Consumer Federation of America

ALL PAIN, NO GAIN:

RESTRUCTURING AND DEREGULATION IN THE INTERSTATE ELECTRICITY MARKET

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Electricity is a unique industry. It is a complex, real time network that requires cooperation and coordination to deliver a vital service. Demand for electricity is inelastic. Consumers faced with high electric prices cannot simply stop using electricity or switch to something else. Supply of electricity is also inelastic. Substantial new power plants take long lead times to construct. The transmission system cannot be expanded easily. Once produced, electricity cannot be stored very efficiently. As a result, it is deeply "affected with the public interest" and requires a balance of public and private responsibilities and incentives to keep it running smoothly.

Restructuring and deregulation have undermined these values in the electricity industry. State policymakers recognized these problems and slowed down or reversed the irresponsible rush toward deregulation. Unfortunately, federal policymakers are charging ahead with deregulation policies such as the Electricity Title of the Energy Bill and the Standard Market Design proposal put forth by the Federal Energy Regulatory Commission.

All Pain, No Gain

States have been convinced to slow down or stop restructuring based on a mountain of evidence that restructuring and deregulation of the electricity industry offers enormous risks for consumers and virtually no rewards. Restructuring and deregulation has unleashed abuse of market power, excessive scarcity overcharges, inefficient transactions costs, and a sharp increase in the cost of capital. These cost increases swamp efficiency gains projected for deregulation.

Market Power

- In a deregulated system, generators and transmission owners have demonstrated the ability to manipulate the market and withhold supplies to drive prices up.
- While a tenfold increase in California has attracted most attention, market power cost increases of 20 to 30 percent have been documented across the country.

Scarcity

- Generators and transmission owners enjoy excess profits when the price of scarce resources is bid far above their costs in tight markets. The bidding system in California and the one that FERC wants to impose on all regions of the country is designed to pay the highest price the market will bear for all power supplied by the market.
- These overcharges add 50% to the wholesale price of electricity. In California, in 2000 before the manipulation caused a complete meltdown, these overcharges equaled $2 billion. An analysis of scarcity pricing in Florida indicates the increase in the wholesale prices would be about that large.

De-Integration Cost Increases

- De-integration of the industry raises costs by requiring more numerous and more complex transactions. Transaction costs increases and the need for more facilities to support trading and prevent abuse of market power could add another 10% to 20% to the cost of electricity.
- Merchant generators demand a quicker recovery of costs and a higher return capital. This short term perspective increases the cost of capital for building new lines, new plants, etc,, by 20% to 50%,

Proponents of deregulation have claimed that opening the retail market would bring price cuts and improved goods and services to consumers. However, FERC's most recent estimates and real world experience indicate pure efficiency gains of only 3-5 percent, which are swamped by all of the added costs.

RESTRUCTURING AND DEREGULATION

Disregarding the fact that the consumer will end up worse off, federal policymakers are charging ahead. The Electricity Title was drafted largely in 2001 and passed the Senate in April 2002. It was drafted before Enron filed for bankruptcy, before there was a clear sense of the magnitude of the exploitation and manipulation that occurred in deregulated markets, and before the financial meltdown in the industry. The House did not even pass an electricity title. Yet, without contemplation of the vast range of massive problems of fraud and market manipulation, Congress is considering repealing the Public Utility Holding Company Act, which provides the cornerstone of consumer and investor protection. Rather than repeal PUHCA, Congress should modernize and strengthen it.

The Electricity Title further demands that the country's consumer and publicly owned electricity systems join regional transmission organizations. To date, these

entities, who serve one-quarter of the country, have fared far better than those generators and distributors that have experienced deregulation.

FERC's Standard Market Design puts consumers further at risk. The nation's transmission wires, the infrastructure over which electricity flows, are a bottleneck facility, like highways, that will not support competition. Constraints on building these facilities are environmental and social, not economic. They have been neglected by utilities and regulators for over a decade, but the SMD forces utilities to bid for these resources under a system that drives prices to the highest price the market will bear.

While the FERC promises to prevent the abuse of market power, the SMD does not define market power in a meaningful way. FERC's most concrete consumer protection is a $1,000 per MWH price cap on wholesale rates. This is 30 times higher than average prices and 20 times the ceiling that was imposed in California to quell the meltdown of the market. FERC has yet to order substantial refunds for the billions of dollars of overcharges in California and the West.

FEDERAL POLICYMAKERS NEED TO STEP BACK AND CAREFULLY RECONSIDER RESTRUCTURING AND DEREGULATION

Rather than rushing ahead with restructuring and deregulation, Congress and FERC need to step back and fully understand the implications of the abuses, operational disruptions, and the financial crisis that has occurred in the electricity industry. Congress must restore simplicity and transparency to the industry. The first goal must be to reinforce consumer and investor protections. A comprehensive review of the national transmission system should be conducted. Effective mechanisms for planning and expanding the grid should be demonstrated in reality. Institutions for managing the grid and overseeing trading should be transfigured before moving forward.

Federal authorities must recognize that vast differences between regions in population densities, resource mix, and institutional make-up must be reflected in the delivery of a vital service like electricity. Implementing either the Electricity Title or SMD without taking these precautionary measures into account will most certainly impose substantial harm on the public.

WHEN YOU ARE HEADED IN THE WRONG DIRECTION, GOING FASTER DOES NOT HELP

A. INSTITUTIONS SHOULD FIT THE FACTS

1. Balancing Public Responsibilities and Private Incentives was the Right Approach to Utility Services

From the beginning of the electric utility industry a century ago until the restructuring craze of the late 1990s, public policy recognized that the electricity industry is "affected with the public interest." The unique nature of electricity as a service and its growing importance to the industrial economy and daily life shaped state and federal policy. As a result, the U.S. developed a uniquely pragmatic approach that blended private and public interests.[1] Unlike most other capitalist countries where state monopolies provided electric service, we relied primarily on private capital that was subject to direct oversight by state and federal utility commissions.

At the federal level, the Public Utility Holding Company Act and the Federal Power Act embraced an approach towards interstate commerce in electricity that sought to keep the industry structure simple and focused on operational efficiency. At the state level, utilities were granted franchises to serve in specific areas, which allowed them to finance projects with a low cost mix of long-term debt and equity. In exchange, they shouldered public responsibilities like the obligation to serve all comers on demand, a commitment to "keep the lights on" by building capacity to meet demand growth, and a duty to interconnect on "just, reasonable and nondiscriminatory rates, terms and conditions." In both state and federal jurisdictions, just and reasonable prices were determined by the actual cost of providing service, which included a reasonable return on private investment.

Public ownership through public and cooperative power was used to meet specific needs in parts of the country where private capital would not go and to provide a benchmark comparison between service areas. It was kept close to the people through municipal or direct consumer (co-op) ownership, which prevented the growth of entrenched national bureaucracies. This pragmatic, diverse approach exhibited inefficiencies, but the balance between public and private was critical to ubiquitous, affordable and reliable service.[2] The result was the best utility sector in human history.

2. Deregulation Destroyed the Balance on Which Utilities Had Thrived: State Regulators Have Backed-Off on Restructuring and Deregulation

While economic theory could find ways to make these utilities better, economic reality proves that the core characteristics of the industry are too powerful and important to fool with.[3] Deregulation did just that, imposing market transactions and encouraging competition where vertical integration and cooperation are critically

important. Policymakers tried to force people to shop in the market for innovative utility products, when reliable service was what they wanted and really needed. 'Deintegration' quickly turned into disintegration because capital and commodity markets would not support the public functions served by this industry.

Policymakers across the country, who are closest to the people who pay the bills, quickly recognized the fatal flaws of electricity deregulation. They stepped back from the deregulation experiment, slowing it down in many cases and reversing it entirely in several other cases.[4] However, in a remarkable example of government policymakers in Washington losing touch with the reality of the rest of the country, Congress and the Federal Energy Regulatory Commission (FERC) are steaming ahead toward more radical restructuring and deregulation of the electricity industry. The Electricity Title of the Energy Act being debated in a House-Senate conference combined with the Standard Market Design (SMD) rules recently proposed by the FERC are a one-two punch that is extremely hazardous to the health of the American electricity consumer.

Both of these measures were conceived long before the meltdown in the competitive electricity sector and have not been revised despite the many documented problems resulting from earlier steps toward deregulation. Neither reflects an understanding of the magnitude of the financial crisis that has hit the industry or of the profound implications that recently revealed massive fraud and abuse have on the electricity market and consumers.

As the *Wall Street Journal* noted on September 16, 2002,

> Even though the California power crisis clearly ranks as a watershed event in U.S. business history, many of the details remain murky. For instance, regulators have yet to sort out what portion of corporate profits generated during the year-long crisis were due to outright manipulation. Nor is it clear the extent to which suppliers conspired to rig the market.[5]

The measures proposed by Congress and FERC would have been inadequate to cope with the problems that had presented themselves before the recent revelations, They do not even begin to address the massive problems that have come to light in the past six months.

B. ALL PAIN, NO GAIN

1. Price Increases That Are Caused by Restructuring

What has convinced the states to change direction, and makes the federal rush toward restructuring and deregulation all the more remarkable, is the mounting evidence that there is little to gain from this policy and much to lose.[6] The key here is not to focus on the public meltdown of California in 2001, to which the SMD devotes so

much attention, but to think about all the other places where significant problems have been persistent, although not as spectacular as the great California fiasco. This analysis includes:

- California in 1999 and 2000, where wholesale prices quadrupled driven by artificial scarcity and market power.[7]
- The Mid-West in 1998, where early versions of the bogus trading practices that overwhelmed California (Daisy chains and wash-trades) inflated prices by half – a billion dollars in just one week.[8]
- Montana, where the abandonment of cost-based pricing led to a fourfold increase in industrial rates and a skyrocketing of residential rates.[9]
- The market structure analyses of Wisconsin,[10] Colorado,[11] and Florida[12] that showed sharp price increases would almost certainly flow from restructuring and deregulation, and convinced policymakers not to go down that path.

The evidence that radical restructuring and deregulation will result in higher costs has become overwhelming. Because of the nature of electricity service, eliminating the critical public interest obligations and values to rely on weak market forces results in manipulation, abuse, and inefficiency. Given the current status of the physical and institutional infrastructure, as well as the fundamental economic characteristics of the electric utility industry, there are four large sources of costs that can be imposed on the public with very few offsetting benefits (see Table 1).

- **Monopoly Overcharges:** Market power drives the price of electricity up because generators and transmission owners can overprice their product or withhold supplies. Analyses of actual markets indicate increases in prices from 20 to several hundred percent.
- **Excess Scarcity Overcharges:** Allowing generators and transmission owners to control/create scarcity and then capture the value of scarcity by pricing goods and services far above their costs. Analyses indicate these could range from 20 percent to 50 percent.
- **Stupidity Costs:** Administrative inefficiencies of imposing markets on complex services that require close coordination and cooperation results in substantial increases in transaction and administrative costs. Analyses indicate these costs are in the range of 10 to 20%.
- **Cost of Capital:** A competitive market raises the cost of capital sharply for this industry, which is very capital intensive, as deregulated generators and transmission owners seek quicker paybacks with less certain revenues. Analyses indicate these increases could range between 5 and 15%.

TABLE 1:
SOURCES OF PRICE INCREASES IN RESTRUCTURE, DEREGULATED ELECTRICITY MARKETS

SOURCE OF INCREASE	PERCENT INCREASE	
	LOW	HIGH
Market Power[a/]	20	400
Scarcity Pricing[b/]	20	50
Administrative/ Operating Inefficiency[c/]	10	20
Cost Of Capital[d/]	5	15

[a/] See Table 3.

[b/] See below pp. xx based on the analysis of the supply curve in Florida that indicates scarcity rents equal to 50% of regulated costs (see Florida Municipal Electric Association, *Energy 2020 Study Commission Wholesale Deregulation Proposal Will Raise Electricity Prices and Maximize Profits of Private Utility Shareholders*, January 29, 2001) as does analysis of the California market in 1999 and 2000 (see Borenstein, Severin, James Bushnell and Frank Wolak, *Measuring Market Inefficiencies in California's Restructured Wholesale Electricity Market* (Center for the Study of Energy markets, June 2002).

[c/] Estimates are equal to the economies of integration, since deintegration would jeopardize these. Lower estimates are found in Hayashi, Paul M., James Yeoung-JLA Goo and William Cliff Chamberlain, Vertical Economies: th e Case of U.S. Electric Utility Industry, 1983-1987 and Kaserman, David L. and John W. Mayo, "The Measurement of Vertical Economies and the Efficient Structure of the Electric Utility Industry," Journal of Industrial Economics, 29:5, 1991. Higher estimates are found in Kwoka, John E. Jr., Power Structure: Ownership, Integration, and Competition in the U.S. electricity Industry (Dordrecht, Boston: 1996).

