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Turning on the Lights 2011: The Consumer Benefits of Electric Power Competition

Policy Report No. 332 by Carl Johnston and Lynne Kiesling* April 2011

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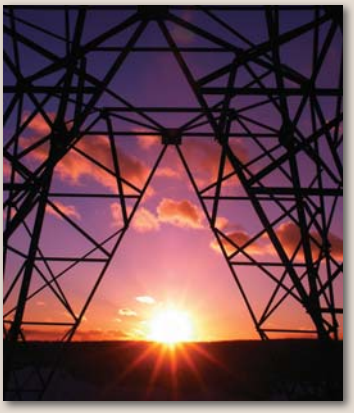

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Executive Summary

Today, the production, delivery and use of electric power is undergoing revolutionary changes not seen since the era of Thomas Edison. These developments promise to be as profound as those that transformed the 1960s-era standard black rotary-dial telephone into today's broadband-access mobile phone. Residential, commercial and industrial consumers will benefit from lower electricity costs, innovative services and increased quality, reliability and security. The economy will benefit from efficient energy use, more productive investment opportunities and new job creation.

For most of the 20th century, electric power was generated by utilities with legally protected monopolies in geographically defined service territories and sold to captive consumers at state-regulated rates. In the 1970s and 1980s, however, energy prices rose more than projected and demand for electricity grew more slowly than anticipated. As a result:

- Regulated electricity prices rose by more than 300 percent from 1970 to 1985, a 60 percent increase after adjusting for inflation.
- Real prices reached a level not seen before or since.
- Regulation of electricity the 1970s and 1980s cost consumers an estimated $200 billion or more in today's dollars.

Meanwhile, in the 1970s and 1980s, deregulation of other network or utility-type industries — including natural gas, telecommunications, airlines, trucking and railroads — reduced prices at least 25 percent below prereform levels. This experience led to expectations that electric power competition would provide similar consumer benefits. Thus, beginning in the late 1990s, a number of states restructured their retail power markets.

Restructuring generally means that prices are set competitively, utilities shed generating plants and transmission lines, and consumers have a choice of providers. Two-thirds of the U.S. population lives in states that have introduced competition and choice. Electricity prices in these states reflect the actual cost of production better than politically determined rates:

- Overall, electricity prices have adjusted more quickly in restructured states to changes in fuel costs and demand than in unrestructured states.
- As a result, in response to market demand as indicated by price, restructured states have added efficiency improvements, plant upgrades, additional generation and transmission capacity at a faster pace than nonrestructured states.
- Demand response — which offers customers lower prices if they agree to reduce or interrupt electricity use when demand peaks — has spread more rapidly in reformed states than in unreformed areas.
- In competitive markets, consumers may pay less for electricity than they once did under monopoly — for example, Texas retail customers in some competitive markets paid up to one-third less in 2010 than in 2001, after adjusting for inflation.

In the study foreword, Vernon Smith, a Nobel laureate in economics, and his colleague Stephen Rassenti note that among the results of competition, restructuring and new technology "has been the development of innovative new services, the increased use of renewable energy sources, additions to generating capacity and moderation in the growth of demand." For example:

- Renewable power output grew almost 20 times faster in restructured states than in states that remained regulated from 2000 through 2005, according to Energy Information Administration data.

About the Authors

Dr. Carl A. Johnston is a post-doctoral research fellow at the Interdisciplinary Center for Economic Science at George Mason University where he studies electricity and health care market reforms. His work focuses on smart grid issues and health care finance, but also includes economic system design for defense agencies, homeland security and public utilities. Prior to receiving his Ph.D. from George Mason University in 2007, Dr. Johnston was a research associate in Harvard Business School's Strategy and Competition Department. He received his B.A. from Stanford University in 1982. Dr. Johnston is a senior fellow with the National Center for Policy Analysis.

Dr. Lynne Kiesling is a senior lecturer in the Department of Economics at Northwestern University, and in the Social Enterprise at Kellogg (SEEK) program in the Kellogg School of Management at Northwestern University. Dr. Kiesling is the author or co-author of many academic journal articles, book chapters, policy studies and public interest comments, most of which analyze electricity policy and market design issues. Her specialization is industrial organization and regulatory policy. As a noted expert in demand response, end-use technology and retail competition, Dr. Kiesling has been asked to speak to various academic, industrial and regulatory groups about regulatory policy, institutional change and experimental economic analysis of electric power market design. She has served as a peer reviewer for the U.S. Department of Energy and the National Science Foundation, and for academic journals including *Energy Journal*, *Public Choice*, and *Review of Economics and Statistics*. She has provided expert testimony in proceedings before the Federal Energy Regulatory Commission, the California Public Utilities Commission, the Illinois Commerce Commission and the New York Public Service Commission. She has also taught several economics workshops for regulators using experimental economics. Dr. Kiesling has a Ph.D. in Economics from Northwestern University and a B.S. in Economics from Miami University, Oxford, Ohio.

- Nationwide, demand response (together with a smaller effect from energy efficiency programs) will slow the growth in demand, such that the electric power consumption previously forecast for 2014 will not be reached until 2018, according to the North American Electric Reliability Corporation (NERC).

- By the end of 2010, nearly a third of U.S. households (an estimated 28 million) will have smart meters permitting two-way communications with utilities and allowing consumers to track and manage their consumption.

However, many states are not ready for the revolution. Of the 26 states that began restructuring in the late 1990s and early 2000s, only 14 have completed the process, and a few have moved to reregulate their markets. Restructuring has been most successful in Texas, where about 43 percent of residential buyers and more than 70 percent of the largest industrial customers in deregulated areas have switched to a competitive retail electric provider, sometimes switching more than once.

Americans spent nearly $354 billion in 2009 on electric power. That doesn't include costs imposed by an overloaded, antiquated transmission and distribution grid: The cost of power outages and interruptions is estimated to be at least $150 billion a year. Furthermore, over the next 25 years, electric power demand is projected to grow 30 percent. The investment required to meet the growth in demand, improve reliability and create a smart grid could amount to $1.5 trillion.

Electricity prices set by regulators rather than markets cannot deliver the services needed to promote innovation and a new generation of electricity distribution networks. Building this infrastructure will require private investment and allow many new industries to develop, generating many new jobs.

Among the steps necessary to realize the potential of the new technologies and markets:

- **Continue the Process of State Restructuring.** States that have not done so must remove structural roadblocks to competition, including splitting vertically integrated utilities into service companies and power generators. They must change pricing policies, such as price caps and default options, that allow incumbent utilities to exercise anti-competitive market power.

- **Allow Retail Market Competition.** The states that do not allow retail competition should remove barriers to price and service competition so that consumers will have real service options, money-saving plans and a variety of generating choices.

- **Devolve or Divest Federal Power Generating and Transmission Assets.** The federal government generates 46 percent of the U.S. electric power through the Tennessee Valley Authority and other utility monopolies. Federal production and transmission facilities should be offered to the states or sold to private investors.

- **Build a National Transmission Grid.** There is a need to develop new transmission capacity and corridors to alleviate chronic congestion in the Northeast corridor and Southern California, to accommodate increased sales in wholesale markets, and to link renewable energy sources to regions needing power. Public-private partnerships could attract private capital.

- **Give the Federal Energy Regulatory Commission the Authority to Site Long-Distance Transmission Lines.** The Federal Energy Regulatory Commission (FERC) should be given the authority necessary to overcome the opposition of states, entrenched economic interests and environmentalists in order to build long-distance transmission lines, especially on land already owned by the federal government.

- **Implement Smart Technologies.** Smart meters are a tool for consumers who want to track and manage their consumption and a component of the smart grid. Their use should not be restricted, but consumers' property rights should be respected, including the right to replace or remove a smart meter when no contracts are violated.

- **Avoid Preferential Subsidies or Mandates for Particular Forms of Energy.** Mandates and price subsidies for particular forms of energy generation distort market prices, which could be costly for consumers and have unintended consequences. Top-down government mandates today will result in investments that can't easily be transitioned to a competitive environment.

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Foreword: Turning on the Lights, 10 Years Later

by Vernon L. Smith and Stephen J. Rassenti

Electric power began as all new private industries normally do: competitive and on the cutting edge of innovation. The authors of this report, economists Carl Johnston and Lynne Kiesling, nicely summarize those exciting turn-of-the-19th-century developments.

The industry later became less competitive and innovative — in a process that can be illustrated by the fate of Arthur Wright's demand meter. Unlike a conventional meter that measures the cumulative amount of electricity used, Wright's meter measured a customer's peak energy consumption — which is the highest demand a consumer makes on the physical capacity of the grid to carry, or transmit, electric power.[1] His meter was approved by the British Board of Trade in 1904.[2] Samuel Insull, head of Chicago Edison, seems to have thought it was the solution to the problem of pricing the fixed costs of electric power generation and transmission capacity separately from the cost of energy consumed in a period. He understood that the capacity of the electric power system was most directly related to peak energy consumption, not cumulative consumption.[3] Adopting Wright's metering technology might have encouraged competitive dynamic pricing of both capacity and energy.

Insull, however, foresaw a less speculative political pathway to greater profits for electric utilities: a state-regulated rate of return on capital. He lobbied hard and successfully for this regulation in the Illinois Legislature and elsewhere, arguing that it would benefit consumers by stabilizing electricity prices (which were falling) and yielding a fair return (guaranteed profit) on capital investment.[4] The regulations discouraged innovation in technology, pricing and service offerings. Under those circumstances, the simple watt-hour meter and residential pricing based on kilowatt-hours consumed was good enough to become ubiquitous. The moral is: Beware of business people bearing the gift of regulation — allowing industries to escape consumer choice!

For much of the 20th century, the electric power industry was governed by federal, state and local regulations with little innovation or consumer choice. Then, in the 1970s and 1980s, Carter administration appointees to various federal regulatory commissions (such as the Federal Energy Regulatory Commission, the Civil Aeronautics Board and the Interstate Commerce Commission) liberalized national markets. For example, they restructured the natural gas industry by separating the ownership and operation of the interstate network of natural gas pipelines from the producers who supplied gas to their customers through the system. Likewise, the federally regulated interstate wholesale electric power industry was restructured by separating the wires business from energy production.[5]

In the late-1990s and early-2000s, several states began the harder task of liberalizing their state-regulated electricity markets, although the pace of reform was slowed by the 2001 debacle in California electricity markets (discussed in the study). Johnston and Kiesling show that prices in restructured systems better reflect costs than in the traditional vertically integrated systems. This means that prices in restructured markets may often be lower than they would be under regulation. However, what is important in restructuring is that prices reflect costs. In the short run, demand — and flexibility in pricing supply — will attract or discourage investment in response to regional needs.

Both the diversity in electric power restructuring and the resistance to restructuring reported by Johnston and Kiesling fulfill the original American expectation that individual states would test institutional changes before their widespread adoption. Both empirical-experimental tests in the laboratory and comparison of results in practice are essential to reducing the massive human errors to which public policy is prone. One issue the restructuring states have handled in different ways is how to ensure adequate investment in generating capacity.[6] Theoretically, allowing prices to rise and fall in response to demand should provide sufficient incentives to expand capacity as needed. In practice, to the extent that prices have been set by markets the result has been the development of innovative new services, the increased use of renewable energy sources, additions to generating capacity and moderation in the growth of demand.

However, lacking the political will to allow electricity prices to rise or fall in response to market conditions, a second-best option has been developed: capacity markets. In some areas, the regional grid operators conduct capacity

supply auctions in which the winners build the contracted capacity and residential consumers are assessed additional charges to pay for it.[7] There is little speculative investment in generating capacity outside the auction.

But capacity auctions may not always garner the needed investment. If the auction is designed as a one-sided hedge against future peak prices, economic experiments using cash-motivated students show that players in such auctions quickly develop the actuarial skill required to determine when to refuse the offer of a payment to add capacity and, instead, purchase electricity in the spot market (where prices can change rapidly).[8] This was demonstrated in a series of experiments that examined the effectiveness of futures markets, capacity markets and guaranteed payments for committing a generating unit to supply power.[9] The experiments found that the only institutional innovation — other than an efficient spot market — that would remedy problems of insufficient investment in a growing economy was interruptible demand response electric power service.

Demand response customers agree to limit their energy use — or allow their service to be interrupted — at times of peak electricity demand (such as hot summer afternoons). Demand response agreements are easy to implement with commercial and industrial customers who routinely monitor and control their electricity consumption. For residential customers, however, this service requires smart meters, which allow control of electric current flowing to individual customers. Smart meters also record electricity usage by time of day, and like Wright's mechanical device a century ago, record peak usage. Smart meters allow service options that charge more or less depending on demand, as measured by grid congestion. To the extent that smart metering and real-time pricing move customers from peak to off-peak consumption, the operating efficiency of the grid increases. Therefore, these customers should not only receive discounted energy prices, but also reduced charges to pay for increased capacity.[10]

In some areas, restructuring has introduced location marginal pricing — which allows energy prices to respond to grid congestion and allocates congestion costs to the users responsible. However, grid congestion doesn't necessarily require building more transmission lines. Two other options are to build more local generators or to offer customers demand response service.

Texas has its own electric power grid, which is only weakly interconnected to the national grid. Thus, the state was especially suitable for a restructuring experiment and the authors report that Texas is the largest and most successful example of electricity restructuring in the United States. By the end of 2010, Texas state grid regulators plan to implement an auction market in which producers offer to supply electric power the next day, but up to the present the state has relied almost entirely on bilateral contracts between suppliers and customers, rather than electronic market auctions.[11] We have always been skeptical of bilateral trading systems, although Texans seems to have made it work.[12]

We read with pleasure this important update and substantive extension of our NCPA article, now 10 years old. While our restructuring proposals have not been adopted in toto, this update indicates that, to the extent they were implemented, beneficial results have followed. Johnston and Kiesling's update also nicely captures the steps that could be taken to best ensure continuing improvements in electric power markets. They also suggest the benefits consumers might expect if the restructuring experiment is allowed to continue in the states that have taken their first few steps, and if it is allowed to spread to other states that have yet to allow energy consumers choice in electric providers.

Vernon L. Smith and Stephen J. Rassenti
Chapman University

Introduction

Today, the production, delivery and use of electric power are undergoing revolutionary changes not seen since the era of Thomas Edison. These developments promise to be as profound as those that transformed the 1960s-era standard black rotary-dial telephone into today's broadband-access mobile phone. As with telecommunications, the rapid spread of new electric power technologies requires profound institutional changes: restructuring existing monopolies, introducing competition in service providers and allowing markets to set prices. Residential, commercial and industrial consumers will benefit from this revolution through lower electricity costs, a wide variety of innovative seices and increased quality, reliability and security. The economy will benefit from more efficient energy use, more productive investment opportunities and new job creation.

In recent years, the federal government and some states have taken many of the steps necessary to allow the electric power revolution to occur. But it is important that federal and state governments avoid policy mistakes, such as mandating the use of particular technologies. Unfortunately, some states have moved in the opposite direction — for instance, toward reregulation of prices and other restrictions on competition — with all the problems, costs and lost opportunities a return to the past entails.

This study will review developments that have led to the current state of affairs, point out the benefits of consumer choice, and suggest the potential for revolution-

Competition and Innovation in the Early Electric Power Industry

The early history of the electric power industry supports Thomas Edison's view that invention and competition are strongly linked. "I can only invent under powerful incentive," Edison said. "No competition means no invention."[1] Edison competed fiercely to develop a practical light bulb, simultaneously developing generators, power systems and the business practices necessary for industry growth.[2] Edison also produced a steady stream of inventions using electric power. Edison's secretary, Samuel Insull, left to head the Chicago Edison Company and pioneered large, networked central-station power plants serving whole communities, capturing economies of scale not possible with stand-alone generating stations.

Competition. At the beginning of the 20th century, most large cities were served by numerous competing electric utilities:[3]

- In 1887 alone, six electric companies were organized in New York City.
- By 1907, 25 electric companies were operating in Chicago.
- Duluth, Minn., had five electric lighting companies operating before 1895, and by 1906, Scranton, Pa., had four.
- As late as the 1930s, Cleveland and Columbus, Ohio, each had two directly competing private electric companies.

Power generating capacity was widely dispersed and broadly owned. For example, in 1900 over 59 percent of electricity-generating capacity in the United States was located at industrial sites.[4]

New Services. Competing companies offered new services to consumers without government help or mandates. For example:

- Private companies began offering electric trolley service, balancing out the nighttime demand for electricity with a daytime market.
- Unlike regulated natural gas utilities, which offered service for a fixed monthly price, the electric industry introduced metering and pricing based on usage.
- Through voluntary teamwork, a committee of the Institute of Electrical Engineers found ways to standardize electrical machinery, which lowered costs and improved service.
- The National Board of Fire Underwriters, a private insurance association, helped develop safety procedures.

Many electrical devices — from light bulbs to electric washers to motion picture cameras to radios and electric trolley cars — were developed by the early electric industry and deeply influenced the way cities were built. Electricity production surged from 4.5 million megawatt-hours (MWh) in 1900 to 17.2 MWh in 1910 while prices fell more than 26 percent.

ary change from new technologies and entrepreneurial innovations in competitive markets.

The Evolution of the Electric Power Industry

In the late 19th and early 20th centuries, the U.S. electric power industry was competitive and innovative. In many areas, industrial customers could choose between competing power companies, or they could produce their own power on-site. Residential consumers in urban areas often had a choice of utility companies, and switching providers simply involved connecting the household to a different set of wires already strung on electric poles. [See the sidebar, "Competition and Innovation in the Early Electric Power Industry."]

However, many economists believed that electrical service — like other utility networks such as water, natural gas and telephone service — is a natural monopoly: a service for which the (marginal) cost of each additional network customer is less than the last customer added. With marginal costs declining, resources are used most efficiently if there is a single service provider. From 1907 to 1920, most states accepted the idea that electric power utilities should become legally protected monopolies for geographically defined service territories with state-regulated rates.[5] Over the next 50 years, existing technologies improved slowly, but steadily. Electric companies grew and regulated rates slowly fell. But there was little of the competition or innovation that characterized the formative years of electric power. As the demand for electricity grew, bigger power plants were built, serving larger areas. The supply wires from plants to industrial, commercial and residential consumers were interconnected to form electric power grids of increasing complexity and geographic reach. Demand for electric power varies from season to season and throughout the day. Networking allowed generators to be turned on when they are needed and power to be shipped from areas with excess supply to areas with excess demand. [See the sidebar, "Electricity Flows on the Grid."]

