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**RECONSIDERING ELECTRICITY RESTRUCTURING:
DO MARKET PROBLEMS INDICATE
A SHORT CIRCUIT OR A TOTAL BLACKOUT?**

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RECONSIDERING ELECTRICITY RESTRUCTURING: DO MARKET PROBLEMS INDICATE A SHORT CIRCUIT OR A TOTAL BLACKOUT?

EXECUTIVE SUMMARY

SYSTEMATIC CAUSES OF THE FAILURE OF RESTRUCTURED ELECTRICITY MARKETS

Judging market performance by the ability to provide consumers with a choice of high quality products at stable, reasonable prices, the restructured electricity market is failing from coast-to-coast. This paper demonstrates that the problems arise from systematic market conditions and flawed market structures, not from accidents, impatience or partial deregulation. The findings, summarized in Table ES-1, compel policymakers to rethink electricity deregulation.

Inevitably, the extreme tightness of supply will ease somewhat, but the electricity market will remain a difficult and dangerous one for consumers. Inflexibility of supply and demand are basic conditions that render the electricity market volatile and vulnerable to abuse.

- Short-term supply responses are constrained because of the difficulty of storing electricity
- Significant additions to supply still require substantial lead times.
- The coordination of an integrated, real-time network has broken down because competition reduces the incentive for market participants to cooperate and makes it difficult for system operators to manage the electricity grid.
- Provision of reserve margins is uncertain in a competitive market, since no one has an interest in building excess capacity, suggesting that these markets may remain tight.

Behaviors in the economic and political marketplace make it clear that powerful interests helped to create and are exploiting this vulnerable market structure.

- Recent mergers that have increased horizontal concentration of generation and vertical integration between generation and transmission make the industry less competitive.
- Utilities cut back on investment in generation and transmission, blaming an uncertain regulatory environment, and simultaneously refused to open their networks to competitors, inhibiting the construction of competitive capacity.
- Inadequate transmission capacity and self-interested manipulation of access to the transmission system limits the ability of power to flow.
- Utilities resisted allowing consumers to aggregate their demand effectively and undermined the ability of consumers to self-supply by blocking or slowing the deployment of distributed generation capacity.

Pricing behavior indicates the existence of market power.

- Bidding behavior indicates an insufficient number of electricity producers to prevent gaming that drives prices to extremely high levels.
- Contracting behavior in the face of a lack of information and rigid rules distort price signals.

TABLE ES-1: CAUSES OF ELECTRIC UTILITY INDUSTRY MARKET FAILURE

BASIC CONDITIONS: SUPPLY

Technology Long lead times 5(7) 6(1), Delayed replacement 6(16) 11(2) Inability to store electricity 5
 Product durability Generation Outages 1(2-11, 4-6) 3(15) 5(40) 10(1-2), Transmission shutdowns 1(4-10),
 Failures take time to repair 6(9) Summer impairment of performance 6(7, 18, 22)

BASIC CONDITIONS: DEMAND

Price elasticity Extremely low short run 2(24) 5(39) 11(2), Limited conservation 6(2,19, 23)
 Substitutes Lack of substitutes, Restriction on self-supply 8
 Cyclical/seasonal Weather-related demand 1(4-6) 2(37) 10(1-2), Inadequate reliability criteria 6(21)
 Purchase method Obligation to serve 1 (4-1) 2(25), Lack of incentive to cut back 1(4-4) 4(46)6(2, 19)

MARKET STRUCTURE

Number of sellers Few sellers 2(ii) 3(21) 4(49-56) 5(6,7) 7
 Number of buyers Constrained demand by utilities 1(4-1) 2(25) 5(30,31), Constrained distribution 6(30)
 Limited end-user choice 5(42,57)
 Barriers to entry Transmission constraints 1(2-15,5-7)5 (11,12), Load pockets, inadequate system 6(10,32)
 Self-supply blocked 8Emergencies 1(2-15), Substation inflexible 6(31)
 Cost structures High fixed
 Vertical integration Affiliate relations distort market 2(38) 6(38), Integration restricts entry 11(3)
 Diversification Utilities add brokerage 2(24,28) Inadequate planning/spending
 for maintenance 6(29,34 - 37)
 Inadequate Market Lack of timely, objective 1(5-3) 2(ii), Load projections 6(8), Unit ratings 6(11)
 Information Planning tools 6(13), Cable condition, incipient failure 6(5,14), Refusal to share best
 practices 6(15), Forecasting 6(17, 28), Inadequate notice 6(20) Dispatch software 6(27)
 Inadequate coordination Breakdown of coordination 1(2-37, 3-3), ISO lacks authority 6(4), Lack of data 6(6)

CONDUCT

Pricing behavior Hoarding, gouging 4(65) 5(3,38) Above cost 10(1-4) 11(17) Reliance on nonfirm power 6(24) 10(2-
 1) 11(3)
 Legal tactics Defaults, abrogation of contracts, daisy chains, two-way deals1(4-10, 5-2) 2(4)
 Refusal to provide market monitoring information 5(4) Inefficient short term sales 6(25),
 Records not preserved 6(33)
 Regulation Transmission rules create problems 1(4-40) 2(20) 11(3), Market rules not developed 6(3)

SOURCES:

1 = Federal Energy Regulatory Commission, *Staff Report to the Federal Energy Regulatory Commission on the Causes of the Pricing Abnormalities in the Midwest During June 1998* (Washington, D.C.; 1998)
 2 = Public Utilities Commission of Ohio Report, *Ohio's Electric Market: June 22-26, 1998, What Happened and Why: A Report to the Ohio General Assembly* (Columbus, Oh; 1998)
 3 = Bohn, Roger E., Alvin K. Klevorick and Charles G. Stalon, Market Monitoring Committee of the California Power Exchange, *Report on Market Issues in the California Power Exchange Energy Markets* (August 17, 1998)
 4 = Bohn, Roger E., Alvin K. Klevorick and Charles G. Stalon, Market Monitoring Committee of the California Power Exchange, *Second Report on Market Issues in the California Power Exchange Energy Markets* (March 9, 1999)
 5 = Klein, Michael and Loretta Lynch, *California's Electricity Options and Challenges* (August, 2000)
 6= Department of Energy, *Interim Report of the U.S. Department of Energy's Power Outage Supply Study Team*, January 1999;
Horizontal Market Power in Restructured Electricity Markets, March 2000
 7 = Department of Energy, *Horizontal Market Power in Restructured Electricity Markets*, March 2000
 8= Alderfer, R. Brent, et al., *Making Connections: Case Studies of Interconnection Barriers and their Impact on Distributed Power Projects* (National Renewable Energy Laboratory, May 2000)
 9 = Energy Information Administration, *The Changing Structure of the Electric Power Industry 1999: Mergers and Other Corporate Combinations*, December 1999
 10 = Staff Report on the Federal Energy Regulatory Commission on Western Markets and the Causes of the the Summer 2000 Price Abnormalities (November 1, 2000)
 11= Wolak, Frank A., et al., "An Analysis of the June 2000 Price Spike in California ISO's Energy and Ancillary Service Market," *Market Surveillance Committee of the California Independent System Operator* (september 6, 2000)

REREGULATION OR RESPONSIBLE DEREGULATION

It is important to stress that we do not have to deregulate every market, or every segment of every market. Markets are a means to an end, not an end in themselves. If basic conditions or market structures are not right, lower prices, higher quality, and genuine consumer choice will not result. With a vital commodity like electricity, consumers can easily be hurt, rather than helped, by imperfect markets.

Policymakers have an obligation to actively consider whether the underlying conditions are conducive to consumer abuse and to take measures to prevent it. In 1997 they could get away with the belief that the market would take care of things; in 2001, they cannot. Policy makers must ensure that basic supply and demand conditions, market structures and trading institutions are adequate to support competition before deregulation. Competition must exist before, and policymakers must monitor market performance closely after, deregulation.

States that have not restructured, should not, not until it can be demonstrated that restructuring can serve the consumer interest. States that have not yet moved too far through the restructuring process – particularly where generation has not yet been divested or control of the grid has not yet been transferred to an ISO/RTO -- should slow or stop the process until they gain confidence that a true market for generation will can be created and the grid can be operated in an manner the promotes reliability and supports market transactions.

States where Humpty Dumpty has been broken and is not likely to be put back together again should undertake vigorous efforts to protect residential consumers. These should include rules to prevent price spikes, law enforcement against pricing abuse, requirements to participate in effective market opening transmission organizations, opt out aggregation for small consumers, and aggressive pursuit of distributed generation.

