PETER S. FOX-PENNER **Principal and Chairman of the Board**

Peter Fox-Penner is an economist with an engineering background and more than twenty years of experience in regulated industries, energy policy, and environmental issues. In a career that has spanned consulting, senior government service, and academia, he has assisted numerous public and private clients in settings that include expert testimony, publications and speeches, and advice to senior management and boards. He is the author of numerous publications and books and a frequent speaker at conferences and meetings.

Dr. Fox-Penner has a long involvement in utility deregulation economics and policy. He is the author of the acclaimed *Electric Utility Restructuring: A Guide to The Competitive Era*, a best-selling work on the subject, and participated in extensive energy and network industry policy activities within the U.S. government. A former vice president at Charles River Associates, Dr. Fox-Penner joined the U.S. Department of Energy in 1993 as the Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, where he held COO responsibilities for a unit of the Department with a budget of approximately $1 billion. He later served as a senior advisor in the White House Office of Science and Technology Policy and an assistant to the Deputy Secretary of Energy. In 1996, he joined *The Brattle Group* as a Principal and Director of the Washington, DC office.

Dr. Fox-Penner received his B.S. in Electrical Engineering and his M.S. in Mechanical Engineering (Energy Policy) from the University of Illinois, and his Ph.D. in Economics from the Graduate School of Business, University of Chicago.

REPRESENTATIVE EXPERIENCE

Regulated Industries and Electric Restructuring

- Electric utility restructuring
- Performance-based and price cap regulation
- Antitrust, market power, and merger-related issues in regulated industries
- Network and transmission pricing, access rules, and governance
- Utility convergence and retail utility strategic issues
- Economic and policy issues in public interest utility programs
- Load and sales forecasting, pricing, and new product analysis
- Utility telecommunications regulatory issues and strategy

Energy, Environmental, and Technology Policy

- Energy taxes
- Pollution permits and trading schemes
- Technology and Market Evaluations
- Public Policies Towards New Technologies and R& D
- Energy conservation—economics and policy
- Energy externalities
- Nuclear power: economics, litigation, and regulation
- Energy security policies and the strategic petroleum reserve

EMPLOYMENT HISTORY

2001-Present: Chairman, *The Brattle Group*, Washington, DC

1996-Present: Principal and Director, *The Brattle Group*, Washington, DC

1993-1996: Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, United States Department of Energy

Senior Advisor for Technology Policy, Office of Science and Technology Policy, Executive Office of the President

Assistant to the Deputy Secretary of Energy

1989-1993: Vice President, Charles River Associates, Boston, MA

1991-1993: Professorial Lecturer, Center for Energy and Environmental Studies, Boston University

1987-1989: Senior Associate, Charles River Associates

1980-1983: Research Engineer and Chief Research Engineer, Illinois Governor's Office of Consumer Service, Chicago, IL

1977-1980: Research Assistant and Research Engineer, Office of Vice Chancellor for Energy Research, University of Illinois, Urbana, IL

REFEREED PUBLICATIONS

With Gregory N. Basheda, Darrell B. Chodorow, Jason A. Hicks, Eric Hirst, James K. Mitchell, Dean M. Murphy and Joseph B. Wharton. "The FERC, Stranded Cost Recovery, and Municipalization." *Energy Law Journal* 19 (1998): 351-386.

"Efficiency and the Public Interest: QF Transmission and the Energy Policy Act of 1992." *Energy Law Journal* 14 (1993): 51-73.

With Karen Palmer, David Simpson, and Michael Toman. "Electricity Fuel Contracting: Relationships with Coal and Gas Suppliers." *Energy Policy*, October, 1993: 1045-1054.

With Franklin M. Fisher, Joen Greenwood, William G. Moss, and Almarin Phillips. "Due Diligence and the Demand for Electricity: A Cautionary Tale." *Journal of Industrial Organization, 1992.*

"Cogeneration After PURPA: Energy Conservation and Industry Structure." *Journal of Law and Economics* 33 (October 1990): 517-552.

"Regulating Independent Power Producers: Lessons of the PURPA Approach." *Resources and Energy* 12 (1990): 117-141.

"A Dynamic Input-Output Analysis of Net Energy Effects in Single Fuel Economics." *Energy Systems and Policy* 5, no. 2 (1981).

With Bruce M. Hannon and Robert Herendeen. "An Energy Conservation Tax: Impacts and Policy Implications." *Energy Systems and Policy* 5, no. 2 (1981).

With R.S. Chambers, R.A. Herendeen, and J.J. Joyce. "Gasohol: Does It or Doesn't It . . . Produce Positive Net Energy?" *Science* 206, no. 4420 (November 1979): 789-795.

"Considerations of Energy Cost and Versatility in Choosing Optimal Stockpile Forms." *Resources Policy* 5, no. 2 (June 1979): 414-448.

"The Acoustic Specification and Design of a Modern Recording Studio." *Journal of the Audio Engineering Society* (June 1979).

With R.A. Herendeen and T. Milke. "New Hybrid 1971 Energy Intensities." *Energy* 4 (1979): 469-473.

"Cynics, Martyrs, and the Value of Energy Conservation." *Science and Public Policy* 5 (1978): 105-110.

With Clark Bullard and David Pilati. "Energy Analysis: Handbook for Combining Process and Input-Output Analysis." *Resources and Energy* (June 1979). Also published by the Energy Research and Development Administration, Washington, DC, ERDA 77-61).