Federal and State Regulation. In the 1920s and 1930s, the federal

Electricity Flows on the Grid

An electric power network, or grid, has to have a continuous flow of electricity at precisely 60 hertz (cycles per second). Since electricity cannot be meaningfully stored or warehoused, it must be generated simultaneously to meet varying demand throughout the day. In order to maintain power flows, some baseload capacity runs continuously. As demand increases throughout the day, other generators are brought on-line. As part of the balancing act, generators provide so-called ancillary services that include load-following, spinning or quick-start reserves, power for voltage control and the dispersion of generation for stability. Quick-starting generators tend to have low capital costs, but high operating costs; spinning reserves are supplied by higher capital cost units with low operating costs. Specifically:

- Spinning reserves are generators that are on-line and operated (loaded) at less than their capacity; therefore, they are available to quickly replace the output of any generator that breaks down.
- Quick-starting gas or hydroturbine generators can supply reserve power and be brought on-line as needed.
- Load-following generators are units whose output can be readily varied to match load variations in the very short run, and the same generators that provide either spinning or quick-start reserves might be used for load following.
- Some generators and other control devices produce no usable power but control voltage to maintain the quality of power.[6]

government became increasingly involved in regulating the electric power industry and in generating power. [See the sidebar, "Federal Intervention in the Era of Monopolies."] This basic federal regulatory structure remained largely unchanged from the 1930s until the 1970s.

State and local regulators, however, continued to have primary control over electricity produced by local utilities and consumed by local businesses and households. In the 1960s, according to a well-known study by economists Harvey Averch and Leland Johnson, state and local regulators allowed utilities to earn a higher rate of return than necessary to attract investors. As a result, they argued, utilities had an incentive to build excess generating capacity.

Beginning in the 1970s, however, regulators were less likely to approve rates that gave utilities adequate returns on invested capital. This rate suppression caused utilities to invest too little, keeping older equipment on line longer. While consumers benefited from lower rates in the short run, in the long run they paid fuel-cost penalties because utilities could not afford to replace old plants with more efficient ones or to switch to lower-cost fuels.

Additionally, in the 1960s and early 1970s, many utilities began to build nuclear power plants. Many people believed that the supply of fossil fuels was disappearing and, in the wake of the 1973 oil embargo by the Organization of Petroleum Exporting Countries (OPEC), they were concerned about the security of fossil fuels. However, the cost of nuclear power plants skyrocketed to unprecedented levels due to environmental, safety and regulatory requirements. Following the Three Mile Island accident in 1979, the credit ratings of utilities that had invested heavily in nuclear power plunged. Eventually, most plans for nuclear power plants were shelved.

In the 1970s and 1980s, energy prices rose more than projected and demand for electricity grew more slowly than anticipated.[12] Regulated electricity prices rose by more than 300 percent from 1970 to 1985, a 60 percent increase after adjusting for inflation. [See Figure I.] Real prices reached a level not seen before or since.[13]

Federal Intervention in the Monopoly Era

Public Utility Holding Company Act. During the Great Depression, concerns about utility failures and the economic power of large utility holding companies that bought many smaller independent electric companies led to the passage of the Public Utility Holding Company Act of 1935 (PUHCA). This act broke up the large electricity trusts, regulated the large multistate utility holding companies and restricted their business activities.[7]

Federal Energy Regulatory Commission. Congress also passed the Federal Power Act in 1935, dramatically broadening the regulatory authority of the Federal Power Commission (FPC), which had been created in 1920. (The FPC was renamed the Federal Energy Regulatory Commission (FERC) in the 1977 legislation that created the U.S. Department of Energy.)[8]

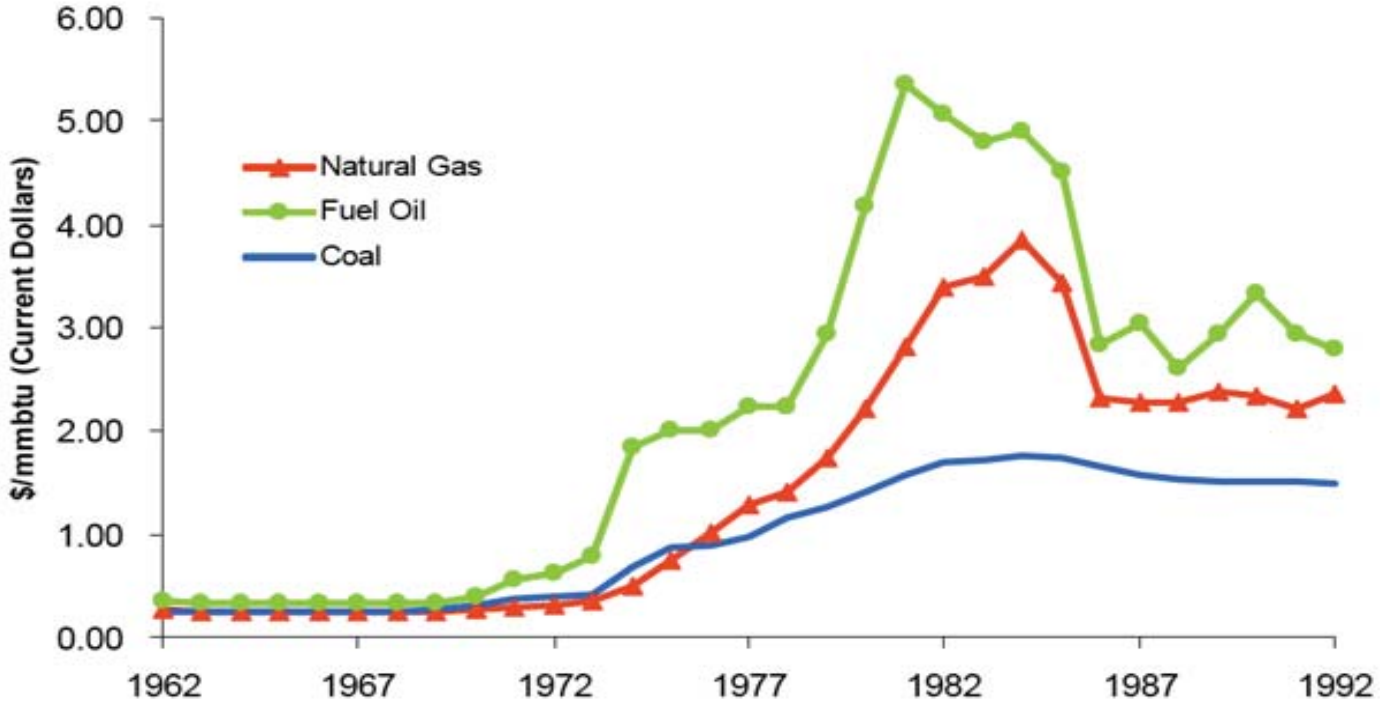
The Tennessee Valley Authority and Power Marketing Administrations. The federal government is the largest electric power producer in the country — through the Tennessee Valley Authority (TVA) and four regional power marketing administrations (PMAs) that generate electric power from dams built and maintained by the U.S. Army Corps of Engineers and the Bureau of Reclamation, and several nuclear power plants.[9]

The TVA, America's largest power company, was created in 1933 to generate and distribute electric power in the Tennessee Valley region. It provides service to more than eight million customers in Tennessee and six other states.

The electricity generated by the regional PMAs such as Bonneville Power Administration in the Pacific Northwest is sold at cost to preferred customers, such as municipal government-owned utilities. These highly subsidized rates are far below the prevailing market rates.[10] The U.S. government supplies approximately 46 percent of the country's electric power through the TVA and the PMAs.[11]

Figure I

Rise in Nominal Input Fuel Costs for Electric Generators, 1962-1992



Source: Edison Electric Institute, Historical Statistics of the Electric Utility Industry Through 1992.

The total cost of top-down regulation in the 1970s and 1980s — which led to building unnecessary power plants and higher electricity prices — has been estimated at $200 billion or more in today's dollars.[14]

Opening the Door to Independent Power Producers. Price controls and OPEC embargoes caused energy shortages in the 1970s. In response, Congress passed the 1978 Public Utility Regulatory Policies Act (PURPA). Among other goals, it aimed to improve energy efficiency and increase reliability of electricity supplies.

PURPA opened the door to competition in electric power generation by requiring utilities to purchase the output of certain independent producers — such as cogenerators that produced electricity as a byproduct of their industrial operations — and led to the emergence of numerous nonutility generation companies. In addition, PURPA required utilities that owned long-distance, high-voltage power lines connected to the interstate grid to convey (wheel) electricity purchased by local utilities from other utilities or independent generators in order to improve service reliability.[15] This power wheeling was implemented through new Federal Energy Regulatory Commission (FERC) regulations.

The Energy Policy Act of 1992. In response to the shortages and price increases of the 1970s and 1980s, the federal government began to reconsider all energy policies, including the regulatory system. The Energy Policy Act of 1992 gave FERC the authority to introduce competition in wholesale markets.

Wholesale power markets initially evolved from informal voluntary markets, or power pools, where utilities traded large quantities of power over high-voltage lines in order to meet generating reserve requirements. As these markets grew, utilities that depended on electricity generated by others and transmitted across the grid sought access to new suppliers.

In 1996, FERC adopted rules (Order Nos. 888 and 889) requiring

Turning on the Lights: 1999

In "Turning on the Lights," a 1999 NCPA report, Vernon Smith — later awarded the Nobel Memorial Prize in Economic Sciences — and Stephen Rassenti recommended state-level restructuring of the electric power industry. They supported competitive power markets for residential and business customers as a complement to the wholesale interstate power markets that had already emerged. Specifically, Smith and Rassenti called for removing all barriers between consumers and suppliers of electricity. Vertically integrated utilities would be split, with the utility choosing whether to sell its generating capacity or its transmission wires with the result that two kinds of businesses would be formed:

- "Supply" companies involved in power generation and marketing.
- "Wires" companies — the former integrated utilities minus their generating capacity — would continue to own and operate the electric power grid.

Smith and Rassenti thought divestiture would force generators — the former utilities and new shareholder-owned merchant generators — to compete against each other for buyers over a neutral electrical grid open to all. Competition would improve efficiencies and attract new entrants. Consumers would reap the benefits.

Supply Companies. Allowing competition in suppliers would produce immediate and substantial benefits to consumers, and open new opportunities to entrepreneurs because generation is the most costly activity. The new competitive electricity suppliers (retailers) would buy power from the generators in wholesale (or bulk power) markets, and contract with the wires companies for transportation services. They would then sell the power to residential, commercial or industrial end-users.

In a restructured market, consumers would have a variety of service and pricing plans to choose from, much as long-distance and cellular telephone service consumers do today. They would have access to the latest price information, so they could make intelligent decisions about buying power for the short term or contracting for the longer term.

New service options tailored to the consumer's needs could emerge, such as demand response, allowing consumers to be rewarded for agreeing to temporary reductions or interruptions in service, if necessary, during peak demand periods. The new market would pass more savings to consumers, allowing them to benefit from their decisions.

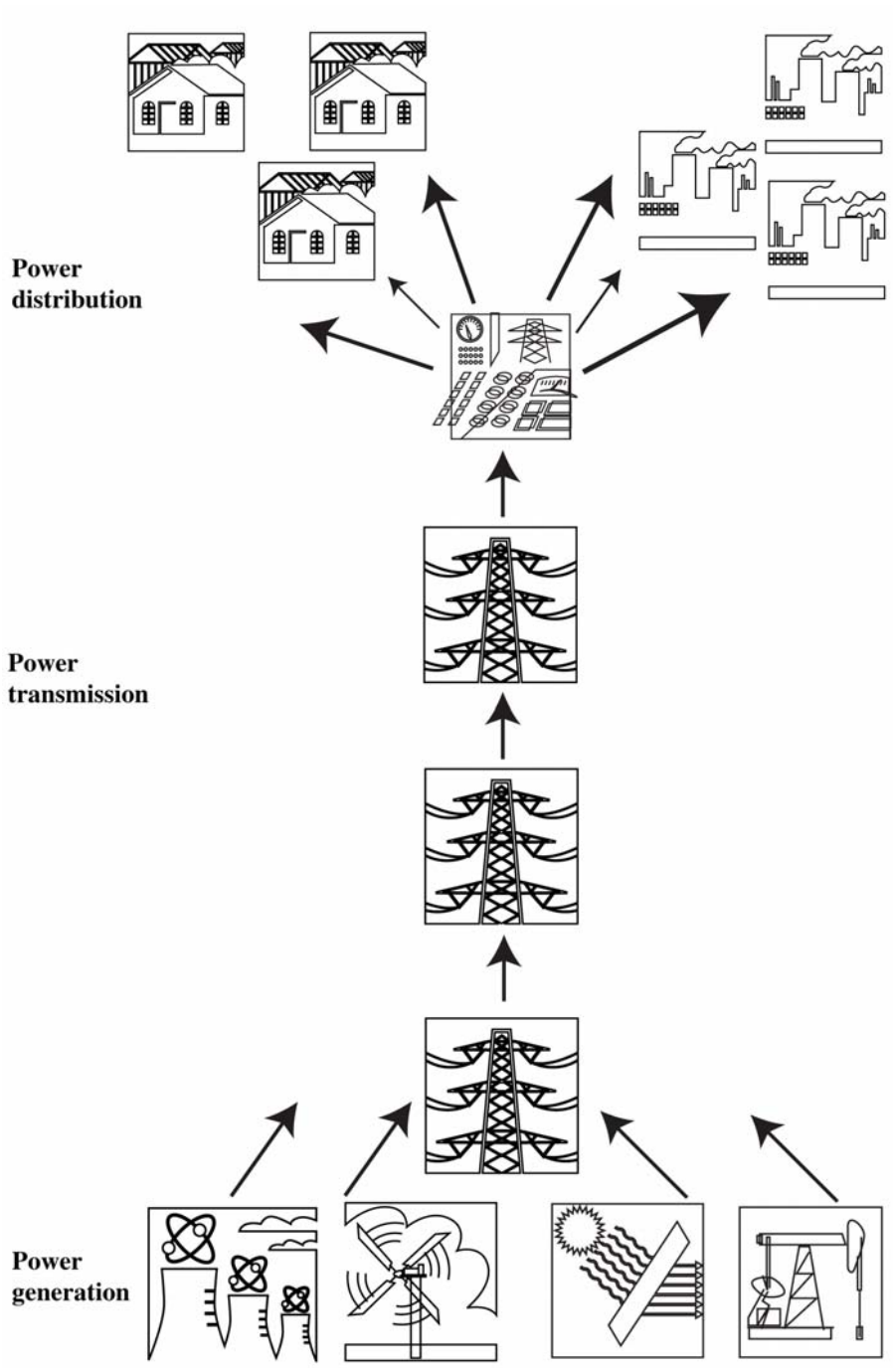
In addition, buyers would be able to bypass the grid and generate their own electric power. Efficient gas generators, fuel cells, wind turbines, solar cells and geothermal technologies were already available in 1999. Entrepreneurs were developing other power sources. Smith and Rassenti saw that competition would spur innovation and hasten the introduction of new technologies to consumer markets.

Local Wires Companies. Smith's and Rassenti's model envisioned local wires companies focused on service. Competition would prevail in the production of the commodity (electricity), but familiar local hands would restore power in emergencies. Privately owned transmission companies would have powerful incentives to invest in the grid. The more they built, the more they could compete. Wires would automatically follow demand. Security-enhancing redundancy would arise as individual power transmission companies competed against each other or business. Little regulation would be required.[18] [See Figure II.]

One could even argue that Smith and Rassenti did not go quite far enough. Leaving sole access to the last mile of wire to the buyer's home in the hands of local utilities gave them effective control of the buyer's front door. Telephone utilities no longer enjoy this monopoly privilege in the telecommunications market — they share the market with cable companies and satellite networks, among others.

Figure II

The Restructured Electric Power Industry



Source: Vernon Smith and Stephen Rassenti, "Turning on the Lights: Deregulating the Market for Electricity," National Center for Policy Analysis, Policy Report No. 228, Figure III, October 1999. Available at http://www.ncpa.org/pub/st228.

all utilities owning transmission lines to provide open and equal access to all electricity suppliers, including nonutility producers.[16] Wholesale power market competition expanded.

The Era of Restructuring

In the 1970s and 1980s, opening other network or utility-type industries — including natural gas, telecommunications, airlines, trucking and railroads — to competition reduced prices at least 25 percent below prereform levels.[17] Many people anticipated similar consumer benefits from electric power competition. Thus, over the past decade, many states have restructured their electric power industries. Restructuring generally means the states allow prices to be set in competitive markets, they have required utilities to divest themselves of some of their generating plants and transmission lines, and they allow consumers to choose their provider.

In an NCPA study, economists Vernon Smith and Stephen Rassenti critique early restructuring efforts and recommend their own restructuring plan. [See the sidebar, "Turning on the Lights: 1999."]

The nature and extent of restructuring has varied by state (see Appendix C). Within states, prices may be determined by markets in some areas and elsewhere by state regulators. In many states, operation and ownership of transmission lines has been turned over to Independent System Operators (ISOs), and retail consumers can purchase electricity from particular types of generators (such as wind and solar power).

Figure III

Regional Transmission Organization (RTO) Locations

Source: Energy Velocity, "Electric Market Overview: RTO Map," Federal Regulation and Oversight of Energy, December 8, 2009. Available at http://www.ferc.gov/market-oversight/mkt-electric/overview/elec-ovr-rto-map.pdf.

FERC approves rates (prices) for wholesale sales of electricity and for electricity transmission in interstate commerce for investor-owned utilities, merchant power generators, power marketers, power pools, power exchanges and ISOs. It reviews rates set by the federal power marketing administrations.