[d/] See below pp. 29-30 and Staff Report, *Market Clearing Prices Under Alternative Resource Scenarios: 2000 –2010* (California Energy Commission, February 2000). U.S. Department of Energy, Office of Economic, Electricity an Natural Gas Analysis, *The Impact of Wholesale Electricity Price Controls on California Summer Reliability* (June 2001)

In a few instances, where prices were very high, primarily as a result of excess capacity and price caps remain in place, consumers have not suffered price increases in the near term. Market power transfers resources between producers, while regulation prevents price increases. Little competition exists for retail customers and efficiency gains are small or nonexistant.

2. The Incredible Shrinking Benefits of Restructuring and Deregulation

When the debate over restructuring of electric utilities began, proponents made a number of claims predicting that restructuring and deregulation of the retail electric market would bring both price and service benefits to consumers.[13] Projected price reductions were placed in the range of 40 percent. Without close scrutiny, these claims gained considerable prominence. As the debate has unfolded, however, it has become clear that the initial claims and promises are likely to far exceed the reality.[14] It is now clear that early analyses, which claimed so much benefit for consumers, had little basis in reality because:

- they were primarily theoretical discussions of the benefits of competition without thorough analysis of the economics of the electric utility industry;

- Their projections were based on unrealistic assumptions about economic and political behavior; and

- the analogies they drew between electricity and other industries ignored the fate of captive customers.

Once public scrutiny was brought to bear on these unsubstantiated claims, official estimates became much more subdued (see Table 2). In the late 1990s the Energy Information Administration (EIA) estimated short-term price declines in a competitive electric market in the range of 6 to 13 percent, before stranded cost recovery is added back in. EIA did not believe that even a 20 percent reduction was sustainable.[15]

Not only did these estimates exclude stranded costs, but they also did not allow for transaction costs, cost shifting, or the exercise of market power. The EIA also recognized that the actual price declines will vary by region.

In the most recent effort to estimate potential efficiency gains, the projections have shrunk yet again. The FERC's analysis projects a base case efficiency gain of about 4 percent over almost 2 years.[16] Once again, transaction costs, market imperfections and market power are not taken into account. Even these small gains have been challenged as being too large.[17]

TABLE 2:
DECLINING PROJECTS OF EFFICIENCY GAINS FROM RESTRUCTURING AND DEREGULATION

DATE OF CLAIM	PERCENTAGE PRICE REDUCTION PROJECTED
1995[a/]	40+
1998[b/]	6 ≤ 20
2002[c/]	3-5

[a/] See, for example, Maloney, Michael, et.al, Customer Choice, Consumer Value: An Analysis of Retail Competition in America's Electric Industry (Citizens for a Sound Economy, 1996); Maloney, Michael T., Robert E. McCormick and Robert D. Sauer, and Jerry Ellig, Economic Deregulation and Customer Choice: Lessons for the Electric utility Industry (Center for Market Process, 1999)

[b/] Energy Information Administration, Electricity Prices in a Competitive Environment: Marginal Cost Pricing of Generation Services and Financial Status of Electric utilities, A Preliminary Analysis Through 2015, (U.S. Department of Energy, August 1997.

[c/] ICF Consulting, *Economic Assessment of RTO Policy,* Prepared for the Federal energy Regulatory Commission, February 26, 2002, Tables ES-1, ES-2. Casazza, John, A., "Electricity Choice: Pick Your Poison: A. Errant Economics? B. Lousy Law? C. Market Manipulation? D. All Three?," *Public Utilities Fortnightly*, 2001 (March 1), identifies efficiency gains in generation of 3 percent. Newbery, 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, places pure efficiency gains at the 5% level for the U.K. (Newberry and Pollitt, pp. 297-298).

The bogus claims that were made for restructuring before the experiment was attempted have been matched by equally bogus attempts to claim that the market is working for the benefit of consumers. In virtually every state that has opened its market, competition is almost entirely lacking, especially for residential customers. To the extent that there have been price decreases, they have been ordered by regulators, not created by market forces. Price caps, which advocates of restructuring and deregulation decry, have protected consumers from dramatic price increases in other states.

There is simply no credible, real world evidence that the leap to markets in electricity services is good for consumers, even where circumstances are ideal. There is also a very strong probability that further deregulation of electric markets could be very bad for consumers. While deregulation will force consumers to bear the risk of increasing costs, there is little potential gain from the radical restructuring and deregulation of the industry.

3. The Impact on Consumers and Local Economies Has Led to Substantial Opposition

Each of the potential costs identified is likely to be far larger than the efficiency gains in fuel use and resource management that can be claimed for restructuring. In other words, when all of likely costs are factored in, consumers are likely to be large net losers. The weight of the evidence indicates that the costs to consumers of radical restructuring and deregulation are likely to be at ten times the size of the benefits. Even if the FERC controls market power, on which it has focused so much attention, consumers are likely to end up much worse off as a result of other factors that would increase prices.

After a decade in which FERC and transmission owners neglected the transmission system, artificial scarcity is apparent. Upgrades need to be made, but there is little chance they will be completed before severe scarcity prices will be imposed. The reality is that scarcity of transmission service will ensure extremely high prices and this "signal" will not ensure that additional transmission can or will be developed where it is most needed.

The fact that Congress and the FERC are charging ahead with restructuring and deregulation, in spite of this decidedly negative cost-benefit analysis, would be laughable if the stakes were not so high. A net increase in consumer bills of 30 percent, for example, would raise electricity costs by $60 billion. Two-thirds of that would be a massive transfer of wealth from consumers to owners of generation and transmission facilities, while one-third would be waste. Outcomes could be much worse than that, as events in California and the West demonstrated.

Not surprisingly, consumers and public policy officials all across the country are outraged. In the West, where consumers have already been badly burned by electricity restructuring, and in the South where policymakers stuck to cost-based pricing to protect consumers, governors and regulators have formed an alliance to stop this radical restructuring. The public sector, which has avoided the pain of restructuring, is concerned. Large industrial users, who first championed restructuring, are now deeply troubled by proposals on the table.

- According to the Western Governors Association "the presently fragile Western economy cannot afford missteps that may result from the unprecedented changes to our electric power system that are embodied in the SMD rule."[18]

- The Southern Governors Association indicates that increases in Arkansas alone could reach $1 billion over the next ten years, concluding that "increases in electricity prices in the Southern states could harm economic development at the same time as the possible increase in generating plants could negatively impact the environment."[19]

- The American Public Power Association is particularly concerned about having clear definitions of market power, suggesting that the utter mishandling of the Western situation demands that "Congress must clearly define the fundamental characteristics of workable competitive markets and FERC should permit wholesale sale at market rates in regional markets that are consistent with those characteristics and require sales at cost-based rates in those that are not.[20]

- Representing large industrial uses, ELCON cautioned that "Don't clone PJM into Other RTOs because "PJM's use of locational marginal pricing (LMP) [is] restricting purchase options and therefore inhibiting competition."[21]

They all recognize that FERC's SMD will unleash anti-consumer forces that will overwhelm any feeble protections that may remain within the Electricity Title, while simultaneously stripping away their ability to shelter consumers from the damage that deregulation will do.

C. RADICAL RESTRUCTURING AND DEREGULATION

1. The Electricity Title of the Energy Act

The first policy proposal that will significantly hurt consumers and lead to more disruptions and higher prices is contained in the Energy Bill moving through the Congress. The Electricity Title was originally introduced over a year ago and substantially completed in the Senate in April 2002. This was before Enron filed for bankruptcy, before the merchant electricity generators admitted to bogus trading practices that pumped up the size of their profits and the price of electricity in California, and before any government officials began to suspect – what is just now becoming apparent - that the price of natural gas had been manipulated in California.

Not considering any of these then unknown factors, Congress drafted the Electricity Title repealing the 1935 Public Utility Holding Company Act (PUHCA) and forcing public and consumer owned electricity systems (that serve over one-quarter of the country) into federally mandated transmission organizations. The public and cooperative segments of the industry, which avoided being swept up in the deregulation frenzy, have fared much better than the rest of the industry.[22]

PUHCA was designed to oversee the structure, financing and operations of utility holding companies. A cornerstone of the electric utility industry under PUHCA was a desire to simplify the ownership structure and to ensure a direct operational or functional relationship between subsidiaries of a holding company. Over the course of the 1990s, deregulation moved the industry structure away from those principles. Many of the systemic abuses that have afflicted the electricity market since restructuring began in the late 1990s would have been prevented if PUHCA had been vigorously enforced.[23] Instead of repealing PUHCA, Congress should modernize and invigorate it.

Properly implemented PUHCA would require simplified structures, examine accounting practices, review affiliate transactions, and restrict diversification by requiring direct functional relationships between activities.[24] : PUHCA was designed to prevent all of the abuses in which Enron and the other merchant generators engaged. In fact, a moment's review of the origins of PUHCA shows that it was enacted as a reaction to gross abuse of electricity consumers in the early days of the industry. The assumption so widely bandied about in the 1990s that other institutions had grown strong enough to protect consumers and investors from these abuses is simply wrong.[25]

Public and consumer owned electricity systems managed to insulate themselves from industry upheaval in the 1990s. Before federal authorities extend their control to the one set of electricity providers who avoided the meltdown, they should demonstrate that some body can run the interstate transmission grid in an orderly manner.

2. The Standard Market Design

The second swipe at consumers comes in FERC's plan to dramatically restructure the industry nationwide, while embracing free market pricing known as Standard Market Design or SMD. Ironically, FERC's market design was largely born from complaints of merchant generators about being discriminated against by transmission owners. Merchant generators complained that transmission owners, holders of the rights to move electricity across the wires, were unfairly allocating access and establishing rates that prevented them from competing to sell electricity. FERC has labored to produce a 600-page order to radically restructure interstate electricity markets to eliminate "undue discrimination" against the very merchant generators.

FERC claims to have invented a system to prevent the most outrageous forms of abuse of market power, such as those committed in California by merchant generators and marketers and natural gas pipeline owners. However, FERC has refused to define market power on a 'going forward' basis and has failed to produce significant refunds to the people of the West who were the victims of unchecked market manipulation. The only concrete protection FERC offers is to "cap" wholesale

rates at $1,000 per MWH, 30 times higher than average rates, and 10 to 20 times higher than the caps that it implemented in California to quell the chaos in that market. FERC's proven inability to protect consumers is extremely troubling in light of its proposal to radically restructure the rules by which electricity moves from state to state.

FERC's plan is to force all regions of the country to implement extremely complex, short-term, dynamic markets for electricity, transmission, and related services, even though most of the country has absolutely no experience with such markets. In so doing, FERC has decided that the new regional transmission organizations must price newly defined transmission and energy products in short term, single price spot markets that will ensure consumers pay the highest price the market will bear for their electricity.

This is a radical deregulation of interstate markets. In the 60 years between the passage of the Federal Power Act (1934) and the implementation of electricity restructuring (1996 in California), federal and state regulators have based electricity prices on the cost of service. FERC now proposes to base electricity prices on the scarcity value of electricity, regardless of what it actually costs to produce and deliver. FERC has imported some high sounding language from economic theory, but the centerpiece of the strategy is to first extend FERC's jurisdiction over transmission capacity and then to allow transmission capacity to be bid up to the highest price the market will bear; or, as FERC euphemizes,

> The adoption of a market-based locational marginal pricing (LMP) transmission congestions management system is designed to provide a mechanism for allocating transmission capacity to those who value it most."[26]

In other words, FERC will create a market based on scarcity pricing where those with funds to pay for it can purchase access to a limited resource; the electrical grid. This will undoubtedly result in huge profits accruing to the few owners of the transmission systems at the ultimate expense of consumers. Furthermore, FERC has proposed to extend its own jurisdiction from wholesale transactions between utilities into transactions that directly affect retail sale of electricity to consumers.

D. Federal Policymakers Need to Step Back and Carefully Reconsider Restructuring and Deregulation

To justify pushing ahead with radical restructuring and deregulation, the FERC has devoted a great deal of effort to preventing a repeat of the worst abuses from recurring, only to lose sight of the fact that even the best outcome is likely to be bad for consumers. The risks for most electricity consumers far outweigh the potential rewards.

The FERC proposal turns the management of the electricity grid into a game of cops and robbers. In order to claim that the practices used in California will not recur, it has designed a complex set of rules and oversight mechanisms that will require an army of accountants and auditors. But, the merchants are certain to continue to run circles around the regulators because the potential profits are so large.[27] Fro its part, Congress has done almost nothing to deal with these abuses. It has failed to subject electricity trading to effective oversight.