"Energy Intensity of Electric Commuter Railways." Center for Advanced Computation Technical Memo 24, June 1974. Reprinted as "Total Energy and Labor Requirements for an Electric Commuter Railroad." *Energy* 3 (1978): 539-542.

MONOGRAPHS AND BOOKS

With Karen Palmer, David Simpson, and Michael Toman. "Power Plant Fuel Supply Contracts: The Changing Nature of the Long-Term Supply Relationship." Arlington, VA: Public Utility Reports, 1992.

Electric Power Transmission and Wheeling: A Technical Primer. Washington, DC: The Edison Electric Institute, 1990.

Electric Utility Restructuring: A Guide to the New Era. Vienna, VA: Public Utility Reports, 1997

BOOK CHAPTERS

With Romkaew Broehm. "Price-Responsive Electric Demand: *A National Necessity, Not an Option,*" forthcoming in *Towards Market Based Pricing of Electricity*, Faruqui Ahmad, ed. 2002.

"Energy Policy: Today's View from the Federal Government," in *The Energy Crisis: Unresolved Issues and Enduring Legacies*, David Feldman, ed., Johns Hopkins University Press, 1996.

"What Role Should the Federal Government Play in Energy Efficiency?" in *Policy Evolution: Energy Conservation to Energy Efficiency*. Douglas A. Decker and Alan Berolzheimer, eds. Liburn, GA: The Fairmount Press, 1997.

SELECTED ADDITIONAL PUBLICATIONS

With Ellen Craig and Adam Schumacher. "Value Drivers in the Utility Industry of 2002." Forthcoming *PUR Analysis of The Nation's Largest Investor-Owned Electric and Gas Utilities*, 2001 Edition, Public Utilities Reports.

"Easing Gridlock on the Grid: Electric Planning and Siting Compacts." Forthcoming in *The Electricity Journal, November* 2001.

"Clean Growth: A Balanced Energy Policy for the 21st Century." Progressive Policy Institute's Policy Report, October 2001.

With Greg Basheda. "A Short Honeymoon for Utility Deregulation." *Issues in Science and Technology*, Spring 2001.

"What not to learn from the Calif. crisis." (Op-ed) *The Providence Journal*, March 3, 2001.

"Epitaph for Electric Deregulation." Prepared for the National Council on Competition and the

Electric Industry, December 2000 meeting, October 2000.

With Frank Graves. "Monopoly Power After Reform? A Time for Soul-Searching." *Public Utilities Fortnightly*, May 2000.

"Federal Restructuring Legislation: Any Chance in This Congressional Session?" *Energy Efficiency*
Journal, March 2000.

"Electric Power Deregulation: Blessings and Blemishes, A Non-Technical Review of the Issues Associated with Competition in Today's Electric Power Industry." Prepared for the National Council on Competition and the Electric Industry, March 14, 2000.

With Johannes P. Pfeifenberger. "Transmission Access, Episode II: FERC's Journey." *Public Utilities Fortnightly*, August 1999.

With J.P. Pfeifenberger, P.Q Hanser, and G.N. Basheda. "In What Shape is Your ISO?" *The Electricity Journal*, July 1998.

"Transco vs. ISO: A Sideshow?" *Public Utilities Fortnightly*, June 1, 1998.

With Matt O'Loughlin. "Fostering Market Center Development and Integration of the Natural Gas Grid Through Improved Pipeline Ratemaking." Prepared for NorAm Gas Transmission Company, May 1998.

"An Open Letter to the President" *The Electricity Journal*, March 1997.

With Philip Q Hanser and Joseph B. Wharton. "Real-Time Pricing: Restructuring's Big Bang?" *Public Utilities Fortnightly*, March 1997.

"Critical Trends in State Utility Regulation." *Natural Resources and Environment* 8 (Winter 1994): 17-20.

"Electricity in A Competitive Environment: The Real Issue is Not Retail Wheeling." *Edison Times IRP Quarterly*, Fall 1994.

With Chris Fitzgerald. "A Proposal for Design-Based Auto Industry Environmental Regulation." *Total Quality Environmental Management* 2 (Spring 1993): 323-327.

"The Private DSM Industry - A Gleam in Whose Eye?" *The Electricity Journal* 4 (December 1991): 21-25.

With Paul D. O'Rourke and Peter J. Spinney. *Competitive Procurement of Electric Utility Resources* (EPRI CU-6898s). Palo Alto, CA: Electric Power Research Institute, July 1990.

With Mark Horton and Peter Spinney. "Bidding Update." *Cogeneration & Resource Recovery* 9,

no. 7 (November/December 1990): 6–11.

With Edward Kee. "Bid Policies Overhauled." *Cogeneration & Resource Recovery* 9, no. 7 (November/December 1990): 14–15.

Comments on Notice of Proposed Rulemaking Concerning Avoided Costs. Before the Federal Energy Regulatory Commission, Docket RM88-4, June, 1988.

"Allowing for Regulation in Forecasting Load and Financial Performance." *Public Utilities Fortnightly* (January 7, 1988).

"Price Formula Issues Associated with SPR Release Programs." Prepared for the Office of Energy Emergencies, U.S. Department of Energy, 1988.

"The Immediate Consequences of an Oil Supply Emergency for the Financial Markets and Major User Groups." Prepared for the Office of Energy Emergencies, U.S. Department of Energy, 1988.