OPENING THE HIGHWAYS OF COMMERCE

The failure to recognize the important role of the continuing monopoly in distribution and transmission resulted in the under-regulation of the wires segments of the industry. Since generation assets are sunk and load is immobile, the wires business stands at the intersection of many of the industry problems as an essential, bottleneck facility in short supply.

These are the highways of commerce over which electricity flows and this highway system is not a market. One of its primary inputs is right-of-way, which relies on governmental power of condemnation. The biggest obstacle to the expansion of transmission capacity is public concern about negative externalities – ugly wires and local health effects – not inadequate incentives. There is virtually no redundancy in the system today and never likely to be head-to-head competition in the wires business.

Because the wires problem is not a market problem, proposals to let the marketplace solve it are not likely to succeed. Given the market power that the wire “owner” would possess and the non-market barriers to expanding capacity, profit maximization would only result in the abuse of market power and the creation of scarcity rents.

- The right model for transmission is a public or private entity imbued with the public interest and dedicated to ensuring that this essential facility fulfils it public functions – ensuring reliability and supporting nondiscriminatory market transactions.

- It must be independent of all market participants and directly responsible and accountable to public authorities for achieving those goals.
- The transmission operator must oversee mandatory, comprehensive open access and standardize transactions over as large an area as possible to minimize transaction costs and capture economics of scale and integration.
- Transactions must be transparent, with the creation of an exchange in which all rates terms and conditions can be identified.
- Brokers must be subject to rules that are similar to those applied to financial transactions like stock sales and dealings.

DEMONOPOLIZATION BEFORE DEREGULATION

The generation market must also be deconcentrated before it is deregulated.

- Markets should not be deregulated until an affirmative finding of the absence of market power is made by responsible antitrust authorities.
- FERC should reconsider market-based pricing for markets that have not been found to be effectively competitive or utilities that fail to join nondiscriminatory transmission organizations.
- Aggressive policies to discipline abuse of market power should be implemented.
- Ownership limits should be established and additional mergers should be denied until effective market structures are defined.
- Caps on wholesale prices that are uniform throughout the relevant interstate market – most likely intertie-wide -- should be set to protect consumers from wild price swings and to prevent energy suppliers from forum shopping and pursuing beggar they neighbor behaviors.

FREEING THE DEMAND SIDE WITHOUT PUNISHING SMALL CONSUMERS

The supply-side of the market and the highways of commerce should be the focal point of policy. If the only way to make electricity deregulation work is to punish small consumers for using electricity when they need it most, these customer classes will rightly vote to go back to the old system. Nevertheless, there are policies that can free the demand side, without punishing it.

- Aggregation of small consumers should be promoted to overcome obstacles to their participation in the market.
- Distributed generation, which adds generation resources and saves on transmission resources, should be facilitated with streamlined interconnection and favorable regulatory treatment.
- More effective programs for short-term reductions in demand among commercial and industrial customers must be developed.
- Retail prices must be capped during the transition to a fully competitive market.

I. PERFORMANCE OF RESTRUCTURED ELECTRICITY MARKETS CHAOS HERE, CHAOS THERE, CHAOS EVERYWHERE

The meltdown of electricity markets in California, the first state to take electricity restructuring to its logical (or illogical) conclusion, has voices raised and angry fingers pointing in every direction. The public is in an uproar.^a The California Public Utility Commission (CPUC) criticized the industry heavily, and challenged the structure of the Independent System Operator (ISO).^b The ISO shot back and criticized the rules laid down by the CPUC and the behaviors it required of utilities.^c The response of the Federal Energy Regulatory Commission (FERC)^d has been criticized by a number of stakeholders including the Governor of California and the Secretary of Energy.^e

The severe problems that restructured electricity markets experienced this summer come as no surprise to consumer advocates.

- An assessment of the structure of restructuring just prior to the start of the nation's first experiment in California, raised strong doubts that residential consumers would benefit much from restructuring.^f
- An analysis of the price spikes of 1998 in California and the mid-west led to the conclusion that market structural conditions create volatility in the electric utility industry and make the abuse of market power highly likely.^g
- A review of deteriorating quality of service in 1999 reinforced these concerns.^h

Amid this din, it would be nice if policy makers could have a little peace and quiet to reflect before having to make their next move. Unfortunately, because many states had started down the path of restructuring and advocates of deregulation will keep the pressure on to plow ahead by making excuses for these problems,ⁱ policymakers are going to have to make some very tough decisions for very high stakes before the cacophony of conflicting messages abates..

^a Needless to say, there are hundreds, if not thousands of newspaper accounts. For a single articles that gives a sense of the national scope of the problem see Smith, Rebecca and John Fialka, "Electricity Firms Play Many Power Games that Jolt Consumers," *Wall Street Journal*, August 4, 2000.

^b Klein, Michael and Loretta Lynch, *California's Electricity Options and Challenges* (August, 2000) (hereafter, CPUC Report).

^c *ISO Response to Selected Portions of the Summer 2000 Report to the Governor* (August 8, 2000) (hereafter ISO-1); Wolak, Frank A., et al., "An Analysis of the June 2000 Price Spike in California ISO's Energy and Ancillary Service Market," *Market Surveillance Committee of the California Independent System Operator* (September 6, 2000) (hereafter ISO-2)

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

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

^f Consumer Federation of America and Consumers Union, *Residential Consumer Economics of Electric Utility Restructuring* (1998) (hereafter Restructuring).

^g Consumer Federation of America and Consumers Union, *Electricity Restructuring and the Price Spikes of 1998*, June 1999 (hereafter, Spikes).

^h Consumer Federation of America, "Request for Reconsideration," *Regional Transmission Organizations*, United States of America, Federal Energy Regulatory Commission, Docket No. RM99-2-000; Order No. 2000, Session, January 20, 1999); *Mergers and Open Access to Transmission in the Restructuring Electric Industry: Analytic Tools, Empirical Evidence and Policies to Build Effective Market Structures* (April 2000).

ⁱ Defenders of restructuring first tried to shrug off price spikes and quality problems as accidents caused by a few technological breakdowns interacting with extraordinarily high demand ("As Might be Expected, Any Lesson to be Learned from the June Power Crisis and Price Spikes Depend Upon Whom You Ask," *Foster Electric Report*, No 145, August 5, 1998, quoting, AEP, p. 15; FERC, Staff Report, p. 4-13). As problems persisted, they have shifted the blame to a transitory shortage of supply or bad rules in a few markets (Bill Briar, *Talk of The Nation*, August, 10, 2000). Given

Because the noise coming from California is so loud, consumers must speak loudly and clearly to be heard. Those who insist that California cannot happen here, there or anywhere else are simply wrong. None of the excuses stands up to the scrutiny of objective empirical analysis.¹

Although California made some mistakes, versions of its problems have already occurred and are continuing to occur in many other markets, for systematic reasons that are similar across markets.

- As Figure 1 shows, price spikes are not unique to California. There have been price spikes, summer after summer, all over the country.
- As Figure 2 shows, tight supply conditions leading to shortages and brown outs are not unique to California. These market conditions exist all over the country. To the extent that these conditions contribute to the problems, they are widespread.
- As Table 1 shows, these are not accidents or aberrations. The underlying problems are structural and long term.

high enough prices, they claim a little patience will call forth new supplies that will solve the problem. In fact, some have argued that prices as high as \$25,000 per megawatt hour are justified (see Michaels, Robert J. and Jerry Ellig, *Electricity Passes the Market Test* (Mercatus Center, October 19. Enron Power Marketing, Inc., *Analysis of the Midwestern Electricity Price Spikes of Late June 1998*, (Enron), p. 2). 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.

¹ In addition to the analysis of the California problem, cited above, other problems in the industry have attracted a great deal of attention. Three regulatory bodies looked at the 1998 price spikes in various parts of the country – the Federal Energy Regulatory Commission (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) (Hereafter, Ohio Report). 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) (Hereafter Cal, Report). The Department of Energy looked the 1999 reliability problem indicated by the outages (U.S. Department of Energy, *Interim Report of the U.S. Department of Energy's Power Outage Supply Study Team*, January 1999) (Hereafter, DOE Outages). It also examined market structural problems (Department of Energy, *Horizontal Market Power in Restructured Electricity Markets*, March 2000 (hereafter, DOE Market Power), Energy Information Administration, *The Changing Structure of the Electric Power Industry 1999: Mergers and Other Corporate Combinations*, December 1999 (Hereafter, DOE Mergers)). and the difficulties that utilities created for the expansion of supply through distributed generation (Alderfer, R. Brent, M. Monika Eldridge, and Thomas J. Starrs, *Making Connections: Case Studies of Interconnection Barriers and their Impact on Distributed Power Projects* (National Renewable Energy Laboratory, May 2000) (hereafter Connections).