While FERC says that participation in its numerous new markets is voluntary, a radical change in how all utilities do business, and ultimately how consumers are charged will be forced on utilities and their customers. Utilities will be forced to negotiate bilateral contracts, under extremely unfavorable conditions. The market price of electricity will rise because merchant generator finance is expensive and FERC has not yet demonstrated that it can prevent the abuse of market power. As stated earlier, the SMD does not even provide a definition of market power or propose any penalties for abusing that power. Market or monopoly power has been and will continue to be a pervasive problem in electricity markets.

As utilities are forced to buy more and more of their transmission services in these markets, changes and growth in load will have to be supported by transmission services purchased in FERC's market. Because FERC has designed the transmission system as the funnel through which all scarcity value flows in the system, the growing demand and resulting price increase in transmission services will be passed on to consumers.

FERC hopes that over time competition will drive scarcity prices down, but transmission systems are complex networks that simply will not support competitive overbuilding. Expansion of transmission facilities and location of generating capacity is constrained not by economics, but by environmental and social concerns. Consequently, scarcity prices (economists call them scarcity rents) will be a permanent feature of transmission markets. Finally, the administrative costs of an extremely complex system for operating half a dozen markets simultaneously will fall on consumers.

The Energy Title and the SMD were conceived long before the magnitude of the crisis in the competitive electricity sector was evident. Neither measure considered the present reality and it is suicidal to hatch either one in the current environment. This is not the time to force radical changes on the electric utility industry, which is the lifeblood of an information-based economy. Rather than force market participants to buy new electricity products on a massive scale in untried markets, federal policy should be seeking to stabilize and simplify the functioning of the industry. It should restore the public interest principles and obligations that previously delivered adequate supplies at stable prices.

Congress needs to reinforce the consumer and investor protections in the Federal Power Act and PUHCA much more vigorously than the electricity title. It

should also allow regions to adopt different models and negotiate an integrated market without guns to their heads.

FERC's efforts to create a standard market design are vastly premature. It is absurd to suggest that discrimination in access to the transmission network, on which the SMD focuses most of its attention, is the fundamental problem in the industry. It has just begun to admit that something went wrong in earlier deregulatory attempts but has not yet figured out what the problem was.[28] FERC has not conducted a comprehensive review of the transmission network in decades nor does it have a planning process for grid expansion. Transmission needs a decade of coordinated resource planning with mandated reserve margins and open access rules to make up for the lost decade of the 1990s during which it was largely ignored. Information exchanges must be developed before the FERC attempts to define market structures. FERC needs to demonstrate that it can create a set of institutions that can build, operate and maintain a transmission grid that is reliable and adequate.

The remainder of this paper presents a review of the empirical basis for the concerns outlined above. The experience and analysis of electricity restructuring demonstrates that the risks to consumers of restructuring are substantial, the potential gains are minuscule, and current federal proposals not only fail to protect consumers but are very likely to impose substantial harm on the public.

THE UNIQUE NATURE OF ELECTRICITY SERVICE

A. THE FUNDAMENTAL CHARACTERISTICS OF ELECTRICITY

1. Demand

Any discussion of electricity policy must start from a simple observation. It is different. Electricity is a necessity that has no substitute on the demand side. Electricity is like oxygen to the 21st century economy and way of life. While the bits and bytes carry information, they cannot go anywhere if the electrons do not flow. The continuous flow of large quantities of electricity to meet highly seasonal demand is the central characteristic of the demand side of the market. Denial of access to this service results in deprivation; access based only on price and the ability to pay results in discrimination.

Demand is driven largely by weather and is geographically focused. Typically, many consumers are affected simultaneously by the same factors that increase demand. This makes the demand on local and regional networks and commodity markets subject to extreme peaks and valleys. Moreover, for the vast majority of

consumers and over the relevant range of economic values, reliability is an externality, a characteristic not included in the price. This is a network industry in which the fate of each depends upon the actions of all. Individuals cannot create their own reliability or capture its full value in private transactions.[29] Economic and institutional barriers make it difficult for small consumers to freely self-supply or to bargain effectively for supplies.

In sum, the price elasticity of market demand is very low in the short-term and low in the long-term. The effects of price increases are minimal on demand. In large part, consumers simply cannot adjust usage based on rates. The demand side cannot be counted on to discipline abusive pricing behavior. Inflexibility of demand and its sensitivity to weather renders the market volatile and vulnerable to abuse.[30] It also creates a widely shared view that the "obligation to serve" is an important principle in the industry.

One of the key factors that drive prices up is the need of utilities to ensure the physical availability of supply. Imposing an obligation on utilities to serve creates an uneven bargaining context. Entities with the obligation to serve are at a disadvantage to those who simply produce or transport electricity. Consumers have generally supported this fundamental principle of utility service because electricity service is just too important to be unreliable.

For all the focus on market efficiency, the ultimate test of electricity service is keeping the lights on. Some load serving entities still have the obligation to ensure that they do so. However, in a deregulated market for supply, there are adverse consequences of this obligation. It is difficult for utilities to exercise restraint as supplies become tight. Merchants can withhold supply and 'only' suffer a financial loss; utilities cannot let the lights go out.

The best evidence from electricity markets is that the short run elasticity of demand is considerably less than -.1. In other words, a 10% increase in price results in less than a 1 percent decrease in demand. In San Diego, where prices doubled during the summer of 2000, the elasticity of demand was less than .03.[31]

A recent study finds that elasticities of demand exhibited in programs targeted at demand reduction are quite low.[32] The model programs achieve elasticities in the range of .03 to .1.[33] Long run elasticities may be somewhat higher, but they are generally considered to be considerably less than 1.[34]

The low elasticity of demand is now recognized as the most critical factor in rendering the market volatile and vulnerable to abuse. When demand is inelastic, consumers are vulnerable to price increases, since they cannot cut back or find substitutes for their use of the commodity. When the most important market force in disciplining market power, demand elasticity, is as low as observed for electricity, there are many opportunities to exercise market power.

2. Supply

Because of the basic physics of electricity, the production, transportation and distribution networks are extremely demanding, real-time systems. Electricity cannot be stored economically. The system requires perfect integrity and real time balancing much more than other services and commodity systems do.[35] The infrastructure to produce, transport and deliver electricity is extremely capital intensive and inflexible. It takes a long time to build and bring power plants and transmission lines into service and they last a long time. Thus, the ability to expand supply in the short and medium term is severely limited.[36] This is the critical factor that creates volatility and vulnerability to the abuse of market power on the supply-side.[37]

Electricity facilities are quintessential infrastructure. Capital-intensive assets in this industry are long-lived, sunk, and inflexible parts of an integrated network. Their value is to the network as a whole and not easily allocated. The problem of meeting peak load demand and the externality nature of reliability render peaking facilities – power generating facilities that are able to quickly start and stop in order to meet short term increases in demand - extremely important, but also financially risky in a market environment. Long-term, public commitments are needed to support these infrastructure projects but that perspective is not promoted by the commodity market mentality.

Because of the nature of the industry, the cooperation of all entities participating in the industry is critical to its smooth operation. The competitive ethic that pervades markets frustrates the achievement of the necessary cooperation, increases costs and weakens the base for coordination and integration of supply and demand. Empirical studies show that strong economies are achieved by coordinating electricity supply and demand.[38] Before restructuring, the electricity industry was a reasonably well-run, complex, integrated network that was under some stress.[39] Creation of markets for electricity services leads to a huge growth in the number of transactions conducted every day and creates heavy administrative requirements. An entity that once maintained real-time balance as an insulated operation that could oversee its own supply, demand and delivery, must now contract to achieve real-time balance simultaneously in five, six or seven different markets over broad geographic areas.[40] This has proven a daunting task[41] that consumes substantial resources.[42]

Accidents have a special role in market networks such as these. Because of the demanding physical nature of the network, accidents are prone to happen. Because of the volatile nature of the commodity, accidents tend to be severe. Because of the integrated nature of the network and demanding real-time performance, accidents are highly disruptive and difficult to fix. To keep things in balance, the system needs either plentiful reserves close at hand, ample amounts of transmission capacity readily available to move abundant supplies from far away, or a great deal of load that can be quickly shed. Most electricity markets do not have those luxuries today,[43] or any chance of acquiring them any time soon.

Environmental impacts, including pollution, carbon emissions, and nuclear waste and vulnerabilities, are a major concern in the industry and they deeply affect the deployment of its facilities and operations. The industry consumes large quantities of water and emits large quantities of pollutants. It is difficult to attribute a value or cost to these factors and incorporate that figure into the cost of a particular transaction. The market for pollution cleanup is established by a fundamentally, non-market transaction – a political decision about what is or is not a pollutant and how much should be tolerated in public space. These environmental concerns result from fundamental decisions by society about how it values the environment and place significant constraints on the deployment and operation of facilities.

Finally, public resources are deeply embedded in the electricity industry in additional ways. The most traditional use of public resources plays a large role in the industry. As a wires industry, use of public rights-of-way is at the core of transmission and distribution. With the grid moving close to capacity, transmission has become a fundamental constraint in the industry and it captures the direct and indirect ways in which the industry burdens public resources.

The interstate highway system for the movement of electrons is inadequate and was not designed to handle market transactions. [44] Transmission capacity is constrained and extremely difficult to expand for environmental and social, not economic, reasons.[45] Getting approval to site new transmission lines is extremely difficult because of the negative impact on public spaces and concerns about public health. Similar constraints on the availability of distribution exist.[46] Wires are difficult to repair or replace in response to outages.[47] This places a premium on flexibility of supply and reserve margins, but neither of these is well accommodated in the industry.[48]

In sum, the elasticity of supply is low. Short-term supply responses are constrained by the difficulty of storing electricity. 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.[49] 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.[50]

B. Increasing Returns to Producers Raises the Cost to Consumers

1. Market Power And Monopoly Rents

The most important market forces are demand and supply elasticities – the ability of consumers to cut back or shift their demand for something and the ability of producers to increase their outputs in response to price increases. If these elasticities are too small, market forces are weak and the exercise of market power becomes more likely. Firms raise prices to increase their profits because they do not lose many

sales to competitors, or because consumers lack alternatives. This is the reality of the electricity industry. As a result, deregulation or restructuring turns supply into a strategic variable.[51] The ability of producers to withhold supply or to hold out for high prices gives them an incentive to drive prices as far above costs as possible, and to keep them there in order to maximize profits.

The exercise of market power allows suppliers to set prices above their costs and achieve above normal profits. Leading liberal (Scherer and Ross)[52] and conservative (Landes and Posner)[53] economists describe this concept in precisely the same terms.

Landes and Posner present the discussion of market power in terms of the elasticity of demand and supply that is ideally suited for understanding the problem in electricity markets. The intuitive point is straightforward. A firm will raise its price if it does not lose too many sales.[54] The elasticity of demand determines how much business will be lost. Consumers can react to price increases in two ways. They can buy less (the market elasticity of demand) or they can switch to the output of another firm, as long as it can expand its output and does not raise its price (the elasticity of supply of the competitive fringe).[55]

Interestingly, the point of the Landes and Posner article was to argue against the simplistic use of market shares in market power analysis. This has long been a major focal point of debate in the electric utility industry.[56] Two aspects of particular concern to Landes and Posner are also critically important in the electric industry – the elasticities of supply and demand.[57]

Once one brings these elasticities into play in an industry like electricity, the analysis becomes extremely troubling.[58] Landes and Posner point out that when demand elasticities are low, market power becomes a substantial problem. By low they mean close to –1. As noted, this is the reality of the electricity industry. The elasticities of supply and demand observed for electricity are extremely low, certainly not more than .1 or .2 in the short term and considerably less than one in the long term. In other words, given the weakness of market forces in the industry, a market power problem is inevitable.

2. Excessive Scarcity Rents

The inelasticity of supply gives rise to another deviation from a typical competitive market; excessive scarcity rents. An economic rent is “a payment to a factor in excess of what is necessary to keep it at its present occupation.”[59] 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.”[60] In economic theory, these sources of overcharges could be competed away if supply and demand elasticities were high and electricity markets worked well. In reality, because of the economic characteristics and social impacts of the electricity

industry, competition only exacerbates pricing inefficiencies. The results are elevated prices and a transfer of wealth from consumers to producers that achieves little or no real costs savings or efficiency gains. Scarcity rents accrue where changes in supply as a response to changes in price are slow or nonexistent. [61]

The merchant generators and transmission owners claim that they must be compensated for the risk of development in an uncertain market, but that comes at the price of a much higher capital costs. Under market conditions there is no long-term security of demand, so merchant generators demand higher rates of return and seek to recover their capital as quickly as possible. The result is to raise capital costs in the near term.