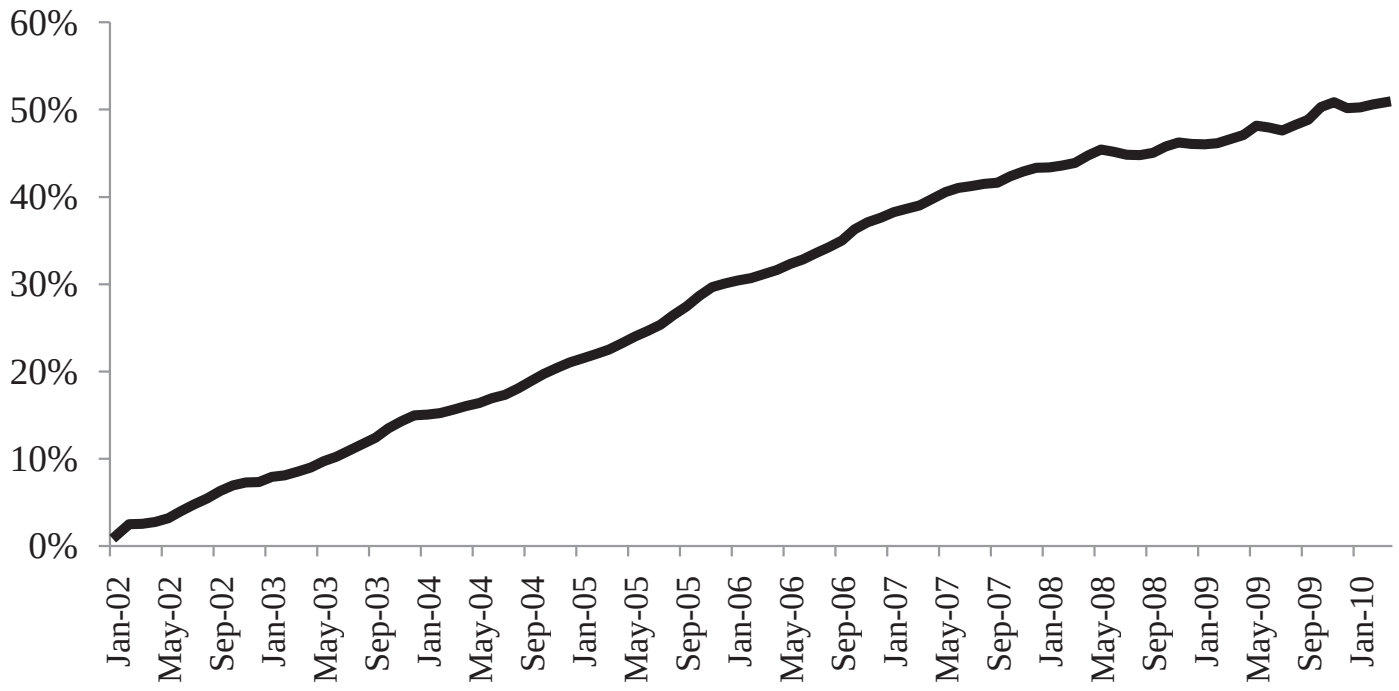
In states that have not restructured, FERC regulates bulk electricity sales to power pools or other limited bilateral sales. In states that have restructured, FERC regulations have fostered the creation of ISOs to run the electricity markets and monitor independent generators.[19] Additionally, a 1999 FERC order encouraged states to establish Regional Transmission Organizations (RTOs), which are largely the same as ISOs except that RTOs have obligations more specific to the running of wholesale electricity markets.[20] Both also help ensure that all electricity suppliers have nondiscriminatory access to the grid. In addition, they operate day-ahead and hourly spot wholesale electricity markets. There are currently seven ISOs and RTOs in the United States, serving two-thirds of the population.[21] [See Figure III.]

Vernon Smith, awarded a Nobel Memorial Prize for his work in experimental economics, and Stephen Rassenti note in their foreword to this study that in both the diversity in electric power restructuring and the resistance to it, the states are acting, as intended, as laboratories for institutional change. Such state-level experiments are essential to getting the reforms right. The experiences of California and Texas, for example, show the divergent outcomes of restructuring.

The California Experience. In the 1990s, Californians faced growing demand for electric power, while rate suppression and environmental concerns about new generating plants and transmission-

Figure IV

Total Residential Megawatt-Hours Switched to Competitive Retail Electric Providers in Texas



Source: "Summary of Retail Competition Market Share Data," Public Utility Commission of Texas, February 20, 2009. Available at http://www.puc.state.tx.us/electric/reports/RptCard/index.cfm.

line siting constrained supply. As a result, California's electricity prices were 50 percent above the national average.[22] In 1998, California became the first state to allow consumers to buy competitively offered retail electric power.

Unfortunately, California's restructuring effort has become a case study in how not to restructure electricity markets. In order to ensure that competition reduced retail prices, the state lowered electric rates by 10 percent from 1996 levels and capped them for up to four years. These artificially low fixed rates gave an advantage to incumbent utilities over potential competitors. Until the rate caps were removed, consumers had little incentive to switch. Initially, more than 300 companies expressed interest in marketing electricity to consumers. A year later, all but 33 had pulled out. By 1999, according to the California Public Utilities Commission, only 1.2 percent of utility customers had switched from their local utility to a competitor.[23]

There were also problems with the transmission grid. Responsibility for planning, enforcing and overseeing future electric grid improvements and expansions was given to the California ISO (Cal-ISO). However, Cal-ISO had limited authority to expand transmission capacity and lacked the financing to do so.

Wholesale prices were deregulated, but retail prices were not. Thus, consumers had no incentive to conserve power or shop for better deals. Even when potential new entrants into electric generation persisted, site approvals were delayed for years in the hearing and challenge process. This meant no new generating plants were completed to meet growing demand. In addition, utilities were required to sell most of their power plants and they were not allowed to

sign long-term fixed-price contracts with suppliers; instead, they were required to buy and sell electricity in spot markets.

When supplies are tight, spot electricity markets prices can rise to extraordinary levels. California utilities paid up to $1 per kilowatt-hour (kWh) for scarce power on peak days, while they were permitted to only charge their customers a fixed rate of about 6 cents per kWh.

Furthermore, California was heavily dependent on natural gas-fueled generation. In 2000, demand for natural gas spiked nationwide, resulting in dramatically higher gas prices. Additionally, a drought resulted in less mountain snow, and thus lower water levels at hydroelectric power plants in the Northwest, which reduced the amount of electric power available for importation to California from other states. At the same time, the price of pollution permits required to cover emissions from power plants in the Los Angeles area increased by a factor of nearly 10 over the summer months.

After months of buying power for much more than they could charge, the utilities approached insolvency. FERC ultimately capped short-term prices in California and the state took complementary action by purchasing power under long-term contracts — but by then the utilities were insolvent.[24]

The disintegration of California's market was soon followed by the financial collapse of Enron, a high-profile participant in California's wholesale market. Enron did not collapse because of problems in the California market, nor was it responsible for the market's collapse, but the two incidents became fused in people's minds as evidence that "markets can't be trusted" to deliver electricity.[25] California subsequently reregulated its market, triggering similar moves by other states.

The Texas Experience. In contrast to California, Texas has so far had the largest and most successful restructuring of any state: About 43 percent of residential buyers and more than 70 percent of the largest industrial customers in deregulated areas have switched to a competitive retail electric provider, sometimes switching more than once.[26] [See Figure IV.]

> *"In Texas, 43 percent of residential customers and 70 percent of large industrial users have switched providers."*

Wholesale Markets. Texas lawmakers assigned to the Electric Reliability Council of Texas (ERCOT), the state's ISO, the task of enabling wholesale competition and facilitating efficient use of the power grid by all market participants.[27] A 1995 state law required all utilities to provide open access to buyers and sellers wanting to transport (wheel) wholesale power across the utilities' transmission lines. ERCOT operates Texas's wholesale spot market, known as the Balancing Energy Market (BEM), which establishes real-time prices at 15 minute intervals throughout the day and ensures that production, consumption and the operating requirements of the transmission system itself are balanced each day. Only about 10 percent of the energy bought in the wholesale market goes through the BEM; most is exchanged through bilateral contracts between generators and retailers.

Retail Competition. In 2002, deregulation allowed Texas retail customers more direct access to market prices.[28] Electric providers now compete on price and several other factors — including types of billing and service options, payment and credit plans, and whether or not the power is from "green" sources, such as solar and wind.[29] Restructuring has been successful in Texas due to its commitment to consumer choice and a wide-open trading environment.[30] Indeed, Texans have more than 16 different electric providers to choose from, offering 53 different electric plans in various combinations around the state. [See the entry on Texas in Appendix C for more details.]

Retail competition is not available everywhere (such as the northern Panhandle) and in the monopoly-protected service territories of cooperatives and municipally owned utilities, including San Antonio, Brownsville, Lubbock, Austin and 70 other municipalities.

Price-to-Beat Regulation. For the first five years, the former utility providers in the Texas market were required to charge a regulated retail rate known as the "price to beat," set by the Public Utilities Commission and adjusted every six months to reflect the cost of production.[31]

Incumbent utilities could not offer lower prices. This attracted new market entrants because merchant generators (nonutilities) and distributors were allowed to charge less. It also encouraged residential, commercial and industrial customers to shop. [See the sidebar, "Prices in the Texas Electricity Market."]

Keeping Up With Demand. ERCOT (like the Midwest Independent Transmission System Operator) relies on competitive merchant generators to build enough capacity to keep up with demand. It assumes market prices will provide enough revenue to finance generator construction.[35] However, the North American Electric Reliability Corporation (NERC) has warned that ERCOT's reserve margin (which is necessary to meet peak demand and outages) will slip under 15 percent in 2013.[36] This could affect the reliability of the system. However, some of the problem is due to delays in generating projects designed to meet increased demand, rather than wholesale market design.[37]

Other States' Experience. Many states followed California's lead in restructuring their electricity markets, but few completed market reforms. Oregon and Virginia, for example, ended their nascent restructuring efforts in 2002 and 2003, respectively, and reforms were more or less permanently delayed in New Mexico, Oklahoma, Arkansas, Arizona, Nevada and Montana in the early 2000s. More recently, Michigan capped retail choice at 10 percent of the utilities' electricity demand, allowing only modest retail choice to continue. Other states remained cost-of-service rate regulated.

Of the 26 states that began regulatory reform in the late 1990s, only 14 states and the District of Columbia completed the process.[38] [For more on restructuring in various states, see Appendix C.]

Innovation in Restructured Markets

Improvements in the design of restructured markets since the late 1990s have created incentives for generating companies to build new capacity and provide new services, and for small producers to enter the wholesale market.[39] Electricity producers and marketers have been experimenting with new services, created by unbundling their power "product" and pricing the pieces in the marketplace. Among the most important of these innovations are locational marginal pricing, demand

Prices in the Texas Electricity Market

During the mid-2000s, price increases were widespread in restructured states for various reasons, including fuel prices, taxes and state regulatory fees. Texas has been no exception. However, deregulated prices in Texas also fell quickly:

- With fuel price increases to July 2008, Texas consumers were paying about 20 percent more in real terms than at the beginning of restructuring.
- However, the real price of natural gas, the state's dominant fuel source, increased by about 50 percent.
- Conversely, as fuel costs fell after July 2008, retail customers were able to shop for better prices — for example, one study found that variable and three-month fixed power rates in late March 2010 were up to one-third lower (35 percent) in some areas than they were in December 2001, after adjusting for inflation.[32]

There are reasons to expect prices to continue to fall. First, deregulation has spawned the construction of massive new capacity in Texas, a driver for future competition.[33] Second, natural gas prices have dropped in response to the discovery of new production sources. Third, the price to beat regulation expired in 2007. Fourth, a switch by ERCOT from bilateral contracts for 95 percent of wholesale energy in restructured areas to a day-ahead market will more transparently reflect declining fuel costs, such as natural gas, forcing more price competition.[34]

response programs, capacity markets and ancillary services.

Locational (Nodal) Marginal Pricing of Energy and Reserves. Locational marginal pricing (LMP) is an efficient way to price wholesale electricity. LMP reflects the variations in supply and demand and transmission system limitations wherever electricity enters or exits the high-voltage physical transmission system controlled by an ISO. LMP forces sellers to bid for the transmission capacity needed to deliver electricity generated at Point A to end-users at Point B at a specific moment in time. It ensures that power prices reflect grid congestion. Generally, the greater the distance and the more congested the grid, the higher the price.

LMP gives an incentive to all participants to always utilize the lowest cost power. If lines are congested in a particular area, the price of transporting electricity through that portion of the grid goes up. LMP provides an engineering-based technique for allocating costs to those who create them or benefit most from transporting power over the system. It also provides a way to measure the economic value of transmission lines, allowing grid owners to profit from adding capacity to the grid. The LMP model is now used in virtually all ISO/RTOs.

Demand Response. Demand response has become a major influence in wholesale markets and is growing rapidly. In a demand response program, industrial customers agree to temporarily shut off their power or limit their use during peak demand periods, such as hot summer afternoons. In exchange, they receive compensatory payments or reduced rates. Among the benefits, demand response reduces the need for peaking generators — which are too expensive to operate except when prices surge during peak demand periods.

> *"Demand response pays customers to reduce their consumption during peak demand."*

Most of the growth in demand response has occurred in restructured markets.[40] ISOs encourage participation in these programs in order to balance supply and demand. Real-time pricing — in which the marginal cost of power varies according to demand throughout the day — gives bulk power users financial incentives to reduce their power use when demand peaks. NERC predicts that demand response (together with a smaller effect from energy efficiency programs) will slow the growth in demand, such that the electric power consumption previously forecast for 2014 will not be reached until four years later, in 2018.[41]

Market prices are set by the marginal cost of the last dispatched generator necessary to meet demand.[42] Influencing the use (or nonuse) of a slightly more expensive generator affects the entire price structure. It can have a profound effect on new investment, system efficiency and reliability calculations. Several ISO/RTO systems — PJM, ISO-New England and ERCOT (Texas) — have revamped their wholesale market rules to enable suppliers to bid demand reduction into the wholesale power market. Nationwide, in 2009, about half of the 38,000 MWs of potential peak consumption subject to demand response was in ISO/RTO markets. The amount is expected to grow to 150,000 MWs by 2019, and though that is not large compared to total U.S. installed capacity of nearly 1.1 million MWs, it is enough to beneficially affect the cost of marginal power during peak periods.[43]

Capacity Markets. There have been growing concerns that the return on investment in competitive markets is too low to attract investment in new generating capacity, largely due to administrative caps on electric power prices in the initial stage of restructuring. In response, several ISO/RTO markets — PJM, ISO-New England and New York ISO — have introduced capacity markets. In a capacity market, generators make, and are accountable for, long-term commitments of generating capacity. The market price for long-term availability indicates the value of adding new generators. (As mentioned previously, in the Midwest ISO and ERCOT, generators make independent decisions about the adequacy of their generation stock.)[44]

Ancillary Services. Mistakes and unplanned spikes in power flows or demand can lead to unacceptable events, such as blackouts and brownouts. When these events occur, restoring the system is more complicated than just turning on a switch.

To smooth out peaks and troughs in power flows, ISO/RTOs have developed an array of markets in highly technical "extras" that

utilities need to avoid mistakes and restore the system's proper power characteristics. This so-called ancillary market includes services that ensure the system has enough generators to accommodate sudden shifts in power flow. It also assures that important parameters for alternating current power, such as frequency, are kept at the right level. Buying and selling power is more complicated when many solar and wind generators sell small, variable power streams into the market. Ancillary services smooth out the power flow when intermittent power sources shut off either through mechanical breakdown or because of clouds or lack of wind.

Restructured Markets

More than 10 years into restructuring, data is now available with which to gauge the relative merits of the new markets for residential consumers and small businesses. It shows that electric power prices in competitive retail markets better reflect such things as fuel costs, overall demand and congestion in the system. One reason is that prices in states with competition are more likely to be unbundled — with fuel costs separated from the cost of service and from charges for improvements to the grid infrastructure.

In past years, consumers in some restructured markets have paid more for electricity than in unrestructured markets precisely because the rates they pay reflect fuel costs and are not subsidized by commercial or industrial ratepayers or taxpayers. Overall, electricity prices have adjusted more quickly to changes in fuel costs and demand in restructured states than in unrestructured states. [For a detailed analysis, see the discussion in Appendix D.] As a result, in response to market demand as indicated by price, restructured states have added efficiency improvements, plant upgrades, additional generation and transmission capacity at a faster pace than nonrestructured states.[45]

> *"Investors and customers benefit from efficiency improvements in restructured areas."*

Wholesale market prices reflect agreements between utilities, merchant generators or other resellers (who, in turn, sell to retail customers) to buy and sell large quantities of electric power at a given time and place. There are fewer regulatory restrictions on bulk power than on most retail transactions. As a result, bulk power prices tend to be more volatile than retail transactions. Since bulk power is auctioned to the highest bidder — sometimes only a day or an hour ahead of when the power is used — many pricing decisions are made on a nearly continuous basis. This allows market participants to quickly change prices to accommodate changes in costs and demand, as well as natural catastrophes or accidental equipment failures.

By contrast, retail pricing in both regulated and restructured states is far less sensitive to market fluctuations. In regulated states, retail pricing is subject to approval by public utilities commissions and other political agencies at city, state and/or federal levels. In restructured states, retail power purchases are typically contracted for a year and rarely for less than a month. These contracted purchases lock both buyer and seller into prices that are, on average, higher than wholesale prices but which are also much less volatile. [For more on retail prices in various states, see Appendix C.]

In restructured states, retail prices generally tend to move more in tandem with wholesale prices than in regulated states. For example:

- In 2003, the year competitive wholesale markets were launched in New England, the average price of electricity there was $48.55 per megawatt-hour (MWh).
- In 2009, ISO-New England reports that the average wholesale price of electricity dropped to $41.99 per MWh, 48 percent below the comparable 2008 level.
- In 2009, spot prices of electricity traded between two RTO territories — PJM Interconnection and Midwest ISO — fell more than 40 percent from their 2008 level, in line with declines in natural gas and other generation fuel prices.[46]

Prices in the New York ISO wholesale market fell to their lowest level since that market began operations in 1999.[47] Note that retail consumers also benefit from price flexibility: As mentioned previously, retail customers in some areas of Texas were paying up to one-third less (35 percent) in late March 2010 than they were in December 2001, after adjusting for inflation.