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Inadequate Market	Lack of timely, objective 1(5-3) 2(ii), Load projections 6(8), Unit ratings 6(11)
Information	Planning tools 6(13), Cable condition, incipient failure 6(5,14) Refusal to share best practices 6(15), Forecasting 6(17, 28) Inadequate notice 6(20) Dispatch software 6(27)
Inadequate coordination	Breakdown of coordination 1(2-37, 3-3), ISO lacks authority 6(4), Lack of data 6(6)

CONDUCT

Pricing behavior	Hoarding, gouging 4(65) 5(3,38) Above cost 10(1-4) 11(17) Reliance on nonfirm power 6(24) 10(2-1) 11(3)
Legal tactics	Defaults, abrogation of contracts, daisy chains, two-way deals1 (4-10, 5-2) 2(4) Refusal to provide market monitoring information 5(4) Inefficient short term sales 6(25), Records not preserved 6(33)
Regulation	Transmission rules create problems 1(4-40) 2(20) 11(3) Market rules not developed 6(3)

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- 6= Department of Energy, *Interim Report of the U.S. Department of Energy's Power Outage Supply Study Team*, January 1999; *Horizontal Market Power in Restructured Electricity Markets*, March 2000
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The stakes are staggering. Hundreds of millions of dollars changed hands in a matter of days in the mid-west and West Coast spikes of 1998 and 1999.^k Billions changed hands in a few months in California in 2000. Consumers in San Diego have suffered increased electricity bills in 2000 of \$700 million^l and California utilities would appear to be in the hole for many billion more,^m which they are seeking to recover from ratepayers. Thus, even short periods of volatility demand vigorous policy responses.

This paper presents an explanation of the causes of this market failure that emphasizes the systematic and structural factors that have rendered the electricity market vulnerable to abuse and prone to volatility. It relies primarily on the results of investigations into the market chaos by regulatory agencies and oversight authorities.

- Accidents – acts of God, or nature – do not only happen in California, they happen everywhere. The extreme volatility of these markets cannot be explained by a combination of weather and accidents.
- The underlying tight market conditions are themselves the result of systematic problems that have not been solved. There are also ways in which new market institutions and transactions make the likelihood of accidents and their impact greater. Accidents do not just happen; controllable conditions and circumstances can make them more or less likely to occur and make their consequences more or less severe.
- Economic and political actions by utilities have created a highly concentrated, supply constrained market. Behaviors in the economic and political marketplace make it clear that there are economic interests that helped to create and exploit this vulnerable market structure.ⁿ

The key to solving the problems of the restructured electricity market is to recognize that the market failure is systemic and will not simply correct itself. Because problems are so severe, they inevitably will abate to some extent, but that does not mean that the market will function well. Refusal to address the systematic problems will prolong and frustrate any transition to an orderly market.^o In fact, the failure to have a legitimate debate about which parts of the electricity market should have been deregulated in the first place has contributed to the fundamental problem because policymakers assumed the market would do things it could not.^p

When a coherent, theoretically based view of the electricity market is taken,^q as opposed to the ad hoc excuses offered by market participants, many of whom are profiting handsomely from the

^k FERC, Staff Report, p. 3-19, estimates a net transfer of revenues (net losses by some, net gains by others) of approximately \$300 million. Five entities accounted for almost three-quarters of the losses (\$215 million). Wolak, Frank, *Harvard Energy Project* estimates above-cost pricing of \$800 million in 1999.

^l Michael Shames, *Talk of the Nation*, August 11, 2000.

^m Berry, Kate and Anne C. Mulkern, "California Utilities Want Consumers to Foot \$3 Billion Electricity Bill," *The Organ County Register*, September 9, 2000. By December, the bill had reached \$6 billion (see Smith, Rebecca, "Struggle Between Utilities and Customers May Affect Future of Energy Deregulation," *Wall Street Journal*, November 27, 2000.

ⁿ An accounting of the vast sums spent by industry to prevent effective competition can be found in Benton, James C., "Money and Power: the Fight Over Electricity Deregulation," *CQ Weekly*, August 12, 2000.

^o Cal Report, p. 51, argued that the problems would get worse without policy intervention, as they apparently have.

^p Commissioner Carl Wood of the California Public Utility Commission described it as the "theological devotion to" *Talk of the Nation*, August 9, 2000.

^q In analyzing market structure and prescribing public policy we apply the structure, conduct performance (SCP) view of economic activity (see Scherer, F. M. and David Ross, *Industrial Market Structure and Economic Performance* (Boston, Houghton Mifflin: 1990). The elements of the approach can be described as follows, pp. 4-5. In SCP analysis the central concern is with market performance, since that is the outcome that affects consumers most directly. The concept of performance is multifaceted. It includes both efficiency and fairness. The measures of performance to which we traditionally look are pricing, quality and profits. Pricing and profits address both efficiency and fairness. They are

wild gyrations in the market, the need for fundamental policy changes becomes apparent. In the first round of electricity restructuring, policymakers seriously overestimated the ability of market forces to function in the electricity industry and underestimated the ability of large entities to take advantages of market weaknesses and flaws. This paper offers a comprehensive set of policy recommendations that outlines a much more active role for regulators in a number of aspects of the market.

II. THE EXPLANATION: STRUCTURAL FLAWS IN ELECTRIC UTILITY MARKETS

A. CHALLENGES ON THE SUPPLY-SIDE

There are systemic causes of the current tightness on the supply-side of the market. Although the current extreme tightness of supply may ease somewhat, inflexibility of supply renders the market volatile and vulnerable to abuse.

- The elasticity of supply is low. Short-term supply responses are constrained by the difficulty of storing electricity.

the most direct measure of how society's wealth is being allocated and distributed. The performance of industries is determined by a number of factors, most directly the conduct of market participants. Conduct is primarily a product of other factors. Conduct is affected and circumscribed by market structure. Market structure includes an analysis of the number and size of the firms in the industry, their cost characteristics and barriers to entry, as well as the basic conditions of supply and demand.

We begin with the fundamental proposition that what society wants from producers of goods and services is good performance. Good performance is multidimensional... Decisions as to what, how much and how to produce should be efficient in two respects: Scarce resources should not be wasted, and production decisions should be responsive qualitatively and quantitatively to consumer demands.

The operations of producers should be progressive, taking advantage of opportunities opened up by science and technology to increase output per unit of input and to provide consumers with superior new products, in both ways contributing to the long-run growth of real income per person. The operation of producers should facilitate stable full employment of resources... The distribution of income should be equitable. Equity is notoriously difficult to define, but it implies at least that producers do not secure rewards in excess of what is needed to call forth the amount of services supplied.

Performance in particular industries or markets is said to depend upon the conduct of sellers and buyers in such matters as pricing policies and practices, overt and taciturn interfirm cooperation, product line and advertising strategies, research and development commitments, investment in production facilities, legal tactics (e. g. enforcing patent rights), and so on.

Conduct depends in turn upon the structure of the relevant market, embracing such features as the number and size distribution of buyers and sellers, the degree of physical or subjective differentiation prevailing among competing seller's products, the presence or absence of barriers to entry of new firms, the ratio of fixed to total costs in the short run for a typical firm, the degree to which firms are vertically integrated from raw material production to retail distribution and the amount of diversity or conglomerateness characterizing individual firms' product lines.

Market structure and conduct are also influenced by various basic conditions. For example, on the supply side, basic conditions include the location and ownership of essential raw materials; the characteristics of the available technology; the degree of work force unionization; the durability of the product; the time pattern of production; the value/weight characteristics of the product and so on. A list of significant basic conditions on the demand side must include at least the price elasticity of demand at various prices; the availability of (and cross elasticity of demand for) substitute products; the rate of growth and variability over time of demand; the method employed by buyers in purchasing; and the marketing characteristics of the product sold.