With others. "Independent Load Forecast for the Commonwealth Edison Service Territory." Governor's Office of Consumer Services, Chicago, June 1981. ICC Docket No. 80-0706.

"The Norwegian Power Planning Process." Institute for Environmental Studies, University of Oslo, Norway, 1981.

With R. Herendeen.. "A 1972 Energy and Labor Commodity-Commodity Input-Output Model." Energy Research Group, University of Illinois, Urbana, IL, March 1980.

"Correspondence Between the EDIO Input-Output Model and the ERG-90 and 360-Order Input-Output Model." Energy Research Group, University of Illinois, Urbana, IL, March 1980.

With J. Kurish. "Energy and Labor Cost of Alternative Coal-Electric Fuel Cycles." Energy Research Group, University of Illinois, Urbana, IL, February 1980.

"Handbook of Research Techniques." Energy Research Group Technical Memo 123. Revised December 1979.

"A Structure of the Electric Utility Industry, 1990." Energy Research Group Technical Memo 121, November 1979.

With B. Hannon and R. Herendeen. "Calculation of Alpha in the Determination of Primary Energy." Energy Research Group, University of Illinois, Urbana, IL, November 1979.

"Notes of the Bechtel ESPM/ERG I/O Bridge for Operating (Annual) and Capital (Investment) Costs, Purchasers Prices, 1978." Energy Research Group Technical Memo 119, August 1979.

"Transformation of Brookhaven National Laboratories 110-Order I/O Data into ERG-Usable

Form." Energy Research Group Technical Memo 118, July 1979.

"1967-1977 Price Indices for Use with the Energy Research Group Energy Input-Output Policy Models." Energy Research Group Technical Memo 117, June 1979.

"Direct Energy Transactions Matrix for 1971." Energy Research Group, University of Illinois, Urbana, IL, June 1979.

With Jack Joyce. "Background Energy Cost Calculations for ACR Gasohol Production." Report to ACR Processes, Inc., November 1977.

With Clark Bullard and Donna Amado. "Net Energy Effects and Resource Depletion: An All-Nuclear Economy." Center for Advanced Computation Document 238, September 1977.

"Taking Appropriate Technology to Task." *WIN* 13:(April 7, 1977):8-10.

With Donna Amado. "Net Energy Effects and Resource Depletion: An All-Oil Economy." Center for Advanced Computation Document 231, April 1977.

"Standardization of Energy Accounting Techniques." Center for Advanced Computation Technical Memo 83, January 1977.

With Jaap Spek. "Stockpile Optimization and Versatility Consideration for Strategic and Critical Materials." Center for Advanced Computation Document 217, May 1976.

"Energy Requirements and Aerosol and Alternative Packaging: A Case Study." Center for Advanced Computation Document 204, February 1976. 2nd revision, July 1976.

With Bruce Hannon. "The Energy Research Group Resource Energy-Employment Model and Its Uses in Stockpile Policymaking." Report to the Office of Preparedness, General Services Administration, July 1975.

"The Coal Future: Capital and Fuel Cycle Energy Costs of a 1000 MW Nuclear Reactor." Appendix B to Michael Rieber's Center for Advanced Computation Document 163, May 1975.

"Summary of Techniques Used for Calculating the Energy Costs of Constructing a Commercial Nuclear Reactor." Center for Advanced Computation Technical Memo, April 1975.

"The Dollar, Energy and Labor Impact of 1971 Regular Route Intercity Bus Transportation." Center for Advanced Computation Technical Memo 31, July 1974.

"Energy Intensity of Motorcycle Travel." Center for Advanced Computation Technical Memo 30, July 1974.

SELECTED CONFERENCE/WORKSHOP PARTICIPATION

"What Does the California Experience Tell Us About Fixing the Rest of America's Power Markets?" By Peter Fox-Penner and Joseph B. Wharton. Presented at the National Association Business Economics Regional/Utility Roundtable, April 24, 2001.

"Taming the Lions in America's Electric Markets: Five Major Challenge." Presented at National Governors' Association Center for Best Practices, Executive Policy Forum on Energy, "*Is Electricity Restructuring in Jeopardy?*" Washington, DC, April 5, 2001.

"The Challenge to Co-operatives in the Electric Power Industry of the 21st Century." NRECA's 30th Annual CEO Leadership Conference. Keystone, CO, August 2, 2000.

"Price-Responsive Electric Demand: A National Priority." The Electric Power Research Institute's International Energy Pricing Conference. Washington, DC, July 26, 2000.

"Incentives, Regulation and Transmission Companies: One Practioner's View." Presented to The Federal Energy Regulatory Commission's RTO Staff. Washington, DC, July 16, 1999.

"ISOs, Transcos, Gridcos, and Long-Run Power Industry Efficiency." Federal Energy Bar Association's Mid-Year Meeting. Washington, DC, December 4, 1998.

"Market Power Issues in Restructured Electric Power Markets." American Bar Association's Satellite Seminar, "Critical Federal and State Practice Issues in Electricity Deregulation." Washington, DC, December 3, 1998

"SAVIOR OR BUREAUCRAT? ISOs, Competition, and Independent Transmission Companies." Winning with Retail Competition, 2nd Annual PUR Conference, Arlington, VA, June 22, 1998.

"The Evolution of the Energy Services Industry." *Have it Your Way: Buying and Saving Energy in the Age of Customer Choice*, Annual Meeting of Energy Management Consortium and the Northeast Energy Efficiency Council, Boston, MA, September 18, 1997.

