
SCARCITY RENTS



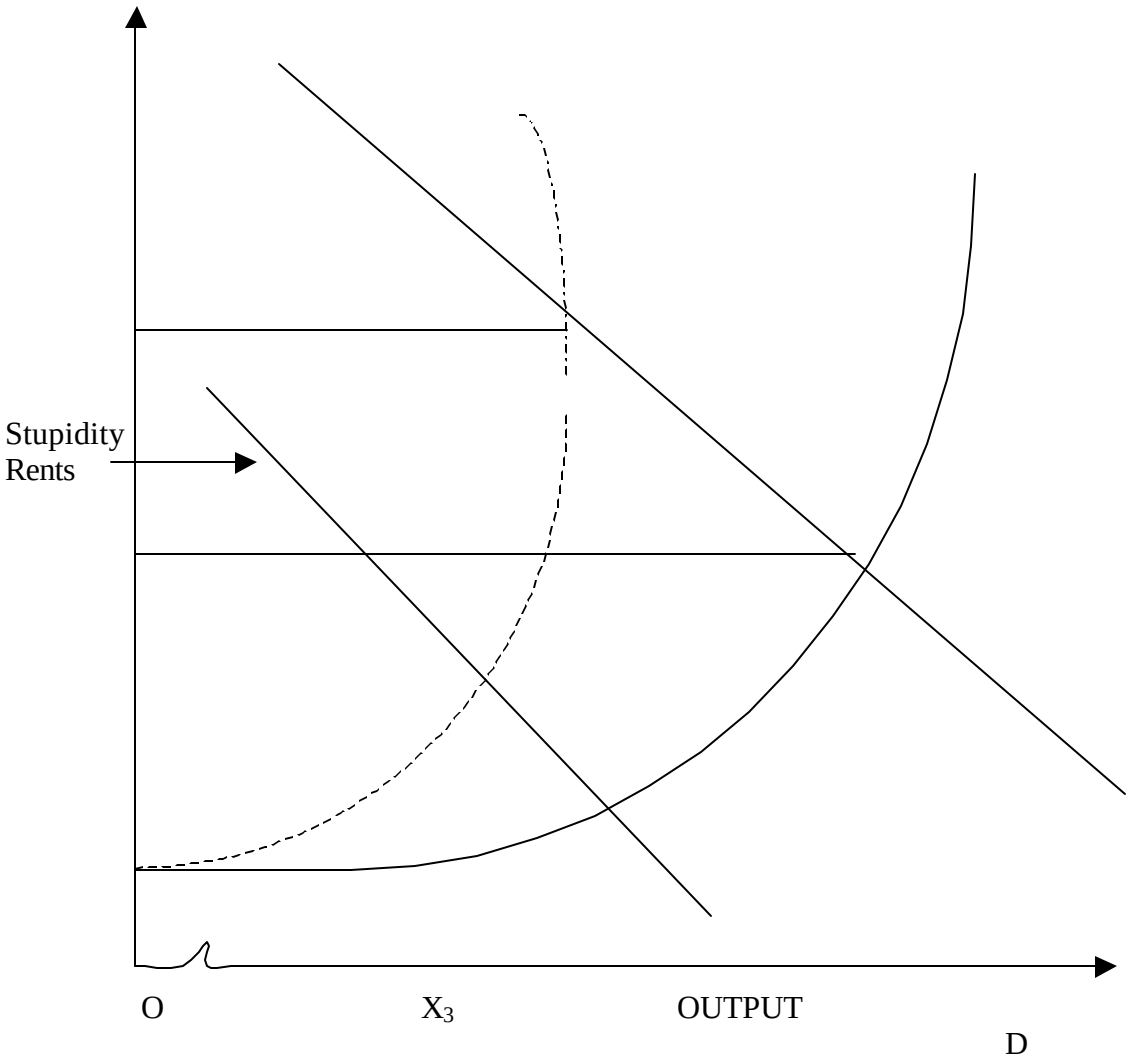
Scarcity rents adapted from Rutherford, Donald, *Dictionary of Economics* (Routledge: London, 1992), p. 138 and Taylor, John, B., *Economics* (Houghton Mifflin, Boston, 1998), p. 350). .

EXHIBIT 8
SCHUMPETERIAN RENTS



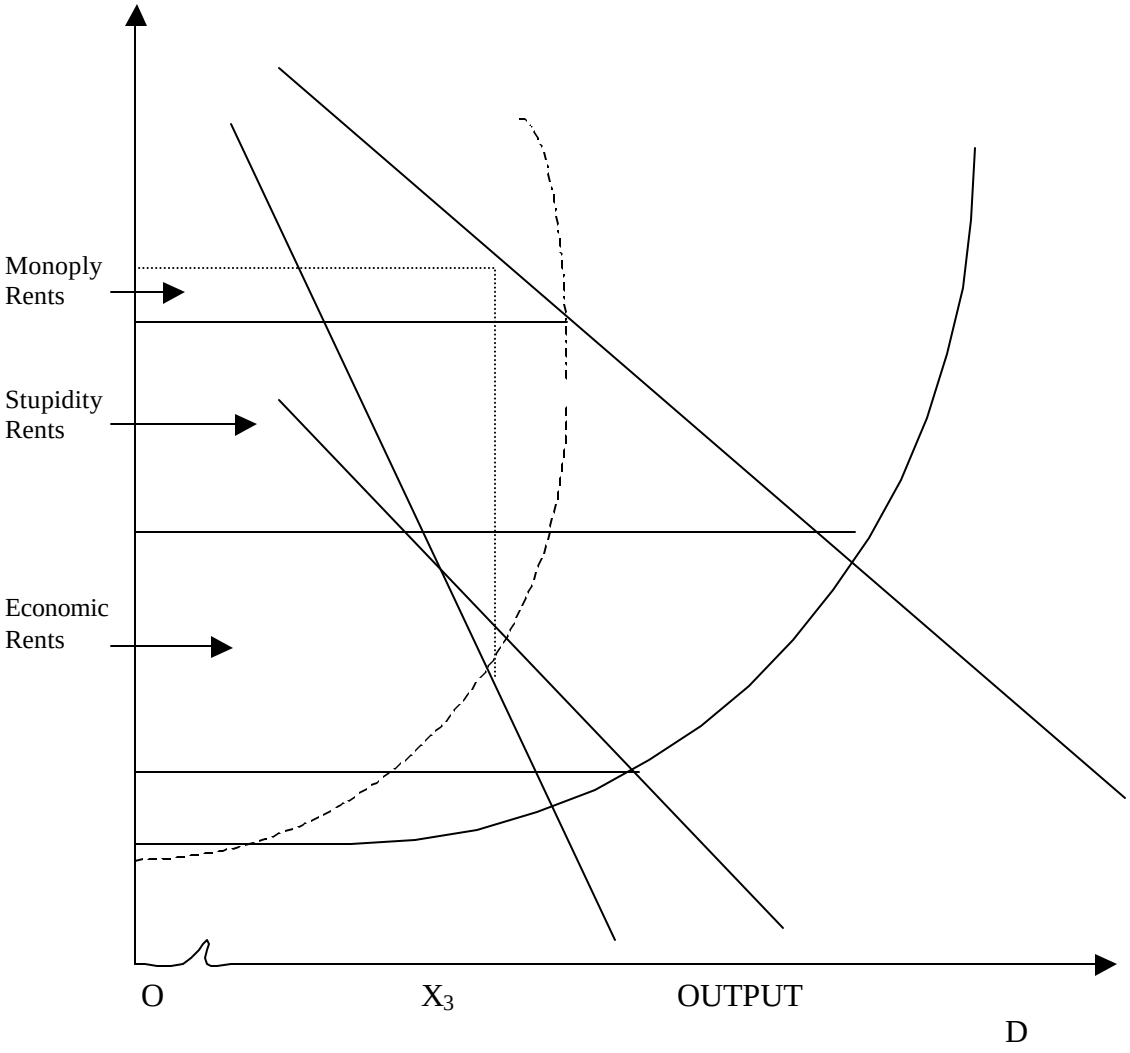
Innovation lowers the cost curve for a producer who enjoys rents. The monopoly price is lower than the competitive price because of the gains in efficiency (shift of the cost curve). The size of the rents depends on the quantity the innovator can produce and its pricing strategy. Rents persist until other producers catch up and compete away the rent, but that results in a lower price in the total market. (adapted from Asch, Peter, *Industrial Organization and Antitrust Policy* (New York, John Wiley and Sons: 1983) p. 27)