- Significant additions to supply require substantial lead times, making the supply-side “lumpy” and slow.
- Adequate reserve margins are uncertain in a competitive market because the provision of reserves is unattractive to business interests, unless peak prices are extremely high. Consequently, markets may be chronically tight or subject to extreme price volatility.
- Incumbents utilities have not only failed to add generation and transmission capacity, claiming uncertainty, but they also refused to open their transmission systems to competitors, which has reduced the willingness of competitors to build power plants.
- Highly concentrated local markets enable large generators to drive up prices by withholding supplies. In these tight markets, collusion is not necessary to drive prices up, parallel actions by a small number of generators is sufficient. Even though peaks are short in duration, they impose huge price distortions.

1. BASIC CONDITIONS

Supply is inelastic. Capital stock is long lived and significantly determines supply and demand responses. While the lead times for smaller, peaking generation units is not long, larger baseload facilities still have substantial lead times, and transmission facilities are especially difficult to bring on line. As a result there are significant constraints in some areas on the ability to expand supply.

Electricity is difficult to store. Battery technology does not allow efficient storage for any but minimal uses. The only effective way to store electricity is to pump water up hill and keep it there until it is needed, but such opportunities are limited. The only effective supply response to peak demand is idle capacity, or reserve margins. On the supply-side, who has an economic interest in building reserve margins to lower prices?

The physical behavior of electricity and its demanding real-time characteristics are unique and create special problems. Market participants can lean on the network or push power into it without enforceable transactions taking place. After the fact administrative accounting does not address the immense impact that this behavior can have on a real-time basis.

Supply-side accidents (outages) are endemic. Accidents affected a variety of technologies in a number of markets at different times. Over the past three years, several major categories of baseload plant – nuclear, fossil, and hydro – have contributed to one or another of the unplanned outages. The problems of technologies prone to outages are compounded by the inability to store electricity.

2. STRUCTURE

Analysis of the market structure leads to the conclusion that market power can be exercised in these markets because they are thin.[†] They have also become concentrated.[§] The Federal Energy Regulatory Commission has been flooded with requests for mergers in anticipation of the development of a competitive market. For example, over 80 percent of the generation capacity divested by utilities subject to restructuring has been bought by subsidiaries of other utilities. In 1992, the year the Energy Policy Act was passed, the largest 10 utilities owned one-third of the national generating capacity, while the top 20 owned 60 percent. By 2000, the top ten had grown to control half of all capacity, the top twenty to three quarters.

[†] Cal, First Report, p. 20-21.

[§] Concentration, Cardell, Judith B., Carrie Cullen Hitt and William W. Hogan, “Market Power and Strategic Interaction in Resources and Energy Economics, 19:1, 1997; DOE, Market Power

(University of California Energy Institute, 1999); Wolak, Frank A. and Robert H. Patrick, "The Impact of Market Rules and Market Structure on the Price Determination Process in England and Wales Electricity Markets," Working Paper PWP-047, *Power* (University of California Energy Institute, 1997); Cal, First Report, p. 21.

^w In the UK, where markets were deregulated a decade ago, the price has been subject to repeated manipulation (see 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).

^x FERC, Staff Report, p. 3-15.

^y 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.

^z Restructuring, p. 13, References cited in the original paper in support of this argument include Comnes, G. Alan, Edward P. Kahn and Time N. Belden, "The Performance of the U.S. Market for Independent Electricity Generation," *The Energy Journal*, 17:3, 1996; Green, R.J. and D. M. Newberry, "Competition in the British Electricity Spot Market," *Journal of Political Economy*, 100:5, 1992; Kennedy J. and Associates, *Electric Utility Restructuring Issues for ERCOT: Prices, Market Power and Market Structure*, (Office of Public utility Counsel of Texas, 1996); 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

^{aa} FERC, Staff Report, pp. 3-2, 4-10.

^{bb} FERC, Staff Report, p. 3-20.

^{cc} FERC, Staff Report, p. 3-20.

^{dd} Ohio Report, p. 29.

^{ee} FERC, Staff Report, p. 4-1.

^{ff} FERC, pp. 4-5. 9

inflexibility of demand and its sensitivity to weather renders the market volatile and vulnerable to abuse.

- ◆ The elasticity of market demand is very low in the short-term and low in the long-term. The demand side cannot be counted on to discipline abusive pricing behavior.
- ◆ Institutional barriers make it difficult for consumers to self-supply.
- ◆ Economic and institutional factors make it difficult for consumers to bargain effectively for supplies.

1. BASIC CONDITIONS

On the demand-side, we find that short-run elasticity of demand is low because of the stock of capital equipment deployed. Consumption is significantly influenced by weather. In the long run, economic growth is a primary driver of demand, which is generally not a public policy that can or will be used as a tool to solve energy problems. The analysis of outages repeatedly points to the problem of inelastic demand. Both the inability to conserve and the lack of incentives to do so have been noted.

2. STRUCTURE

Restructuring has not allowed small customers to express their demand effectively.⁹⁹ Small consumers have not been allowed to express demand effectively. In many instances, they were the last allowed to shop. They were also prevented from forming buyers cooperatives or aggregating demand in other ways. High transaction costs and load patterns that exhibit relatively high peaks makes them unattractive to many suppliers.

Self-supply has not been allowed or facilitated by existing institutional structures.^{hh} Distributed generation which would allow small customers, especially commercial customers, to reduce their demand and even add supply to the grid, have been blocked by institutional arrangements.

3. CONDUCT

Virtually all demand, certainly for residential customers, is still met by a utility obligation to serve. The obligation to serve becomes a virtual edict to avoid blackouts at all costs.ⁱⁱ Consumers have generally supported this continuation of the fundamental principle of utility service. Electricity service is just too important to be unreliable.

However, in an unfettered market for supply there are adverse consequences of this behavior. It is difficult for utilities to exercise restraint as supplies become tight.^{jj} Utilities need physical supply to meet their load. Marketers can default and negotiate or litigate damages later, but when the lights go out, utilities have experienced a critical, real time problem with severe consequences.^{kk} This

⁹⁹ Restructuring, p. 10. Blumberg, Ben and Jonathan Shaevitz, "Load Aggregation: the Wolf at the Door," *Public Utilities Fortnightly*, January 1, 1997; Guinane, Kay, *Group Buying Power* (Environmental Action, May 1997); Small Business Survival Committee, *Potential Economic Impacts of Restructuring the Electric Utility Industry* (Washington, D.C.: November 1997).

^{hh} Connections identifies barriers to self-supply in the form of distributed generation.

ⁱⁱ FERC, Staff Report, p. 4-1.

^{jj} Cal Second Report, p. 48.

^{kk} Ohio Report, pp. 24-25.. 39.

difference places them at a disadvantage in market transaction relationships. For all the focus on market efficiency in restructuring, the ultimate test of electricity service is keeping the lights on, and some entities still have the obligation to ensure that they do. The obligations and incentives of these entities drives them to what can be considered extreme behavior from a simple market point of view. They are driven to pay an awful lot to meet demand.^{mm}

Pricing structures also give little incentive to alter demand in the short-term. These pricing and marketing structures can be changed, but they are long-standing and may encounter consumer resistance for a variety of reasons. One of the key factors that drove prices up was the need of utilities to ensure physical availability of supplies.

Suppliers have blamed small consumers for price spikes—for failing to “respond” to price signals at the time of peak demand. Energy conservation should be encouraged, but the fact remains that small consumers have very limited ability to significantly reduce demand, particularly at certain peak times. Heat waves to which high price apologists point to justify prices increases result in serious illness and deaths when consumers, in particular the elderly and ill, are forced to cut back air conditioning use in order to reduce electric bills.

Restructuring may require much more attention to interruptible rates for large customers, not small residential customers, to facilitate the response to tight markets. Interruptible customers must be prepared to actually be interrupted.ⁿⁿ New incentives in a restructured market call into question whether utilities will live up to the non-price terms of their interruptible tariffs, given the high price they can fetch for released power or avoided for purchased power.

C. THE HIGHWAYS OF COMMERCE

The wires components of the industry – transmission and distribution, which are the highways of commerce over which electricity flows – are presently natural monopolies and are likely to remain so for the foreseeable future. Since generation assets are sunk and load is immobile, the transmission system stands at the intersection of many of the industry problems.

- The breakdown of coordination of an integrated, real-time network in the restructuring industry occurs because competition reduces the incentive for market participants to cooperate and makes it difficult for system operators to manage the electricity network.
- Inadequate transmission capacity and restrictions on access to transmission limit the ability of power to flow.
- Manipulation of access to the transmission system for self-interested profit motives makes problems worse and frustrates the ability to expand supply.
- As a constrained bottleneck facility that restricts expanding supply, the transmission system facilitates this manipulation.