"Volatility and Stability in the Deregulated Generation Marketplace." Restructuring and Convergence, Successful Strategies in the Energy Services Marketplace, Arlington, VA, May 22, 1997.

"Progress and Promise: The Clinton Administration's Efforts in Fostering Sustainable Development." Global Accords for Sustainable Development: Enabling Technologies and Links to Finance and Legal Institutions Conference, M.I.T., Cambridge, MA, September 5, 1996.

Invited Speaker, Fourth Biennial Conference of the International Society for Ecological Economics, Boston, MA, August 7, 1996.

"Linking Energy, Environment, and Technology to the Economy." Globalcon Energy and Environment Exposition, April 3, 1996.

21st Annual Illinois Energy Conference, November 1996.

Civil Engineering Research Foundation, Washington meeting, October 12, 1995.

"Technology and Economic Growth: The Government's Role." M.I.T. Club of Washington, DC, October 10, 1995.

"The Impact of Government Budget Changes and Restructuring on Engineering." ASME and the Public Lecture Series, Washington, DC, September 21, 1995.

"Energy - Environment - Technology: Two Visions, Two Directions." *Proceedings of the 1995 International Energy and Environment Congress.* Association of Energy Engineers, Richmond, VA, 1995.

"The Federal Role in Energy Efficiency." Eighth Biannual DSM Evaluation Conference, Chicago, IL, August 24, 1995.

Invited Speaker, Seventh National DOE/EPRI Demand-Side Management Conference, Dallas, TX, June 28, 1995.

"Utility Restructuring and Regulatory Reform." Invited Presentation, National Association of Regulatory Utility Commissioners Attorneys' Conference, Tucson, AZ, May 18, 1995.

Invited Speaker, Conservation Committee, Semi-Annual Meetings of the National Association of Regulatory Utility Commissioners, 1994 and 1995.

Invited Panelist, OECD Seminar on Sustainable Production and Consumption, Massachusetts Institute of Technology, December 19, 1994.

"Electric Utilities and the Environment: Restructuring Need Not Mean Retreat." Invited Presentation, "Brave New World - Managing Externalities in a Competitive Electric Utility Industry." University of Illinois Center for Regulatory Studies, Chicago, IL, November 17, 1994.

Invited Speaker, International Ground Source Heat Pump Association, Hershey, PA, October 17, 1994.

Invited Speaker, "Washington: Business and Public Policy," Brookings Institution Seminar, October 18, 1994.

"Federal Climate Change Management Programs and Climate-Wise," Businesses for Social Responsibility 1994 Environment Conference, Boston, MA, October 13, 1994.

Invited Speaker, National Association of State Energy Officials, Asheville, NC, August 31, 1984.

Invited Speaker, Annual Meeting of the California Institute for Energy Efficiency, Berkeley, CA, July 25, 1994.

"Voluntary Greenhouse Gas Reporting Under the Energy Policy Act of 1992." Invited Presentation, International Conference on Global Climate Change, Center for Environmental Information, Washington, DC, February 1993.

Panel Moderator, Natural Gas Procurement Strategies, Association of Energy Engineers Annual Conference, Boston, MA, June1992.

Panel Moderator, Alternative Fuel Vehicles Conference, the Management Exchange, Washington, DC, April 1992.

Invited Presenter, American Water Works Association. Conservation Committee Workshop, Austin, TX, January 1992.

"The Future History of DSM." Plenary presentation, 5th National Demand–Side Management Conference, Boston, MA, August 1, 1991.

"Visibility of the Buy Strategy — Bulk Power Transfers: Solution or Fatal Attraction?" The Management Exchange "The Buy vs. Build Decision" Conference, Washington, DC, March 22,1991.

"Industrials and Electric Utilities: Your Stake in the Future of Power." Invited Presenter, McGraw-Hill "Industrial and Utilities" Conference, Chicago, IL, October 22, 1990.

"Is Deintegrated Electric Generation Efficient? A Proposed Empirical Research Framework." *Proceedings of 13th Annual International Conference of the International Association of Energy Economists*. Copenhagen, Denmark, June 1990.

"Competitive Resource Procurement: Where Are We Going?" Invited Presentation, Edison Electric Institute Interconnection Arrangements Committee, Richmond, VA, April 20, 1990.

"Utility Regulation and DSM: Rethinking the Regulatory Boundaries." Presentation with Peter Spinney, *DSM Bidding: Challenges and Opportunities*, Albany, NY, April 12, 1990.

"An Introduction to Competitive Power Procurement." University of Illinois Center for Regulatory Studies, Workshop on Competitive Bidding, Chicago, IL, October 10 and May 9, 1990.

Invited Presenter, "Is Deintegrated Electricity Efficient?" *Resources for the Future*, Washington, DC, February 14, 1990.

Chair, "Cogeneration IPPs — Current Developments," Association of Energy Engineers, 12th World Energy Engineering Congress, October 25, 1989.

Convener, Electric Power Research Institute (EPRI) Workshops on Competitive Resource

Procurement ("Bidmet"), Chicago, IL, October 18, 1989.

"IPP Bidding: The View From Today's Utilities." *Proceedings* of the Third Annual Conference, American Cogeneration Association, September 25-27, 1989.

"Purchasing Independent Generation: The Case for Negotiated Contracts." With Mary Smith. *Utility Opportunities in New Generation* (EPRI CU-6605). Palo Alto, CA: Electric Power Research Institute, June 1989.