Additionally, market competition has improved the operating efficiency of producers and the grid in restructured states:

- Plant operators have replaced inefficient generators with new equipment that uses less fuel to make more power.[48]
- Based on prices in the ISO/RTO markets, the grid operator dispatches the most cost-efficient plants first, giving an advantage to generators with economical equipment.
- Investors in power generation benefit directly from reducing idle-time through equipment upgrades and better maintenance.[49]

Measured in terms of the amount of heat required to generate electricity (heat rates), from 1998 to 2007 the efficiency of electric power plants improved 9.4 percent. Furthermore, nuclear power plant utilization rates rose from 81 percent to 93 percent.[50] Generating efficiency in ISO/RTO areas improved faster than in regulated states.[51] Estimates of the efficiency gain range from 2 percent to 5 percent.[52]

The New Revolution in Electric Power

A decade ago, states were just beginning the transition to competitive, market-driven electric power. Over the next 10 years, there will be revolutionary changes in all areas of electric power: generation, transmission and distribution, consumption, technology and markets. Some of these developments are briefly discussed below.

The Revolution in Generation. Society is going through a second wave of environmental awareness since the 1960s, this time centered on global climate change concerns.[53] Novel technologies are opening the way to new services that save energy and open entirely new commercial possibilities. The growth of renewable energy promises to address several concerns, including reducing emissions of carbon dioxide and other greenhouse gases, and conserving potentially limited fossil fuels.[54]

Notably, Energy Information Administration data indicates that renewable power output has grown almost 20 times faster in states that have restructured than in states that remained regulated over the period 2000 through 2005.[55] Wind-power is the fastest growing new electricity source. Wind power producers prefer restructured RTO markets because their broad geographic reach encompasses a wide range of backup generation resources to compensate for wind's variable output, and wind producers can get market-based prices for balancing energy. In contrast, traditional utility transmission tariffs can impose rather punitive energy imbalance penalties. The fairer treatment of wind power's variable output removes a barrier to its use. Furthermore, prices in the hour-ahead and day-ahead markets in restructured states are able to adjust for the intermittency of wind and solar power.[56]

On the other hand, some states require that a specific percentage of generating capacity come from renewable sources, such as wind and solar. However, because wind and solar output is variable, conventional power plants need more spinning reserves in case clouds block the sun or the wind dies.[57]

The Revolution in Distribution. Modern transmission technologies are changing the current analog grid system, where power flows from generator to buyer, into a system where both power and digitized data flow in all directions, permitting an interactive market with real-time prices. Consider:

- By the end of 2010, an estimated 28 million customers had smart meters permitting two-way communications between utilities and nearly a third of U.S. households.[58]
- However, creating a smart grid, as well as satisfying infrastructure and generation needs, could require the investment of $1.5 trillion over the next 20 years.[59]
- This investment could save electricity customers some of the cost by power interruptions and quality problems, estimated to be at least $150 billion annually.[60]

Electricity prices set by regulators rather than markets cannot deliver the services needed to promote innovation and a new generation of electricity distribution networks. Building this infrastructure will require private investment and allow many new industries to develop, generating many new jobs.[61]

Higher capacity lines owned by merchant distributors will span greater distances, allowing power to flow across North America and linking more consumers and generators, including windmills, solar farms and small home-size systems.

The Revolution in Consumption. Demand response is already reshaping use patterns. When

residential, commercial or industrial consumers choose to reduce their power use during peak periods in exchange for lower rates and/or payments, they move more power demand into off-peak periods. This reduces the need for new generators to meet peak power loads. This is a huge change that affects new generator financing and makes real-time data about power use more valuable.

> *"A smart grid with real-time pricing and data will create opportunities for new businesses."*

Buyers will get new tools to manage their energy use in a cost-effective way. The new technologies will open the door to a wide range of new ways to participate in the energy market, from electricity-fueled automobiles to allowing residential buyers and businesses to generate their own electricity and sell the surplus into the market. The dramatic technology changes in telecommunications are a very real example for energy markets to follow.

Micronets and community nets (also known as Power Parks in some parts of the world) allow small groups of residential, commercial or industrial consumers to produce electricity and other byproducts (such as steam for heating, cooling or industrial processes) in a cooperative way. Under current regulatory schemes such activities are possible but extremely difficult because they cause planning and operational problems for regulators, utilities and grid operators. As authorities become better at managing loads in a decentralized market where prices are determined at specific locations and they have better information, resistance to these operations may decrease over time and make everyone better off.

The Revolution in New Technologies/Businesses. New businesses and technologies are emerging at an impressive rate — from new drilling technologies to extract natural gas from unconventional shale formations, to new software being invented by Google and other companies to help homeowners and businesses track their power use and purchases.

Real-time pricing and dissemination of market information will allow consumers to fine-tune their energy consumption using services that they can buy commercially. As buyers become sellers who can bid their homegrown power production into the grid, consumers will also be able to fine-tune their production and sales to the grid.

Electricity may become the 21st century fuel of choice for automobiles and transportation. It can compete directly or be coupled with gasoline and diesel to power many types of transportation. This would make the United States less dependent on foreign oil. It would also help the environment. Powering a car on electricity would result in 93 percent less smog-forming volatile organic compounds and 31 percent less nitrogen oxide emissions than a car running on gasoline.[62]

An electric grid powered by many local generators will be less prone to sabotage and accidents. When catastrophes occur, damage will be less severe and recovery quicker.

Plug-in hybrid electric vehicles (PHEVs) exemplify how consumers could play a number of different roles in the new smart grid economy. As consumers, PHEV owners could choose to fuel their transportation needs with domestically-produced electricity rather than imported gasoline. PHEVs may eventually offer consumers the ability to sell power to the grid. Indeed, with adequate batteries, PHEVs could store electric power generated by wind or solar panels and sell it back to the smart grid at the time of day when wholesale prices make it profitable. Other new smart grid businesses might include:

- **Demand Response Aggregators:** Businesses that collect commitments to reduce power use during peak-use periods and assemble them into large groups of retail, commercial or industrial power users.
- **Networked Appliances:** Home appliance makers are already building devices with the ability to switch into a power-saving "brownout" mode, or even turn themselves off on command.
- **The "Wired" Grid:** Just as appliances within the home can be networked together, so can the devices used to operate the grid itself.
- **Home Operating Systems:** Eventually, overall software operating systems may run all of the other systems in the house such as vehicle charging, home energy monitoring, demand response management and energy production from solar panels.

The Revolution in Markets. Ever more sophisticated and dependable markets are springing up as more participants enter and more energy and ancillary services are traded over greater distances. Obstacles to moving power within and between the three major grid interconnections are becoming smaller. But the need for short-term capacity and redundancy becomes greater as wind and solar become more important. Meeting the economic and environmental needs of the 21st century requires a more dynamic, buyer-oriented electric power industry.

Policy Recommendations

Progress on state and national goals of increased energy efficiency, improved system reliability and security, reduced emissions of pollutants and greenhouse gases, enhanced consumer welfare, job growth and so forth, requires continuing the process of restructuring the power industry, creating competitive markets and implementing new technologies. Building this 21st century electric power system will require the engagement of federal and state agencies, private industry, entrepreneurs and consumers. Following are some essential steps.

Restructure the Industry to Provide Market Competition. States that have not done so should remove structural roadblocks to competition. This includes splitting vertically integrated utilities into service companies and power generators. It also means changing regulated pricing policies, such as price caps and default options, that maintain the anticompetitive advantages enjoyed by incumbent suppliers, allowing them to exercise market power.

Implement Retail Choice. Retail market competition offers consumers real service options, money-saving plans and a variety of generating choices. The states that do not allow competition should remove barriers to price and service competition.

Free markets increase consumer welfare. Some consumers prefer to pay an unvarying price per kilowatt; some prefer to pay exactly the same amount each month, based on their past average usage. Still other consumers want real-time prices that reward them for reducing or shifting their consumption patterns. And others want renewable or locally produced power. Each of these consumers might pay a different price, but what they receive better suits their individual needs.

> *"Regulated states should restructure their electric power markets."*

Devolve or Divest Federal Power Generating and Transmission Assets. Currently, the federal government has conflicting roles as a market participant and a market regulator. Prices for the transmission and line services and power produced by the Tennessee Valley Authority and the four power marketing administrations should reflect unsubsidized costs and consumers in their service areas should be allowed a choice of suppliers. As with other utility monopolies, production and transmission functions should be separated. Control of the resulting entities should be devolved to the states or sold to private investors, as appropriate.

Build a National Transmission Grid. There is a need to develop new transmission capacity and corridors to alleviate chronic congestion in the Northeast corridor and Southern California, to accommodate increased sales in wholesale markets, and to link renewable energy sources to regions needing power. Furthermore, power consumers in every state should have the opportunity to benefit from interstate electricity sales. Interconnecting the various regional grids would allow electric power generation and use to be balanced across broad regions of the country, and make remote sources of solar, wind and hydropower more accessible. Public-private partnerships similar to those used to build and maintain toll roads and toll lanes could be used to attract private capital.

Give FERC Authority to Site Long-Distance Transmission Lines. There are numerous problems related to building new transmission capacity, including the difficulties of getting the permission of local authorities to build and in some cases overlapping ownership and participants who may have perverse incentives. For example, if the purpose of building a new power line is to provide redundancy, the owner of the incumbent monopoly power line is likely to object, even though increasing redundancy improves the overall reliability of the system.

As a federal agency regulating interstate commerce, FERC has the authority to overcome the opposition of states, entrenched economic interests and environmentalists. However, in recent years FERC's siting decisions have reversed or placed on hold for further study and justification by the courts. In cases where FERC intervenes to override local objections to particular siting decisions because it has designated a transmission corridor is of national interest, only Congress, not the courts, should be allowed to reverse its decisions. Furthermore, in the West, particularly, long-distance transmission lines could be routed through land already owned by the federal government and controlled by such agencies as the Bureau of Land Management. This would minimize potential takings of private property, and reduce costs, since private landowners must be compensated.

Implement Smart Technologies. Smart metering technology has a variety of uses. Smart meters are an important tool for consumers who want to track and manage their consumption. With a choice of retail plans, consumers should be able to obtain discounts for reducing their consumption or allowing service interruption at times of peak demand. Without choice, however, the main benefit of smart meters is that they eliminate the cost to utilities of reading meters and disconnecting customers for nonpayment.

There is considerable suspicion of smart meters in the general public and policymakers will face pressure to limit their use, or severely regulate them. Restricting the use of smart meters would be a mistake, as would a narrow federal definition of who owns the information stored in the smart meter. Consumers' property rights should be respected, including the right to replace or remove a smart meter when no contracts are violated.

Avoid Preferential Subsidies or Mandates for Particular Forms of Energy. Mandates and price subsidies for particular forms of energy generation distort market prices, which could be costly for consumers and have unintended consequences. The 1978 Natural Gas Policy Act, for example, discouraged the use of natural gas to generate electricity. Utilities turned to coal, a cheaper, plentiful alternative. As a result, coal-fueled generators account for about 50 percent of the nation's electric power output, with the attendant air quality problems burning coal entails.

However, lifting price controls on natural gas led to a new era of natural gas exploration, and prices have fallen in recent years as supplies have become plentiful. Environmental regulations are also changing. As a result, power plants are now burning more natural gas and less coal.[63] By 2011, NERC expects natural gas to overtake coal as the dominant fuel source for peak capacity generation in North America, accounting for 32 percent of on-peak generation.[64]

Top-down government mandates today will result in investments that can't easily be transitioned to a competitive environment. For instance, although both wind and solar power are federally subsidized, wind power is generally much closer than solar power to being market competitive with other standard forms of electrical production. Yet, solar modules are accounting for ever greater proportions of some states' electricity. As the amount of power from solar resources grows it will begin to account for a disproportionate share of household spending on energy and increase the political pressure to find cheaper ways of abating carbon emissions than building forests of solar panels.

Conclusion

Competition and market prices will allow consumers of all kinds (residential, commercial and industrial) to pay prices derived in transparent wholesale markets that reflect the real costs of delivering power to their doorstep, business or factory. At the same time, they need the ability to respond to these prices by using more or less power, or even selling power into the market — thereby providing collective market discipline. That means that generators will always consider the impact on their customers of any decision they make when building new generators or selecting a fuel. If they make the wrong decision, they know their clients will find a smarter, more efficient supplier offering a better deal.

Done properly, restructuring will help innovators create a wide range of new businesses based on the emerging energy network known as the smart grid. It is necessary to finish the task of reform in order for consumers in every state to enjoy the advantage of improvements in energy efficiency, increase the security of energy sources, promote job creation and realize other economic benefits.

Appendix A
Analysis of Electricity Prices

The table below represents a set of four regressions in each of the four columns reserved for: 1) total market, 2) residential market, 3) commercial market and 4) industrial market. The regressions are based on average retail prices, including transmission, generation and marketing costs against the variable set out in the first column. The variables in the first column represent factors influencing electricity prices nationwide during the 120 months from January 1999 through December 2009. The variables are:

- The market price of natural gas measured in dollars per 1,000 cubic feet ("natgasprice").
- The market price of natural gas in states only during months in which electricity restructuring was taking place and price caps have been removed ("ngXfreeprice").
- A "dummy" variable that takes the value of one when electricity restructuring was taking place and price caps have been removed ("freeprices").
- A "constant" or base price of electricity assuming no influence from the variables listed above.

A simplified way of interpreting this data is to start with the constant and then add or subtract the value of the coefficient if it applies. The regression only takes natural gas prices into account. This is because most of the alternative fuels for electricity generation (including coal, hydro-electric, wind and solar) are more stable in terms of their pricing and cost, and therefore do not have the same short-term effect on prices that natural gas does. Only fuel oil and other oil products are

Appendix Table I

Prices in Regulated Versus Restructured States

	All	Residential	Commercial	Industrial
natgasprice	0.344***	0.355***	0.329***	0.325***
	(50.43)	(47.48)	(46.95)	(44.94)
ngXfreeprice	0.263***	0.251***	0.181***	0.270***
	(12.77)	(11.13)	(8.59)	(12.39)
freeprices	-0.635	-0.515**	-0.19	-0.920***
	(-3.74)	(-2.77)	(-1.09)	(-5.13)
Constant	5.586***	7.001***	5.947***	3.787***
	(118.54)	(135.67)	(123.31)	(75.90)
Observations	6659	6659	6646	6646
Adjusted R-Squared	0.43	0.39	0.37	0.37

t statistics in parentheses

*p<0.05,**p<0.01,***p<0.001

Note: Regression of monthly aggregate costs per kilowatt-hour (levels in each state and the District of Columbia for the years 1999-2009). Prices for the (1) overall market, (2) residential, (3) commercial and (4) industrial submarkets. The panel regression includes dummy variables marking those states that implemented and continue to implement restructuring programs, and another dummy variable to mark those times when price caps were in place. In turn, those periods where both restructuring was in place and price caps were withdrawn were marked by another dummy variable called "freeprices." The regression also includes another variable equal to zero when caps were in place and the natural gas price when caps were off in restructured states called "ngXfreeprice." The regression uses state-level fixed effects to account for differences in generator fuel composition, state regulations, geography and other state-specific factors. The variable "natgasprice" stands for the natural gas price in dollars per thousand square feet measured at city gate for each month.

as volatile as natural gas, and they contribute only a minor share of generator fuel in most of the country. Additionally, restructured states on average get a larger percentage of their electricity from natural gas than unrestructured states.

Prices in Competitive Markets Better Reflect Fuel Costs. There is good evidence that competitive retail markets better reflect the real cost of power than highly regulated markets. The analysis of electricity markets nationwide in Appendix A shows that some of the recent price volatility is due to the fact that restructured markets are more responsive to changes in natural gas prices than are prices in monopoly-protected states:

- From 1999 to 2009, in both unregulated and regulated states, a $1 increase per 1,000 cubic feet of natural gas resulted in an increase in electricity prices of 0.34 cents per kWh.
- Therefore, based on this analysis, it can be inferred that the $5 per 1,000 cubic feet increase in natural gas prices between 2002 and 2008 added about 1.5 cents per kWh to electricity rates in all states.
- However, in the states that restructured, electricity prices increased an *additional* 0.26 cents per kWh, so the $5 per 1,000 cubic feet natural gas price increase from 2002 to 2009 caused prices in restructured states to go up by an *additional* 1.3 cents per kWh.
- As a result of the extra sensitivity of restructuring states to natural gas price changes, the historical gap between restructured states' prices and prices in regulated states increased from 2 cents in 2003 to 4 cents in 2009, or by about 2 cents.

Another factor was the expiration of price caps in restructuring states from 2005 to 2008. Of the 2 cent price gap, 0.6 cents was due to the effect of these expiring price caps. The expiring price caps, and the 1.3 cents due to the extra sensitivity to natural gas prices, explain 95 percent of the increased difference in prices. The effects in the restructured states are the same for residential, commercial and industrial customers considered separately, with little variation. The price sensitivity is due in large part to the fact that, on average, states that underwent restructuring get a greater percentage of their electric power from natural gas than nonrestructured states.

Price Flexibility. Prices adjust quickly in competitive markets, whereas when prices are set by regulators, there are delays and inefficiencies. Thus, when fuel costs rise, power prices rise more quickly and by a higher amount in RTO states than in monopoly-protected states.[65] For example:

- In retail markets, between 1997 (the year before restructuring implementation began) and 2009 — a period of rising fuel costs — power costs in RTO states climbed 47.1 percent (13.4 percent after adjusting for inflation).[66]
- In monopoly-protected states, power costs climbed 42.44 percent (9.8 percent after inflation).
- However, between 2008 and 2009, a period of falling fuel costs, real prices declined 2.2 percent in restructured ISO/RTO states and only 1.2 percent in regulated states.[67]

These results indicate that retail prices in restructured states are more responsive to changes in wholesale markets than in states that maintained traditional vertically integrated monopoly power companies. [For a discussion of other claims by deregulation critics, see Appendix D, "Answering the Critics of Deregulation."]