1. BASIC CONDITIONS

^{ll} Ohio Report, p. 35.

^{mm} FERC, Staff Report, p. 4-4; Ohio Report, p. 25.

ⁿⁿ “Corporate Customers Demand Probe into Electric Utility Practices,” *Wichita Eagle*, Mar 14, 1999.

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 balance periods when some customers are off line while other customers who are on line. Empirical studies show strong economies are achieved by coordinating supply and demand.^{oo}

Ironically, in a restructured environment utilities discover that their systems do not perform as rated.^{pp} This is a systemic factor that must be brought into the planning process. The DOE *Market Power* report affirms the importance of transmission capacity and pricing as a key condition for the exercise of market power.^{qq}

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.^{rr} Prior to the price spikes of 1998, the number of traders increased over 50 fold; the quantity traded increased several hundred times.^{ss}

2. STRUCTURE

The recent DOE outages report underscores technology constraints as a systemic problem. The transmission resource is clearly limited.^{tt} Similar constraints on the availability of distribution have been noted.^{uu} Transmission is difficult to repair or replace in response to outages.^{vv} This then places a premium on flexibility of supply and reserve margins, but neither of these is well accommodated in the industry.^{ww}

^{oo} Restructuring, p. 7. References cited in the original as supporting this observation include Gegax, 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.

^{pp} DOE Outages, Findings 7, 18, 22.

^{qq} DOE, *Market Power*, p. 9, 13.

^{rr} Restructuring, p. 8. References cited in the text in support of this proposition include 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 Cost" *The Electricity Journal*, October, 1996.

^{ss} FERC, 3-1, 3-2.

^{tt} DOE Outages, Findings, 10, 32.

^{uu} DOE Outages, Finding 30.

^{vv} DOE Outages, Findings 9, 31.

^{ww} DOE Outages, Findings, 1, 16.

The transmission supply problem is pervasive and widespread.^{xx} 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. This condition has existed for some time.^{yy} However, it is clear that the introduction of competition has put a strain on an already stressed asset.^{zz}

Vertical integration between generation, transmission and distribution makes entry more difficult and creates an ongoing problem about codes of conduct to govern the treatment of non-affiliated entities.^{aaa} Moreover, the rules for allocating the scarce transmission resource during times of stress were far from optimum.^{bbb} In a competitive market, some entities gain an interest in hoarding this asset.^{ccc} As a result, markets may have appeared more constrained to buyers than they were in actual physical terms.^{ddd}

Conduct of the transmission organizations will be dictated by the form of governance. An intense debate has raged over the rules of participation and decision-making, but the CPUC's displeasure with the California ISO underscores how rigorous the governance of the transmission organization must be.^{eee} The ISO is a nonprofit organization with a self-perpetuating board made up of stakeholder representatives. The CPUC argues that industry representation on the board has resulted in rules that make abuse of market power feasible, if not likely. The board is responsible to neither stockholders nor government entities. FERC oversight is virtually non-existent.

The CPUC is particularly concerned about the refusal of the ISO to provide the data necessary to investigate abusive bidding practices. The market monitoring function may prove to be extremely important. Monitoring and disclosure of resource bid prices, operating characteristics and demand bid prices under multi-settlement may be necessary to provide better information to market participants and transparency of transactions.

3. CONDUCT

With a mix of planned and market driven behaviors interacting with genuine concerns about physical shortages, the actual state of the available physical system is difficult to perceive.^{fff} Our analysis of the price spikes concludes that this uncertainty has been exploited to raise prices.

To the extent that withholding supplies is a strategy, it is dependent upon the inability of competitors to offer supplies. Thus, the exercise of market power can be enhanced if competitors can be prevented from entering the market.^{ggg} The mechanism for doing this is to prevent the transmission of power or to raise the price of transmission services.^{hhh} In the former case, the

^{xx} Harris, p. 5.

^{yy} Ohio Report, p. 19.

^{zz} Ohio Report, pp. 20-21.

^{aaa} Restructuring, p. 13. References cited in the original paper in support of this argument include Comnes, G. A., E. P. Kahn and T. N. Belden, "The Performance of the U.S. Market for Independent Electricity Generation," *The Energy Journal*, 17:3, 1996; Green, R.J. and D. M. Newberry, "Competition in the British Electricity Spot Market," *Journal of Political Economy*, 100:5, 1992; Kennedy J. and Associates, *Electric Utility Restructuring Issues for ERCOT: Prices, Market Power and Market Structure*, (Office of Public Utility Counsel of Texas, 1996); Newberry, D. M. And M. G. Pollitt, "The Restructuring and Privatisation of Britain's CEBG -- Was It Worth It?," *The Journal of Industrial Economics*, 45:3, 1997.

^{bbb} FERC Report, p. 5-6.

^{ccc} Thilly.

^{ddd} Cal, Second Report, p. 24 Ohio Report, p. 17.

^{eee} CPUC Report,

^{fff} Cal, Second Report, p. 24.

^{ggg} Thilly, p. 4; FERC, Staff Report, p. 4-7.

^{hhh} DOE, Market Power, p. 2; Cardell, Hitt and Hogan.

generation owner captures the rents. In the latter case the transmission owner captures excess profits.ⁱⁱⁱ Large entities tend to gain regionally dominant positions, especially where they control transmission. Because geographic markets are small, market power can be easily exercised in specific markets.^{jjj} Because many of the entities are vertically integrated, there is no dispute over these rents and they are not competed away.

Although the outage report did not seek to discover manipulative behavior as part of its study, certain findings may indicate problems in this regard. The business factors^{kkk} and the failure to preserve records^{lll} are consistent with our finding in the analysis of price spikes. The DOE *Market Power* report concluded that the empirical evidence clearly indicated market power had been exercised in some restructured markets^{mmm} and the potential for its exercise in other markets is substantial.ⁿⁿⁿ

One of the most important changes in behavior that affected the market during the price spikes and outages is to reduce the ability of system managers to coordinate and run the transmission system. The problem stems both from complexity and from a lack of cooperation. Market participants do not have an incentive to cooperate.^{ooo}

There were also complications of financial and ownership relationships between entities.^{ppp} Who owns what and who has the obligations to provide the various services that support the movement of electricity were not always crystal clear.

The outage report raises the problem of transaction pressures in a number of ways. An unwillingness to share best practices is a generic problem.^{qqq} Inadequate notice of problems^{rrr} and business factors^{sss} also fall into this category. Even more fundamental is the lack of authority of the ISO to respond to problems^{ttt} and an absence of rules.^{uuu}

Thus we have a new market with a multitude of complex transactions. One of the most important requirements for coping with this new market situation would be good information. Unfortunately, such information is not generally available during difficult periods. There is simply no centralized, reliable source of information.^{vvv} Information is much more difficult to gather for system operators. Moreover, the brokers who were the sources of information may well have interests that would be served by skewing information in one direction or another.^{www} A number of information and

ⁱⁱⁱ FERC, Staff Report, p. 4-7.

^{jjj} Cal, First Report, p. 21.

^{kkk} DOE Outages, Finding 38.

^{lll} DOE Outages, Finding 33.

^{mmm} DOE, Market Power, pp. 4-5.

ⁿⁿⁿ DOE, Market Power, chapter 4; Borenstein, Severin, James Bushnell and Christopher Knittel, "A Cournot-Nash Equilibrium Analysis of The New Jersey Electricity Market," *Review of General Public Utilities Restructuring Petition*, Docket No. EA97060396, 1997; Sweester, Al, "Measuring a Dominant Firm's Market Power in a Restructured Electricity Market, A Case Study of Colorado," *Utility Policy*, 1999; Public Service Commission of Utah, *Market Power Report to the Electrical Deregulation and Customer Choice Task Force*, 1998; Michigan Public Service Commission, "Staff Market Power Discussion Paper," *Electric Restructuring*, Case No. U-11290, 1998.

^{ooo} Ohio Report, p. 38

^{ppp} Ohio Report, p. 28; Outages.

^{qqq} DOE Outages, Finding 15.

^{rrr} DOE Outages, Finding 20.

^{sss} DOE Outages, Finding 38.

^{ttt} DOE Outages, Finding 4.

^{uuu} DOE Outages, Finding 3.

^{vvv} FERC, Staff Report, p. 3-2.