EXHIBIT 9
STUPIDITY RENTS



The cost curve shifts up and to the left due to inefficiencies introduced into the market (X-inefficiency from Asch, Peter, *Industrial Organization and Antitrust Policy* (New York, John Wiley and Sons: 1983), p. 97) and it bends backwards to the ability to game/withhold supply. (Backward bending supply curve from Aperjis, Dimitri, *The Oil Market in the 1980s: OPEC Oil Policy and Economic Development* (Ballinger, Cambridge, 1982, p. 173).

EXHIBIT 10
COMBINING ECONOMIC, MONOPOLY AND STUPIDITY RENTS



ENDNOTES

[1] Needless to say, there are hundreds, if not thousands of newspaper accounts. For a single articles that gives a sense of the national scope of the problem see Smith, Rebecca and John Fialka, "Electricity Firms Play Many Power Games that Jolt Consumers," *Wall Street Journal,* August 4, 2000; Klein, Michael and Loretta Lynch, *California's Electricity Options and Challenges* (August, 2000) (hereafter, CPUC Report) ; *ISO Response to Selected Portions of the Summer 2000 Report to the Governor* (August 8, 2000) (hereafter ISO-1); Wolak, Frank A., et al., "An Analysis of the June 2000 Price Spike in California ISO's Energy and Ancillary Service Market," *Market Surveillance Committee of the California Independent System Operator* (September 6, 2000) (hereafter ISO-2)

[2] Staff Report on the Federal Energy Regulatory Commission on Western Markets and the Causes of the Summer 2000 Price Abnormalities (November 1, 2000) (hereafter, FERC Staff Report II).

[3] Energy and Power Subcommittee hearings (September 11) and a NARUC convention (November 13-14) held in San Diego witnessed heated exchanges between, Consumer Groups, various industry representatives, the Governor and representatives of the FERC. Subsequently, the Secretary of Energy added his voice, "Energy Chief Joins Cali *Wall Street Journal,* November 22, 2000.

[4] Hildebrandt, Eric, Further Analysis of the Exercise and Cost Impacts of Market Power in California's Wholesale Energy Markets (Department of Market Analysis California Independent System Operator, March 2001), Impacts of Market Power in California's Wholesale Energy Market: More Detailed Analysis Based on Individual Seller Schedules and Transactions in the ISO and PX Markets (Department of Market Analysis, California Independent System Operator, April 9, 2001); Sheffrin, Anjali, Empirical Evidence of Strategic Bidding in California ISO Real Time Market (Department of Market Analysis, California Independent System Operator, March 21, 2001)

[5] Scherer, F. M. and David Ross, Industrial *Market Structure and Economic Performance* (Boston, Houghton Mifflin: 1990); Shepherd, William, G., *The Economics of Industrial Organization* (Prentice Hall, Engelwood Cliffs, N.J., 1985), presents a similar view.

[6] Landes, W. M. and R. A. Posner, "Market Power in Anti-trust Cases," *Harvard Law Review*, 19: 1981.

[7] Bohn, Roger E., Alvin K. Klevorick and Charles G. Stalon, Market Monitoring Committee of the California Power Exchange, *Report on Market Issues in the California Power Exchange Energy Markets* (August 17, 1998), at 51, argued that the problems would get worse without policy intervention, as they apparently have. Other early and "official" analyses of the problems in the California market before 2000 can be found in Bohn, Roger E., Alvin K. Klevorick and Charles G. Stalon, Market Monitoring Committee of the California Power Exchange, *Second Report on Market Issues in the California Power Exchange Energy Markets* (March 9, 1999). Early "official" analyses of the summer 2000 problem can be found in Borenstein, Everin, James Bushnell and Frank A. Wolak, *Diagnosing Market Power in California's Restructured Electricity Market* (August 2000), and Wolak, Frank A., et al., "An Analysis of the June 2000 Price Spike in California ISO's Energy and Ancillary Service Mar *Market Surveillance Committee of the California Independent System Operator* (September 6, 2000); and *ISO filing Analysis of Market Power*.

[8] Commissioner Carl Wood of the California Public Utility Commission described it as the "theological devotion to deregulation at any price," *Talk of the Nation*, August 9, 2000.

[9] Cooper, Mark, *Industrial Organization and Market Performance in the Transportation and Communications Industries: A Review of Current Theories and Empirical Applications to the Railroad, Electric Utility, Airline, Telecommunications and Oil Pipeline Industries with Hypotheses about Natural Gas Pipelines* (January 1986) (hereafter, Cooper, *Organization*), identified basic economic conditions in the electricity industry that raise doubts about the prospects for deregulation as the debate was beginning (see also Cooper, Mark, "Theory vs. Reality," *Consumer Federation of America Utilities Conference*, April 6, 1987). Cooper, Mark, "Protecting the Public Interest in the Transition to Competition in New York Industries," The Electric Utility Industry in Transition (Public Utilities Reports, Inc. & the New York State Energy Research and Development Authority, 1994), stated the concerns as the policy of restructuring was being formulated. Cooper, Mark, *Residential Consumer Economics of Electric Utility Restructuring* (Consumer Federation of America and Consumers Union, July 1998) (hereafter, Cooper, *Economics)*, identified specific flaws in the restructuring policies that had been adopted. *Electricity Restructuring and the Price Spikes of 1998* (Consumer Federation of America and Consumers Union, June 1999) (hereafter, Cooper, *Spike*), *Reconsidering Electricity Restructuring* (Consumer Federation and Consumers Union, November 2000) (hereafter, Cooper, *Reconsidering)*. In addition to the analyses of the electric utility industry, the Consumer Federation of America has applied a similar analysis to a variety of other "network" industries including Open *Skies Closed Airports* (Consumer Federation of America, February, 1997*; Economic Concentration and Diversity in Broadcast Media* (Consumer Federation of America, November 1995*);* and "Antitrust as Consumer Protection in the New Economy: Lessons From the Microsoft Case," *Hastings Law* Review, forthcoming.

[10] Scherer and Ross, at 15.

[11] Scherer and Ross, at 18.

[12] Scherer and Ross, at 20.

[13] Scherer and Ross, at 17…18.

[14] Scherer and Ross, Chapter 18.

[15] Scherer and Ross, at 16…17.

[16] Summarizing the literature, Scherer and Ross, provide the following useful set of characteristics, pat 53-54.

Structural Criteria

The number of traders should be at least as large as scale economies permit.
There should be no artificial inhibitions on mobility and entry.
There should be moderate and price-sensitive quality differentials in products offered.

Conduct Criteria

Some uncertainty should exist in minds of rivals as to whether price initiatives will be followed.
Firms should strive to attain their goals independently, without collusion.
There should be no unfair, exclusionary, predatory, or coercive tactics.
Inefficient suppliers and customers should not be shielded permanently.
Sales promotions should be informative, or at least not misleading.
There should be no persistent, harmful price discrimination.

