

Californication Of Electricity How And Why Lights Went Out In the Golden State

Introduction

Until around the last decade, services like electricity and water were considered as public services and kept in the *safe* hands of the government. In the 1990s, with the wave of Monetarism running over Keynesianism, many developed nations attempted market provision of these services. Britain, for instance, pioneered the creation of electricity markets with great success. This success was also replicated in various parts of US, except in one - California.

In California, *a sort of* market provision of electricity was attempted but was terribly unsuccessful. A few months into the new market order, and the state witnessed massive interruptions of power and rolling blackouts resulting in traffic accidents and millions of dollars of losses. Wholesale power prices shot up manifold. California attained an electricity supply status no different from a backward developing country city.

Various academicians nastily used the electricity crisis in California to censure market forces.¹ New York Times columnist Paul Krugman called it "a warning about the dangers of placing blind faith in markets."² Los Angeles Times commentator Robert Scheer said it's yet another sign that "capitalism is falling apart."³ Both attributed market manipulation by *evil and malevolent* electricity suppliers as the chief reason for the crunch.⁴ The Californian disaster dealt a severe rhetorical blow to the movement for a minimalist state. It is for this reason that this crisis is so important.

In this paper, I seek to establish that rather than the market forces it was the inane and unwarranted intervention by the state that was responsible for the fiasco in California.

Structure

The methodology adopted in this paper is the following. First, the pre-reform electricity sector in California is examined and the problems therein briefly discussed. Second, the structure, working and regulation of the post-reform electricity market are analyzed. Third, the debacle that occurred in the Californian Electricity Market is evaluated in a chronological manner. Fourth, the causes and reasons for the crisis are elucidated. Finally, the role of the state and that of the market in this debacle is investigated.

California's Electricity Sector In The Pre-Reform Period

A graphic representation of the Californian electricity sector can be seen in Exhibit 1.

The Players: California's electricity industry was vertically integrated and organized around three regulated private monopolies or investor owned utilities (IOUs): Pacific Gas & Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E). These companies owned and operated everything from generation, transmission and distribution and catered to the electricity needs of consumers in their exclusive franchise areas. California Public Utilities Commission (CPUC), an independent state regulatory agency, heavily regulated the prices, costs, and

¹ Sullum, Jacob. "Power Struggle," Reason Online, January 9, 2001 accessed at <http://reason.com/sullum/010901.shtml>

² Krugman, Paul. "California Screaming," *The New York Times*, December 10, 2000 accessed at <http://www.nytimes.com/2000/12/10/opinion/10KRUG.html>

³ Scheer, Robert. "These Messes Are What Deregulation Gets Us," *Los Angeles Times*, December 26, 2000 accessed at http://www.robertscheer.com/1_natcolumn/00_columns/122600.htm

⁴ DiLorenzo, Thomas. "La-La Land," Ludwig von Mises Institute, March 22, 2001 accessed at <http://www.mises.org/fullarticle.asp?control=635&month=30&title=La%2DLa+Land&id=45>

service obligations of these. These three companies together supplied three-fourths of the state's consumption. The rest came from big and small municipal utilities.⁵

Although utilities in California supplied a large fraction of their retail customers' needs themselves, approximately 20 percent of California's electricity supply was imported from Canada, Mexico and other Western states during spring and summer. There was a single synchronized electric power network for the entire region that operated under the command of the Western System Coordinating Council (WSCC).

Role Of CPUC And FERC: Throughout US, the regulation of private firms supplying electricity was split between individual state public utility commissions and the Federal Energy Regulatory Commission (FERC). So was the case in California. The CPUC regulated retail electricity prices on the basis of costs incurred by the utilities, oversaw the utility planning and reviewed the reasonableness of their costs. FERC, on the other hand, regulated prices and terms and conditions of wholesale power transactions between utilities and controlled sales of unbundled transmission service that supported these transactions. FERC allowed wholesale power producers to sell at "market-based rates" provided they showed that they lacked market power and that the prices at which they sold power reflected the interplay of supply and demand.