^{www} FERC, Staff Report, pp. 4-3, 4-4, 4-16.

management weaknesses are noted including inadequate forecasting tools, a lack of monitoring instruments,^{yyy} and little real time information to respond to problems.^{zzz}

Although not strictly a problem of “manipulation,” the outage report identifies incentive and behavioral problems that can be classified in this category. The complaint about inefficient short-term transactions is essentially a complaint about the market transaction mechanism.^{aaaa} The new market also elicited a reliance on nonfirm sales, which simply could not be sustained in a stressed market.^{bbbb}

^{xxx} Outages, Finding 8, 13, 17, 18 20.

^{yyy} Outages, Findings 5, 11, 14.

^{zzz} Outages, Findings 6, 27.

^{aaaa} Outages, Finding 25.

^{bbbb} Outages, Finding 24.

IV. POLICY RECOMMENDATIONS

A. REREGULATION OR RESPONSIBLE DEREGULATION

Before we begin offering recommendations about how to make the electricity market work better, it is important to stress that we do not have to deregulate every market, or every segment of every market. Markets are a means to an end, not an end in themselves. If basic conditions or market structures are not right, lower prices, higher quality, and genuine consumer choice will not result. With a commodity as vital as electricity, consumers can easily be hurt, rather than helped, by imperfect markets and policy makers should err on the side of caution.

The market looks orderly when capacity is plentiful or transmission is less strained. At those times, the chance that accidents will trigger painful events and the opportunity to abuse market power will be reduced. Policymakers might have hoped that such conditions would smooth the transition to a competitive market, but that has not been the case, since it is now clear that untoward events occur repeatedly and market participants have the incentive and ability to exploits those events. In 1997 policymakers could get away with the belief that the market would take care of things; in 2001, they cannot. Policymakers have an obligation to actively consider whether the underlying conditions are conducive to consumer abuse and to take measures to prevent it. Given the observed behavior of markets, policymaker should be prepared to act in four areas.

- Policy makers have an obligation to ensure that the basic conditions are adequate to support competition before they deregulate. It is simply irresponsible to create markets that suffer from significant problems like inadequate capacity at the outset.
- Market structures must support competition. The number of suppliers and their ability to bring product to market must be sufficient to deliver workably competitive markets. Highly concentrated markets with bottleneck facilities that lack open access rules make the market vulnerable to the exercise of market power.
- Market institutions should be developed before, not after, trading begins so that conduct is transparent and disciplined by market forces. Undeveloped information and trading mechanisms are prone to manipulation. When abuse occurs under such circumstances, it is no accident; it is the result of bad public policy choices or poor policy implementation.
- Competition must exist before markets are deregulated and policymakers must monitor market performance. Aggressive policies to discipline abuse of market power should be implemented. Any entity that engages in actions that tend to tighten electricity markets and then seeks to exploit that situation through sales at inflated prices should be presumed to have engaged in market manipulation. They should bear the burden of proving that they are not guilty of profiteering and the penalty for market manipulation should be severe.

States that have not restructured, should not, not until it can be demonstrated that restructuring can serve the consumer interest. States that have not yet moved too far through the restructuring process – particularly where generation has not yet been divested or control of the grid has not yet been transferred to an ISO/RTO -- should slow or stop the process until they gain confidence that a true market for generation can be created and the grid can be operated in a manner the promotes reliability and supports market transactions.

States where Humpty Dumpty has been broken and is not likely to be put back together again should undertake vigorous efforts to protect residential consumers. These should include rules to prevent price spikes, law enforcement against pricing abuse, requirements to participate in effective

market opening transmission organizations, opt out aggregation for small consumers, and aggressive pursuit of distributed generation.

While the states pause or backtrack in their restructuring efforts, federal policymaker must confront the failure of the interstate market. If federal authorities cannot create an effective interstate market, states will inevitably fail in their restructuring efforts. Unless comprehensive federal reforms are enacted, the chances of success at the state level are slim. Regardless of where they are in the process, all states should review consumer protection mechanisms and policies that restrict the ability of small customers to express their demand.

Policy action should be based upon specific findings of conditions that render a specific market vulnerable to abuse. The goal is an orderly, efficient market; the means should fit the end. While a specific set of regulatory interventions will not fit every market, regulatory do-nothing policy does not fit every market either. If policymakers cannot confidently conclude that these conditions will be in place, they should not deregulate or restructure the industry.

B. THE IMPORTANCE OF TRANSMISSION SYSTEMS

The transmission system lies at the intersection of two powerful and difficult functions in the restructuring industry. It must balance the physical demands of reliable power with the economic demands of efficient markets. It is simply impossible to conceive of reliability issues that do not have market function impacts and market function issues that do not have reliability impacts.

There are certain functions that the system operator must perform if it is to provide reliable electricity and support efficient market operations. As has been argued throughout this paper, the structures that are put into place will determine how the industry participants behave in performing those functions. Of course, market participants perform these functions by taking action in the marketplace. The way they conduct themselves generally reflects the institutions which they represent and the (internal and external) rules that the institutions must obey. The institutional structure affects the conduct of business that performs the functions of the electricity system.

The rules of the operation of the grid must be in place to ensure both efficiency through competition and reliability of the grid. To the extent that coordination can lower costs, through lowering reserve requirements, this function too should be preserved. However, the rules must be competitively neutral.

The network operator must monitor and run the network in a manner that executes transactions and clears the market physically and financially. Even if there were no sunk costs, proprietary interests in facilities, or diverse organizational entities involved (investor owned, consumer owned, publicly owned) implementing an industry structure to accomplish the goals of reliability and market operations would be difficult enough. With the existing facilities, interests and institutions in place, it is extremely difficult, if not impossible.

The ultimate goals of the formation of transmission organizations are to ensure reliable operation of the electricity grid and efficient market transactions for electricity services through effective management of transmission functions. Where market transactions can be relied upon to accomplish this goal, they should be, but when they cannot, regulated transaction must be used. Most people prefer to do business in stable markets.

1. HIGHWAYS OF COMMERCE

Policymakers cannot force entities to compete in the marketplace, they can only provide the opportunity and hope incentives will elicit entrants. In the electric utility industry, the transmission

system is the highway of commerce. Access to and use of the grid determines whether the opportunity exists. The effectiveness of competitive markets will be substantially affected by the ability to move electricity between states. To date, federal policymakers have done a terrible job of ensuring that the transmission system is available and adequate to support the interstate market in electricity.

Commerce is the key to competitive efficiency. Without open highways of commerce the goals of restructuring simply cannot be accomplished from both the market abuse and market efficiency points of view.

- Because the ability (or willingness) of entities in the market to expand supply is limited, entry from outside the market must be encouraged – particularly new players from other geographic areas. Therefore, an effective interstate market would make the exercise of market power much more difficult.
- An effective interstate market would make efficient generation of electricity much easier since most states are too small to constitute an efficient market in electricity. Even New York and California appear to be too small, at least in the near to mid-term.
- An effective interstate market would also enhance the quality of supply. Economies of coordination are still strong in the physical marketplace.

The electricity market is a complex, highly differentiated economic market composed of numerous interrelated products and geographic areas. There are a variety of different products in different markets including real time physical markets for energy, reserves (ancillary, backup), and capacity. These are overlaid with procurement markets for services and financial markets, where commitments are exchanged including markets for energy futures of varying lengths and transmission services of varying lengths and firmness.

The size of markets will be wholly determined by administrative decisions, since the flow of electricity must be managed on an active basis.^{cccc} It must be big enough to be reliable and efficient. Existing ISOs are too small to ensure reliability or efficient markets.

Public policy must open the wires and ensure that physical and financial transactions can be executed quickly and effectively.

- Mandatory, comprehensive open access is necessary.
- The transmission operator must standardize transactions over the largest areas possible to minimize transaction costs and maximize the potential efficiencies of scope and coordination.
- Transactions must be transparent, with the creation of an exchange in which all rates terms and conditions can be identified.
- Brokers must be subject to rules that are similar to those applied to financial transactions like stock sales and dealings.

The goal of a transmission organization should be to promote a broad market that allows all resources to compete in all markets. All resources should have access to all markets through timely

^{cccc} However, it has become clear that for short periods of time utilities and energy suppliers can lean on the grid (taking power or delivering power that they should not), which creates operational difficulties and commercial problems. Therefore questions of geographic size are critical.

interconnection. All means to meet capacity needs must have equal access. The current institutional structure emphasizes generation at the expense of transmission, demand-side management (especially weak at present) and distributed energy (largely precluded or reduced by current institutional obstacles).