Invited speaker, Least–Cost Utility Regulation, National Association of State Utility Consumer Advocates, Columbus, OH, June 15, 1989.

Seminar on electric power transmission, RETSIE Conference, Santa Clara, CA, June 19, 1989.

"Purchasing Independent Generation: The Case for Negotiated Contracts." Presentation with Mary Smith, EEI/EPRI Utility Opportunities for New Generation, Boston, MA, June 29, 1989.

Invited Speaker, "The Outlook for IPPs in Washington," the Independent Power Producers of New York (IPPNY) 3rd Annual Meeting, Albany, NY, December 2, 1988.

"Resource Recovery: Evaluating the Development Benefits." Part of the session: Waste–to–Energy Sales and Economic Development, the National League of Cities Resource Recovery in Transition Conference, Arlington, VA, November 15, 1988.

Co-chair, session on the Canadian Electric Power Trade, the American Cogeneration Association and Cogeneration & Independent Power Coalition of America (ACA/CIPCA) 2nd Annual Meeting and Exposition, Chicago, IL, September 26, 1988.

"An Econometric Analysis of the Impacts of PURPA Enforcement Differentials." *Proceedings of the Sixth NARUC Biennial Regulatory Information Conference*. National Regulatory Research Institute, September 1988.

ADVISORY BOARDS AND OTHER PROFESSIONAL ACTIVITIES

Advisory Board, Center for National Policy, Washington, DC, 1993-1996

Advisory Board, Massachusetts Institute of Technology Energy Laboratory, 1993-1996

Nominator, Heniz Foundation Awards, 1995-1996.

Hearing Official, National Energy Policy Plan Hearings, United States Department of Energy, 1994.

Member, Interagency Climate Change Management Committee, Council on Environmental Quality, 1992-1995.

Energy Efficiency and Renewable Energy Group Leader, U.S.-Mexico Energy Trade Mission, June 1995.

Advisor to the Federal Fleet Conversion Task Force, U.S. Department of Energy, 1994.

Attendee, U.S.–Japan Energy Policy Consultations, Atlantic Council of the United States, U.S. State Department, November 6–8, 1990.

Member, Illinois Solar Energy Advisory Board, 1980.

HONORS AND AWARDS

Who's Who in the East (1991, 1992)
Fellow, Center for the Study of Economy and the State, University of Chicago, 1986
NSF Travel Fellow, Dec. 1981
MIT Institute Fellowship, 1978
Earle C. Anthony Fellowship, 1978
Union Carbide Fellow, 1977-78
Michigan Annual Giving Scholarship, 1976
Illinois State Scholar, 1976
National Merit Scholar, 1976
Sigma Tau Beta
Phi Kappa Phi
Eta Kappa Nu

TEACHING AND RESEARCH SUPERVISION

Professorial Lecturer, Center for Energy and Environmental Studies, Boston University, 1991 and 1992. Designed and taught original course in graduate environmental economics and policy.

Supervisor of 5 student master's theses and member of one Ph.D. committee, Boston University Center for Energy and Environmental Studies, Boston, MA.

Teaching Assistant, Pricing Practices, Professor B. Peter Pashigan, University of Chicago, 1986.

Guest Lecturer at Massachusetts Institute of Technology and University of California, Berkeley.

REVIEW WORK

Energy, *Science, Resources and Energy, U.S. Department of Energy.*

Shock Waves: Enron 's Swoon Leaves A Grand Experiment In a State of Disarray --- Electricity Policy May Be Left To Lurch Between Poles Of Regulation, Free Rein --- Recession Is Powerful Factor

By Rebecca Smith
Staff Reporter of The Wall Street Journal

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It was one of the great fantasies of American business: a deregulated market that would send cheaper and more reliable supplies of electricity coursing into homes and offices across the nation.

But look what's happened instead. Enron Corp., the vast energy trader at the center of the new freewheeling U.S. power markets, now faces collapse amid a blizzard of questionable financial deals. And California, the first big state to deregulate its electricity market, has watched its experiment turn into a disaster, with intermittent blackouts and retail power rates as much as 40% higher than they were a year ago.

Now, with the power industry hovering uneasily between regulation and deregulation, it faces the prospect of a market that combines the worst features of both: a return to government restrictions, mixed with volatility and price spikes as companies struggle to meet the nation's future energy needs.

Investors and lenders, spooked by the twin specters of California and Enron , have become less likely to commit capital to building new power plants, transmission lines and natural-gas pipelines. The U.S. will require big additions to its power production and distribution capacity when it emerges from the current recession -- but for now, at least, the nation's capital markets are reluctant to cough up the necessary funds.

Responding to the dramatic decline in their stock prices and the recession, energy companies are retrenching. Calpine Corp., one of the most aggressive players in the deregulated market, is waffling on previously announced plans to build billions of dollars in new power plants. Virginia-based AES Corp., which has missed its recent earnings targets, has scaled back its expansion goals and is selling some of its foreign assets. Northeast Utilities is curtailing plans to build a 30-mile undersea transmission line from Connecticut to Long Island.

Meanwhile, regulators are racing to place new guardrails on the U.S. power market. The federal government is trying to beef up its market-surveillance activities. And it also is trying to broker deals between states that might make

interstate energy transmission faster, cheaper and easier.

The power market is in "the midst of an ugly adolescence that we cannot allow to last much longer," says Nora Brownell, a member of the Federal Energy Regulatory Commission in Washington.