The implications of the increase in the cost of capital are striking. In analyzing "cost-plus" regulation for peaking facilities, the Department of Energy focused its attention on a financial scenario in which merchant generators insisted on a 16 percent return on investment and a three-year cost recovery period (even though the facilities last twenty or thirty years).[62] In that analysis, a ten-year recovery results in a revenue requirement that is about half as large. The discussion shows clearly that very short cost recovery periods are driving the industry.[63]

As remarkable as this analysis is, the merchant generators actually proposed even more extreme analyses in reaction to the price spikes in the Midwest in 1998. To defend huge price spikes, Enron sought to justify astronomical prices for power by putting forward an analysis that involved the concept of essentially disposable power plants – capital intensive facilities with 20 to 30 year lives -- that were used for a few hours and then abandoned. Enron and other merchant generators argued that it was reasonable to build power plants that would be expected to run just ten hours of their useful life.[64] In order to justify building such a power plant, investors would have to project market prices for those very short periods of $10,000 to $25,000 per MW.

A regulated utility approach to supplying electricity lowers the cost of capital. [65] It lengthens the time horizon for investment, to match the lives of the assets. It brokers the relationship between the supply and demand sides to lower risk. Although the DOE analysis does not state enough of its assumption to consider the cost structure of a "utility" building peak plant, a financial analysis prepared by the California Energy Commission does.[66] Merchant finance raises the cost of capital by between 25 and 50 percent in these analyses. Merchant finance raises the costs of capital by almost 25 percent in the CEC view, because of a higher cost of equity. Shortening the cost recovery period, as the DOE does, drives capital costs up by another twenty percent. Reliance on more expensive equity (or more expensive debt) as is likely to be necessary for merchant plants, would drive the cost of capital up even higher. The cost of capital for merchants is likely to be 50 percent higher than utility financed projects.

Ironically, while restructuring promised to shield consumers from capital cost risk, restructuring has exposed them to a great deal of fuel price risk. Although fuel

adjustment clauses had already shifted some of that risk to ratepayers, the restructured energy market has compounded the problem for several reasons. Purchased power, especially in spot markets, has exhibited much greater price volatility than input fuel costs. Utilities have been foreclosed in some cases and been discouraged in others from owning generation assets, which denies them one of the most effective means of mitigating risk; physical hedges.

3. Empirical Evidence on Market Power, Scarcity Overcharges

Given the weakness of market forces, generation and transmission owners are able to withhold supply to drive prices above costs. Distinguishing between real and artificial scarcity becomes difficult. The withholding problem was identified early on in the analysis of electricity markets. The markup of price over cost increases in lock step with the reduction of available plant, even in systems with excess capacity.[67]

Merchants behaved as predicted. After buying up existing power plants, producers began running plants less than the previous owners.[68] In fact, producers do not even have an interest in delivering existing capacity. [69]

The disappearance of these generation assets is part of a pattern of resource denial that has the effect of driving up the price of electricity.[70] Whether it is purely strategic, illegally manipulative, or even collusive, remains to be seen,[71] but there is no doubt that the pursuit of private interests has denied the electricity market substantial resources.[72]

The events in California have popularized a whole new vocabulary of market abuses including “hockey stick bidding,”[73] “megawatt laundering,”[74] and wash-trades,[75] not to mention Enron’s colorful code words.[76] The analysis of bidding behavior outside of California indicates that these and other problems are not unique to that market.[77] The problem of manipulation of bidding is not one that is likely to just go away; nor is it limited to conditions where markets are extremely tight.[78]

Having learned how to manipulate the market, the primary interest of producers is to keep it tight.[79] Exorbitant prices do not elicit efficient supply responses in such a market. They reward and create an incentive for more effective gaming.[80] To state the concept in layman’s terms, you make so much money by running the price up that you are much better off by cutting back production than by increasing output, which would lower the price. You can only get away with this when demand is inelastic (since that creates huge economic rents) and the supply beyond your control cannot be easily expanded in the short-term (since competition would dissipate the rents).[81]

Table 3 shows the results of a number of analyses of markets. It includes simulations and actual results. The most extensive problem occurred in California, [82] but virtually all markets, even those like PJM and the upper Mid-west, that are well endowed with transmission capacity and excess generation, have been beset by the problem.

TABLE 3:
MARKET POWER INDICATOR CHARACTERISTICS

STATE	CONCENTRATION		ESTIMATED MARK-UP		
	HHI	LEADING FIRM SHARE	LERNER INDEX	MODEL	YEAR
COLORADO	2813	38	52	DOMINANT FIRM	2002
WISCONSIN	2761	47	300+	COURNOT	2000
PENNSYLVANIA	2000	20	9 - 19	COURNOT	1995
PJM	1150	16	29	ACTUAL	
U. K.	1962	31	21	ACTUAL	1994
FLORIDA	1940	38	80	Dominant Firm	1997
			1000+	Cartel	
CALIFORNIA	1537	10	22-29	COURNOT	1998
			30	ACTUAL	2000
NEW ENGLAND			4-11	ACTUAL Market Power Constrained	

SOURCE: Market shares of Generation = Energy Information Administration, *State Electricity Profiles* (U.S. Department of Energy, March 1999); Import capacity for HHI calculation = Cambridge Energy Research Associates (CERA), *Electric Power Trends: 2001* (2000); *High Tension: The Future of Power Transmission in North America* (August 2000) (hereafter, CERA, *High Tension)*; U.S. Census Bureau, *Statistical Abstract of the United States: 2000* (U.S. Department of Commerce), Population growth =Table 20, Cooling degree days and urban population = Table 39, 414: HHI and markups = Wisconsin = Bushnell, James, Christopher Knittel and Frank Wolak, *Estimating the Opportunities for Market Power in Deregulated Wisconsin Electricity Market* (Consumers First, ND); Colorado = Sweetser, Al, *An Empirical Analysis of a Dominant Firm's Market Power in a Restructured Electricity Market: A Case Study of Colorado* (April 1, 1998); Pennsylvania = Rudkevich, Alesandr, Max Duckworth, and Richard Rosen, "Modeling Electricity Pricing in a Deregulated Generation Industry: The Potential for Oligopoly Pricing in a Poolco," *The Energy Journal,* 1998 (19); PJM = .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; UK = Wolak, Frank A. and Robert H. Patrick, *Impact of Market Rules and Market Structure on the Price Determination Process in the England and Wales Electricity Market* (POWER, February 1997), Wolfram, Catherine, "Measuring Duopoly Power in the British Spot Market," *American Economic Review,* 89: 1999, p. 812, California =);.Hildebrandt, Eric, *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), Klein, Michael and Loretta Lynch, *California's Electricity Options and Challenges* (August, 2000).

For the first year of the reliance on the spot market in California, the exercise of market power has been estimated to have increased costs by 22 to 30 percent, driving prices up by $400 million to $600 million.[83] From 1998 to the summer of 2000, well over a billion dollars of rents was collected in California.[84]

Policymakers are struggling to avoid a similar problem in Montana.[85] As recently as April 2000, Montana was a very low cost state, with the price of electricity forty percent below the national average. However, industrial customer prices went "to market" very quickly and their rates almost quadrupled, driving the statewide average price above the national average.[86] While the legislature made a deal with the merchant generator who bought most of the capacity in the state to keep residential rate increases "down" to *only* 50 percent when they "go to market,"[87] the public utility commission batted to keep prices at just and reasonable levels,[88] and a referendum to reclaim the resources and recapture the scarcity rents for consumer is under way.[89]

The abuse of market power and the impact of tight markets that have been so much in evidence in California are not limited to that market. PJM, the poster child for deregulation, has suffered similarly near vertical supply and the exercise of market power that parallels the problem in California in its early days.[90] In the PJM pool, the mark-up in the first year was estimated at 29 percent, increasing prices by $400 to $600 million.[91] In one week in 1998 in the Midwest, $500 million changed hands;[92] $70 million was collected in New York in one day.[93] The New England power pool experienced price run-ups.[94] In the UK, the mark-up of price over cost has been sustained at the 25 percent level over a long period of time.[95]

Simulations of a number of other markets have been conducted. These studies have led policymakers in the states to avoid restructuring and deregulation. This paper focuses on a simulation of the Florida market.[96] It suggests that Florida would be vulnerable to the market power problem experienced in virtually every other restructured market. The results of the simulation parallel the findings in other studies.

Given the supply-side characteristics, which are similar to or more severe than those observed in other states and nations, it is not surprising to find that the underlying supply curve in Florida is similar to other states. As demand approaches the peak, costs are likely to rise sharply in a restructured market. We have seen this supply curve repeatedly. Even in a competitive market, the price of electricity would likely rise. The theoretical market-clearing price in Florida – marginal cost as represented in the cost curve – would be about 50 percent higher than the regulated price. The scarcity rents created by the steep supply curve are very large. The amount collected in scarcity rents would be about $2 billion. The market price of electricity including scarcity rents would rise to about $39/MWH, well above the cost of $25.5/MWH. In California in 2000, excessive scarcity rents were in the range of 40 to 50 percent.[97]

The exercise of market power would drive prices even higher. A single firm, acting alone but knowing that a substantial part of its capacity will be needed in many

hours of the year, would have the ability to raise prices substantially. Substantial markups can be expected in virtually every hour in which the pivotal supplier is called upon. In the dominant firm case, prices would rise to in excess of $500 per MWh for a few hours and would be above $100 per MWh for about 2 percent of the hours. In the dominant firm case, the average price would rise to almost $46 per MWh from the regulated price of $25.5 and the competitive price of $39. In the cartel case, prices would hit the $1,000 cap almost 10 percent of the time and prices would be above $100 about a third of the time. The average price would rise to over $370 per MWh. Before the meltdown in California, we would never have considered such a possibility, but that is the price that was sustained in California for almost half a year, during the off-peak period. The result of withholding and excessive scarcity rents to drive prices far above costs is supranormal profits.[98] The CAL-ISO analysis shows that by February 2001, the costs of a new plant brought on line in California when the restructured market commenced in May 1998 would have been fully recovered in just three years.[99] Excessive returns have not escaped the attention of the analysts dealing with the situation in the UK, although that market has not exhibited the extreme dysfunction of the California market. As Wolak and Patrick put it, "the return to capital in this industry is increased by 25% as a result of this strategy.[100]

C. DE-INTEGRATION COST INCREASES

The severe conditions of the electricity market reflect the demanding nature of the service and these conditions point to another major risk of cost increases: administrative inefficiency. Before deregulation, the electricity industry was a reasonably well-run engineering-intensive integrated network.[101] One of the central activities of electric utility monopolies is to balance load -- to aggregate customers who use electricity at different times of the day or year. By bringing together customers with dissimilar load patterns, utilities are able to use their facilities more fully -- to smooth demand [or usage] by balancing periods when some customers are off line with other customers who are on line.

1. Transaction Costs

Creation of markets for electricity services requires a huge growth in transactions. These transactions create heavy administrative requirements in an industry that exhibits economies of coordination. Directly related to the transactions and managerial functions are facilities costs. Demands on network facilities are likely to increase as a result of the wide range of new transactions taking place. The physical facilities to support these transactions will have to be constructed and maintained. An increase in the number of transactions may require costly improvements to the transmission system in order to ensure reliability. Prior to the price spikes of 1998, the number of traders increased over fifty fold; the quantity traded increased several hundred times.[102] To make matters worse, the interstate highway system for the movement of electrons is grossly inadequate.[103] It was not

designed to handle such a volume of transactions. Capacity is constrained and extremely difficult to expand for environmental and social, not economic, reasons.[104]

The limits on transmission capacity to carry any increased load are pervasive and widespread.[105] This is reflected in both the inability to move power between regions and the existence of load pockets within regions. In the near term, there is little that can be done about these constraints. These conditions have existed for some time.[106] However, it is clear that the introduction of competition has put a strain on an already stressed asset.[107]

Contracting to achieve real-time balance simultaneously in five, six or seven different markets over broad geographic areas[108] has proven a daunting task[109] that consumes substantial resources and may undermine economies of coordination and integration, while it imposes many new administrative and transaction costs to support the new commerce. The engineers have managed to impose enough order to keep the lights on (with increasingly less success than under the old system),[110] but the economic institutions have failed to create orderly markets.

In retrospect, claims of efficiency gains and price reductions of 40 percent or more seem silly.[111] In fact, they were silly in prospect, but many policy makers simply ignored the evidence.[112] Careful analysis showed that efficiency could only be boosted by 10 percent[113] under the best of circumstances and real world experience has achieved half that.[114]

Indeed, it may well be that inefficiencies introduced into what had been a reasonably well-managed network have increased costs by over 10 percent. In 1998, just as restructuring was being implemented in California, two consumer groups argued that based on econometric studies of the economies of integration, restructuring could raise prices by 12 to 22 percent.[115] A recent estimate has placed the increase in transaction and capital costs at 15 percent.[116]

2. Increasing Needs for Excess Capacity

Reserve margins and excess capacity emerge as such critically important factors for maintaining system reliability and for disciplining market power that they deserve to be singled out for particular attention by policy makers. In a restructured industry, keeping the lights on involves two problems, not one. Not only must the electrons be available, but the consumer must also be able to afford to flip the switch.