Appendix B Glossary[68]

Aggregators: Entities that purchase electricity wholesale for retail customers.

Ancillary Services: Necessary services that must be provided in the generation and delivery of electricity. As defined by the Federal Energy Regulatory Commission, they include: coordination and scheduling services (load following, energy imbalance service, control of transmission congestion); automatic generation control (load frequency control and the economic dispatch of plants); contractual agreements (loss compensation service); and support of system integrity and security (reactive power, or spinning and operating reserves).

Averch-Johnson Effect: The Averch-Johnson effect occurs when a company's profit to capital ratio is regulated at a certain percentage. The company then has a tendency to invest excessive amounts of capital in order to boost profits. This was frequently the case in regulated utilities.

Baseload: The minimum amount of electric power delivered or required over a given period of time at a steady rate in order to maintain the flow of electricity.

Bilateral Contract: A direct contract between the power producer and user or broker outside of a centralized power pool or power exchange.

British Thermal Unit (Btu): A standard unit for measuring the quantity of heat energy equal to the quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

Cogenerator: A generating facility that produces electricity and another form of useful thermal energy (such as heat or steam), used for industrial and commercial heating or cooling purposes.

Congestion: A condition that occurs when insufficient transfer capacity is available to implement all of the preferred schedules for electricity transmission simultaneously.

Day-Ahead Market: The forward market for energy and ancillary services to be supplied during the settlement period of a particular trading day that is conducted by the independent system operator, the power exchange and other scheduling coordinators. This market closes with the independent system operator's acceptance of the final day-ahead schedule.

Demand-Side Management: The planning, implementation and monitoring of utility-administered programs designed to encourage consumers to modify patterns of electricity usage, including the timing and level of electricity demand.

Divestiture: The stripping off of one utility function from the others by selling (spinning-off) or in some other way changing the ownership of the assets related to that function. Stripping off is most commonly associated with spinning-off generation assets so they are no longer owned by the shareholders that own the transmission and distribution assets.

Electric Power Cooperatives: Nonprofit electric power utilities governed by a board elected by customers.

Electric Utility: Typically, a vertically integrated organization that generates, sells and delivers (over its own distribution system) electric power in a specified service area. For most of the 20th century, most utilities were granted government monopolies: They were the sole source of power for customers in their area and competition was not allowed. Electricity prices were set by local, state or federal governments. Under restructuring, many utilities face competition and prices are set by markets. Utilities have divested themselves of much of their generating capacity and transmission lines.

Energy Policy Act of 1992 (EPAct): Among other things, the legislation created a new class of nonutility power generators exempt from the provisions of the Public Holding Company Act of 1935. It also granted the Federal Energy Regulatory Commission authority to require utilities and transmission grid operators to transport nonutility generators' power.

Federal Energy Regulatory Commission (FERC): A quasi-independent regulatory agency within the Department of Energy having jurisdiction over interstate electricity sales, wholesale electric rates, hydroelectric licensing, natural gas pricing, oil pipeline rates and gas pipeline certification.

Grid: The layout of an electrical distribution system.

Independent System Operators (ISO): An independent, federally-regulated entity that coordinates regional transmission in a nondiscriminatory manner, and ensures the safety and reliability of the electric system.

Load (Electric): The amount of electric power delivered or required at any specific point or points on a system. The requirement originates at the energy-consuming equipment of the consumers.

Locational Marginal Pricing (LMP): LMP is a way for wholesale electric energy prices to efficiently reflect the variations in supply, demand, and transmission system limitations wherever electric energy enters or exits the high-voltage physical transmission system controlled by the ISO.

Merchant Generators: Investor owned, nonutility wholesale nonutility electricity producers. Unlike traditional electric utilities, independent power producers do not possess transmission facilities or sell electricity in the retail market.

National Interest Electric Transmission Corridor (NIETC): Geographic regions designated by the U.S. Department of Energy where electricity transmission limitations are adversely affecting residents. Declared corridors where such congestion exists are the Mid-Atlantic Area National Corridor (including some or all counties in Delaware, Ohio, Maryland, New Jersey, New York, Pennsylvania, Virginia, West

Virginia and Washington, D.C.) and the Southwest Area National Corridor (including seven counties in Southern California and three counties in western Arizona).

Peak Demand: The maximum load during a specified period of time.

Power Pool: An association of two or more interconnected electric systems having an agreement to coordinate operations and planning for improved reliability and efficiencies.

Public Utility Regulatory Policies Act of 1978 (PURPA): The Public Utility Regulatory Policies Act of 1978 passed by the U.S. Congress. This statute requires states to implement utility conservation programs and create special markets for co-generators and small producers who meet certain standards, including the requirement that states set the prices and quantities of power the utilities must buy from such facilities.

Regional Transmission Organization (RTO): A utility industry concept that the Federal Energy Regulatory Commission embraced for the certification of voluntary groups that would be responsible for transmission planning and use on a regional basis.

Reliability: Electric system reliability has two components — adequacy and security. Adequacy is the ability of the electric system to supply to aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system facilities. Security is the ability of the electric system to withstand sudden disturbances, such as electric short circuits or unanticipated loss of system facilities. Reliability may be measured by the frequency, duration and magnitude of adverse effects on consumer services.

Resellers: Firms that purchase electricity wholesale and sell it to retail customers.

Reserve Margin (Operating): The amount of unused available capability of an electric power system at peak load for a utility system as a percentage of total capability.

Restructuring: The process of replacing a monopoly system of electric utilities with competing sellers, allowing individual retail customers to choose their electricity supplier but still receive delivery over the power lines of the local utility. It includes the reconfiguration of the vertically-integrated electric utility.

Retail Market: Sales covering electrical energy supplied for residential, commercial and industrial end-use purposes. Other small classes, such as agriculture and street lighting, also are included in this category.

Retail Wheeling: The process of moving electric power from a point of generation across one or more utility-owned transmission and distribution systems to a retail customer.

Smart Grid: The name given to an electric transmission grid that permits two-way communications between utilities and their customers.

Spinning Reserve: Reserve generating capacity running at a zero load and synchronized to the electric system.

Stranded Costs: Costs, such as capital investment in generating facilities, incurred by a utility which are prudent for a protected monopoly but that may not be recoverable under market competition.

Transmission System (Electric): An interconnected group of electric transmission lines and associated equipment for moving or transferring electric energy in bulk between points of supply and points at which it is transformed for delivery over the distribution system lines to consumers or is delivered to other electric systems.

Unbundling: Separating the total process of electric power service into its component parts for the purpose of separate pricing or service offerings.

Vertical Integration: An arrangement whereby the same company owns all the different aspects of making, selling and delivering a product or service. In the electric industry, it refers to the historically common arrangement whereby a utility would own its own generating plants, transmission system and distribution lines to provide all aspects of electric service.

Watt: Unit of power (equivalent to one ampere flowing under pressure of one volt) commonly expressed in watt-hours (W), kilowatt-hours (kWh) and so forth.

Wheeling Service: The movement of electricity from one system to another over transmission facilities of intervening systems. Wheeling service contracts can be established between two or more systems.

Wholesale Power Market: The purchase and sale of electricity from generators to resellers (who sell to retail customers), along with the ancillary services needed to maintain reliability and power quality at the transmission level.

Appendix C
Restructured States Today

State-regulated retail markets for homes and small businesses have been fully functioning for fewer years than the regional wholesale markets. There is greater diversity of retail market policies among the 14 restructured states (not counting California) and the District of Columbia. An examination of eight of the restructured retail markets follows, as well as a brief overview of other states' experiences.

California. Retail choice has been limited in California since the market debacle of 2000-2001 (discussed previously); however, the state's new wholesale market, which began operating in April 2009, is on the cutting edge of market design. Instead of just three regions for pricing electricity, the new system tracks prices of trades at more than 4,000 "locational nodes."[69]

In addition, California is beginning to reopen the market for retail power buyers. In early 2010, California utility regulators approved a plan to allow more businesses to buy power from independent marketers and take advantage of low prices in the bulk power market.

Connecticut. When Connecticut began restructuring in 1998, rates were capped at the December 31, 1996, level from July 1, 1998, until January 1, 2000, when a competitive retail market was phased in. Ratepayers in Connecticut had access to an inexpensive default service like those in restructured states such as Illinois and New Jersey. The state also resisted building the transmission infrastructure necessary to allow importation of less expensive power supplies from neighboring states. Thus, few alternative producers entered the market. As a result, the state faced problems of insufficient capacity in both generation and transmission.[70] In 2009, the state took the unusual step of requiring power distributors to build peaking generation plants at "cost of service plus reasonable rate of return as determined by the state."[71]

As of 2010, there were about two dozen suppliers and aggregators actively marketing to residential buyers.[72] As of June 2010, Connecticut Light & Power, the state's largest utility, reported that 29 percent of residential customers and more than 90 percent of its largest customers were sourcing power competitively.

Illinois. Beginning in 1999, large consumers were able to choose suppliers, but smaller consumers were phased in over the period through 2006. Incumbent utilities Commonwealth Edison, Illinois Power and Ameren kept their distribution and transmission lines but sold their generation equipment, opening generation and metering services to competition.

Residential retail rates were reduced 20 percent and capped until January 1, 2007, making it impossible for competitors to offer a better deal. Moreover, residential power buyers had access to a low-cost default. As a result, commercial customers quickly jumped into the competitive market, but residential customers stayed out and there were few new suppliers.

When residential rate caps came off at the end of 2006, consumers accustomed to paying subsidized rates as low as 2.5 cents per kWh saw rates quadruple to as much as 10 cents in some areas. Since 2007, however, residential retail buyers in the Commonwealth Edison (most of the northern third of Illinois, including Chicago) and Ameren (central and southern Illinois) service areas have been able to choose real-time pricing. This allows retail consumers to monitor the variation in electricity prices throughout the day, change their power consumption accordingly and get a lower electricity price in return. By 2009:

- Alternative retail electric suppliers provided 50 percent of all kilowatt-hours consumed, and controlled almost all generating capacity.
- Markets also provided about 75 percent of the nonresidential (commercial and industrial) electric load.
- Within the Ameren service territory about 96 percent of all very large-size commercial and industrial customers, and about 71 percent of all large-size commercial and industrial customers had switched to alternative retail electric suppliers.[73]

Michigan. A tiered approach to Michigan's electric market restructuring in 1998 allowed competitive options first for larger customers. Complete retail access was achieved by January 2002. Rates for large and industrial customers were capped through 2003, and small business rates were capped through 2004.

However, Michigan did not require vertically integrated electricity utilities to separate and/or sell either their wires and transmission business or generating

power plants. Regulated utilities dominate Michigan's retail electric market; however, retail customers, with a few exceptions, are allowed to shop among 24 licensed alternative electricity services. The retail market has not been very competitive, but retail prices have been stable. During a run-up in energy prices, Michigan's retail choice program actually lost buyers from 2005-2008.[74]

As electricity prices continued to rise, the state decided to cap participation in the retail program at no more than 10 percent of each utility's total electricity demand.[75] Ironically, the cap went into effect in 2008, at the very peak of high electricity costs, locking consumers out of the market for lower-cost electricity supplies as fuel prices fell.[76]

New Jersey. Restructuring began in 1999, when incumbent utilities sold or spun off most of their generating capacity to unregulated subsidiaries. Rates were initially reduced 15 percent and capped until 2003, then allowed to float. The new system was quickly adopted by commercial and industrial buyers who could contract with a competitive supplier or choose to buy electricity hour-by-hour in the real-time energy market.

About 80 percent of the commercial and industrial demand (or load) was served by competitive suppliers; however, as of July 2009, only 2 percent of residential customers were. Some observers have blamed the low penetration of competitive providers partly on the BGS default arrangement, since competitive rates were not very different from the BGS rate.[77]

New York. In 1998, New York required utilities to completely separate generation from transmission and delivery, resulting in nearly 70 different power plant owners and about 60 electricity service companies competitively serving buyers.[78] About 70 percent of commercial and industrial companies purchase power based on hourly market prices and the state is expanding the program, which also allows companies to participate in demand reduction programs.

However, only about 20 percent of homes get their power from competitive markets. The low penetration rate has been ascribed to low profit margins on transactions with residential customers, the relatively high cost of billing and other transaction costs that keep suppliers from pursuing the home market aggressively.[79]

Pennsylvania. In 1999, the incumbent Pennsylvania utilities, Penn Power, Duquesne Light and PECO, unbundled their generation businesses and consumers began choosing new competitive suppliers. All residential customers received an 8 percent rate reduction and competitive suppliers provided customers a "shopping credit" that initially saved them about 14 percent over regulated rates. However, the shopping credit was not increased at the same rate as fuel prices increased over much of the last decade, so the incentive for many retail customers to switch gradually disappeared.

In addition, a series of court cases and settlements kept rate caps in place in eastern parts of the state until 2010 and 2011. In the rest of the state, until quite recently, a long-standing cap on retail prices kept prices about 25 percent below market level and was a disincentive for new competition to enter the retail market. Power prices are expected to climb after these caps expire.

Competition has been in effect longest in western Pennsylvania, where Duquesne Light is located. Since rate caps expired in 2004, 20 percent of Duquesne Light residential customers and 56 percent of commercial customers, accounting for 89 percent of demand (or load), have switched to one of the 15 competing power suppliers. As a result, electricity rates fell nearly 30 percent below 1991 rates in constant dollars.[80]

In central and eastern Pennsylvania, price caps expired in 2010. After PPL's rates rose 30 percent (to reflect market-priced power purchased in long-term contracts), competitors moved in quickly.[81] As of April 2010, 28 percent of PPL's 1.4 million customers had shopped for power. That includes 27 percent of residential customers (46 percent of PPL's electrical consumption) and 80 percent of PPL's industrial customers.[82]

Texas. Retail competition came to Texas in 2002, as previously discussed. The market remains competitive to this day. Texans can search online for the best plan to meet their needs. For example, a search on an address in Houston in spring 2010 showed 25 different options available from nine different competitive providers. Prices ranged from 10.3 cents per kWh with a 12-month contract to 14.9 cents per kWh for a one-month contract for clients paying cash.

In the area of the National Center for Policy Analysis in Dallas, there

were 25 options by 10 suppliers. Prices ranged from 8.3 cents per kWh for one month to 14.9 cents per kWh for a pay-as-you-go plan requiring cash payments but no credit check. Interestingly, the high priced cash offer was the fourth most popular plan. The low-cost, one-month plan was the most popular.

Other Restructured States. Other states have also undertaken restructuring of their electric markets, some more successfully than others.

Delaware. In January 2000, Delaware Electric Cooperative's restructuring plan was approved. As a result, about half of Delaware's electricity market is served by competitive suppliers.

District of Columbia. Restructuring began in 2001. Until 2008, residential customers could choose the incumbent utility (which had capped rates until 2008), or an alternative provider. Residential customers have overwhelmingly stayed with the incumbent, Potomac Electric Power Company (PEPCO). In fact, less than 13 percent of residential consumers in 2003 were using an alternative provider — the remaining 87 percent stayed with PEPCO.

Maine. Restructuring allowed retail competition by March 2000 with a market share cap of 33 percent for large investor-owned utilities in old service areas. Under Maine law, consumers are allowed to choose a "competitive electricity provider." Customers that do not choose a specific supplier are served by the "standard offer" supply. There is little competition for private households and small businesses, with less than 2 percent of the three main utilities' small clients shopping for power. On the other hand, more than 80 percent of the biggest customers shop for power.

Maryland. Maryland began restructuring in 2000. Customers can choose their incumbent utility (rates were capped until 2006 or 2008, depending on location), or an alternative provider. A rate freeze (after an initial 3 percent to 7.5 percent reduction in rates) was extended to July 2008 under certain circumstances. Provider of Last Resort (POLR) service at capped rates was available throughout the transition period. The phase-out of stranded cost payments has muted rate increases within regulated service areas.

Thus, despite price increases after the expiration of price caps, residential customers overwhelmingly stayed with incumbents. Medium and large commercial and industrial customers, however, shopped for power at rates of 20 percent and 90 percent, respectively.

Massachusetts. Starting in March 1998, Massachusetts customers could select an alternative supplier or join groups of customers served by aggregators. Generation was open for competition, but metering and billing were not. Competitive suppliers include brokers and direct competitive suppliers.

Massachusetts allowed customers to stay on a special discounted rate if they were receiving electric service prior to deregulation. After 2004, customers not choosing a competitive option were assigned default service. Rates for the default service were determined by the market price for blocks of power bought every six months for individual customer classes. About 15 percent of residential customers switched to competitive suppliers by 2010, and 70 percent of large commercial and industrial customers used competitive sources.

New Hampshire. As a result of litigation, electric utilities in New Hampshire restructured different ways at different times. There are about 50 suppliers registered to serve customers within the state but most residential customers receive default service. The Public Service of New Hampshire, a subsidiary of Northeast Utilities, serves approximately 70 percent of the retail customers in New Hampshire. It implemented retail access in 2001 for a majority of its customers and rates were reduced by 10 percent.