The guiding principle of market design is to achieve market prices that are certain and can be relied upon. Pricing mechanisms should be transparent – known in advance and not subject to arbitrary change. Therefore the pricing mechanisms should avoid after the fact administration, discontinuity between regions, volatility and excessive reliance on locational tariffs that make hedging difficult. Uniformity throughout the market (including rates, terms and conditions) minimizes artificial geographic barriers that may impede market development. Prices should be based on cost causation principles, or determined by market-based solutions, only where markets are workably competitive, so that resources are used efficiently.

Operational rules must be compatible throughout the market, and executed on an efficient (one-stop) basis to facilitate long term transactions (such as interconnection) and allow short term decisions (such as scheduling capacity, congestion management) to be executed with certainty. Thus, the operation and pricing mechanisms should endeavor to ensure that transmission services can be procured on a predictable basis, distinguish effectively between energy and transmission, allow for firm curtailments, firm physical delivery and transportability of services across regions and promote market liquidity by designing rules to induce supply in thin markets including firm transmission rights and regulation services.

Trading institutions must also be more highly developed quickly. The overheating of the market in 1998 reflects a fundamental lack of institutions to convey information and ensure the soundness of transactions. The situation has not improved greatly. Measures to ensure openness and confidence in transactions should be taken. Securities and commodity exchanges impose rules to protect the public and ensure an orderly market. Power exchanges should too.

Power exchanges should follow the pattern of stock or mercantile exchanges. These impose rules on traders that seek to ensure transparent pricing, control the flow of trading, impose memberships criteria, require registration of participants, and manage the types of trades including issues such as short selling, margin requirements, credit requirements and option rules. There is no reason that a physically important and difficult to manage commodity like electricity should not be subject to rules at least as stringent as those we impose on mere financial transactions.

2. RELIABILITY

Unfortunately, from the perspective of simple economic efficiency, the transmission system is also the key to the reliability of the electric utility industry. The electricity grid is an extremely demanding, real-time physical system. Reliability of this system is a true externality. Few individual consumers or utilities can create their own reliability (not without incurring very substantial costs). Every individual's reliability is dependent on the behavior of neighbors. Reliability is a regional, if not national, problem that requires a regional, if not national, solution.

The transmission functions are, broadly speaking, the operation and monitoring of the network in the near term and the planning and building of the network in the long term. Short-term reliability, essentially congestion management, receives the greatest amount of attention. Issues such as outage scheduling for transmission and generation, control of path flows to prevent problems and redispatch or curtailment schedules to respond to problems must be handled in a competitively neutral manner. However, long term capacity planning and expansion must also be addressed. The process is laborious and promises to keep transmission capacity in short supply. Incentives for congestion relief and interregional expansion are important, but there are additional obstacles

including citing, coordination and environmental concerns that are independent of marketplace incentives.

Given the above analysis, it would only be a slight exaggeration to conclude that the failure to develop effective transmission organizations in the interstate market is the single greatest cause of the failure of electricity restructuring. The structural problems in the electric utility industry are so severe, the role of non-discriminatory access to the transmission system so fundamental to an effectively competitive interstate electricity market, and the resistance of vertically integrated incumbent network owners so vigorous, that the FERC's proposed voluntary negotiations will fail to solve the problem in a timely manner. There is simply not enough muscle in the Final Rule to induce the incumbent utilities to part with their market power voluntarily. Nor do we believe that they should (or could) be bribed to do so. They must feel compelled to do so. At the federal level, creating effective transmission organizations would be the single most important step to alleviate many of its problems.

The failure to recognize the important role of the continuing monopoly in distribution and transmission resulted in the under-regulation of these industry segments. If the object of public policy is to allow competition in the wholesale supply of generation to find demand in a competitive retail sector, the monopoly wires between the two must be operated in a rigorously effective manner to support competition.

As currently configured, the transmission and distribution wires come nowhere near being operated in an open access, procompetitive manner. The Federal Energy Regulatory Commission's (FERC) authority has been repeatedly challenged, which has led it to take a voluntary approach to open access. The uncertainty has also created timidity in design of its open access regimes. As a result, the transmission grid will not support competition as firmly as it should.

3. GOVERNANCE

The governance of the new transmission organizations is critical. The transmission network is an essential, bottleneck facility in short supply. At present and for the foreseeable future, it is a natural monopoly. One of its primary inputs is right-of-way. This input exists to a substantial degree through the exercise of governmental power – condemnation. One of the biggest obstacles to the expansion of transmission capacity is public concern about negative externalities – ugly wires and local health effects. Consequently, zoning and citing are critical and difficult issues.

Proposals to let the marketplace solve the transmission problem are just another expression of the same theological devotion to deregulation at any price that got us into this mess in the first place. The problem with transmission is not a market problem and the solution is not to declare a market. The right model for transmission is a public interest model that creates an entity, public or private, dedicated to ensuring that this essential facility fulfils its public functions – ensuring reliability and supporting nondiscriminatory market transactions. The entity must be responsible and accountable for achieving these, and only these goals.

Creating such an entity does not mean it cannot be efficient or involve incentives to ensure that those goals are accomplished in a speedy and effective manner. It does mean that the goal is not simply to make a profit, or to maximize profits. Given the market power that the transmission "owner" would inevitably possess and the non-market nature of the barriers to expanding capacity, the entity cannot be a profit maximizing entity. If it were, it would abuse its market power and create scarcity rents. Increasing the profitability of the transmission entity cannot overcome the social and institutional obstacles to increasing output of this sector.

In fact, profit maximization may undermine effective solutions to the wires problem for two reasons. Profit maximization has not generally been associated with the consideration of the full range of least cost solutions to problems. Moreover, the public will be more likely to resist bearing the negative externalities of expanding wire capacity when there is the suspicion that the pain is only going to make some facility owner rich.

The transmission entity must be independent of all market participant. If it is not, it will quickly be captured by those who would profit from the abuse of market power in the transmission and generation markets. As a general proposition, vertical divestiture is the only solution that eliminates the problems of affiliate transactions. In addition to divestiture, it now appears that a truly independent and responsible system operator must be established. This system operator should be given the authority to run the system solely for reliability and social efficiency (lowest total social cost) purposes. Thus, the entity must be rate regulated or publicly owned.

C. ESTABLISHING A COMPETITIVE SUPPLY-SIDE

Open highways of commerce are a necessary, but not sufficient condition for competitive markets. Markets must be demonopolized and deconcentrated before they are deregulated or prices will be higher than they should be. Mergers have reduced the number of players in specific markets. Acquisitions have allowed specific entities to gain market power. Lax law enforcement has allowed market power to be abused.

- Markets must be deconcentrated. Market should not be deregulated until an affirmative finding of the absence of market power is made by responsible antitrust authorities and until the network is found to be irreversibly open to competition.
- Ownership limits should be established.
- Additional mergers should be denied until effective market structures are defined.
- A regional cap on prices in the interstate market should be set to protect consumers from wild price swings and to prevent energy suppliers from shopping and pursuing beggar they neighbor behaviors.
- Law enforcement must aggressively pursue abusive behaviors based on a specific set of triggers.

1. PREVENTING CONCENTRATION OF GENERATION MARKETS

One of the most urgent areas for public policy action is developing a response to mergers. It may be useful to put a halt to concentration through mergers until we have a better idea of how market structures and institutions will function under the unique conditions of the electricity industry.^{dddd} There is no more likely source of supply to alleviate near term shortages.

Mergers between most utilities in the early period of restructuring entail significant market extension that involves monopoly and bottleneck facilities. To the extent that utilities have had exclusive distribution territories, they are extending the distribution monopoly. Similarly, since utilities have owned the transmission facilities within their service territories, most mergers involve market extension over these bottlenecks. Since these facilities have not been subject to competition, they

^{dddd} Klein, Joel, Assistant Attorney General, "Making the Transition from Regulation to Competition: Thinking About Merger Policy During the Process of Electric Power Restructuring," Federal Energy Regulatory Commission, January 21, 1998.

can be a source of cross subsidy. Because they are bottlenecks and determine the ability to provide service, they certainly provide the basis for anticompetitive behaviors.