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, electricity markets free of reserve planning and coordination may be chronically tight or subject to extreme price instability.

Based on restructured market performance, reserve margins need to be well above traditional levels of 15 to 20 percent and perhaps as much as 30 to 40 percent

to prevent the abuse of market power.[117] In addition to the normal operating reserve that the industry has required, there must also be a competitive, or economic, reserve whose primary function is to restrain pricing abuse.

The message that emerges from the real world experience in electricity markets is that they must be both unconcentrated and have substantial excess capacity if the abuse of market power is to be prevented. Bidders into the market must face the prospect that a substantial part of their capacity will not be called upon a significant part of the time if they bid high.[118] Analyses of other markets like Australia confirm this.[119] Simulations based on American cost and demand data, for system with twenty percent excess capacity, lead to a similar conclusion.[120] Similarly, in analyzing the California market, even at moderate levels of demand (in the 300th highest capacity hour of December), a substantial market power threat exists.[121]

Insight into the reserve margin requirement can be gained from considering simulation of markets at different levels of demand elasticity. A simulation for Wisconsin,[122] similar to those done in a number of other states, is a good example.[123] Oligopoly pricing would result in huge mark-ups of price over cost in about half the hours of the year, i.e. above 6000 MW on a system with about 14000 MW of capacity. This simulation is quite similar to the observed pattern in California in mid-2000, before the severe market problems of the winter of 2000 to spring of 2001 period. The deviation of bids from prices takes place at about the same relative level of demand (about half way up the supply curve). Expanding transmission would restrain prices up to 8000 MW, but then the supply side becomes too tight to prevent the exercise of market power. When one assumes a demand elasticity of -.4, four times the 'normal' elasticity, however, market power is substantially controlled at all levels of demand. The authors of this simulation pause to consider the implications of such a huge increase in demand elasticity. In order to have the price disciplining effect, the demand elasticity must reduce demand by 20 to 30 percent as the system moves toward the peak. As the authors point out, this is a massive reduction in demand.

To put this finding in simple terms, if you assume away the peak, you assume away the problem. Reduced demand has the price disciplining effect because it creates excess capacity (therefore making the withholding strategy unprofitable). The reserve margin settles in at about 40 percent of the peak demand.

CONCLUSION: ONE SIZE DOES NOT FIT ALL; IT MAY NOT FIT ANY

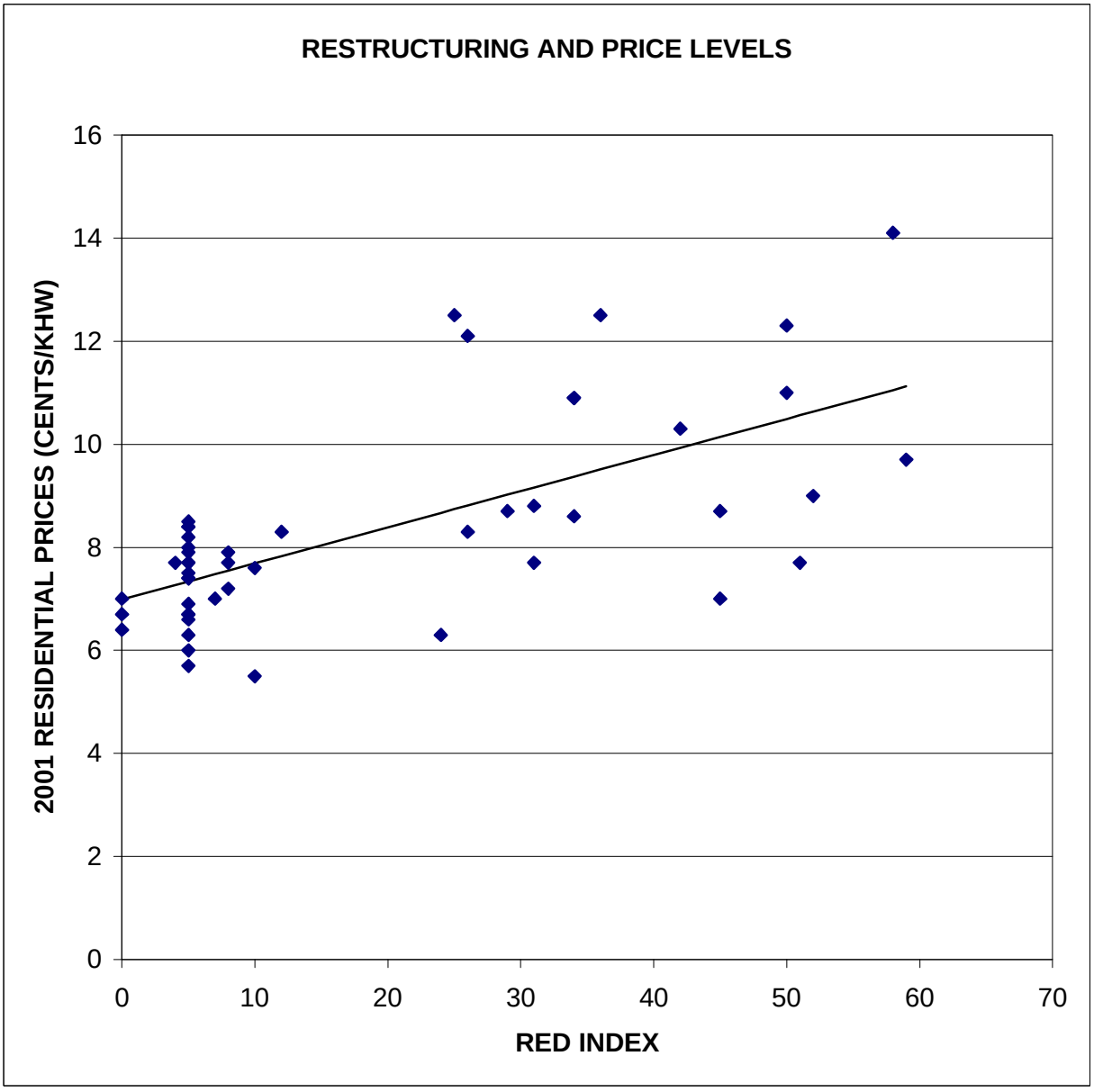
Restructuring was tried first in states where prices were highest. For example, as shown in Figure 1, there is a clear correlation between those states that have moved farthest toward deregulation, as measured by the "Retail Energy Deregulation Index" prepared by the Center for the Advancement of Energy Markets. Restructuring

did not cause high rates, but it also has not cured them. Residential rates in Pennsylvania, the top rated state, have not budged in comparison to national averages. In 1995, before the restructuring movement began, Pennsylvania has the 11th highest residential rates in the contiguous 48 states and was about 15 percent above the national average. In 2001, residential rates in Pennsylvania were the10th highest in the country and were 14 percent above the national average. They remain about 25 percent above the states that have not restructured.[124]

Pennsylvania and the PJM power pool, of which it is the core, are often offered as the testimonial to restructuring and deregulation, but a close look at their experience and circumstances should provide a strong note of caution for those who wish to import the Pennsylvania model or to force others to adopt that model, as the SMD does. It must be recognized that Pennsylvania started from very high rates in a situation with excess capacity and lots of transmission resources operated by an existing power pool. It ordered rate reductions. Price caps are still in place for the high cost utilities. Nevertheless, it now suffers from dramatically rising wholesale prices, a volatile spot market and the abuse of market power. Independent competitors are exiting the state and the number of customers who have voluntarily switched to competitors has been declining rapidly. [125] Responding to this tightening situation one utility has been badly burned in the spot market.[126] It incurred high costs in spot markets and sought to recover them from ratepayers. A similar problem has afflicted the neighboring state of New Jersey.[127] In both bases, a final reckoning for these costs was deferred.

The power pool/transmission organization for the part of Pennsylvania where the benefits of deregulation are claimed, PJM, and its neighbors are relatively well endowed in generation and transmission resources. [128] It was a long-standing pool that has tried to evolve to a wholesale market. It imposes critical restraints on “pure” market transactions, like a reserve requirement,[129] and protects its native load customers by shutting down flows when things get tight.[130] States at the end of the line or lacking these resources do not have this luxury and beggar thy neighbor policies are not sound national policies. The spot market exhibits the same volatility in the East as it does in the West. [131] It is plagued with the same complaints about the exercise of market power [132] and outages.[133] In the tight geographical area with relatively short distances, this burden may be bearable, but in the West and Southwest, this approach would be disastrous for consumers. [134]

FIGURE 1:



Sources: Energy Information Administration, *Electric Power Monthly: March 2002*, Table53; Center for the Advancement of Energy Markets, RED Index

The SMD essentially imposes the PJM model from the northern and eastern part of the country on the entire nation, but it just does not fit. It is an extremely complex scheme whose explicit purpose is to ensure that every electron sold to the public fetches the highest price the market will bear. It rides roughshod over the explicit policy conclusions of local officials (as described in Figure 2). They have either chosen not to start down this path, or have changed their minds in light of the negative experiences. Vast differences between regions in population densities, weather conditions, resource mix, consumptions patterns and institutional make-up must be reflected in the delivery of a vital service like electricity.

FIGURE 2:
RESTRUCTURING IN RESIDENTIAL ELECTRICITY MARKETS

= Restructured

= Reversing Direction

= Never Started

ENDNOTES

[1] Hirsh, Richard, F., *Power Loss: the Origins of Deregulation and Restructuring in the American Electric Utility System* (1999); Stone, Alan, *Public Service Liberalism: Telecommunications and Transitions in Public Policy* (Princeton: Princeton University Press, 1991); Duane, Timothy P., "Regulation's Rationale: Learning from the California Energy Crisis," *Yale Journal on Regulation,* 19 (2002 recounts the history and calls for a recognition of the reason the electric utility industry was regulated, but does not provide a detailed discussion of the underlying economics.

[2] Cooper, Mark, *The Public Interest and U.S. Capitalism* (Consumer Federation of America, August 2002), argues that the combination of oil price shocks, environmental concerns and the inability of utilities to bring nuclear power on line at a reasonable cost, placed a severe strain on the system. Reform destroyed the fabric of the industry by abandoning the franchise.

[3]Rosen, Rosen, Richard, Freyr Sverrisson and John Stutz, *Can Electric Utility Restructuring Meet the Challenges It Has Created,* (Tellus Institute, November 2000). raise questions about the ability of any set of institutions to run the industry based primarily on external market transactions. On the problems in the electric utility industry, see, 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) which identified basic economic conditions in the electricity and telecommunications industries that raise doubts about the prospects for deregulation as the debate was beginning. For early analysis of electricity see also Cooper, Mark, "Theory vs. Reality," Consumer Federation of America Utilities Conference, April 6, 1987), "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), Back *To Basics In Analyzing The Failure Of Electricity Restructuring: Accepting The Limits Of Markets,* Energy Markets in Turmoil, Institute for Regulatory Policy Studies Illinois State University, May 17, 2001.

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[5] Thurm, Scott, Robert Gavin and Mitchel Benson, "As California Starved for Energy, U.S. Businesses Had a Feast," *Wall Street Journal,* September 16, 2002, p. A-8.

[6] Casazza, J.A., "Small Consumers – What Has Hurt them and What Can be Done About it," Presentation to the National Association of Regulatory Utility Commissioners, November 13, 2001; in Cooper, Mark, *Residential Consumer Economics of Electric Utility Restructuring* (Consumer Federation of America and Consumers Union, July 1998) (hereafter, Cooper, *Economics)*, and Coyle, Eugene, *Price Discrimination, Electronic Redlining, and Price Fixing in Deregulated Electric Power* (American Public Power Association, January 2000).

[7] Borenstein, Severin, James Bushnell and Frank Wolak, *Measuring Market Inefficiencies in California's Restructured Wholesale Electricity Market* (Center for the Study of Energy markets, June 2002), p. 36. See also *Behind The Headlines Of Electricity Restructuring* (Consumer Federation of America, November 2001), *Reconsidering Electricity Restructuring* (Consumer Federation and Consumers Union, November 2000), *Electricity Deregulation And Consumers: Lessons From A Hot Spring And A Cool Summer* August 30, 2001.

[8] 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) (hereafter, FERC, Staff Report); 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;* Cooper, Mark, *Electricity Restructuring and the Price Spikes of 1998* (Consumer Federation of America and Consumers Union, June 1999).