Performance Criteria

Firms' production and distribution operations should be efficient and not wasteful or resources.
Output levels and product quality (that is variety, durability, safety, reliability, and so forth) should be responsive to consumer demands.
Profits should be at levels just sufficient to reward investment, efficiency, and innovation.
Prices should encourage rational choice, guide markets toward equilibrium , and not intensify cyclical instability.
Opportunities for introducing technically superior new products and processes should be exploited.
Promotional expenses should not be excessive.
Success should accrue to sellers who best serve consumer wants

[17] Scherer and Ross, at 21…22.
[18] Scherer and Ross, at 70… 71.
[19] Landes and Posner, at 937.
[20] Scherer and Ross, at 415… 416.
[21] Scherer and Ross, at 415... 416.
[22] Landes and Posner, at 938.
[23] Ordover, J.A. and R. D. Willig, "Herfindahl Concentration, Rivalry, and Mergers," *Harvard Law Review*, 95: 1982.
[24] Lawrence Sullivan and Warren S. Grimes, *The Law of Antitrust: An Integrated Handbook*, Hornbook Series (West Group, St. Paul, 2000), at 596-597.

The coordination that can produce adverse effects can be either tacit or express. And such coordination need not be unlawful in and of itself. According to the 1992 Guidelines, to coordinate successfully, firms must reach terms of interaction that are profitable to the firms involved and
be able to detect and punish deviations. The conditions likely to facilitate these two elements are discussed separately, although they frequently overlap

In discussing how firms might reach terms for profitable coordination, the Guidelines avoid using the term "agreement," probably because no agreement or conspiracy within the meaning of Section 1 of the Sherman Act is necessary for the profitable interaction to occur. As examples of such profitable coordination, the Guidelines list "common price, fixed price differentials, stable market shares, or customer or territorial restrictions." Sometimes the facilitating device may be as simple as a tradition or convention in an industry.

The rule of thumb reflected in all iterations of the Merger Guidelines is that the more concentrated an industry, the more likely is oligopolistic behavior by that industry... Still, the inference that higher concentration increases the risks of oligopolistic conduct seems well grounded. As the number of industry participants becomes smaller, the task of coordinating industry behavior becomes easier. For example, a ten-firm industry is more likely to require some sort of coordination to maintain prices at an oligopoly level, whereas the three-firm industry might more easily maintain prices through parallel behavior without express coordination.

Oligopoly conditions may or may not require collusion that would independently violate Section 1 of the Sherman Act. A supracompetitive price level may be maintained through price leadership (usually the leader is the largest firm), through observance of a well-established trade rule (e.g., a convention of a 50 percent markup in price among competing retailers), or through strategic discipline of nonconforming members of the industry. The most common form of such disciplining action is the price war, instituted to prevent any member from gaining market share at the expense of the others. An industry characterized by two-level pricing-a higher level of pricing that normally prevails but is interrupted by occasional price wars-may be exercising this oligopolistic behavior. The price war is aimed at discouraging industry participants from abandoning price discipline.

[25] U.S. Department of Justice, Merger Guideline, revised, 1992.
[26] J. W. Friedman, Oligopoly Theory (Cambridge: Cambridge University Press, 1983), pat 8-9.
[27] Shepherd, p. 389, gives the following formulas for the Herfindahl-Hirschman Index (HHI) and the Concentration Ratio (CR):

$$n \quad 2$$

$$H = \sum_{i=1}^{n} S_i$$

$$CR_m = \sum_{i=1}^{m} S_i$$

where
n = the number of firms
m= the market share of the largest firms (4 for the 4 firm concentration ratio)
S_i = the share of the ith firm.

[28] Shepherd, at 4.
[29] Shepherd, at 4.
[30] Shepherd, at 4.
[31] The Department of Justice Guidelines of 1984 had a dominant firm proviso, which was dropped in the 1992 update.
[32] CAL-ISO reminds the FERC that it raised significant question about the granting of market-based rate authority and asked for prospective mitigation measures long before the market breakdown became apparent (see "Motion to Intervene and Protest of the California Independent System Operator," *Williams Energy Marketing & Trading Company*, Docket No. ER99-1722-004, April 2, 2001, at 7-8.
[33] Landes and Posner, at 947.
[34] For a variety of energy and communications industries elasticities are quite low. In a broad review of economic conditions, we provided the following observation (Cooper, *Industrial Organization*).

> [The] Exhibit... shows how three factors affect the ability of the dominant firm to set prices above costs -- demand elasticity and supply elasticity and strategic interaction. We have chosen relatively low demand elasticities (.5 and 1) and relatively low supply elasticities (.5 and 1) , which seem to typify the transportation and communication industries. We also consider situations in which the strategic interactions are neutral compared to those in which they double the effective market share of the dominant firm (k=0 and k=l). We then estimate the percentage by which a firm with a 20 percent market share could set prices above costs. This market share is chosen since it falls at about the level at which general theory and the merger guidelines define a five or six firm market with roughly equal shares as highly concentrated. Under the worst case set of factors (low supply and demand elasticities and strategic interactions which reinforce the effortto set prices above costs) , a dominant firm with a 20 percent market share could set price 44 percent above costs. Under the best case (moderate supply and demand elasticities and no strategic interaction), it could set prices 11 percent above costs.
>
> EXHIBIT
> THE EFFECTS OF SUPPLY AND DEMAND ELASTICITIES AND
> STRATEGIC INTERACTION ON MARKET POWER DEPENDENT VARIABLE:
>
> The Percentage By Which A Firm With A 20 Percent Market Share Is Able To Set Prices Above Marginal Cost As Estimated By The Adjusted Lerner Index:

	ELASTICITY OF DEMAND			
	.5		1.0	
	Elasticity Of Supply		Elasticity Of Supply	
	.5	1.0	.5	1.0
STRATEGIC INTERACTION				
REINFORCING (k=1)	44	31	28	22
NEUTRAL (k=0)	22	15	14	11

[35] Landes and Posner, at 942.
[36] November 22 ISO filing in Docket NO. EL00-95-012, Attachment A: Analysis of Market Power in California's Wholesale Energy Markets; California ISO, *Report on Real Time Supply Costs Above Single Price Auction Threshold: December 8, 2000 – January 31, 2001* (February 28, 2001).
[37] Sheffrin, Anjali, *Market Analysis Report* (Memorandum to ISO Board of Directors, March 23, 2001).
[38] Operations and Engineering, *CAISO 2001 Summer Assessment* (March 22, 2001).
[39] Puller, Steven L., "Pricing and Firm Conduct in California's Deregulated Electricity Market" (November 2000).

[40] Marcus, William B., and Greg Russzon, *Cost Curve Analysis of the California Power Markets*, (JBS Energy, Inc., September 29, 2000).

[41] Borenstein, Severin and James Bushnell, "An Empirical Analysis of the Potential for Market Power in California's Electricity *Journal of Industrial Economics*, 47:3, September 1999. A linear interpolation for the 372nd hour based on *Id*, at Table V., predicts an average price of about $80 per MWh in December. The actual price in December 2000 was $317 and February hit $363, but the model did not include the jump in the cost of gas and NOx. Under the FERC ceiling price calculation generators were allowed to add about $230/MWH, due to the cost of these two inputs, so the model predicts the exercise of market power well.

[42] Id., finds that market power disappears at 33,000 MWh of demand. With a maximum dependable capacity of 42,000 MW, this suggests a reserve margin of 21.5 percent is necessary, exactly three times the level at which the FERC triggers price mitigation. Ironically, the reserve margin necessary to dissipate market power indicated by this research is roughly equal to the traditional regulated reserve margins that state commissions require.