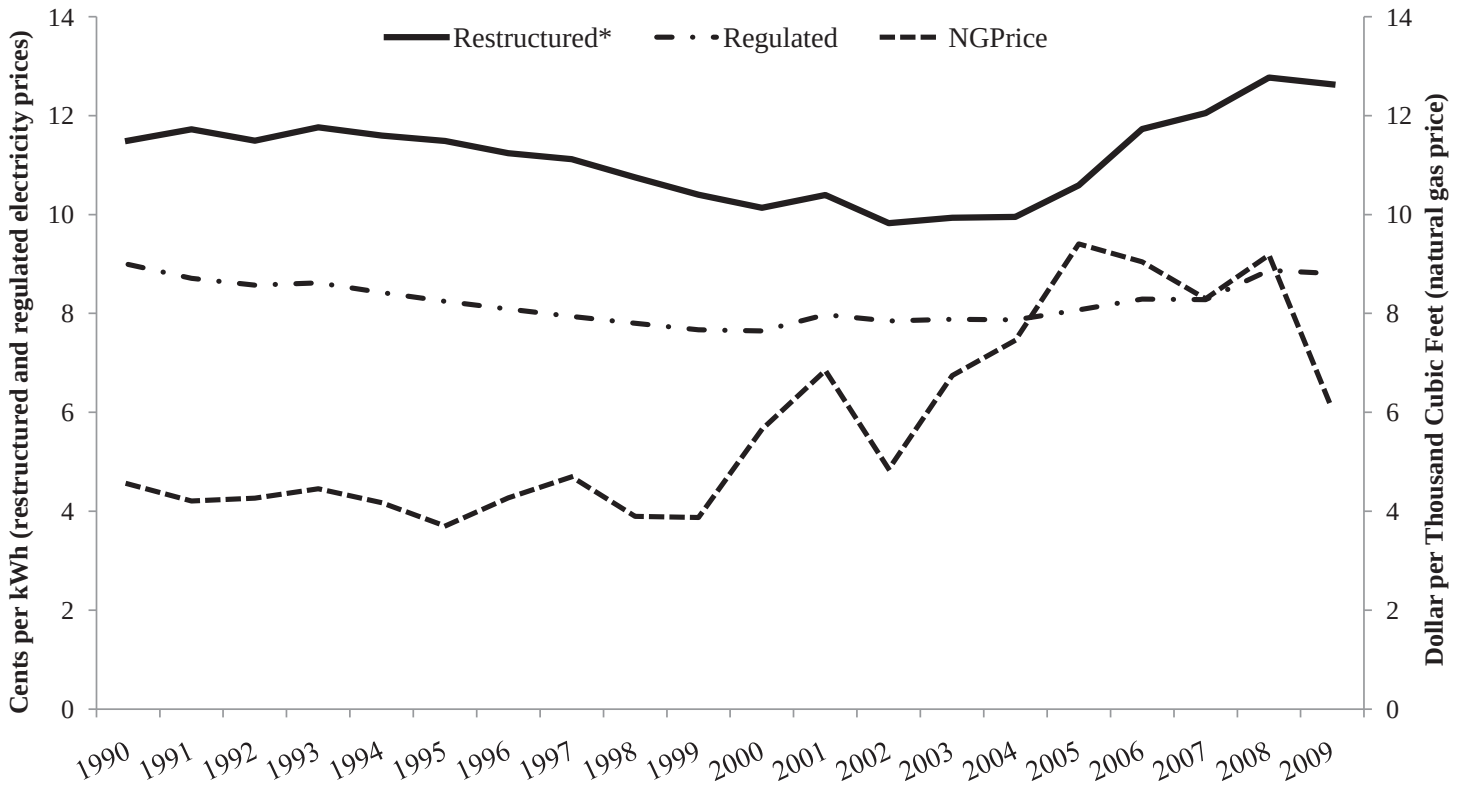
Rhode Island. In July 1997, Rhode Island became the first state to phase in statewide retail wheeling (for industrial customers). Residential consumers were scheduled to have retail access by July 1998. Subsequent legislation required utilities to offer standard offer service (SOS) to customers not participating in retail competition until 2009, and last resort service (LRS) to customers who left the competitive market. The latest data for 2008 suggest that only about 12.5 percent of the state's megawatt hours are sourced in competitive markets.[83]

Appendix D
Answering the Critics of Deregulation

Over the last three years, the American Public Power Association (APPA), the trade association of government-owned utilities, has distributed a series of reports

Appendix Figure I

Average Retail Prices by Regulatory Classification, 1990-2009 (in 2008$)



*Restructured states include Connecticut, Delaware, Illionis, Massachusetts, Maryland, Maine, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island and Texas, as well as the District of Columbia.

Note: Graphic shows the coincidence of the gain in natural gas prices (broken line) with the accelerated gain of restructured state prices (solid line) compared to regulated states (dotted line). The gap between the two increases with natural gas prices then begins to fall or level out. Restructured and regulated electricity prices are measured in cents per kWh (left axis), while natural gas prices are measured in dollars per thousand cubic feet (right axis).

Sources: Natural Gas prices from Energy Information Administration, Annual Energy Review, Table 6.7 Natural Gas Wellhead, City Gate, and Imports Prices, 1949-2008. Available at http://www.eia.doe.gov/emeu/aer/txt/stb0607.xls; Energy Information Administration, Electric Power Monthly, Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State. Available at http://www.eia.doe.gov/cneaf/electricity/epm/epmxlfile5_6_a.xls.

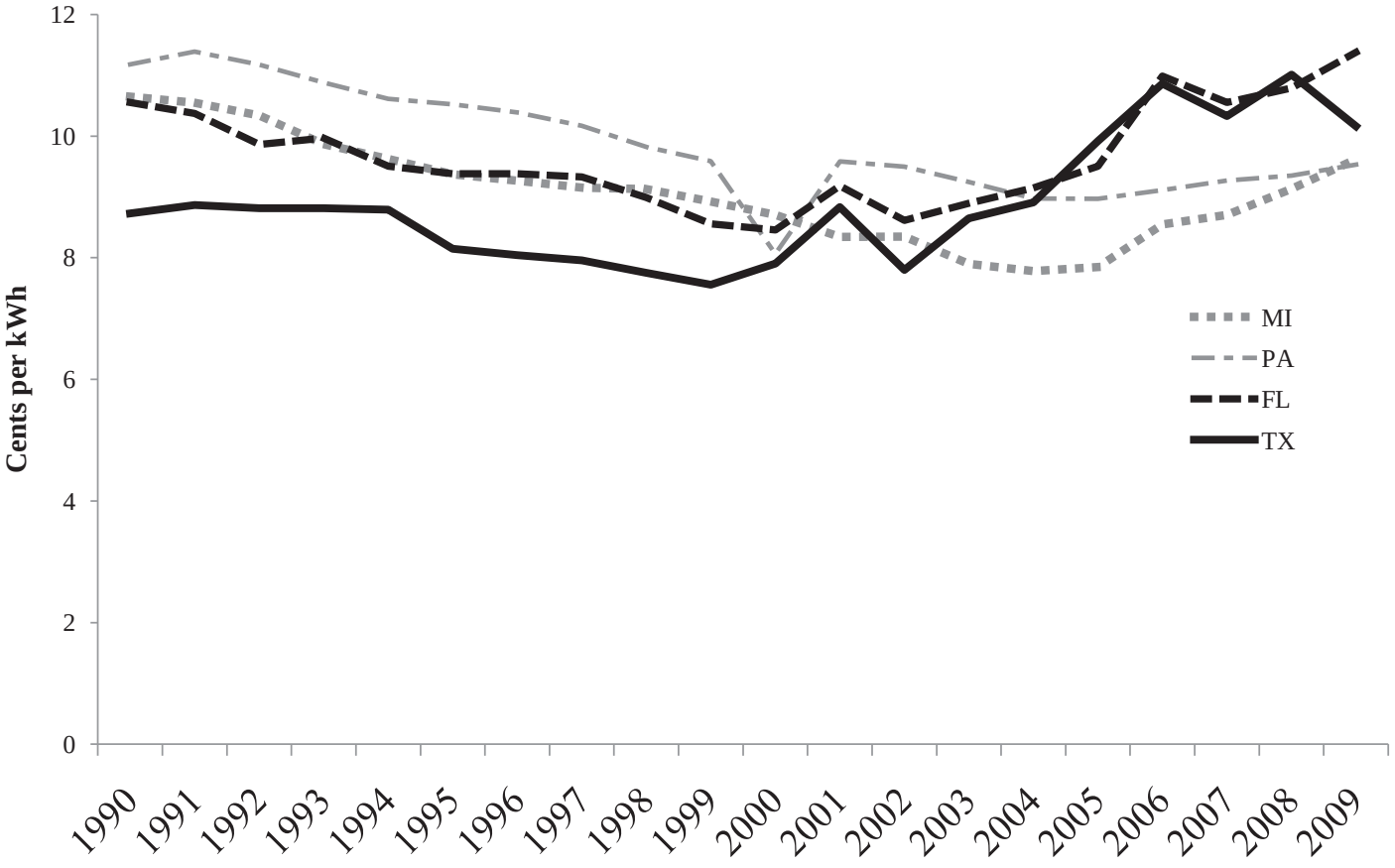
comparing retail price trends in deregulated and regulated states.

In a March 2010 APPA report, average retail prices were calculated for each state using Energy Information Administration data. The APPA reports a sharp increase in the difference between the average prices in the two groups of states, from 3.1 cents per kWh in 1997 to 4.4 per kWh in 2007. They concluded that deregulation raised consumer costs beyond what they were 10 years earlier. The reason why, according to the APPA, is that:

"In most deregulated states, investor-owned utilities (IOUs) sold off their electric generating facilities as part of the implementation of the retail choice regime, as it was expected that after a short transition period,

Appendix Figure II

Four States' Annual Average Price in Constant Dollars, 1990-2009



Source: Energy Information Administration, "Annual Energy Review," Table 6.7, "Natural Gas Wellhead, City Gate, and Imports Prices, 1949-2008;" available at http://www.eia.doe.gov/emeu/aer/txt/stb0607.xls. Energy Information Administration, "Electric Power Monthly," Table 5.6.A, "Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State;" available at http://www.eia.doe.gov/cneaf/electricity/epm/epmxlfile5_6_a.xls. Department of Commerce, Bureau of Economic Affairs, Table 1.1.4, "Price Indexes for Gross Domestic Product;" available at http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=4&Freq=Qtr&FirstYear=2007&LastYear=2009.

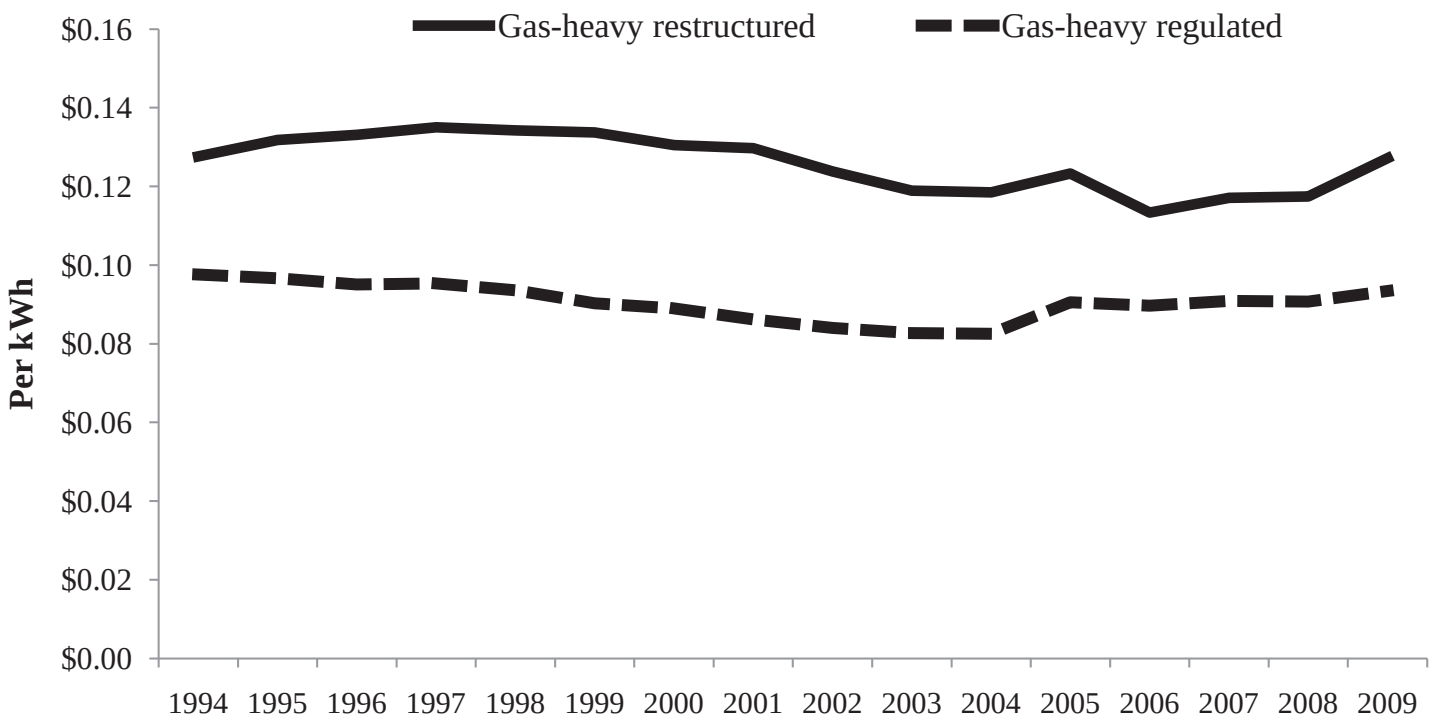
alternative providers would serve virtually all buyers. Instead, retail competition failed to develop as anticipated, so these IOUs must now purchase power from the wholesale market to serve the large majority of customers that are still taking utility service."[84]

Critique of the APPA's Analysis. There are several problems with the APPA's analysis. Among them:

- APPA did not take into account differences in fuel prices — specifically, natural gas — although the mix of generating sources in the two groups of states differs and thus affects electricity costs differently. (Regulated states also

Appendix Figure III

Average Price Gap Between Gas-Heavy Regulated and Restructured States



Source: Energy Information Administration, "Annual Energy Review," Table 6.7, "Natural Gas Wellhead, City Gate, and Imports Price, 1949-2008;" available at http://www.eia.doe.gov/emeu/aer/txt/stb0607.xls; Energy Information Administration, "Electric Power Monthly," Table 5.6.A, "Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State;" available at http://www.eia.doe.gov/cneaf/electricity/epm/epmxlfile5_6_a.xls; Department of Commerce, Bureau of Economic Affairs, Table 1.1.4, "Price Indexes for Gross Domestic Product;" available at http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=4&Freq=Qtr&FirstYear=2007&LastYear=2009.

have lower fuel prices due to the percentage of their electric power produced by heavily subsidized hydroelectric power plants.)

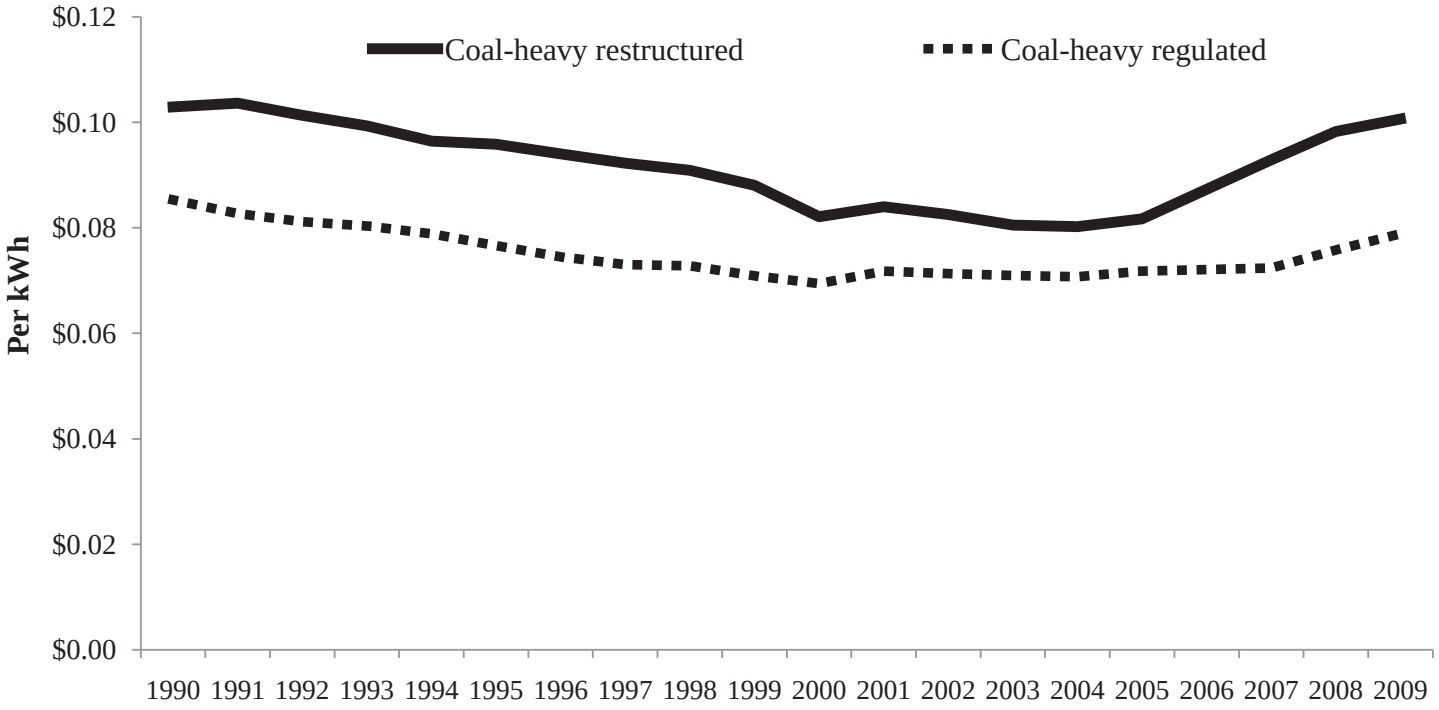
- APPA included California and Montana as deregulated states in their analysis, although both largely abandoned restructuring efforts, and they do not include Ohio and Pennsylvania, where retail restructuring is still occurring.
- APPA began with 1997 prices, about the time that several states began changing their regulations; however, prices earlier in the 1990s are relevant because the states that later deregulated already had prices higher than the national average, which was a motive for reform.

Correcting for these flaws, but otherwise following the same methods as the APPA and using U.S. Department of Energy data, prices for total delivered cost (generation, transmission, distribution) to all buyers in each state were analyzed. The prices include sales by investor-owned utilities, consumer-owned utilities, and private energy marketers and providers.