[9] Egan, Timothy, "Cheap Power Gone, Montana to Vote on Buying Dams," *New York Times,* August 29, 2002.

[10] Bushnell, James, Christopher Knittel and Frank Wolak, *Estimating the Opportunities for Market Power in Deregulated Wisconsin Electricity Market* (Consumers First, ND).

[11] Sweetser, Al, *An Empirical Analysis of a Dominant Firm's Market Power in a Restructured Electricity Market: A Case Study of Colorado* (April 1, 1998)

[12] Florida Municipal Electric Association, *Energy 2020 Study Commission Wholesale Deregulation Proposal Will Raise Electricity Prices and Maximize Profits of Private Utility Shareholders,* January 29, 2001.

[13] See, for example, Maloney, Michael, et. al, *Customer Choice, Consumer Value: An Analysis of Retail Competition in America's Electric Industry* (Citizens for a Sound Economy, 1996); Maloney, Michael T., Robert E. McCormick and Robert D. Sauer, and Jerry Ellig, *Economic Deregulation and Customer Choice: Lessons for the Electric utility Industry* (Center for Market Process, 1999).

[14] Pharris, Dale, *Who Really Benefits From Retail Competition?* (National Rural Electric Cooperative Association, September 1996). Kahal, Matthew I., *The CSEF Electric Deregulation Study: Economic Miracle or the Economists' Cold Fusion* (Electric Consumers' Alliance, December 1996). Binz, Ronald J., Thomas Feiler and Michael J. McFadden, *Navigating A Course to Competition: A Consumer Perspective on Electric Restructuring* (Competition Policy Institute, 1997)

[15] Energy Information Administration, *Electricity Prices in a Competitive Environment: Marginal Cost Pricing of Generation Services and Financial Status of Electric utilities, A Preliminary Analysis Through 2015*, (U.S. Department of Energy, August 1997).

> Finally, the projections in this case represent a severe reduction in the price of electricity relative to average annual prices in 1997. Even if economic theory and the assumptions of this analysis (i.e. full scale competition begins in 1998) suggest the outcome of the Intense Competition Case are theoretically possible, these results have a low probability of occurrence relative to the other cases in this report, and are unlikely to be achieved *over the short term.*
>
> The resulting cost reductions and price increases (from the reduction in capacity) mean that the prices projected in the Intense Competition Case should not be considered sustainable over the long term (EIA, pp. 44... 61)

The EIA focused on much smaller net reductions in electricity costs of 10 percent. In the cases considered to be mot likely to occur (all of which exclude the recovery of stranded costs through prices), electricity prices would be as much as 0. 7 cents lower than the price projected in [Annual Economic Outlook 1997] AEO97 *Reference Case* nationally in 1998 – a 10 percent reduction based on an average price of 6.9 cents per kilowatthour – and by as much as 0.7 cents per kilowatthour in 2015 – an 11-percent reduction based on the average price of 6.3 cents per kilowatthour (EIA, p. 62).

[16] ICF Consulting, *Economic Assessment of RTO Policy*, Prepared for the Federal energy Regulatory Commission, February 26, 2002, Tables ES-1, ES-2. Casazza, John, A., "Electricity Choice: Pick Your Poison: A. Errant Economics? B. Lousy Law? C. Market Manipulation? D. All Three?," *Public Utilities Fortnightly*, 2001 (March 1), identifies efficiency gains in generation of 3 percent.. This latter figure is consistent with the actual experience in the U.K., which began phasing in a competitive retail electric market in 1990, suggests caution is necessary in the estimation of benefits. Efficiency gains have not been very large and the exercise of market power is a constant threat to consumer gains from restructuring, resulting in the gains not being passed through to consumers.

> Our preferred case is pro-privatization allowing for the expansion of nuclear power under the CEBG, ignoring environmental gains (whose cash value is hard to measure), and discounting at the public sector discount rate of 6%, for which case the net present value of benefits is L9.6 billion, equivalent to a permanent cost savings of about 0.16p/kWh, compared to an average 1994/95 price of about 2.8p/kWh, or a cost savings of 5% forever...

In any exercise of this kind, a systematic attempt to understand the workings of the industry raises yet further questions for further analysis and discussion. First, who benefited from the cost reductions that we found – was it taxpayers and shareholders as Yarrow [1992] suggests, rather than consumers? Our rather tentative answer is yes, given the large increase in profits and the relatively small decline in real final prices, and we have attempted to quantify these redistributive impacts, though they are subject to larger error margins than the simple efficiency gains (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, , pp. 297-298).

[17] "Comments on the RTO Cost Benefit Analysis Report by the New Mexico and Rhode Island Offices of Attorney General, The Rhode Island Division of Public Utilities and Carriers, the Public Advocate for the State of Maine and the Colorado Office of Consumer Counsel," before the Federal Energy Regulatory Commission, Electricity Market Design Structure, Docket Nos. RM01-12-000, etc., May 3, 2002; .

[18] *Western Governors Letter to Pat Wood, et al*., August 22, 2002; Tapan Munroe and Leslie Baroody, "California's Flawed Deregulation – Implications for the State and the Nation," *The Journal of Energy and Development*, (26), 2002.

[19] Southern Governors' Association, *Governors Protect Southern Electricity Ratepayers*, Press Release, August 26, 2002.

[20] "Motion to Intervene of the American Public Power Association," *Public Utility District No. 1 of Snohomish County*, Docket EL-02-56-000, March 4, 2002, p. citing APPA resolutions. See also "Joint Comments of the American Public Power Association, Electricity Consumers Resource Council, National Rural Electric Cooperative Association, Transmission Access Policy Study Group, and Transmission Dependent Utility Systems on Market Power and Mitigation Strawman Discussion Paper," *Electricity Market Design and Structure*, Docket No. RM01-12-000, March 11, 2002.

[21] ELCON, "Don't Clone PJM into Other RTOs, ElCON Urges FERC, Citing Flaws in Model, *ELCON Report*, (1) 2002; *Making the SMD Market Work for Customers: Recommendations for Enhancing FERC's Proposed RTO Standard Market Design*, June 27, 2002. A recent survey of industrial customers – early, leading proponents of deregulation because they thought they had the expertise to shop in electricity markets – shows they now fear and do not want deregulation (see RKS Research, *Turn Back the Clock? Major Business Customers Find Few Benefits to Date from Electricity Deregulation*, February 28, 2002; Duane, p. 539, citing survey results provided by William Golove, Presentation to the Energy and Resources Groups

Colloquium, University of California, Berkeley, February, 20, 2002). For residential customers, who have less expertise, the prospects are even more foreboding.

[22] "S&P Sees Negative Rating Trend Continuing: Deteriorating Picture," August 12, 2002,

> The one bright spot S&P found has been the relative stability of the public power cooperatives sector, where ratings actions have been "considerably more measured." It attributes much of that stability to the fact that public power agencies in deregulated states have remained vertically integrated and stay outside of deregulation.

[23] Although the agency has let many of the PUHCA powers atrophy, it can still be binding (see "AEP/CSW Merger Rejected by Court," ELCON Report, No. 2, 2002) and a range of abuses that have afflicted the electricity market would have been prevented by aggressive implementation of PUHCA (see PUHCA Repeal: A Catalyst to Corporate Raiders: Absence of PUHCA Aids Regulatory Chaos, not Competition, TVPPA News, March-April, 2002).

[24] "Testimony of Scott Hempling," *The Public Utility Holding Company Actt of 1935 and S. 1766*, Committee on Energy and Natural Resources, United States Senate, February 6, 2002, pp. 30-32.

[25] "Testimony of Dr. mark N. Cooper on The Regulation of Public Utility Holding Companies," Committee on Banking, Housing, and Urban Affairs, United States Senate, April 29, 1997. "Testimony of Dr. Mark N. Cooper on Behalf of the Consumer Federation of America and the Environmental Action Foundation on Exempting Registered Holding Companies from the Public Utility Holding Company Act for Diversification into Telecommunications," Committee on Energy and Commerce, United States House of Representatives, July 29, 1994; "Statement of Dr. Mark N. Cooper, Joint Hearing on the Public Utility Holding Company Act of 1935," Committees on Finance and Technology and Electricity, National Association of Regulatory Utility Commissioners, February 28, 1989; "Independent Power Producers and the Public Utility Holding Company Act of 1935, Subcommittee on Energy and Power of the Energy and Commerce Committee, U.S. House of Representatives, September 14, 1988.

[26] "Commission Proposed New foundation for Bulk Power Markets with Clear, Standardized Rules and Vigilant Oversight," *Federal Energy Regulatory Commission*, Docket No. RM01-12-000, Press Release, July 31, 2002, p. 2.

[27] The *Houston Chronicle* reported on September 14, 2002, that merchant generators in Texas had been caught at another new game to manipulate the market.

[28] Davis, Tina, "EnronOnline Called the Tune for Gas Price Data – FERC," *Energy Daily*, August 15, 2002; Thurm, Gavin, and Benson,

[29] It has now become apparent that the value of peak load reduction is far higher than the market-clearing price at the peak. Marcus, William B., and Greg Russzon, *Cost Curve Analysis of the California Power Markets*, (JBS Energy, Inc., September 29, 2000), estimates the value of peak shaving at between 5 and 10 times the market clearing price. Borenstein, Severin, *The Trouble with Electricity Markets* (University of California Energy Institute, Program on Workable Energy Regulation: January 2001) (hereafter, Borenstein, *Trouble)*, uses an example in which the value of reduced demand is just under four times the market price.

[30] Phillipovic, Dragana, *Energy Risk: Valuing and Managing Energy Derivates* (New York: McGraw-Hill, 1998), p. 3, cites a number of factors that distinguish energy from other commodities, but makes it quite evident that the need to physically consume the product on a real-time basis is the central factor.

[31] 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).

[32] 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.

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

[34]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, OH: 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 Expenditure Survey Data," *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."

[35] Gegaux, Douglas and Kenneth Nowotny, "Competition and the Electric Utility Industry," *Yale Journal on Regulation*, 10:63, 1997; Gilsdorf, Keith, "Testing for Subadditivity of Vertically-Integrated Electric Utilities," *Southern Economic Journal*, 18:12, 1995: Henderson, J. Stephen, "Cost Estimation for Vertically Integrated Firms: the Cost of Electricity," M. A. Crew (Ed.), *Analyzing the Impact of Regulatory Change in Public Utilities* (Lexington, MA, Lexington Books, 1985); Hirst, Erick and Brenda Kirby, "Dynamic Scheduling: The Forgotten Issue," *Public Utilities Fortnightly*, April 15, 1997; Kaserman, David L. and John W. Mayo, "The Measurement of Vertical Economies and the Efficient Structure of the Electric Utility Industry," Journal of Industrial Economics, 29:5, 1991; Kwoka, John E. Jr., *Power Structure: Ownership, Integration, and Competition in the U.S. Electricity Industry* (Dordrecht, Boston: 1996); Roberts, Mark J., "Economies of Density and Size in the Production and Delivery of Electric Power," *Land Economics*, 62:4, 1986.

[36] Hirst, Eric and Stand Hadley, "Generation Adequacy: Who Decides," *Electricity Journal* (October 1999) and Borenstein, *Trouble*, argue for market-based solutions to ensure capacity sufficiency on the basis of demand side responsiveness, not supply-side construction of reserves.

[37] Pirrong, Stephen Craig, *The Economics, Law and Public Policy of Market Power Manipulation* (Boston: Kluwer, 1996), pp. 10, 24, 59, 70, identifies storage and transportation costs, as well as low elasticities of demand as critical factors making market manipulation more likely.

[38] Gilsdorf, Keith, "Testing for Subadditivity of Vertically-Integrated Electric Utilities," *Southern Economic Journal*, 18:12, 1995: Henderson, J. Stephen, "Cost Estimation for Vertically Integrated Firms: the Cost of Electricity," M. A. Crew (Ed.), *Analyzing the Impact of Regulatory Change in Public Utilities* (Lexington, MA: Lexington Books, 1985); Hirst, Erick and Brenda Kirby, "Dynamic Scheduling: The Forgotten Issue," *Public Utilities Fortnightly*, April 15, 1997; Kaserman, David L. and John W. Mayo, "The Measurement of Vertical Economies and the Efficient Structure of the Electric Utility Industry," Journal of Industrial Economics, 29:5, 1991; Kwoka, John E. Jr., *Power Structure: Ownership, Integration, and Competition in the U.S. Electricity Industry* (Boston: Dordrecht, 1996); Roberts, Mark J., "Economies of Density and Size in the Production and Delivery of Electric Power," *Land Economics*, 62:4, 1986.