[43] For the Midwest in 1998 see Federal Energy Regulatory Commission, Staff Report to the Federal Energy Regulatory Commission on the Causes of the Pricing Abnormalities in the Midwest During June 1998 (Washington, D.C., 1998); Public Utilities Commission of Ohio Report, Ohio's Electric Market (June 22-26, 1998); What Happened and Why: A Report to the Ohio General Assembly (Columbus, Oh, 1998); the summer of 1999 experienced outages and price spikes (see Energy Information Administration, *Interim Report of the U.S. Department of Energy's Power Outage Supply Study Team* (January 1999) (hereafter, EIA, *Outages).* Rose, Kenneth, *The California Electric Restructuring Meltdown and the Fallout in Other States*, National Conference of State Legislature, AFI/ASI Joint Winter Meeting, AFI Energy and Transportation Committee (December 13, 2000) (hereafter *Other States*); *The California Electric Meltdown*, presentation to the NRRI Board of Directors Meeting, September 14, 2000, (hereafter, (Rose, *Meltdown),* .

[44] Cooper, *Spike;* Earle, Robert L, Phillip Q. Hanser, Weldon C. Johnson and James D. Reitzes, "Lessons from the First Year of Competition in the California Electricity Market," *The Electricity Journal* (October 1999),

[45] Cooper, *Reconsidering.*

[46] Rosen, Richard, Freyr Sverrisson and John Stutz, *Can Electric Utility Restructuring Meet the Challenges it Has Created* (Tellus Institute, November 2000)

[47] McDiarmid, Robert C., Lisa G. Dowden, and Daniel I. Davidson, "A Modest Proposal: Revoke the Nobel Price? Recognize the Limitations of Theory? Or Grant a License to Steal?," *Electricity Journal,* January/February 2001.

[48] Allen, Daniel, Bruce Biewald and David Schlissel, *Generator Outage Increases: A Preliminary Analysis of Outage Trends in the New England Electricity Market* (Union of Concerned Scientists, January 7, 2001

[49] Bowring, Joseph, et. al., *Monitoring the PJM Market: Summer 1999,* UCEI Power Conference, March 17, 2000)

[50] Bowring, et. al., Rose, *Other States;* Stoft, Steven, *PJM's Capacity Market in a Price-spike World* (May 2000). Mansur, Erin, T., *Pricing Behavior in the Initial Summer of the Restructured PJM Wholesale Electricity Market* (University of California Energy Institute, Program on Workable Energy Regulation, April 2001

[51] Bushnell, James and Erin Mansur, *The Impact of Retail Rate Deregulation on Electricity Consumption in San Diego* (University of California Energy Institute, Program on Workable Energy, April 2001).

[52]Reviews of dozens of studies can be found in Bohi, Douglas, *Analyzing Demand Behavior: A Study of Energy Elasticities* (Baltimore: Resources for the Future/Johns Hopkins, 1981) and Pyndyck, Robert, S., *The Structure of World Energy Demand* (Cambridge: MIT Press, 1979). Joskow, Paul and Richard Schmalensee, *Markets For Power: An Analysis of Electric Utility Deregulation* (Cambridge: MIT press, 1984), concluded that many geographic markets would exhibit market power problems, in large part because the empirical evidence dictated the use of low elasticities of demand.

> We made two assumptions about the short run elasticity of demand (the percentage reduction in demand caused by a 1 percent increase in price) at this point. The first (low) assumption was that demand elasticity equaled –0.1; the second (high) was that it equaled –0.5. These are consistent with available econometric evidence.

A decade and a half later, Rose, Kenneth, *Electric Restructuring Issue for Residential and Small Business Customers* (Columbus, Ohio: National Regulatory Research Institute, June 2000), reviewed more recent literatures and found short run elasticities in the range of .2 (citing Branch, E. Ralph, "Short Run Income Elasticity of Residential Electricity Using Consumer *Energy Journal*, 14:4, 1993 and long run elasticities of about 1.0 (citing Hyman, Leonard, S. *America Electric Utilities: Past, Present and Future* (Arlington, VA; Public Utilities Reports, 1988). In analyzing the California market, Borenstein and Bushnell, state that "We have run simulations for elasticities 0.1, 0.4, and 1.0, a range covering most current estimates of short-run and long-run price elasticity." In other words, even in the long run, as currently configured, the demand elasticity is not sufficient to keep the market from "coming apart."

[53] Hirst, Eric, and Brendan Kirby, *Retail-Load Participation in Competitive Wholesale Electricity Markets* (prepared for the Edison Electric Institute and the Project for Sustainable FERC Energy Policy, December 2000.

[54] Id. citing Braithwaite, S., "Customer Response to Market Prices How Much Can You Get When You Need it Most?" *EPRI International Energy Conference*, Washington, D. C., July 2000)

[55] Id. (citing Schwarz, et al., Industrial Response to Real-Time Prices for Electricity: Short-Run and Long-Run (University of North Carolina, December 2000.

[56] Marimucci, Carla, "Abraham Touts Conservation in S.F. But Energy Chief Says More Supply is Long-term Solution," *San Francisco Chronicle*, May 5, 2001.

[57] Order Establishing Prospective Mitigation and Monitoring Plan for the California Wholesale Electric Markets and Establishing an Investigation of Public Utility Rates in Wholesale Energy Markets, to be reported at 95 F.E.R.C. ¶ 61,115. That Order is referred to herein as "the Prospective Mitigation Order." at 21, arguing that "given the lack of demand response, these prices may not reflect what the market would have established as appropriate scarcity rents and, therefore, may not be just and reasonable."

[58] In the FERC model, the check on scarcity rents becomes the willingness to pay, FERC, *Prospective Mitigation Order*, at 26-27

> Some comments contend that the use of marginal cost pricing will not provide sufficient scarcity rents to the highest cost, most marginal generators, and contend that an adder should be include to cover scarcity rents. However, the Commission sees no reason to include a scarcity adder. Because the Commission is requiring public utility load serving entities to submit demand bids indicating the prices at which their loads can be curtailed, the demand bids will provide an opportunity for all generators using proxy bids to receive scarcity rents.*/
>
> */ In cases where the demand for energy exceeds the supply of energy at the marginal cost of the last unit dispatched, the market clearing price will rise to the level of the marginal buyer's reservation price (the amount they are willing to pay). This will efficiently allocate energy to those that value it the most (as shown by their willingness to pay). At the same time, it will provide scarcity rents to all generators using proxy bids.

[59] The theoretical importance of demand response is obvious (Borenstein, Severin James Bushnell and Christopher Knittel, "Market Power in Electricity Markets: Beyond Concentration M *The Energy Journal*, 20:4, 1999), but how to achieve the necessary level of response, without abusive pricing, is not so obvious. Borenstein, Bushnell and Knittel, Id., at 84, point out that if the elasticity could be raised to .4 from .1, it would have an immense impact on market prices. This constitutes at least a quadrupling of the short-term elasticity and there is increasing evidence that it would require a ten-fold increase.

[60] Such programs certainly should play a role in reducing peak demand, since "negawatts" have substantial value. Marcus and Russzon, *Cost Curve Analysis*, estimate the value of peak shaving at between 5 and 10 times the market-clearing price. Borenstein, Severin, *The Trouble With Electricity Markets* (January 2001) uses an example in which the value of reduced demand is just under four times the market price. However, they cannot be relied upon to discipline pricing abuse.

[61] The CAL-ISO and the FERC have been debating which markets to include in the analysis and which abuses are subject to FERC jurisdiction hence publicly discussed figures vary. FERC, *Prospective Mitigation Order*, at 5-6, gives s brief recounting of the dispute.

[62] The CAL-ISO request is based on a methodology distorted by a series of erroneous assumptions dictated by the FERC, and therefore grossly underestimates the actual abuse that is taking place. Moreover, the CAL-ISO analysis does not include the results of any investigation into natural gas prices in the California market. A detailed and direct comparison of actual costs incurred and prices charged on a plant-by-plant basis, which is the methodology used to order the wholesale electricity market for six decades prior to the deregulation experiments of the 1990s, would inevitably reveal that the abuses are much larger than $6 billion.