That's because, for the consumer, energy deregulation has been anything but good news. Unlike the deregulated telecommunications market, where fierce competition brought down prices while guaranteeing a reasonable level of reliability, the deregulated power market isn't likely to provide real benefits until it stabilizes. For now, consumers are at the mercy of wholesale forces they often can't understand and have few real options to switch between service providers.

The theory behind deregulation was that it would lead to the emergence of efficient companies that would specialize in providing electric power, carrying it over long distances or delivering it to a final customer.

While the industry started to move in that direction, it isn't anymore. Many big power companies in the most populous states, which are the ones that also happen to be deregulated, still do a little of everything and are increasingly confused about where to place their business bets.

When it comes to electricity markets, says Frank Wolak, a Stanford University economics professor, these kinds of "hybrids don't work." But, he fears that they will be around for some time to come, especially since regulators, who once thought the markets themselves would bring about deregulation's goals, are only belatedly assuming responsibility for making sure things run smoothly.

Enron 's sudden meltdown will deal a heavy blow to the broader energy marketplace that sat at the center of electricity deregulation -- providing a place for utilities and power plants to buy energy they needed in a hurry, or to unload their excess supplies. The company's EnronOnline trading system, which was shut down Wednesday, accounted for a quarter of all wholesale energy trades among U.S. utilities, independent power producers and other market players.

The trading system's shutdown came in the wake of disclosures that Enron 's directors and top officers approved a series of partnerships that moved debts off the company's balance sheet. In several cases, those partnerships enriched company officers but later produced huge losses for Enron .

That kind of "balance-sheet abuse" says Goldman Sachs analyst Jonathan Raleigh, might now "reduce overall liquidity and cause lenders to tighten credit standards" for the entire energy-trading industry. The result could be the kind of supply squeezes that led to six days of blackouts in California earlier this year.

California's supply problems didn't spread beyond the Pacific Northwest -- but that's largely because of the sharp economic downturn. As spot-market power prices in California shot up to an average of $317 per megawatt in December 2000 from $32 per megawatt hour the preceding April, energy companies were making enormous amounts of money. Investors drove up the price of the companies' stocks, with Enron at one point trading at 60 times its projected next year's earnings. New funding was flooding in from debt and equity markets. Under pressure from regulators worried about a repeat of the California debacle, energy companies got busy building power plants, drawing up plans to fix the nation's antiquated electric-transmission systems and plotting new natural-gas pipelines.

But that golden moment for the industry turned out to be short-lived. Early this year, federal energy regulators placed caps on the wholesale price of power sold in the western U.S. as California's two main investor-owned utilities were pushed to the brink of insolvency. Then, in the spring, natural-gas and electricity prices collapsed around the country as the economy suddenly slowed to a crawl. Even before Enron got into trouble, the big energy companies began to see their stock prices sink, and investors began to cast a more critical eye on their expansion plans in the wake of the California chaos and the resulting multibillion-dollar electricity payment crisis.

One of the first signs that a sea change was under way came a few months ago when demand for power-generation turbines began to soften. Because there are only three domestic suppliers of such multimillion-dollar engines, the most expensive pieces of machinery used by commercial electricity producers, the machines must be ordered well in advance of their deployment.

A year ago, says David Sokol, chief executive of Iowa-based utility owner Mid-American Energy Holdings Co., "you had to pay a premium to get a turbine." Companies with lots of turbines on order, such as San Jose, Calif.-based Calpine, boasted that they would clean up in newly deregulated markets such as the West, the Northeast and New York, where electricity supplies back then were tight. "But now," Mr. Sokol says, "I know of at least 100 [turbines] that are for sale. People want you to take their place in line."

While most energy companies are pressing ahead with projects they have started, they have grown cautious about breaking ground on new ones. Just a few months ago Calpine boldly claimed it would have 70,000 megawatts of generating capacity -- the equivalent of 35 to 45 big power plants -- in operation by 2005. Now it's backing away from that assertion. The company currently has only a fraction of that capacity, 11,000 megawatts.

At the root of the problem is a lack of capital and earnings. While energy companies routinely beat their own bullish quarterly profit estimates last year, many of them have lately indicated that they will miss earnings projections.

With electricity and natural-gas prices down, energy sales tend to be less profitable. Hence, investors haven't been willing to pay the same price-earnings multiples for energy stocks.

Bankers, meanwhile, want convincing evidence that future power prices will be high enough to justify new projects. That's far from guaranteed in deregulated markets. In fact, national electricity prices, which hit a 52-week peak of $216 per megawatt, now are being quoted at $23.45 per megawatt, according to the Mirant National Power Index.

To give some idea of how radically the landscape has shifted, take the case of power conglomerate UtiliCorp United Inc., of Kansas City, Mo. In April, taking advantage of the general enthusiasm toward deregulated markets, it spun off its Aquila Inc. trading unit at a price of $24 a share, raising $480 million. "We saw an opportunity to crystalize the value" of the trading company, says UtiliCorp President Bob Green.

Aquila's stock soared to $35 before it began slipping at the end of May. Since then, it has tumbled by half. Today, with a price/earnings ratio of eight -- less than most utilities -- the "equity markets are closed" to Aquila, Mr. Green says.

Now, UtiliCorp, which mainly owns regulated utilities, is planning to buy back all the publicly traded Aquila shares. It hopes that by taking shelter under UtiliCorp's umbrella, Aquila will be able to benefit enough from its parent's strong credit rating and healthy balance sheet to keep trading and buying more power plants.