[39] Mistr, Alfred E. Jr., "Incremental-Cost Pricing: What Efficiency Requires," *Public Utilities Fortnightly*, January 1, 1996; Oren, Shmuel, S., "Economic Inefficiency of Passive Transmission Rights in Congested Electricity Systems with Competitive Generation," *The Energy Journal*, 18:1, 1997, "Passive Transmission Rights Will Not Do the Job," *The Electricity Journal*, 10:5, 1997; Ostroski, Gerald B., "Embedded-Cost Pricing: What Fairness Demands," *Public Utilities Fortnightly*, January 1, 1996; Radford, Bruce W., "Electric Transmission: An Overview, *Public Utilities Fortnightly*, January 1, 1996: Volpe, Mark J., "Let's Not Socialize Transmission Rates," *Public Utility Fortnightly*, February 15, 1997. Bohi, Douglas and Karen Palmer; "The Efficiency of Wholesale vs. Retail Competition in Electricity, *The Electricity Journal*, October 1996; Gegaux, Douglas and Kenneth Nowotny, "Competition and the Electric Utility Industry, *Yale Journal on Regulation*, 10:63, 1997, Cornelli, Steve, "Will Customer Choice Always Lower Costs?," *The Electricity Journal*, October, 1996.

[40]Geographic scope is needed to achieve what network economists call pool effects in network industries Stabell, Charles B. and Oysteing D. Fjeldstad, "Configuring Value Chains for Competitive Advantage: On Chains, Shops and Networks," *Strategic Management Journal*, 19: 1998 or load balancing in the electric utility industry, Cooper, *Economics.*

[41] 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), describe the process in a context that finds the potential for market power and inefficiency.

[42] 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) (hereafter, FERC, Staff Report), p. 3-2; Ohio Report, pp. 20-21; Kiah, E., *Thoughts on Wild Prices*, July 1998, DOE, Outages.

[43] Cambridge Energy Research Associates (CERA), *Electric Power Trends: 2001* (2000); *High Tension: The Future of Power Transmission in North America* (August 2000) (hereafter, CERA, *High Tension);* Stipp, David, "The Real Threat to America's Power," *Fortune*, March 5, 2001.

[44]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);* p. 19; CERA, *High Tension.*

[45] Brendan, Kirby and Eric Hirst, "Maintaining Transmission Adequacy in the Future," *Electricity Journal* (1999), acknowledge the primary importance of noneconomic factors.

[46] Department of Energy, *Interim Report of the U.S. Department of Energy's Power Outage Supply Study Team*, January 1999 (hereafter, DOE, *Outages*), Finding 30.

[47] DOE Outages, Findings 9, 31.

[48] DOE Outages, Findings, 1, 16.

[49] Puller, Steven L., "Pricing and Firm Conduct in California's Deregulated Electricity Market" (Power, November 2000).

[50] Marcus and Ruazonvan.

[51] Even introductory economics texts now contain long discussions of strategic behavior and game theory [see, for example, Taylor, John, *Economics* (Boston: Houghton Mifflin, 1998), Chapter 11] and it has become a routine part of applied policy

analysis Hasting, Justine, *Factors that Affect Prices of Refined Petroleum Products*, Federal Trade Commission Public Conference, August 2, 2001.

[52] Scherer, F. M. and David Ross, Industrial *Market Structure and Economic Performance* (Boston: Houghton Mifflin: 1990, Third edition), pp. 21…22,

> 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.

[53] Interestingly, the first economic text cited by Landes and Posner (at note 6 – can't be – this is first reference) was the 1980 edition of Scherer and Ross. Landes and Posner (p. 937) offer a similar concept

> Our concept of market power is illustrated… 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'

[54] Up to the point where the marginal revenue from the last unit sold equals the marginal cost of producing it.

[55] Landes and Posner describe their analysis as follows:

> 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.

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

where:

S_d = the market share of the dominant firm

e_m = elasticity of demand in the market

e_j^s = elasticity of supply of the competitive fringe

s_i = market share of the fringe.

In words this formula says that the markup of price over cost will be directly related to the market share of the 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).

[56] Rosen, et al., Bushnell, James, Christopher Knittel and Frank Wolak, *Estimating the Opportunities for Market Power in Deregulated Wisconsin Electricity Market* (Consumers First, ND), pp. 10-13.

[57] Landes and Posner, at 947.

> 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

[58] Landes and Posner, at 942.

> [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.

[59] Pearce, George, *The Dictionary of Modern Economics* (Cambridge, MA: MIT Press, 1984), p. 124.
[60] Bannock, Graham, R.E. Banock and Evan Davis, *Dictionary of Economics* (London: Penguin, 1987). P. 128.
[61] 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* (London: Routledge, 1992), p. 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.

[62]U.S. Department of Energy, Office of Economic, Electricity an Natural Gas Analysis, *The Impact of Wholesale Electricity Price Controls on California Summer Reliability* (June 2001)
[63] *Id., p. 13.*

> Thus, a new combustion turbine would have to operate for more than 55 percent of the hours in a year in order to recover its fixed costs over a 3-year period if it were paid only $25/megawatt hour above its operating costs.
>
> Because combustion turbines have high operating costs and are built to meet peak demand, developers generally expect that they will have relatively low capacity factors, ranging from 10 percent to 30 percent – significantly less than would be required to recover capital costs in 3 years under the cost-plus proposal. Although capacity factors for new combustion turbines in California are likely to be above average for the next year, the projected break-even point of more than 55 percent represents a considerable risk for developers, which many will be unwilling to bear. Even if a developer expected to spread the plant's fixed costs over a 10-year period, the risk would still be high at a projected capacity factor of nearly 30 percent every year for 10 years

[64] Enron Power Marketing, Inc., *Analysis of the Midwestern Electricity Price Spikes of Late June 1998*; Michaels, Robert J. and Jerry Ellig, *Electricity Passes the Market Test* (Mercatus Center, October 19, 1998; an analogous response for the summer 2000 problems in California can be found in Electric Power Supply Association, *California: The Real Story*, September 11, 2000 Enron, p. 7.
[65]Watts, Price C., "Heresy? The Case Against Deregulation of Electricity Generation," *The electricity Journal*, 2001 (March 3).
[66] Staff Report, *Market Clearing Prices Under Alternative Resource Scenarios: 2000 –2010* (California Energy Commission, February 2000). The alternative analyses focus on a combined cycle plant, but the only difference in the financial assumptions is to increase the fixed charge factor for combustion turbines by assuming a higher rate of return on equity.
[67] Rosen, et al.,

> The capacity non-availability should be compared to the reserve margin of 25%… [The] Figure… indicates that the PCMI increases from approximately 9% to 22% as the level of unavailable capacity increases from 10% to 18.5%.*a*/ In other works, each additional percent of capacity that is not available, as a result of scheduled or unscheduled outage, results in a 1.5% increase in market clearing prices relative to the "perfectly competitive" price.

a/ It should be noted that even when the capacity non-availability is at the maximum value of 18.5% in the range considered, there is still *excess capacity* in the system, and therefore, the market power observed is not at its maximum.

[68] Puller, shows an immediate reduction in utilization after deregulation and divestiture. 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."

[69] A recent analysis utilizing the Lerner index approach to examine the withholding strategy makes it clear that weak market fundamentals are the key to sustained withholding strategies. This analysis identifies the market share necessary that would make it profitable to withhold supplies to raise prices. Withholding is clearly an attractive strategy for a substantial part of the normal operating conditions for electric utility markets. Kwoka, John, E. Jr., *Unilateral Withholding: Market Power and California's Electricity Crisis*, Discussion Paper No. 01-03 (Center for Economic Research, 2001), p. 10, concludes as follows.

> For market operation at [supply] elasticities such as .1, which appear to characterize the marginal capacity decile, the necessary post-withholding share is only 5 percent for a fairly large pre-withholding margin of .50. In that range, withholding may be a profitable strategy under plausible circumstances. Even with somewhat larger supply elasticities, withholding often remains profitable. For example, if S = 0.5 and pre-withholding margin is 20 percent, a 10 percent post-withholding share suffices. And if S=1.0 – a value that encompasses output down to 70 percent of capacity – a 10 percent pre-withholding margin still requires only a 10 percent post-withholding share.

[70] Borenstein, Bushnell and Wolak, *Diagnosing*.

[71] Puller.

[72] 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). 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.

[73] Rothkopf; FERC, June 19th Order.

[74] FERC, June 19th Order.

[75] Davis, Tina, "Reliant Admits 'Round-Trip Trading to Boost Revenues," *energy Daily*, May 14, 2002, "duke Admits to ICS 'Round-Trip' Trades," *energy daily*, July 17, 2002.

[76] "Those Hideous, Awful Enron Memos," *Wall Street Journal*, May 16, 2002.

[77] Harris, Kiah, E., *Thoughts on Wild Prices*, July 1998, p. 4.; Borenstein, Diagnosing; Wolak and Patrick; Cal, First Report, p. 21; FERC, Staff Report, pp. 3-2, 4-10.

[78] 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.

[79] Puller 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, Lynch, Chapter III; Marcus, William and Jan Hamrin, *How We Got into the California Energy Crisis*, JBS Energy (2000) (hereafter, Marcus, *Crisis*).

[80] There is a formal theory of this in economics -- called a backward bending supply curve. It has been extensively applied to labor markets. That the concept is routine is attested to by its inclusion in introductory texts, see for example, Taylor, John, B., *Economics* (Boston: Houghton Mifflin, 1998), pp. 327-329. The most directly analogous situation is behavior of the OPEC cartel (see Adelman, Morris, "OPEC the Clumsy Cartel," *The Energy Journal*, 1:1980; Bohi, Douglas and W. David Montgomery, *Oil Prices, Energy Security and Import Policy* (Washington: Resources for the Future, 1982); Aperjis, Dimitri, *The Oil Market in the 1980s: OPEC Oil Policy and Economic Development* (Cambridge, MA: Ballinger, 1982); Teece, David, "OPEC Behavior: An Alternative View," in James M. Griffin and David J. Teece (Eds.), *OPEC Behavior and World Oil Prices* (London: George Allen and Unwin, 1982); Adelman, Morris, "OPEC as a Cartel," in James M. Griffin and David J. Teece (Eds.), *OPEC Behavior and World Oil Prices* (London: George Allen and Unwin, 1982).

[81] Wolak, "An Analysis of the June 2000 Price," p. 14.

[82] 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).

[83] Borenstein, Busnell and Wolak, Diagnosing Market Power, pp. 32-33,

> The aggregate ^TC/TC is 22.4%, amounting to total payments in excess of competitive levels equal to $494 million.a/

a/ Note that the percent increase in purchase cost, ^ TC/(TC-^TC) was 29%.
[84] Cooper, *Reconsidering.*
[85] NRECA Energy Policy Department, *Retail Wheeling Report* (July 2001).
[86] EIA, *Electricity Average Revenue April 2001*.
[87] Ochenski, George, "Power Play," *Missoula* Independent, April 26, 2001; NRECA, *Retail Wheeling*, p. 33.
[88] Davis, Tina, "PPL Challenges Montana Limits on Power Rates," *The energy Daily*, July 11, 2001.
[89] Egan.
[90] Bowring, et. al., Rose, *Other States;* Stoft, *PJM's Capacity Market;* Allen, Biewald and Schlissel; Rosen, et al. .
[91] Mansur.
[92] 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),
[93] Rosen, et al.
[94] McDiarmid, Dowden, and Davidson; Allen, Biewald and Schlissel; Rosen, et al.
[95] Wolfram, *Reform*, notes the following

> From 1992 to 1994, on average prices were 25 percent above the cost of the last plant needed to generate electricity in a given period. That suggests prices would have been substantially lower had they been set competitively. Since 1994, fuel prices have come down but electricity prices have not fallen accordingly. That suggests profits have risen and provides further evidence that prices are not responding to competitive forces.

[96] The model is based on the following assumptions and techniques

A constant elasticity of demand of -.1 is assumed in the form of $Q = kP^e$.
Demand is anchored in 1000 MW increments assuming the average cost of production of $25.5/MWh by adjusting *k*.
All fringe supply is utilized first and the dominant firm/cartel face the residual for their demand curve.
Total nameplate capacity is 40000 MW; import capacity is 4000 MW.
Demand ranges from 8000 MW to 36000 MW per hour.
Fringe supply is 24000 MW in the dominant firm case, 16000 MW in the cartel case.
Given spinning reserves and outages, at 36000 MW of load, the residual demand in the dominant firm case is 12000 MW and in the cartel case it is 20000 MW.
A price cap of $1,000 is assumed.
Cost data and net generation are taken from the FEMA study.