With these corrections, the analysis shows that while prices in the states that remained in the regulated category were essentially flat in the 1990s, the to-be-restructured states showed prices increases for the first few years of the decade, followed by modest drops. That small differences emerged even when all states

Appendix Figure IV

Average Price Gap Between Coal-Heavy Regulated and Restructured States



Source: Energy Information Administration, "Annual Energy Review," Table 6.7, "Natural Gas Wellhead, City Gate, and Imports Price, 1949-2008;" available at http://www.eia.doe.gov/emeu/aer/txt/stb0607.xls; Energy Information Administration, "Electric Power Monthly," Table 5.6.A, "Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State;" available at http://www.eia.doe.gov/cneaf/electricity/epm/epmxlfile5_6_a.xls; Department of Commerce, Bureau of Economic Affairs, Table 1.1.4, "Price Indexes for Gross Domestic Product;" available at http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=4&Freq=Qtr&FirstYear=2007&LastYear=2009.

remained regulated suggests the two groups were exposed to somewhat different economic influences.

For 1997, the numbers show the eventually restructured states with prices averaging 8.8 cents per kWh and regulated states at 6.1 cents per kWh, a difference of 2.7 cents. Both restructured and regulated states show increasing prices from 2000 through 2008, and small drops in prices in the first half of 2009. [See Appendix Figure I.]

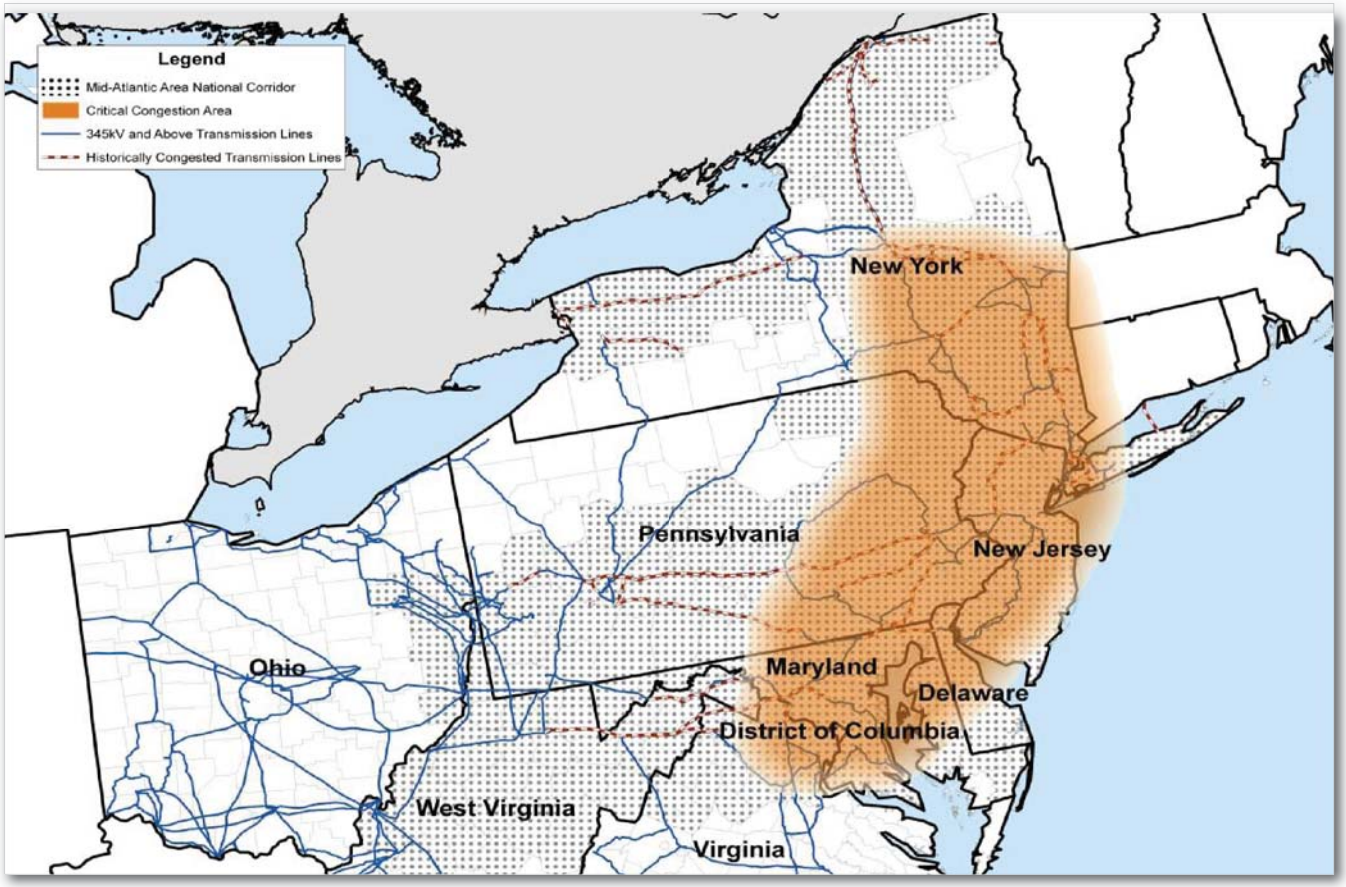
The pace of the increases was higher in the restructured states, however, resulting in increasingly larger differences between the two groups in annual average prices. By 2008 the difference had widened to approximately 4 cents per kWh, eventually rising to 4.2 cents. However, the gap fell to 3.85 cents, as of December 2009, and was still steady or declining in 2010.

Finally, a major problem with APPA's approach is that numbers were not adjusted for overall inflation, so simple comparisons across years can be misleading. When the numbers are adjusted for overall inflation to show constant 2008 dollar values, the price gap between restructured and regulated states becomes less dramatic: compared with 1997, a gain of 0.8 cents.

Comparison of Restructured and Regulated Natural Gas Dependent States. Appendix Figure II shows annual average

Appendix Figure V

Mid-Atlantic Area National Corridor Critical Congestion Area



Source: U.S. Department of Energy, "National Corridor Designation Maps: Mid-Atlantic Area;" available at http://nietc.anl.gov/documents/docs/NIETC_MidAtlantic_Area_Corridor_Map.pdf.

prices for Texas and Florida. Texas has restructured while Florida has remained regulated. Both have similar average price profiles except that Texas was initially about 2 cents cheaper than Florida, closed the gap for several years and dropped below Florida again in 2009.

Both states also have a high proportion of natural gas-fueled generation: In 2007, Texas obtained more than 49 percent of its power from natural gas-fueled plants, while Florida obtained almost 45 percent. The states have similar coal-fueled production, and the remainder in both states is mainly nuclear power. Both states import small amounts of electric power from nearby states.

Comparison of Restructured and Regulated Coal-Dependent States. Appendix Figure II also shows two "coal heavy" states: Michigan, classified by the APPA as deregulated, and Pennsylvania, listed as regulated. Both generated more than 50 percent of their power from coal in 2007, and approximately 10 percent from natural gas. Both states also participated in restructured wholesale markets — Pennsylvania since 1998 and Michigan beginning in 2005 — and both import power from and export power to neighboring states.

Comparison of Restructured and Regulated States. Of the four states shown in Appendix Figure II, prices in the regulated states of Penn-

sylvania and Florida were level or increased slightly from 2008 to 2009, while the two deregulated states featured falling retail prices. Compared by predominate fuel source:

- Among states with a lot of natural gas generation, there is a widening price gap between restructured and regulated states. [See Appendix Figure III.]

- Among the coal-heavy states, however, the increasing price differential disappears, and both regulated and deregulated states wind up in 2008 with real prices slightly lower than they were in 1990.[85] [See Appendix Figure IV.]

Recently developed natural gas resources in the United States present a new "more likely scenario," at least for the next several years: ample supplies of natural gas will help keep power prices lower, especially in the states using a lot of natural gas — and most of those are restructured states. Ample supplies of gas will also keep coal prices low, too. But particularly in the year or two after the fuel price peak in July 2008, the data (when they become available) should show that average prices in the restructured states continued to go down.

Higher Prices Due to Grid Congestion in Restructured States. Little attention has been paid to the role that the relatively congested transmission grid in the Northeast has played in driving prices higher. The states with the steepest price increases are largely on the East Coast, where the transmission grid is stretched to its limit due to heavy demand in crowded areas [see Appendix Figure V]. Gaining approval for extending or building new grid capacity has been nearly impossible. Restructuring has substantially increased the amount of electricity being transmitted over the grid network, adding new burdens to the system.[86]

Transmission congestion can also increase costs by requiring the dispatch of power from less efficient generators.[87] Appendix Figure VI looks separately at restructured states that touch the historically congested major Northeast corridor power lines cited in the National Interest Electric Transmission Corridors (NIETC) report and those restructured states that do not border the Northeast corridor.

- Through the early 2000s, the spread between average electricity prices in congested and noncongested states was actually *negative* — that is, prices were lower in states that had a shortage in grid capacity, though the difference was most often less than 50 cents per MWh, and the price spread virtually disappeared in 2005 and 2006.

- It appears that the spread between congested states versus noncongested states swings from negative to positive around 2006 — coincident with the sharp increase in restructured state retail prices.

- By the end of 2009, the positive spread (with congested states reporting a higher price) was a little more than 1.3 cents per kWh.

New pricing regimes for transporting electricity in the congested regions through the Locational Marginal Pricing (LMP) system may also have contributed to slightly higher energy costs. The congestion costs during this period came at the same time as price caps were expiring and natural gas prices were rising steeply, contributing to higher prices in the restructured states.

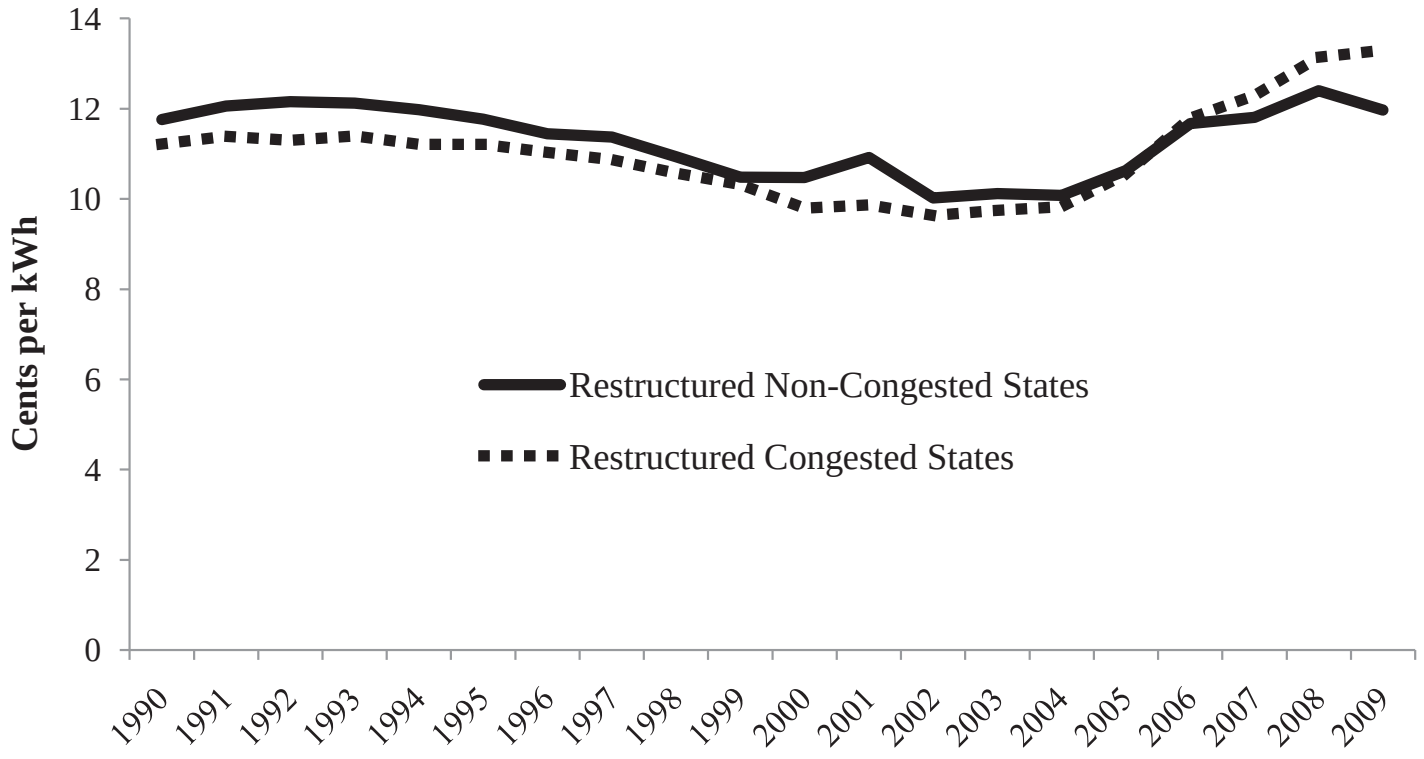
Capital Investment. Experience has shown that initial concerns that there might be too little investment in generation due to market competition were unwarranted. Low natural gas prices and high electricity prices around 1990-1991 led to a boom in natural gas-fired generation in the following years. Thus, in the five-year period from 2001 to 2006, at the peak of the transition into restructured markets, there was almost as much investment as in the previous 20 years.

The best indicator of the adequacy of generation investment is the reserve capacity margin — the difference between generators' rated capacity and peak demand in summer. The boom in generation construction in the middle of the 1990s added a lot to reserve capacity. Reserve capacity also grew after the recession began late in 2008. The reason plant owners added more capacity in restructured markets was that they could pass on construction costs to consumers through additional future sales of electricity. In due course, the extra capacity will keep a lid on costs.

Producers in regulated states, on the other hand, do not have the ability to respond so flexibly to changes in the market. They

Appendix Figure VI

Average Price Gap Between Non-Congested and Congested Restructured States



Source: Energy Information Administration, "Annual Energy Review," Table 6.7, "Natural Gas Wellhead, City Gate, and Imports Price, 1949-2008;" available at http://www.eia.doe.gov/emeu/aer/txt/stb0607.xls; Energy Information Administration, "Electric Power Monthly," Table 5.6.A, "Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State;" available at http://www.eia.doe.gov/cneaf/electricity/epm/epmxlfile5_6_a.xls; Department of Commerce, Bureau of Economic Affairs, Table 1.1.4, "Price Indexes for Gross Domestic Product;" available at http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=4&Freq=Qtr&FirstYear=2007&LastYear=2009.

may have to keep electricity rates constant while costs rise, which means that utilities have to cut back on other things in order to buy fuel. Those "other things" include maintenance or overhead, but they also include investment in new generators and efficiency upgrades. When energy prices rise, utilities often cut back on investments in fuel efficient plants and thus have shrinking reserve margins. When costs are falling (as typically happens during a recession) utilities might have money for investment, but they have less scope to cut electricity rates to accommodate lower demand.

Thus, utilities delay projects when they should be accelerating them, and raise rates when they should be cutting them. For example, as the U.S. economy was hitting the bottom of a major recession in late 2009, utilities in monopoly states were filing for rate increases of 5 percent to 10 percent. The utilities claimed they needed more money to invest in their electricity grids, but the investment would have been more useful during the previous economic expansion.[88] The rate increases came as total U.S. electricity output fell 3.7 percent in 2009, the steepest drop since 1938.[89]

Endnotes

Notes to the Foreword

1. Frank F. Fowle, ed., *Standard Handbook for Electrical Engineers Fourth Edition* (New York: McGraw-Hill Book Company, Inc., 1918).

2. Henry G. Solomon, *Electricity Meters* (London: Charles Griffin & Company, Limited, 1906).

3. In fact, this notion of efficient pricing persists in Spain, where the installation of an ICP (Potential Control Interrupters) in the customer's meter box limits the maximum current flowing at any point in time (tripping as any circuit breaker would when the allowed potential is exceeded). The customer must pay a monthly fee per unit of potential to have his peak consumption potential raised.

4. His partner in saddling us with a century of rate of return regulation mischief was Theodore Vail, who was thinking in the same rut for the emerging competitive telephone industry. See David Evans, ed., *Breaking Up Bell* (Oxford, U.K.: Elsevier Science Ltd., 1982). In all practicality and honesty, we should note that both Vail and Insull feared the specter of nationalization, which was the worldwide trend against which they offered extensive regulation as an alternative in the United States. The hazards in calling good policy shots is here illustrated: Ultimately, the failure of these nationalized foreign industries led to their own money-losing demise, and in many ways liberalization was easier, if not always rosier, abroad (for example, see the authors' summary of Joskow).

5. In the gas industry the one state exception has been Georgia, where local pipe distribution is regulated but the commodity is sold by competing suppliers to individual customers. The Georgia Public Service Commission currently lists 11 approved suppliers.

6. We first encountered the argument that there is not enough capital investment to assure adequate generation capacity in our study and restructuring proposal for the Arizona Corporation Commission in 1984. It was claimed that as long-term investments, "No one would ever build a spec generator." Yet refineries, chemical and other factories are built speculatively, and paid for (or not) by the prices derived from the sale of the output. Hotel owners pay the investment cost out of future room rents, always at risk of failure.

7. The contrary argument — that "too much money" was pouring into the industry — gained special force in the early spread of state regulation strongly favored by the industry. Indeed, it was the industry's main complaint.

8. Peter Crampton and Steven Stoft, *The Convergence of Market Designs for Adequate Generating Capacity*, White Paper for the Electricity Oversight Board, April 25, 2006.

9. Hernan Bejarano, Lance Clifner, Carl Johnston et al., *Experimental Power Markets: an Investigation of Regulatory Alternatives*, working paper at the Economic Science Institute, Chapman University.

10. Nuclear power proponents should support price incentives to smooth consumption, because consumption smoothing allows the use of a larger steady stream of energy (base power) from nuclear units.

11. For example in "Market Design and Motivated Human Trading Behavior in Electricity Markets," from Proceedings of the 32nd Hawaii International Conference on System Sciences published in 1999, we found that bilateral trading produced less efficient markets and more frequent, intermittent instances of market power.

12. However, a 2008 evaluation by Hugh Outhred, discussed in this study, was critical of the continued heavy reliance on bilateral contracts. Hugh Outhred, "Texas Nodal Electricity Market: Critical Evaluation," May 2, 2008. Available at http://lifelong.engr.utexas.edu/ercot/080502%20ERCOT_Critical_Evaluation_Outhred.pdf.