In other words, the regulated utilities, once considered homely wallflowers, are looking more alluring these days as trading firms, such as Aquila and Enron , have fallen from favor. That could portend a reduction in the huge trading volumes, and accompanying price volatility, that marked the early stages of energy deregulation.

But that won't help consumers unless new power plants and transmission lines come online in time for the economy's resurgence and new rules are put in place that guarantee a more transparent market. The latter won't be an easy task, because power trading is done on a variety of public and private exchanges, with traders darting in and out to take advantage of price discrepancies.

Lately, there's been growing evidence that some power companies have found lucrative ways to exploit this system -- at consumers' expense. Their tactics include manipulating wholesale electricity auctions, taking juice from transmission systems when they aren't supposed to and denying weaker competitors access to transmission lines. Regulators believe that this behavior has contributed to supply glitches and inflated prices.

Under its new chairman, Pat Wood, the FERC has been pressing companies to take steps it believes will create power markets that are less susceptible to such shenanigans. Chief among them is for utilities to surrender control of their high-voltage power lines to independent operators that would give all market participants fair access and will operate spot markets for power.

Earlier this month, the commission told three of the nation's big integrated utilities -- American Electric Power Co., Entergy Corp. and Southern Co. -- that until they relinquish control of their power lines to an independent operator, FERC may intervene to limit the prices they charge wholesale customers. At least one of the three is appealing the FERC mandate.

The commission has also stepped up efforts to settle pesky but important technical issues, such as how independent power producers can hook up new plants to the lines of nearby utilities and how transmission services can best be priced.

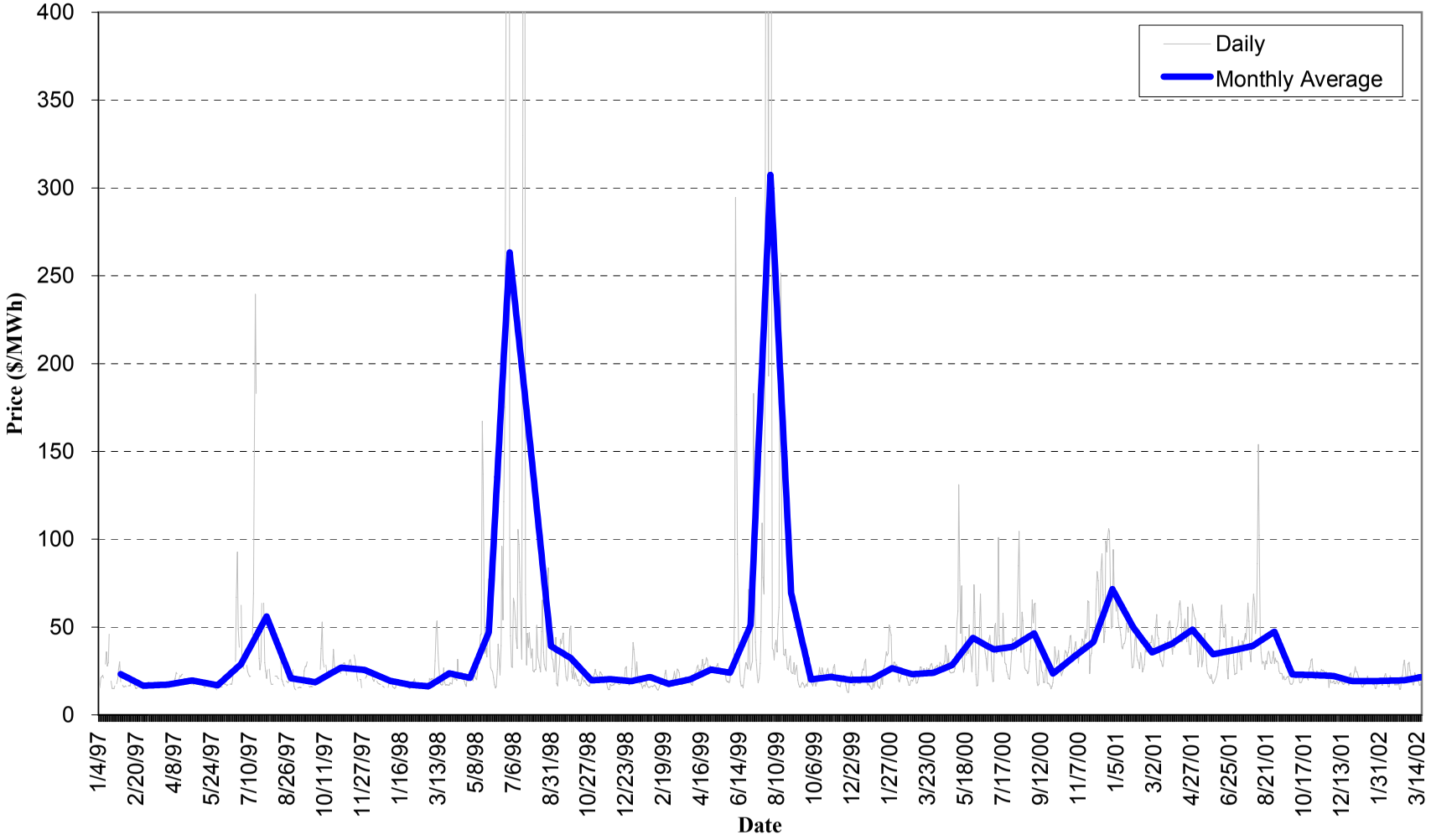
Still, even a more aggressive FERC hasn't been able to solve some lingering problems. A good example is the continued existence of one of the nation's worst transmission bottlenecks. Known as "Path 15," the line interconnects the populous southern part of California with more abundant energy resources in the north. The Department of Energy has pledged to help expand Path 15, which was implicated as a key cause of the blackouts in California earlier this year.