[63] Comments of the California Independent System Operator Corporation on Staff's Recommendation on Prospective Market Monitoring and Mitigation for the California Wholesale Electric Power Market," *San Diego Gas & Electric Company v. Seller of Energy and Ancillary Services Into Markets Operated by the California Independent System Operator and the California Power Exchange*, March 22, 2001; Request for Rehearing on Behalf of the County of San Diego, *San Diego Gas & Electric Company v. Seller of Energy and Ancillary Services Into Markets Operated by the California Independent System Operator and the California Power Exchange*, March 22, 2001.

[64] Hildebrandt, *Further Analysis*, at 8.

[65] Request for Rehearing on Behalf of the County of San Diego, *San Diego Gas & Electric Company v. Seller of Energy and Ancillary Services Into Markets Operated by the California Independent System Operator and the California Power Exchange*, March 22, 200, at 7-8.

[66] Hildebrandt, *Further Analysis*, at 2.

> On an annualized basis, wholesale energy prices since January 2000 are exceeding the cost necessary for new investment by about 400%, and would allow recovery of an investment in new supply in a period of less than two years.

Hildebrandt's assumed capital cost recovery was 14 to 15 percent. Thus, with an estimate of actual cost recovery more than 400% larger than that, the annual recovery is at least 70%. Moreover, the 14 to 15 percent for annual capital cost recovery is based on a return on equity of 17% (see California Energy Commission, *Market Clearing Prices Under Alternative Resource Scenarios*, February 2000, at Table III-1).

[67] County of San Diego, at 7, calculates that a five-year capital recovery would require a charge of $32/Mwh. Thus, a one-year pay back would require capital cost recovery of $160/MWH. The cost of operating such a new plant would be just over $120 per MWh, including $32/MWh for capital cost recovery. Thus, at a ceiling price of $273, which implies a windfall of $150/MWh, the total capital cost recovery is over $180 per MWh, indicating a less than one-year payback or a return on investment of over 100 percent.

[68] Combining the results of Hildebrandt, *Further Analysis*, Tables 3-1, B-1 and B-2, we calculate annual recovery of capital costs under actual prices in effect in California in the past three years as follows:

	NP15	SP15
Low Cost plant ($500/MWh@ 14%ROI)	46	32
High cost plant ($600/MWH@16%ROI)	39	26

[69] Hildebrandt, *Impacts of Market Power*, at Table 2-4.

[70] Stanton, Same, "Buy Out?," *Sacramento Bee*, May 6, 2001, cites PG&E plant sale revenue of $1.5 billion and SCE revenue of just under $1 billion. SDGE revenues were about $.5 billion.

[71] In reviewing first quarter financial results, the following analysis focuses on wholesale or trading business segments and operating results, where available:

PROFITS IN MILLIONS OF DOLLARS

	1Q2001	1Q2000
Enron: Wholesale Services (IBIT)	$755	$429
Duke: Energy Services (EBIT)	428	139
MIR: With California contingency (NI)	420	95
REI:Wholesale, (operating income)	216	(22)
Dynegy: Marketing & Trade (NI)	100	50
Williams : Marketing and Trading (NI)	485	78

[72] Landes and Posner, at 954; "If a firms has a 70% market share in an industry that has $100 million in annual sales, and the market elasticity of demand is 1, the resulting annual deadweight loss $24.5 million.

[73] Following Landes and Posner, at 954:

$$D=S_i^2 (P)(Q)/2e^d = (.1)^2 ($7 \text{ billion})/2(.03)$$

[74] FERC, *Prospective Mitigation Order, at* 3, 4, 7.

[75] Since supply of a fixed asset does not respond to price changes, there is little or no dead weight loss, as Taylor, John, B., *Economics* (Houghton Mifflin, Boston, 1998), p. 350, puts it,

Economic rent is the price of anything that has a fixed supply. Economic rent is also sometimes called *pure rent.* Economic rent is a significant concept in economics precisely because the quantity supplied does not depend on the price. Thus, a tax on economic rents would not change the amount supplied; it would not affect economic efficiency or cause a deadweight loss.

[76] Scherer and Ross, at 15-29. Abuse of monopoly power imposes static, deadweight loss (see Asch, Peter, *Industrial Organization and Antitrust Policy* (New York, John Wiley and Sons: 1983) at 83) and may impose dynamic x-efficiency losses (see Asch, p. 97).

[77] That the concept is routine is attested to by its inclusion in introductory texts, see for example, Taylor, at 327-329. Adelman, Morris, "OPEC the Clumsy Cartel," *The Energy Journal*, 1:1980; Bohi, Douglas and W. David Montgomery, *Oil Prices, Energy Security and Import Policy* (Resources for the Future, Washington, 1982); Aperjis, Dimitri, *The Oil Market in the 1980s: OPEC Oil Policy and Economic Development* (Ballinger, Cambridge, 1982); Teece, David, "OPEC Behavior: An Alternative View," in James M. Griffin and David J. Teece (Eds.), *OPEC Behavior and World Oil Prices* (George Allen and Unwin, London, 1982); Adelman, Morris, "OPEC as a Cartel," in James M. Griffin and David J. Teece (Eds.), *OPEC Behavior and World Oil Prices* (George Allen and Unwin, London, 1982). Newberry, David M., "Competition, Contracts, and Entry in the Electricity Spot *Rand Journal of Economics*, 29:4, 1998,, at 729, notes that an analysis by Bolle, Friedel, "Supply Function Equilibria and the Danger of Tacit Collusion: The Case of Spot Markets for Electricity," *Energy Economics*, April 1992, which seems to capture the essence of the California market, allows a backward bending supply function.

[78] Kahn, *Options*, at 36, gives an estimate of approximately 672 MW added capacity, or 2 percent, for 1996 to 1999. This is compared to a growth in peak demand of 5,522 MW over the period. In contrast, nationwide, generating capacity has declined by about 10 percent, while noncoincident peak increased by 10 percent (Energy Information Administration, *Electric Power Annual* 1999, December 2000, Tables 34, 35). Harvey, Hal Bentham Paulos and Eric Heitz, "California and the Energy Crisis: Diagnosis and Cure," *Energy Foundation*, March 8, 2001.

[79] In addition to the price spikes of 1998 (see Federal Energy Regulatory Commission, Staff Report to the Federal Energy Regulatory Commission on the Causes of the Pricing Abnormalities in the Midwest During June 1998 (Washington, D.C., 1998); Public Utilities Commission of Ohio Report, Ohio's Electric Market (June 22-26, 1998); What Happened and Why: A Report to the Ohio General Assembly (Columbus, Oh, 1998); the summer of 1999 experienced price spikes (see Rose, Kenneth, *The California Electric Restructuring Meltdown and the Fallout in Other States*, National Conference of State Legislature, AFI/ASI Joint Winter Meeting, AFI Energy and Transportation Committee (December 13, 2000) (hereafter *Other States*); *The California Electric Meltdown*, presentation to the NRRI Board of Directors Meeting, September 14, 2000, (hereafter, (Rose, *Meltdown*),; Bowring, Joseph, et. al., *Monitoring the PJM Market: Summer 1999*, UCEI Power Conference, March 17, 2000) and supply outages (EIA, *Outages*); and the summer of 2000 also exhibited sharp run ups in New York and New England (see Rose, *Meltdown*).