[97] Bornstein, Bushnell and Wolak.
[98] This is the line of discussion pursued by Landes and Posner.
[99] 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

[100] Wolak, Frank A. and Robert H. Patrick, *Impact of Market Rules and Market Structure on the Price Determination Process in the England and Wales Electricity Market* (University Of California Energy Institute, Program On Workable Energy Regulation, February 1997
[101] Cooper, Restructuring, p. 8; Mistr, Alfred E. Jr., "Incremental-Cost Pricing: What Efficiency Requires," *Public Utilities Fortnightly*, January 1, 1996; Oren, Shmuel, S., "Economic Inefficiency of Passive Transmission Rights in Congested Electricity Systems with Competitive Generation," *The Energy Journal*, 18:1, 1997, "Passive Transmission Rights Will Not Do the Job," *The Electricity Journal*, 10:5, 1997; Ostroski, Gerald B., "Embedded-Cost Pricing: What Fairness Demands," *Public Utilities Fortnightly*, January 1, 1996; Radford, Bruce W., "Electric Transmission: An Overview, *Public Utilities Fortnightly*, January 1, 1996: Volpe, Mark J., "Let's Not Socialize Transmission Rates," *Public Utility Fortnightly*, February 15, 1997. Bohi, Douglas and Karen Palmer; "The Efficiency of Wholesale vs. Retail Competition in Electricity, *The Electricity Journal*, October 1996; Gegax, Douglas and Kenneth Nowotny, "Competition and the Electric Utility Industry, *Yale Journal on Regulation*, 10:63, 1997, Cornelli, Steve, "Will Customer Choice Always Lower Costs?", *The Electricity Journal*, October, 1996.
[102] FERC, 3-1, 3-2.
[103] CERA, *High Tension.*
[104] Brendan, Kirby and Eric Hirst, "Maintaining Transmission Adequacy in the Future," *Electricity Journal* (1999), acknowledge the primary importance of noneconomic factors.
[105] Harris, p. 5.
[106] Ohio Report, p. 19.
[107] Ohio Report, pp. 20-21.

[108] Geographic scope is needed to achieve what network economists call pool effects in network industries Stabell, Charles B. and Oysteing D. Fjeldstad, "Configuring Value Chains for Competitive Advantage: On Chains, Shops and Networks," *Strategic Management Journal*, 19:1998 or load balancing in the electric utility industry, Cooper, *Economics.*

[109] Richard, Sverrisson, and Stutz, raise questions about the ability of any set of institutions to run the industry based primarily on external market transactions. 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), describes the process in a context that finds the potential for market power and inefficiency.

[110] Energy Information Administration, *Interim Report of the U.S. Department of Energy's Power Outage Supply Study Team* (January 1999) (hereafter, EIA, *Outages).*

[111] Maloney, Michael T., Robert E. McCormick and Robert D. Sauer, Customer Choice, Customer Value: An Analysis of Retail Competition in America's Electric Utility Industry (Citizens for a Sound Economy Foundation, 1996); Crandall, Robert and Jerry Ellig, Economic Deregulation and Customer Choice: Lessons for the Electric Utility Industry (Center for Market Process, 19997).

[112] Pharris, Dale, Who Really Benefits From Retail Competition? (National Rural Electric Cooperative Association, September 1996). Kahal, Matthew I., The CSEF Electric Deregulation Study: Economic Miracle or the Economists' Cold Fusion (Electric Consumers' Alliance, December 1996). Binz, Ronald J., Thomas Feiler and Michael J. McFadden, Navigating A Course to Competition: A Consumer Perspective on Electric Restructuring (Competition Policy Institute, 1997).

[113] EIA, *Competitive Markets.*

[114] Newberry, and Pollitt, estimated efficiency gains of 5 percent. Casazza, John, A., "Electricity Choice: Pick Your Poison: A. Errant Economics? B. Lousy Law? C. Market Manipulation? D. All Three?," *Public Utilities Fortnightly*, 2001 (March 1), identifies efficiency gains in generation of 3 percent.

[115] Cooper, Restructuring.

[116] Cassaza, 2001. A guest editorial, a decade earlier by the same author, just as the UK was implementing restructuring, raised doubts about the economic benefits of restructuring (see Casazza, John A., Allan J. Schultz and Joseph C. Swidler, "A Brave New World: Let's Look Before we Leap," *Electricity Journal*, 1990 (November).

[117] The Cal-ISO has argued for a dependable reserve of 14 to 19 percent, which translates into a nameplate reserve in the range of 20 to 25 percent. The analysis assumed that reserves are not owned by existing large generators or strategic actors, that they would be under an obligation to offer, and that import capacity of about 10 percent of peak is available. Relaxation of any of these assumptions would increase the reserve necessary to avoid market power. From a national policy perspective, deconcentrating markets and preventing withholding have proven extremely difficult. Assuming the availability of import capacity from neighboring markets implicitly suggests that the reserve margin in that market is larger, since spare capacity can be exported. Taking these factors into account from indicates the reserve margins necessary to prevent abuse are in excess of 30 percent of nameplate capacity.

[118] As we have noted, the market power problems were well known long before the California market was created. An early 1997 analysis of the UK market concluded that

> The most basic lesson is that competition in name is just that. Whether or not setting up an electricity market similar to the E&W [England and Wales] market will deliver benefits to consumers in the form of lower prices, depends on the market structure and the details of the market rules governing its operation. Subtle differences in the rules of the market can dramatically enhance the ability of generators selling into the market to set prices substantially in excess of their marginal and average costs…
>
> Given the number of firms in the market and the market rules, what is important to limiting market power is reducing the size of the largest firm relative to all others. The key to the success of this capacity-withholding bidding strategy at obtaining high prices is that frequently the largest generator knows that a significant portion of its capacity will be called upon, regardless of the prices it bids. If all generators are equal in size and the total system load is significantly less than the sum of their capacities, then only very rarely, if ever, will the largest generator know with virtual certainty that a substantial fraction of its capacity will be required to serve the market… The larger is the extent of demand uncertainty faced by the largest firm relative to capacity, the less likely this capacity withholding strategy will be successful (Wolak, 1997, p. 46.).

This expression – "if all generators are equal in size and the total system load is significantly less than the sum of their capacities" – is vastly different than the current status of most electricity markets, restructured or otherwise. The need for excess capacity and the need to deconcentrate markets are quite substantial. The abuse of market power in the UK, which is the object of the above quote, was taking place with reserve margins of over 20 percent (Id, at p. 30).

[119] In Australia, where the market power problem did not occur early in the process, [when deregulation was first implemented?] the primary reason appears to have been the existence of excess capacity of 40 percent. Simulations in advance of the opening of the Australian market identified both highly competitive and the possibility of strategic bidding, but excess capacity loomed large in the market, Brennan, Donna and Jane Melanie, "Market Power in the Australian Power Market," *Energy Economics,* 1998 (20). Wolak, Frank A., "An Empirical Analysis of the Impact of Hedge Contracts on Bidding

Behavior in A Competitive Electricity Market," *International Economic Journal*, 2000 (14), analyzed the early pricing behavior in the market and found that excess capacity was a central driver of bidding behavior, p. 34,

> How did the major generators get themselves in a situation where aggressive bidding and low prices yield the maximum profit possible? Stated differently: Why did the generators sign contracts for such a large fraction of their capacity? … Clearly, a major factor in the decision of the large generators to sign these contracts is excess generation capacity to serve both the VPX and NSW SEM. Even in the absence of contract cover being held by any participants, the large amount of capacity available to serve each state market relative to that state's demand in the vast majority of half-hours for the year implies that all generators face a significant probability all of their capacity will not be dispatched if they do not bid aggressively.

[120] Rudkevich, Alesandr, Max Duckworth, and Richard Rosen, "Modelling Electricity Pricing in a Deregulated Generation Industry: The Potential for Oligopoly Pricing in a Poolco," *The Energy Journal*, 1998 (19).

> We found that the average price mark-up over the course of one year is 16% in a market with five identical firms, and 11% for ten identical firms. For purposes of reference, the DOJ and FERC guidelines state that a market with more than ten identical firms is "unconcentrated." In addition, we find that in order to reduce the annual PCMI [Price Cost Margin Index] to 5%, the poolco would require almost thirty identical firms.

[121] Borenstein, Severin and James Bushnell, "An Empirical Analysis of the Potential for Market Power in California's Electricity Industry," *Journal of Industrial Economics*, 47:3, September 1999. A linear interpolation for the 372nd hour based on 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. They find that market power disappears at just 33,000 MW of demand. With a maximum peak demand in the month of just over 41,000 MW this implies a peak capacity for the month of 44,000 MW. In other words, at the 300th hour where market power is eliminated, excess capacity is at least 29 percent.

[122]Bushnell, James, Christopher Knittel and Frank Wolak, *Estimating the Opportunities for Market Power in Deregulated Wisconsin Electricity Market* (Consumers First, ND).

[123] Authors find that quadrupling the elasticity of demand to .4 has the effect of eliminating the abuse of market power under the modeling assumptions (see Sweetser, Al, *An Empirical Analysis of a Cominnat Dominant? Firm's Market Power in a Restructured Electricity Market: A Case Study of Colorado* (April 1, 1998); Rudkovich, Duckworth and Rosen, review data from Pennsylvania, Borenstein and Bushnell, apply the approach to California).

[124] These estimates are based on the figures available for September 2000.

[125] Pennsylvania Shopping statistics shows the addition of residential customers who are switching dropped from 10,000 a month in 1999 to 5,000 in 2000,

[126] *Petition of Metropolitan Edison Company and Pennsylvania Electric Company for Interim Relief Pursuant to Section F.2 of Their Approved Approved Restructuring Plan*, Before The Pennsylvania Public Utility *Commission Docket Nos P-00001860, P-00001861;* Lobensz, George, "Pennsylvania Court Zaps GPU Rate Relief," *Energy Daily*, February 22, 2002.

[127] Holly, Chris, "N.J. Governor Signs Bill to Fix Restructuring 'Flaw'," *Energy Daily*, September 10, 2002.

[128] Hirst, Erik, *Expanding U.S. Transmission Capacity* (Edison Electric Institute, July 2000) shows that PJM has the smallest number of miles of transmission lines per megawatt of peak demand.

[129] *Storm Warning*, PennFuture's E-Cubed, February 20, 2001.

[130] NERC statistics for 1998, show substantial interruptions in 1998.

[131] Bowring, et. al., Rose, *Other States;* Stoft, Steven, *PJM's Capacity Market in a Price-spike World* (May 2000).

[132] *Storm Warning*, PennFuture's E-Cubed, February 20, 2001.

[133] DOE, Outages.

[134] The population density of the PJM region is 400 people per square mile of land. In the rest of the country, the population density is about 70. Similarly, in New York where LMP has been applied the population density is just under 400. The economic costs of low density markets are a fact of life that cannot be avoided, but locational marginal pricing does not use the economic cost of transmission, it charges the opportunity or scarcity costs. As a result, severe efficiency and equity problems arise. In fact, LMP should really be referred to as LMR, Locational Marginal Rents.

Since transmission is a virtually fixed asset in the short and mid-term, LMP creates massive transfers of inframarginal rents from consumers to transmission owners. Since these are scarcity rents, they do not contribute to economic efficiency. Even the defenders of locational marginal pricing grudgingly admit that the rents could be taxed away (Hogan, William W., *Coordination for Competition: Electricity Market Design Principles* (February 15, 2001).

Moreover, to a significant extent that scarcity is the result of strategic behavior by transmission owners – particularly integrated generation/transmission owners – to keep markets tight or defend their market power by raising barriers to entry, allowing them to collect the windfalls of inframarginal scarcity rents rewards anticompetitive behavior.

There are also problems with this pricing scheme at the margin. To the extent that the inability to expand capacity is a social problem – grounded in environmental and health concerns – throwing money at the problem (i.e. raising the marginal rate of return) does not help solve it. Again, the result is a wealth transfer with little efficiency pay off.

There is no competitive market to supply transmission services, since transmission networks appear to be natural monopolies resting on government powers of condemnation and rights of way where building of competitive redundant networks is uneconomic. Rewarding transmission owners with increased incentives do not necessarily produce the least cost additions to supply.

Under these circumstances, the wealth transfers associated with scarcity pricing vastly exceed the efficiency gains. To the extent that one wants to induce generators not to take transmission for granted and locate in places that save on this scarce resource, it is possible to show producers the scarcity values in the prices they pay and then tax away the windfalls (distributing them to consumers, whose locational decisions are not the cause of the scarcity, and with the exception of a few very electricity intensive industries, nor are they dictated by the cost of electricity). If the point is to identify congested lines and load pockets to induce generators to take congestion into account in the location of new facilities, an administrative incentive scheme could be just as effective without creating the massive transfer of wealth.