But actually getting the work done may require PG&E Corp.'s Pacific Gas & Electric unit, which owns the 90-mile stretch of line, to get approval for the expansion from the state Public Utilities Commission. But Pacific Gas, which placed itself under the protection of the federal bankruptcy courts amid the California power crisis, is at loggerheads with the PUC. The upshot is that there may be significant delays in upgrading Path 15. The implication: when the economy cranks back up, so too will the possibility of more supply shortages and higher prices, says Terry Winter, chief executive of California's Independent System Operator, which operates the state's electricity grid.

(See related letter: "Letters to the Editor -- Advice for California: Join the Free Market" -- WSJ Dec. 10, 2001)

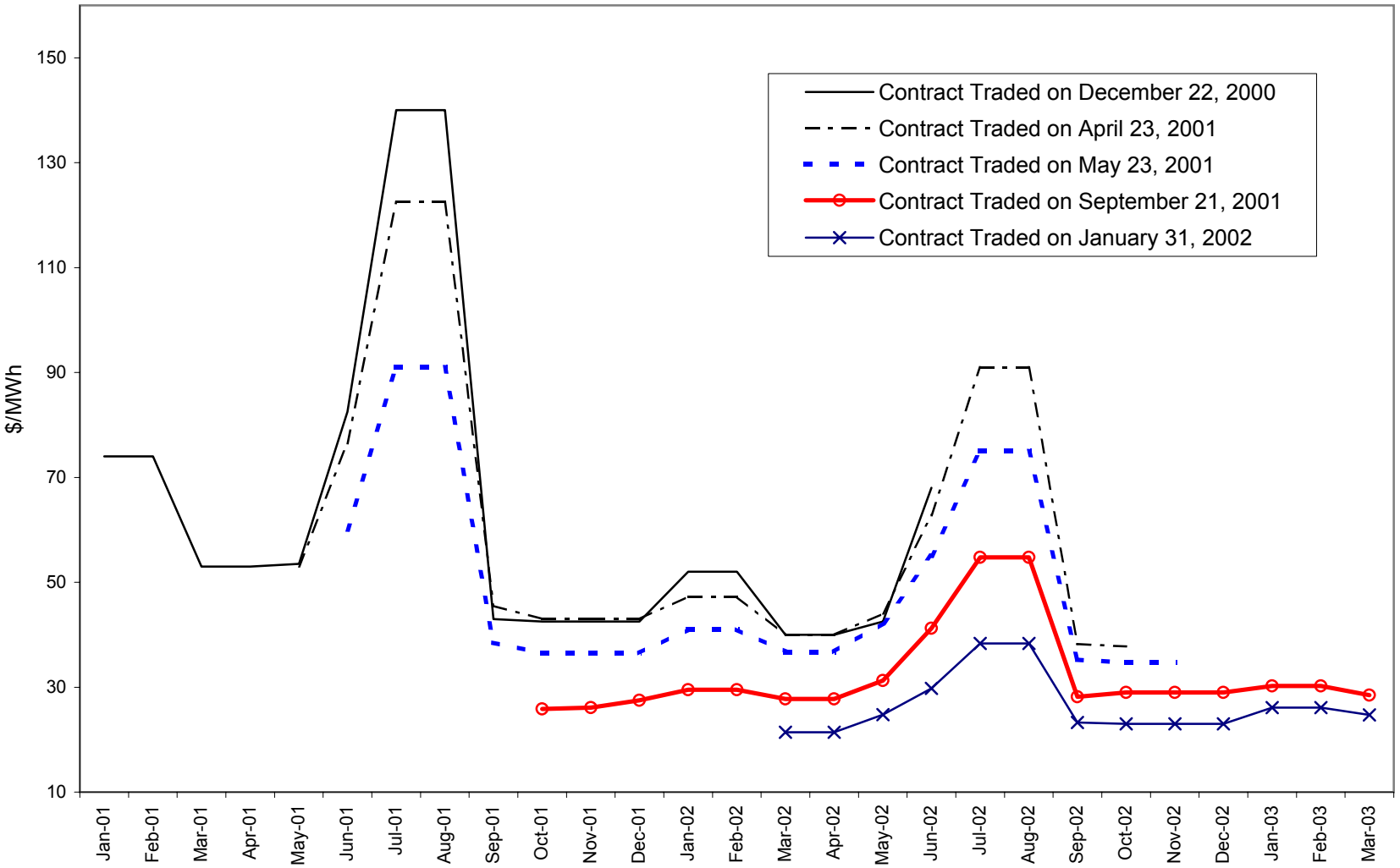
Schedule 3

Cinergy Daily and Monthly Average Prices During Peak Hours
Using Daily Prices from Power Markets Week



Source: Platts Power Markets Week Price Index Database

Forward Prices for 1 Month, 5x16 Hours Power Contracts at Cinergy



Source: Bridge and NYMEX

Schedule 4