[80] The immense sums spent in opposing vigorous competition at the federal level can be found in Benton, James C., "Money and Power: The Fight Over Electricity Deregulation," *CQ Weekly*, August 12, 2000.
[81] The key elements of this scenario were laid out in Kahn, *Options*. An interesting perspective on perceptions about the crisis that tracks many of the arguments made below can be found in "Roundtable Dialogue on California Energy Crisis ," *Sacramento Bee* (December 24, 2000). Marcus, William and Jan Hamrin, *How We Got into the California Energy Crisis*, JBS Energy (2000}) (hereafter, Marcus, *Crisis*), provides specific estimates of the size of each of the factors, as do Harvey, Paulos and Heitz.
[82] See Marcus, *Crisis.* The Department of Energy documented the difficulties that utilities created for the expansion of supply through distributed generation see Alderfer, R. Brent, M. Monika Eldridge, and Thomas J. Starrs, *Making Connections: Case Studies of Interconnection Barriers and their Impact on Distributed Power Projects* (National Renewable Energy Laboratory, May 2000).
[83] Marcus, *Crisis,* gives the following figures for long term resources 1400 MW renewables and cogeneration, 2000 MW of efficiency – and for short term resources – 2300 MW of uncontracted spot capacity and 2500 MW of bogus interruptible contracts. The California Energy Commission put distributed generation as high as 20 percent, or as much as 10,000 MW, by 2010, which alarmed PG&E, see *Pacific Gas and Electric Company's Position on Distribution Competition, Distributed Generation and the Role of the Distribution Company*, p. 27.
[84] Wolak, *Analysis*, and Kahn, Alfred, et al., *Pricing in the California Power Exchange Electricity Market: Should California Switch from Uniform Pricing to Pay-as-Bid Pricing* (California Power Exchange, January 23, 2001) also recognize that utilities did not take these opportunities, but excuse it by suggesting they did not trust regulators.
[85] Puller, shows an immediate reduction in utilization after deregulation and divestiture.
[86] Rose, *Other States,* shows an increase in unplanned outages between 1999 and 2000 of about 1,000 MW in June, 1,600 MW in July, and 2,500 MW in August. Marcus, *Crisis*, states, "Forced outage rates for California natural gas plants over the past five years have gone from the traditional 5-10 percent per year outage rate to an average of almost 50 percent."
[87] Borenstein, Everin, James Bushnell and Frank A. Wolak, *Diagnosing Market Power in California's Restructured Electricity Market* (August 2000).
[88] Puller.
[89] In addition to findings on market power cited above, see Bohn, Roger E., Alvin K. Klevorick and Charles G. Stalon, Market Monitoring Committee of the California Power Exchange, *Report on Market Issues in the California Power Exchange Energy Markets* (August 17, 1998) and Energy Information Administration, *Horizontal Market Power in Restructured Electricity Markets* (March 2000).
[90] Marcus and Russzon call it a summer 2000 shift. They show that the jump in gas prices runs the cost from 8.3 cents per kWh to 16.5 cents at 40,000 MW without the summer shift and 24 cents with the summer shift. At 45,000 MW, the price is 78 cents per kWh and at 35,000 MW, it is 11.4 cents. Adding 5,000 to 10,000 MW to the system has a huge benefit in relieving price pressures.
[91] Borenstein, Severin, James Bushnell and Steven Stoft, "The Competitive Effects of Transmission Capacity in a Deregulated Electricity Market," *Rand Journal of Economics*, 31:2, 2000, at 318, state, matter of factly, "Congestion on the north-south transmission lines often divides the state into at least two distinct geographic markets." See also Dowden, Lisa G, Robert C. McDiarmid and Will S. Huang, *Market Power: Will We Know it When We See It?: The California Experience*, American Public Power Association (December 2000); Marcus, *Crisis.*
[92] Bushnell, James and Frank A. Wolak, "Regulation and the Leverage of Local Market Power in California's Electricity Market" (July 1999).
[93] Dowden, McDiarmid, and Huang: Marcus, *Crisis.*
[94] Dowden, McDiarmid, and Huang; Marcus, *Crisis.*
[95] Landes and Posner, at 958, given an example "for illustrative purposes only" in which they identify the market share necessary for a firm to charge a price 20% above marginal cost

	SUPPLY ELASTICITY	
	LOW	HIGH
	(.5)	(3.0)
DEMAND ELASTICITY		
LOW (1.0)	23	61
HIGH (2.5)	44	46

[96] Dowden, McDiarmid, and Huang, Id.; Marcus, William and Jan Hamrin, *How We Got into the California Energy Crisis*, JBS Energy (2000).
[97] Hildebrandt, *Further Analysis*, at 8, finds mark-ups of 30 percent using the extreme assumptions of spot gas and NOx. Using more realistic assumptions would increase the estimate.
[98] Tabors, Richard D. and Luis Paz Galindo, *Transmission Pricing in PJM: Allowing the Economics of the Market to Work* (May 12, 1999). Rao, Narasimha and Richard D. Tabors, *Transmission Markets: Stretching the Rules for Fun and Profit*, TCA Working Paper, No. 327-0400 (April 2000). The importance of transmission is underscored in Borenstein, Bushnell and Stoft. Consumer Federation of America, "Request for Reconsideration," *Regional Transmission Organizations,* United States of America, Federal Energy Regulatory Commission, Docket No. RM99-2-000; Order No. 2000, Session (January 20, 1999).

[99]Cooper, Mark, *Mergers and Open Access to Transmission in the Restructuring Electric Industry: Analytic Tools, Empirical Evidence and Policies to Build Effective Market Structures*, (Consumer Federation of America, April 2000).
[100] Energy Information Administration, *The Changing Structure of the Electric Power Industry 1999: Mergers and Other Corporate Combinations* (December 1999).
[101] Dowden, McDiarmid, and Huang, recounts the evidence presented to FERC on market power and FERC's seeming inaction; Cooper, *Spikes*, discusses the failure of FERC to react vigorously to complaints of market power in response to the 1998 price spikes.
[102] Dowden, McDiarmid and Huang.
[103] Cooper, *Spikes*.
[104] A frustrated FERC staff member wrote a blistering critique of FERC's unwillingness to investigate transaction data in 1998 and 1999, just prior to the onset of the big problems in the California market in 2000. See
Open Memorandum, From: Ron Rattey, OMTR, To:FERC Staff (June 2, 2000).
[105] Dowden, McDiarmid, and Huang.
[106] *Order Authorizing Disposition of Jurisdictional Facilities*, PGE National Energy Group, Inc., PG&E Enterprises and PG&E Shareholdings, Inc, Federal Energy Regulatory Commission (January 12, 2001).
[107] Commissioner Massey, dissenting, *Order Authorizing Disposition of Jurisdictional Facilities*, PGE National Energy Group, Inc., PG&E Enterprises and PG&E Shareholdings, Inc, Federal Energy Regulatory Commission (January 12, 2001).
[108] McDiarmid, *Modest Proposal*. *Kahn*, et al. argue, based primarily on experimental results, that the bidding system does not matter much, compared to the problems of market power, tight supplies and inelastic demand and given the ability of those with market power to adapt their bidding strategies to any system. To the extent that the purpose is to prevent attention from being directed away from the important issues, this is a useful analysis, but the arguments miss the fundamental problem identified by other analysts and the victims of the one-price system. The critics of the one-price system focus on the massive economic rents and the lottery nature of the one price system, which exposes a few very high price offers to little risk, a bidding strategy which is consistent with the backward bending supply curve (see the sources cited at notes 12 and 13 in Kahn, et al.).
McDiarmid, et al., *Modest Proposal*, summarizes the lottery nature of this type of auction as follows:

> 'I know that a simple bidding strategy of bidding very high on the last few MW will be extremely profitable for everyone, including me, if I have enough MW already running at the time, and so I will follow that strategy and I expect anyone else in the business to have enough brains to see the same advantage."
> They describe the huge rents as follows (p. 16):
> the cost difference from a market-clearing price of $75 or one of $1,075 is $50 million per hour, or $500 million per 10-hour peak period. If the bidding behavior of one of the last few suppliers were rational then, the failure of a 100 MW unit to be dispatched would mean that the last supplier would lose $75,000 (gross revenue, which would translate into significantly less on lost profits after reduction of the out-of-pocket costs) for a 10-hour period; but if that supplier had 4,000 MW already in the market dispatched based on bids that would be rational for the second-price theory, the additional amount that it would gain *for the output of those units already running* if a market-clearing pride at the $1,075 level were established would be $4 million per hour, or $40, million for the 10-hour period.