Notes to the Study

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1. Robert Conot, *A Streak of Luck* (New York: Bantam Books, 1980), quoted in Richard Munson, *From Edison to Enron* (West Port, Conn.: Praeger, 2005), page 18.

2. Edison's vision for the electricity network based on direct current competed with George Westinghouse's embrace of Nicola Tesla's alternating current approach. Edison lost out in the larger debate about whether the country should adopt a standard electric power sys-

tem based on direct current or alternating current, but he remained a believer in competition. Richard Munson, *From Edison to Enron*, pages 18-42.

3. Much of this section is borrowed from Vernon L. Smith and Stephen Rassenti, "Turning on the Lights: Deregulating the Market for Electricity," National Center for Policy Analysis, Study No. 228, October 1, 1999. Available at http://www.ncpa.org/pub/st228?pg=11.

4. Vernon L. Smith and Stephen Rassenti, "Turning on the Lights," page 5.

5. John E. Kwoka, Jr., *Power Structure: Ownership, Integration, and Competition in the U.S. Electricity Industry* (New York: Kluwer Academic Publisher, 1996).

6. John E. Kwoka, Jr., *Power Structure*, page 27.

7. John E. Kwoka, Jr., *Power Structure*, page 8.

8. Ibid.

9. A fifth, the Alaska PMA, has been privatized.

10. Adam D. Thierer, "(271) Power Marketing Administrations," in Scott A. Hodge, ed., *Balancing America's Budget: Ending the Era of Big Government* (Washington, D.C.: Heritage Foundation, 1997).

11. U.S. Army Corps of Engineers, "U.S. Sources of Electrical Power." Available at http://epec.saw.usace.army.mil/Sadiki-Intro_to_HAC_and_Hydropower_Benefit_Process.ppt.

12. Richard Munson, *From Edison to Enron*, chapters 3-4.

13. "The ultimate effect of…rising fuel costs, capital cost escalation and environmental concerns and demand uncertainty — and the policymakers' response to them was to create an unmitigated disaster for electricity consumers and utility shareholders," wrote Frank Huntowski, Neil Fisher and Aaron Patterson in "Embrace Electric Competition or It's Déjà Vu All Over Again," The NorthBridge Group, October 2008. Available at http://econ2.econ.iastate.edu/tesfatsi/Embrace_Electric_Competition.NorthBridgeGroup.October 2008.pdf.

14. Frank Huntowski, Neil Fisher and Aaron Patterson, "Embrace Electric Competition or It's Deja Vu All Over Again." Available at http://nbgroup.com/publications/Embrace_Electric_Competition_Or_Its_Deja_Vu_All_Over_Again.pdf.

15. Greg A. Jarrell, "The Demand for State Regulation of the Electric Utility Industry," *Journal of Law and Economics*, October 1978, pages 269-95.

16. "Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities," Federal Energy Regulatory Commission, Order No. 888, April 24, 1996; available at http://www.ferc.gov/legal/maj-ord-reg/land-docs/order888.asp. And, "Open Access Same-Time Information System (formerly Real-Time Information Networks) and Standards of Conduct," Federal Energy Regulatory Commission, Order No. 889, April 24, 1996; available at http://www.ferc.gov/legal/maj-ord-reg/land-docs/order889.asp. See also, "Energy Policy Act of 1992," 102nd United States Congress, H.R. 776, October 5, 1992; available at http://thomas.loc.gov/cgi-bin/bdquery/z?d102:HR00776:@@@D&summ2=m&.

17. Robert Crandall and Jerry Ellig, "Electric restructuring and consumer interests: lessons from other industries," *The Electricity Journal*, Volume 11, Issue 1, January-February 1998, pages 12-16. See also Crandall and Ellig, *Economic Deregulation and Buyer Choice: Lessons for the Electric Industry* (Fairfax, Va.: Center for Market Processes, 1997). And, Clifford Winston, "Economic Deregulation: Day of Reckoning for Microeconomists," *Journal of Economic Literature*, Volume 13, September 1993, pages 1263-89 and Winston, "U.S. Industry Adjustment to Economic Deregulation," *Journal of Economic Perspectives*, Volume 12, Number 3, summer 1998, pages 89-110.

18. Smith and Rassenti had worried that the ISO/RTOs would add bureaucracy and unnecessary costs. Certainly many market participants have had occasion to complain that management was not responsive to their needs. For example, the California ISO took more than seven years to change those features of the market that may have caused the system to collapse in 2001. This may suggest the management is not very responsive. On balance, though, ISO/RTO management has been more flexible and constructive than critics

feared. See, "The Value of Independent Regional Grid Operators," ISO/RTO Council, November 2005. Available at http://www.caiso.com/14c6/14c6c4291aa40.pdf.

19. The Southwest Power Pool, Inc., in Oklahoma, for example, is a FERC-approved RTO. However, for historical reasons, FERC does not control markets in Texas. In Texas, all markets are regulated by the state Public Utilities Commission (PUC).

20. "Regional Transmission Organizations," Federal Energy Regulatory Commission, Order No. 2000, December 20, 1999. Available at http://www.ferc.gov/legal/maj-ord-reg/land-docs/RM99-2A.pdf. See also "What's the Difference between an ISO and an RTO," Available at http://en.wikipedia.org/wiki/ISO_RTO.

21. They are the California Independent System Operator (California ISO); the Electric Reliability Council of Texas (ERCOT, an ISO); ISO New England (ISO-NE, an RTO); the Midwest Independent Transmission System Operator (Midwest ISO, an RTO); the New York Independent System Operator (NY ISO); PJM Interconnection (PJM, an RTO); and the Southwest Power Pool (SPP, an RTO). States without ISO/RTOs include most of the south, central and mountain west, and Florida.

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23. Rebecca Smith, "NRG Energy May Exit Texas Project," *Wall Street Journal (Online)*, January 29, 2010.

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28. Retail choice was the result of the enactment of Texas Senate Bill 7 on January 1, 2002. See Lynne L. Kiesling and Andrew N. Kleit, *Electricity Restructuring: The Texas Story* (Washington, D.C.: American Enterprise Institute, 2009). Also, U.S. Energy Information Administration, "American Public Power Association — About Public Power — Public Power & State Restructuring," *Status of State Electric Industry Activity*, February 15, 2010. Available at http://www.appanet.org/aboutpublic/staterestructuringdetail.cfm?State=108&sn.ItemNumber=2102.

29. H. Sterling Burnett, "Power for the Future: The Debate Over New Coal-Fired Power Plants in Texas."

30. Robert J. Michaels, "Competition in Texas Electric Markets: What Texas did Right and What's Left to Do," Texas Public Policy Foundation, March 2007. Available at http://www.texaspolicy.com/pdf/2007-03-RR07-electric3-rm.pdf.

31. "Summary of Price to Beat and TCRF Cases," Public Utilities Commission of Texas. Available at http://www.puc.state.tx.us/electric/rates/PBT/PTB_TCRF_Summary.pdf.

32. Barry T. Smitherman, "Public Priorities and the Role of Competition," KEMA Executive Forum, March 30, 2010. Available at http://www.puc.state.tx.us/about/commissioners/smitherman/present/pp/KEMA_033010.pdf.

33. Robert J. Michaels, "Competition in Texas Electric Markets: What Texas did Right and What's Left to Do."

34. Expected to start experimental operations on May 1, 2010. See *Texas Energy Report*, April 26, 2010. Available at http://www.texasenergyreport.com/energypress/downloadep.cfm?dcid=140. Critics of Texas's restructuring point to a number of factors in the operation of the wholesale markets as contributing to higher prices for consumers. Most importantly, under ERCOT rules, generators offer power into the balancing market and then the highest-cost bid for required energy sets the price for all other accepted bids. This means that generators that produce relatively inexpensive coal-fired electricity (for example) are paid as if they are producing more expensive power from natural gas-fired power plants. Though only 10 percent of the market, the BEM has an inordinate influence on prices state-

wide because those who buy and sell wholesale power through long-term contracts rely on BEM prices to value their owner energy. On this see, for instance, Cities Aggregation Power Project, Inc., "The History of Electric Deregulation in Texas," 2009. Available at http://www.capptx.com/files/HistElectricDereg_TX.pdf. Or, McCullough Research, "Transparency in ERCOT: A No-Cost Strategy to Reduce Electricity Prices in Texas," May 5, 2009. Available at http://www.mresearch.com/pdfs/398.pdf. Other concerns are raised by Paul L. Jaskow, "Lessons Learned from Electricity Market Liberalization," *Energy Journal*, Special Issue, 2008.

35. The other ISO/RTOs have adopted a central planning model based on "capacity markets" to decide when to build more generation capacity.

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46. "State of the Market Report for PJM," Monitoring Analytics, LLC., March 11, 2010. Available at http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2009.shtml.

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65. There are four RTOs in the United States: ISO-New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont), Midwest ISO (most of Illinois, Indiana, Iowa, Michigan, Minnesota and Wisconsin, and parts of Missouri, Montana, North Dakota, Ohio and South Dakota), PJM Interconnection (most of Delaware, Maryland, New Jersey, Ohio, Pennsylvania, Virginia and West Virginia, and parts of Illinois, Indiana, Kentucky, Michigan and North Carolina), Southwest Power Pool (most of Kansas, Nebraska and Oklahoma, and parts of Arkansas, Louisiana, Missouri, New Mexico and Texas).

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80. Joel Malina, "Pennsylvania: Just the Facts Please," Compete Coalition, January 2010. Available at http://www.competecoalition.com/blog/2010/01/pennsylvania-just-facts-please.

81. Tim Mekeel, "27% of PPL Customers Change Suppliers," *Lancaster Online*, March 17, 2010. Available at http://articles.lancasteronline.com/local/4/249934.

82. Rate caps remain in place until 2011 for Reading's Met Ed, Erie's Penelec, Philadelphia's PECO and Greensburg's Allegheny Power.

83. Energy Information Administration, "State Energy Profiles." Available at http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=RI.

84. "Retail Electric Rates in Deregulated and Regulated States: 2009 Update," American Public Power Association, March 2010. Available at http://www.appanet.org/files/PDFs/RKWfinal2009update.pdf.

85. It is also important to note that coal prices increased along with natural gas prices during the mid- to late-2000s, although not by as much as natural gas.

86. As a result, the U.S. Department of Energy (D.O.E.) designated the Mid-Atlantic area as a National Interest Electric Transmission Corridor in order to focus the industry's attention on making it more robust. The National Corridor includes certain counties in Ohio, West Virginia, Pennsylvania and New York. D.O.E. based its designation on data and analysis showing that persistent transmission congestion exists in these two areas. The Mid-Atlantic area includes New York, Maryland, Virginia and all of New Jersey, Delaware and the District of Columbia.

87. See, for example, ESAI Power's report on "Achievements in Electricity Industry Restructuring in Connecticut," which notes the role of high distribution costs in pushing up Connecticut prices.

88. Rebecca Smith, "Utilities Push for Round of Rate Increases," *Wall Street Journal*, November 27, 2009.

89. Rebecca Smith, "Turmoil in Power Sector; Falling Electricity Demand Trips Up Utilities Plans for Infrastructure Projects," *Wall Street Journal*, January 14, 2010.

About the NCPA

NCPA
NATIONAL CENTER FOR POLICY ANALYSIS

The NCPA is a nonprofit, nonpartisan organization established in 1983. Its aim is to examine public policies in areas that have a significant impact on the lives of all Americans — retirement, health care, education, taxes, the economy, the environment — and to propose innovative, market-driven solutions. The NCPA seeks to unleash the power of ideas for positive change by identifying, encouraging and aggressively marketing the best scholarly research.

Health Care Policy.

The NCPA is probably best known for developing the concept of Health Savings Accounts (HSAs), previously known as Medical Savings Accounts (MSAs). NCPA President John C. Goodman is widely acknowledged (*Wall Street Journal*, WebMD and the *National Journal*) as the "Father of HSAs." NCPA research, public education and briefings for members of Congress and the White House staff helped lead Congress to approve a pilot MSA program for small businesses and the self-employed in 1996 and to vote in 1997 to allow Medicare beneficiaries to have MSAs. In 2003, as part of Medicare reform, Congress and the President made HSAs available to all nonseniors, potentially revolutionizing the entire health care industry. HSAs now are potentially available to 250 million nonelderly Americans.

The NCPA outlined the concept of using federal tax credits to encourage private health insurance and helped formulate bipartisan proposals in both the Senate and the House. The NCPA and BlueCross BlueShield of Texas developed a plan to use money that federal, state and local governments now spend on indigent health care to help the poor purchase health insurance. The SPN Medicaid Exchange, an initiative of the NCPA for the State Policy Network, is identifying and sharing the best ideas for health care reform with researchers and policymakers in every state.

NCPA President John C. Goodman is called the "Father of HSAs" by *The Wall Street Journal*, WebMD and the *National Journal*.

Taxes & Economic Growth.

The NCPA helped shape the pro-growth approach to tax policy during the 1990s. A package of tax cuts designed by the NCPA and the U.S. Chamber of Commerce in 1991 became the core of the Contract with America in 1994. Three of the five proposals (capital gains tax cut, Roth IRA and eliminating the Social Security earnings penalty) became law. A fourth proposal — rolling back the tax on Social Security benefits — passed the House of Representatives in summer 2002. The NCPA's proposal for an across-the-board tax cut became the centerpiece of President Bush's tax cut proposals.

NCPA research demonstrates the benefits of shifting the tax burden on work and productive investment to consumption. An NCPA study by Boston University economist Laurence Kotlikoff analyzed three versions of a consumption tax: a flat tax, a value-added tax and a national sales tax. Based on this work, Dr. Goodman wrote a full-page editorial for *Forbes* ("A Kinder, Gentler Flat Tax") advocating a version of the flat tax that is both progressive and fair.

A major NCPA study, "Wealth, Inheritance and the Estate Tax," completely undermines the claim by proponents of the estate tax that it prevents the concentration of wealth in the hands of financial dynasties. Actually, the contribution of inheritances to the distribution of wealth in the United States is surprisingly small. Senate Majority Leader Bill Frist (R-TN) and Senator Jon Kyl (R-AZ) distributed a letter to their colleagues about the study. In his letter, Sen. Frist said, "I hope this report will offer you a fresh perspective on the merits of this issue. Now is the time for us to do something about the death tax."

Retirement Reform.

With a grant from the NCPA, economists at Texas A&M University developed a model to evaluate the future of Social Security and Medicare, working under the direction of Thomas R. Saving, who for years was one of two private-sector trustees of Social Security and Medicare.

The NCPA study, "Ten Steps to Baby Boomer Retirement," shows that as 77 million baby boomers begin to retire, the nation's institutions are totally unprepared. Promises made under Social Security, Medicare and Medicaid are inadequately funded. State and local institutions are not doing better — millions of government workers are discovering that their pensions are under-funded and local governments are retrenching on post-retirement health care promises.

Pension Reform.

Pension reforms signed into law include ideas to improve 401(k)s developed and proposed by the NCPA and the Brookings Institution. Among the NCPA/Brookings 401(k) reforms are automatic enrollment of employees into companies' 401(k) plans, automatic contribution rate increases so that workers' contributions grow with their wages, and better default investment options for workers who do not make an investment choice.

The NCPA's online Social Security calculator allows visitors to discover their expected taxes and benefits and how much they would have accumulated had their taxes been invested privately.

Environment & Energy.

The NCPA's E-Team is one of the largest collections of energy and environmental policy experts and scientists who believe that sound science, economic prosperity and protecting the environment are compatible. The team seeks to correct misinformation and promote sensible solutions to energy and environment problems. A pathbreaking 2001 NCPA study showed that the costs of the Kyoto agreement to reduce carbon emissions in developed countries would far exceed any benefits.

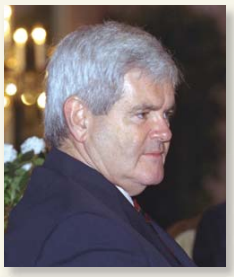
Educating the next generation.

The NCPA's Debate Central is the most comprehensive online site for free information for 400,000 U.S. high school debaters. In 2006, the site drew more than one million hits per month. Debate Central received the prestigious Templeton Freedom Prize for Student Outreach.

Promoting Ideas.

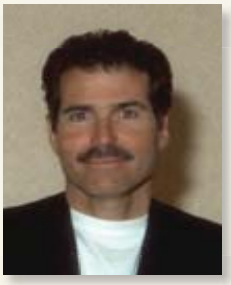
NCPA studies, ideas and experts are quoted frequently in news stories nationwide. Columns written by NCPA scholars appear regularly in national publications such as the *Wall Street Journal*, the *Washington Times*, *USA Today* and many other major-market daily newspapers, as well as on radio talk shows, on television public affairs programs, and in public policy newsletters. According to media figures from Burrelles*Luce*, more than 900,000 people daily read or hear about NCPA ideas and activities somewhere in the United States.

What Others Say About the NCPA



"The NCPA generates more analysis per dollar than any think tank in the country. It does an amazingly good job of going out and finding the right things and talking about them in intelligent ways."

Newt Gingrich, former Speaker of the U.S. House of Representatives



"We know what works. It's what the NCPA talks about: limited government, economic freedom; things like Health Savings Accounts. These things work, allowing people choices. We've seen how this created America."

John Stossel,
former co-anchor ABC-TV's *20/20*

"I don't know of any organization in America that produces better ideas with less money than the NCPA."

Phil Gramm,
former U.S. Senator

"Thank you . . . for advocating such radical causes as balanced budgets, limited government and tax reform, and to be able to try and bring power back to the people."

Tommy Thompson,
former Secretary of Health and Human Services

The NCPA is a 501(c)(3) nonprofit public policy organization. We depend entirely on the financial support of individuals, corporations and foundations that believe in private sector solutions to public policy problems. You can contribute to our effort by mailing your donation to our Dallas headquarters at 12770 Coit Road, Suite 800, Dallas, TX 75251, or visiting our Web site at www.ncpa.org and clicking "Support Us."