The problem of vertical integration in most mergers is of extreme importance. Most merging utilities combine transmission and generation assets, as well as distribution assets. Restructuring is intended to introduce competition into the generation market, and it is quite clear that transmission is a bottleneck with respect to the generation market. Allowing the extension of control over transmission assets confounds the goal of increasing competition in generation. Competitors can be foreclosed from the market or squeezed by price. The markets that have been created in the early stages of restructuring have clearly demonstrated the ability of large players to forbear from selling into tight markets.

2. PREVENTING ABUSIVE CONDUCT

It is also important to monitor closely the supply, bidding and pricing behavior of generation entities even in markets where divestiture and/or open access have taken place. The basic supply and demand conditions in electricity markets may be so severe, that market structures that are traditionally defined as competitive will break down situationally.

Abusive conduct must be identified, investigated, eliminated and punished. Much closer market scrutiny than has occurred in the first few years is necessary. Law enforcement must be proactive, rather than reactive.

Triggers for heightened scrutiny can be drawn directly from the analysis of industry structure. The empirical conditions that are believed to increase the likelihood of the exercise of market power should be set at conservative levels – levels that lean toward protecting competition and consumers. They can be identified for both market structure and conduct. For example, horizontal market structure identifies the moderately concentrated threshold at the equivalent of ten, equal-sized competitor (an HHI of 1,000). These markets should receive greater scrutiny since this market is vulnerable to the abuse of market power. The empirical literature identifies other potential market structural triggers. If a vertically integrated utility controls more than 20 percent of the bottleneck transmission assets or more accounts for more than 35 percent of demand, the scrutiny should be heightened.

On the conduct side, any vertically integrated utility that has engaged in market tightening behavior and later profited from actions that exploit the tightness should be subject to greater scrutiny. The types of activities associated with market tightening include supply tightening measures (such as taking plant out of service on an unscheduled basis, withholding supply, executing a swap, engaging in a two-way transaction or a daisy chain in default) or actions that leverage the transmission bottleneck (such as taking transmission out of service on an unscheduled basis, declared an emergency, participating in a request for a TLR, violating market rules).

These triggers could be linked to a much more important set of pricing behaviors. Over the past decade, the FERC has allowed utilities to use market-based rates based on criteria that are not as rigorous as they should be. The FERC could reconsider market-based rates in either of the circumstances above. It could also use other market events, like mergers, the failure to participate in a regional transmission organization, etc. as a circumstance to review market-based rates.

3. PREVENTING MARKETS FROM OVERHEATING

Consumers express a strong commitment to reliability and an aversion to price shocks. It may be difficult to accomplish both goals at historic price levels in unfettered commodity markets but that is the baseline against which “competition” will be judged. The most obvious means for

preventing the overheating of markets is to have adequate reserve margins. However, in a competitive market, it is not clear that any supply-side entity has an interest in carrying excess capacity. Therefore, mechanisms to respond to spikes are necessary as well.

We do not believe that residential consumers want to see their prices tracking the commodity price of electricity or to be forced to evaluate and implement complex hedging instrument alternatives. For firm residential and small business customers, it may be more important to develop programs that let them enjoy stable prices without sending utilities plunging into markets to avoid blackouts. Proposals to build peaking reserves at stabilized prices become attractive if markets are going to be extremely volatile. Distributed generation could provide a source of reserves on which consumers could rely to prevent price spikes. Aggregators could provide this function.

Not only do policymakers have an obligation to do a much better job of laying the foundation for competition before they throw the doors open, they have an obligation to monitor market performance closely, so that rapid responses can be offered to abusive events. Having experienced repeated spikes, policymakers should also implement a series of circuit breakers to prevent the sort of abuse that has occurred. These should remain in place until regulators can affirmatively conclude that market structures are functioning in a manner that is likely to prevent such abuse.

The most obvious circuit breaker is a price ceiling or cap that simply does not allow trades to take place at prices above a certain level. This is generally considered the most extreme measure.

At some point, the FERC could declare that prices above certain levels are not deemed just and reasonable and therefore, market based rates are suspended. The transactions could be allowed to move forward, but the final price would be subject to adjudication. Other circuit breakers can be utilized before a cap is imposed. For example, trading could be suspended for a period (as is the practice with the stock market). Unfortunately, since the physical movement of electricity cannot be suspended, nor is that necessarily desirable, suspension of trading could be tricky.

D. FREEING THE DEMAND SIDE WITHOUT PUNISHING SMALL CONSUMERS

1. ACCOMODATING DEMAND

For policy purposes, this paper emphasizes the supply-side of the market and the highways of commerce as the target. There are both economic and political reasons to do so.

Economically, growing electricity demand is an exogenous factor. The growth of digital economy indicates a resurgence of American economic superiority and it is absurd to suggest that growth should be slowed because of the failure of supply to expand sufficiently. While demand has grown, it is the failure of the supply-side to deliver adequate capacity that has fueled the problems in the market.

Politically, residential and small consumers have generally not been vigorous supporters of restructuring and they are not likely to support demand-side changes that place significant burdens on them until generation and transmission have been thoroughly reformed. As noted in the introduction, they have been highly critical of the entire undertaking. If the only way to make electricity deregulation work is to punish small consumers, those customer classes may well vote to go back to the old system. Nevertheless, there are demand side policies that can assist the market, without punishing small consumers.

2. CREATING RESPONSIVENESS

Unless consumers have the ability to express their demand in an effective manner, price signals will be meaningless. Rules for aggregating small consumer demand have been hostile or neutral, when they must be favorable. Opt-out aggregation should be required to facilitate small consumer participation in the market. Distributed generation should be the most highly valued resource, since it saves on both generation and transmission resources, both of which are in short supply. Favorable treatment of distributed generation should be implemented including streamlined interconnection and payment at the top of the market.

At the same time, there is no need to punish consumers with high prices to which they have little short term response. Price caps on retail rates should be maintained until markets are fully competitive.

More effective programs for short-term reductions in demand among commercial and industrial customers must be developed. Making interruptible rates more effective for those who are interested, and facilitating aggregation or other forms of participation, may elicit more demand reduction. Interruptible customers must feel they are getting a fair chance to benefit and fair value from the interruption. Interruptible rates based on a regulated system that did not contemplate frequent interruptions may be inadequate. Rewards for releasing power need to reflect the higher prices being paid at peak.

- Given the greater frequency and higher prices occurring in the marketplace, new rules on who is cut back and who is not and how customers are compensated are needed.
- Indeed, in the "market context," large industrial and commercial customers would be responsive to a market in curtailment.
- However, the allocation of fixed costs, for which interruptible customers are responsible, should not burden firm sales customers unfairly.

A common misconception which develops in circuit building is that black wires carry negative current and red wires carry positive current. This happens because of the colour coding often used on electrical meters to indicate polarity. In order to avoid this misconception, sometimes red wires can be used to connect the negative side of the battery to the negative side of the meters, or sometimes only use one colour of wire. If you do not have sufficient equipment to allow all the learners to make all the circuits or you want to experiment with simulations, you can use the PhET simulation for building an electric circuit. You can use the PhET simulation software which can be downloaded from <http://phet.colorado.edu/en/simulation/circuit-construction-kit-dc>. The promise of electricity restructuring is that a competitive market in power, accompanied by effective regulation of distribution and transmission and appropriate policies to ensure reliability, will lead to a more efficient electricity industry. Generators will have incentives to use the least-cost technologies for producing power, and competition will allow problems, we offer below some background on the electricity industry. We review the technology for producing and delivering power, the structure of the sector, the history of policy conditioning, and lighting systems into a total package of energy management services for both households and businesses. Through these packages, energy companies can best exploit the. In economic terms, electricity is a commodity capable of being bought, sold, and traded. An electricity market, also power exchange or PX, is a system enabling purchases, through bids to buy; sales, through offers to sell; and short-term trading, generally in the form of financial or obligation swaps. Bids and offers use supply and demand principles to set the price. Long-term trades are contracts similar to power purchase agreements and generally considered private bi-lateral transactions between Consumers Union - "Reconsidering Electricity Restructuring: Do Market Problems Indicate a Short Circuit or a Total Blackout?" City versus Private Ownership of Toronto Hydro [PDF]. Electricity Co-ops: Prairie Power. National Rural Electric Co-operative Association. Toronto Windshare Co-operative. Phyllis Ingram, a community planner and co-operative developer in Bracebridge, Ontario (e-mail: pigram@vianet.on.ca) started Ontario Energy Co-op Inc. last year in anticipation of Ontario's deregulated electricity market. Her goal is to provide consumers with more information so they can make educated