"Roundtable Dialogue on California Energy Crisis ," *Sacramento Bee* (December 24, 2000). participants clearly care a great deal about the average price and believe that the very high rents available on all sales at peak times has dissuaded sellers from offering reasonable prices for longer terms. Similarly, Florida Municipal Electric Association, which represents consumers, show substantial rents, see *Energy 2020 Study Commission Wholesale Deregulation Proposal Will Raise Electric Rates and Maximize Profits of Private Utility Shareholders*. TURN and Woychik, do not accept this point of view.
[109] Rosen, Sverrisson, and Stutz, stress the importance of rents in the industry.
[110] Wolak, et. al.; TURN and Woychik, stress this problem.
[111] Wolak, et. al.
[112] See, Market Surveillance Committee, "Analysis of Order Proposing Remedies for California Wholesale Electric Markets," *Federal Energy Regulatory Commission*, Dockets ER00-95-000, et. Al., (December 4, 2000), as well as Wolak, et. al., Bushnell, and Wolak, Borenstein, Bushnell and Wolak, and Bohn, Klevorick and Stalon.
[113] Department of Market Analysis, *Report on Real Time Supply Costs Above Single Price Auction Threshold: December 8, 2000 – January 31, 2001*, February 28, 2001, finally did ask for refunds of over $.5 billion of unjust and unreasonable charges.
[114] *ISO Response to Selected Portions of the Summer 2000 Report to the Governor* (August 8, 2000); Wolak, et. al. TURN and Woychik, question the importance of the lack of long term contracts (see also Harvey, Scott M. and William Hogan, *California Electricity Prices and Forward Market Hedging*, October 17, 2000.
[115] *ISO Response*, at 5.

> Indeed, planners of deregulation recognized that much of the success of the markets depend on work to be implemented and/or regulated by state policymakers. This work included development of demand responsiveness products, implementation of hedging instruments for entities that serve load, development of real time rates and installation of real time meters, promotion of consumer education on issues of price responsiveness and conservation, and facilitation of review of transmission lines and/or substations at critical junctions in the transmission system. Most of this work remains to be done.

[116] Wolak et. al.
[117] Marcus, *Crisis.*
[118] Marcus, *Crisis.*
[119] Klemperer, Paul, *The Economic Theory of Auction* (Nuffield College, July 2000).
[120] McDiarmid, Dowden, and Davidson, "A Modest Proposal." Needless to say, the general literature on this topic is huge. To keep the citations manageable, we note only those sources that have been directly entered into the current debate or deal explicitly with electricity markets.
[121] Newberry, David M., "Competition, " citing in particular Wolfram, Catherine, D. "Strategic Bidding in a Multi-unit Auction: An Empirical Analysis of Bids to Supply Electricity in England and Wales," *Rand Journal of Economics*, 29, 1998. Newberry cites von der Fehr, N-H.M. and D. Harbrord, "Spot Market Competition in the UK electricity Industry," *Economic Journal*, 103 1993, as the origin of the auction theory approach. Brunekreeft, Gert, "A Multiple-unit, Multiple-period Auction in the British Electricity Spot Market," *Energy Economics*, 23, 2001, reviews this debate from the auction side.
[122] Some analysts emphasize the problem of imperfect institutions interacting with market power (see "Comments and Testimony of the Utility Reform Network (Turn) and the Utility Consumers; Action Network (UCAN) of the November 1, 2000, Order Proposing Remedies for California Wholesale Electric Markets," before the Federal Energy Regulatory Commission, *San Diego Gas & Electric, et. al*, Docket No. EL00-95-000, November 22, 2000 (hereafter TURN); "Testimony of Eric Charles Woychik, on behalf of TURN and UCAN, *San Diego Gas & Electric, et. al*, Docket No. EL00-95-000, November 22, 2000. This view should be distinguished from those who argue that imperfections institutions are the primary, if not sole cause of the problems (see Chandley, John D., Scott Harvey and William Hogan, *Electricity Market Reform in California*, November 22, 2000 and *Issues in the Analysis of Market Power in California*, October 27, 2000.
[123] Klemperer, Economic *Theory*, at 30, stresses the important of uncertainty in avoiding tacit collusion, which is a particular problem in electricity markets with cites to general auction literature.
[124]
[125] Newberry, David, "Viewpoint: Freer Electricity Markets in the UK: A Progress Report," *Energy Policy*, 26:10, 1998, pp. 746-747; "Interview – UK Power Pool Says Reduces Price Surges," *Reuters*, April 16, 1999). Green, R.J. and D. M. Newberry, "Competition in the British Electricity Spot Market," *Journal of Political Economy*, 100:5, 1992; Newberry, David M. And Michael G. Pollitt, "The Restructuring and Privatisation of Britain's CEBG -- Was It Worth It?," *The Journal of Industrial Economics*, 45:3, 1997; Green, Richard, "The Electricity Contract Market in England and Wales," *The Journal of Industrial Economics*, 47:1, 1999; Wolfram, Catherine, "Measuring Duopoly Power in the British Spot Market," *American Economic Review*, 89: 1999.
[126] Klemperer, *Economic Theory, argues* that signaling and disciplining is more easily accomplished in a one-price auction. Interestingly, antitrust law makes it clear that coordinated activity need not be collusive.
[127] Puller, "Pricing and Firm Conduct," finds strong evidence of static market power and weak evidence of dynamic gaming in the first year of the market. There is a general consensus that gaming increased in subsequent years (Kahn, Michael and Loretta Lynch, *California's Electricity Options and Challenges: Report to Governor Gray Davis,* (hereafter, *Options*) Chapter III; Marcus, William and Jan Hamrin, *How We Got into the California Energy Crisis*, JBS Energy (2000).
[128]Bolle; see also "Necessary Conditions for Efficient Multiple-bid Auctions, in R. Nau, E. Gronn, M. Machina and O. Bergland, *Economic and Environmental Risk and Uncertainty: New Models and Methods* (Kluwer, 1997). Newberry, *Competition*, notes that behavior that Bolle allows poses a challenge for supply function analysis. Three auction "games" were modeled with an eye toward the U.K. electricity market. Game A leads to "arbitrarily high profits p. 98)." Game A describes California perfectly. Games B and C are saved by showing the consumers the spot market price and assuming they respond. In the best game, Game C, it is clear that if there is a supply-side response and a demand side response, the market could work

> When the consumers have to pay spot prices, an increasing number of producers implies that prices converge to marginal costs. This convergence is slow, however, if the fluctuations of demand are small (102).

[129] Sheffrin, *Empirical Evidence*.
[130] Klemperer, *Economic Theory*, at 30-31 citing Newberry, *Competition*, and Wolfram, *Strategic Bidding*, identifies four characteristics of the electricity market that are a concern in electricity markets that lead to concerns about "implicitly collusive

> ll number of bidders, capacity constraints, frequent repetition of auctions, and difficulty of entry.

[131] Teece, David, J. and Mary Coleman, "The Meaning of Monopoly: Antitrust Analysis in High-Technology Industries," *The Antitrust Bulletin* (Winter 1998), identifies Ricardian (scarcity), Schumpeterian (entrepreneurial) and monopoly (Porterian) rents (pat 819-822).
[132] The vexing problem of sorting out the nature of the rents is not just an idle eye-of-the-needle exercise. A great distraction in the debate presented to policy makers are disputes between parties seeking, who agree there is a massive problem requiring relief, over what the cause of the problem is. For example, see "Request for Rehearing and Comment of San Diego Gas and Electric

> *San Diego Gas & Electric Company v. Seller of Energy and Ancillary Services Into Markets Operated by the California Independent System Operator and the California Power Exchange*, May 8, 2001at 18-19.
>
> Various analysts, including Drs. Wolak, Sheffrin, Hildebrandt, Joskow, and Kahn, have submitted impressive studies in this proceeding purporting to show that individual suppliers have unlawfully exercised "market power" to drive up prices. But the case for pervasive anticompetitive conduct by suppliers is not

apparent -no smoking guns have been found thus far. A far more likely explanation of supplier behavior has been offered by Drs. Harvey and Hogan... After reviewing the studies prepared by the aforementioned analysts, Drs. Harvey and Hogan conclude that there is "no proof that strategic withholding has occurred..." [T]hey see rational profit maximizers responding to the incentives produced by a "seriously flawed" market design.

Drs. Harvey and Hogan do not dismiss "the possibility of the exercise of market power", but they contend that "the principal policy focus should be on fashioning workable solutions for the other more serious problems in market design that relate to the underlying causes of the market meltdown." In this regard, their only policy recommendation that is within the Commission's jurisdictional reach is for the Commission to approve market designs that rely on the grid operator "operating a coordinated and efficient market with consistent pricing for all that includes unit commitment, day-ahead scheduling, and real-time balancing." Of course, the absence of supplier misconduct would not protect suppliers from having to refund charges in excess of the just and reasonable rate for those periods since October 2, 2000, the date established by the Commission for commencement of potential refunds. Under the Federal Power Act, consumers have the legal right to be protected from a dysfunctional market-based ratemaking process every bit as much as the right to be protected from
anticompetitive conduct by individual market participants.

SDG&E believes that a properly designed wholesale market would be capable of producing lawful, competitive prices, even when supply is relatively scarce and even if the resulting prices are relatively high. The wholesale prices that have prevailed in California since last May, however, have been inexplicable and have been produced by market-based mechanisms that are notorious for being inefficient, ineffective, and inattentive to incentives. The Commission must insist that these market-based pricing mechanisms be re-designed from first principles in accordance with designs that have proven to be workable elsewhere. Until then, the Commission must discharge its legal duty and restrain the broken market to a zone of reasonableness using whatever tools are necessary to get the job done" and reclaim for consumers all charges that have been assessed in excess of lawful rates.

[133] Pearce, George, *The Dictionary of Modern Economics* (MIT Press, Cambridge, 1984), p. 124.

[134] Bannock, Graham, R.E. Banock and Evan Davis, *Dictionary of Economics* (Penguin, London, 1987). AT 128.

[135] Teece and Coleman, p. 819, define scarcity rents as :

> In many contexts where knowledge and other assets underpin a firm's competitive advantage, additional inputs cannot simply be purchased on the market to expand output… historically at least, economists have associated Ricardian rents with scarce natural resources like land or iron ore.
> The origin of the concept has been associated with land, hence it is occasionally referred to as ground rents (Rutherford, Donald, *Dictionary of Economics* (Routledge: London, 1992), at 137).
> As land was regarded in **classic economics** as the only fixed factor of production, it alone earned rent. However, as any factor of production can be fixed in supply, 'rent' can be earned by any factor of production. Popular examples of factors with an **inelasticity of supply** abound; labor can earn economic rent as persons with rare talents (e.g. opera singers and top sports players) have high earnings largely consisting of economic rent.

[136] Teece and Coleman, p. 822) define present Monopoly (Porterian) rents which "stems from the naked exercise of market power

[137] Pearce, at 366.

> Quasi-rent. The return to a seller of a good or service over and above its *opportunity cost* when the good is temporarily in fixed supply. The concept was applied by *Alfred Marshall* to the determination of the price of capital in the short run when the supply of capital is fixed. The owners of capital receive a payment which differs from the opportunity cost of using that resource by the amount of quasi-rent. In the long run when the factor can be augmented or depleted the equilibrium price will reflect the cost of alternative uses.

[138] Teece and Coleman, pp. 820-821

[139] Scherer, F. M. and David Ross, Industrial *Market Structure and Economic Performance* (Boston, Houghton Mifflin: 1990), at 660.

> Viewed in their entirety, the theory and evidence suggest a threshold concept of the most favorable climate for rapid technological change. A bit of monopoly power in the form of structural concentration is conducive to innovation, particularly <u>when advances in the relevant knowledge base occur slowly</u>. But very high concentration has a positive effect only in rare cases, and more often it is apt to retard progress by restricting the number of independent courses of initiative and by dampening firms' incentive to gain market position through accelerated R&D. Likewise, given the important role that technically <u>audacious newcomers</u> play in making radical innovations, it seems important that barriers to new entry be kept at modest level.
> Schumpeter was right in asserting that perfect competition has no title to being established as the model of

> dynamic efficiency. But his less cautious followers were wrong when they implied that powerful monopolies and tightly knit cartels had a strong claim to that title. What is needed for rapid technical progress is a subtle blend of competition and monopoly, with more emphasis in general on the former than the latter, and with the role of monopolistic elements diminishing when rich technological opportunities exist.

[140] Specific and concrete stupidity rents can be identified. Cooper, *Economics*, identified increases in transaction costs and loss of load balancing (pool effects). Cooper, *Outages,* identified breakdowns in coordination, while Cooper, *Spike, and Reconsidering,* identify gaming.

[141]

[142] Wolak, et. al. Joskow, Paul and Edward Kahn, *A Quantitative Analysis of Pricing Behavior In California's Wholesale Electricity Market During Summer 2000,* January 15, 2001.

[143] Maloney, Michael, et. al, *Customer Choice, Consumer Value: An Analysis of Retail Competition in America's Electric Industry* (Citizens for a Sound Economy, 1996).

[144] Energy Information Administration, *Electricity $Sales and Revenue 2000,* shows that California has the third highest residential rates in the nation on a statewide average basis. xx

[145] *Manifesto on the California Electricity Crisis*, January 26, 2001.

[146] *New York Times,* March 27, 2001.

[147] In statistical analysis, the problem is a classic case of balancing Type I and Type II error. One can commit the error of not deregulating a market that should be deregulated (Commissioner Wood's fear) or one can commit the error of deregulating a market that should not be (the California problem). One can tests each of the hypotheses separately. Most importantly, one can test the hypothesis that deregulation will not have negative side effects. One can reduce the probability of incorrectly rejecting the hypothesis or incorrectly accepting it. Hays, William, *Statistics* (New York: Holt, Rinehart and Winston, 1963, at 281-282.

> The conventions about the permissible size of the probability of Type I error actually grew out of a particular sort of experimental setting. Here it is known in advance that one kind of error is extremely important and is to be avoided. In this kind of experiment these conventional procedures do make sense when viewed from the decision-making point of view...
>
> As an example of an experimental setting where Type I error is clearly to be avoided, imagine that one is testing a new medicine [deregulation], with the goal of deciding if the medicine is safe for the normal adult population. By "safe" we will mean that the medicine fails to produce a particular set of undesirable reactions on all but a very few normal adults [unjust and unreasonable prices]. Now in this instance, deciding that the medicine is safe when actually it tends to produce reactions in a relatively large proportion of adults is certainly an error to be avoided. Such an error might be called "abhorrent" to the experimenter and the interests he represents. Therefore, the hypothesis "medicine unsafe" or its statistical equivalent is cast in the role of the null hypothesis, H_o, and the value of a chosen to be extremely small, so that the abhorrent Type I error is very unlikely to be committed. A great deal of evidence against the null hypothesis is required before H_o is to be rejected.