Problems Therein: The existing system had always been unsatisfactory. The electricity prices in California were among the highest in the US (about 50 percent higher than the US national average in 1996). The high prices were attributed to - high cost of nuclear power plant investments, expensive long-term contracts with independent power suppliers, excess generating capacity, and costly and ineffective regulatory institutions. In the 1990s, when California plunged into recession, apprehension grew that continued high electricity prices would drive out many industries from the state. There emerged broad agreement and pressure from industrial consumers to reform the existing industry-structure and regulatory system.

Reforms: In early 1993, the CPUC comprehensively reviewed the structure and performance of California's electricity industry and in April 1994, came out with a reform program called the "Blue Book". In early 1996, the CPUC issued its restructuring decision, and later the same year, the restructuring law – Assembly Bill 1890 was passed by the Californian legislature.

The New Californian Electricity Market

The reforms resulted in the formation of a new electricity market in California. The structure, the operating arrangements and the regulatory framework of this market have been outlined below.⁶

The New Market Structure

In this section, we examine the various components of the new Californian Electricity Market.

Consider Exhibit 2. As is generally known and as becomes further evident from the Exhibit, any electricity market has three phases to it - generation, transmission and distribution. The structure of the Californian electricity market changed as regards all these three phases and this has been delineated below.

- The generation of electricity and its sale into the wholesale market were completely deregulated. The generation of wholesale electricity came to be handled by the three IOUs, municipal utilities, out-of-state electricity providers and independent Power Producers (IPPs).

⁵ This section is largely based on the following two research papers: Joskow, Paul L. "California's Electricity Crisis," Massachusetts Institute of Technology, November 28, 2001 accessed at http://econ-www.mit.edu/faculty/pjoskow/files/CALIFORNIA_11-28-01.pdf and "California Power Crisis: Lessons for Developing Countries," Energy and Mining Sector Board, The World Bank, April 2001 accessed at http://www.worldbank.org/html/fpd/energy/pdfs/e_calex0400.pdf

⁶ Ibid.

- A new non-profit quasi-government corporation was instituted under California legal statutes and was called the Power Exchange (Cal PX). It acted as a market place in which generators and suppliers competed to meet demand for electric energy. It functioned as an auctioneer and did not engage in energy trading by itself. While the IOUs had to compulsorily participate in the PX, other buyers and sellers of bulk power such as municipalities, Independent Power Producers (IPPs) and out-of-state producers could avoid participating in the PX and trade electricity through bilateral contracts etc. The PX regularly submitted day-ahead schedules to Cal ISO. The PX was the face of the wholesale electricity market in California.
- So far as transmission of electricity was concerned, an Independent System Operator (Cal ISO) was established to operate the statewide transmission system impartially for buyers and sellers of bulk electricity. Any supplier that met the regulated reliability standards had access to the system. Cal ISO functioned as a non-profit quasi-government agency. It did not own any generation, transmission or distribution systems, and relied entirely on the services supplied from the market to meet the demand on the statewide power system.
- The IOUs owned the transmission facilities, but they were required to provide open access to competing generators, wholesale marketers etc at prices determined by FERC and CPUC.
- There were also intermediary entities known as scheduling coordinators (SCs) that accepted schedules from non-PX participants and then submitted those schedules to the Cal ISO. The SCs acted as a liaison between such participants and the Cal ISO. They numbered around forty. The marketing affiliates of IOUs, large municipal utilities etc were the major scheduling coordinators. The SCs continuously coordinated scheduling activities and submitted “balanced” schedules to ISO in which the quantity of energy supplied equaled the quantity demanded.
- Utility distribution companies (UDCs) and electricity service providers (ESPs) dominated the distribution segment of the market. The UDCs were the retail arms of the IOUs and were subject to regulation. The ESPs, on the other hand, were independent power distributors free from any regulation. The UDCs and the ESPs would purchase energy from Cal PX and resell this electricity to their customers. All retail consumers were allowed to choose a competitive electricity service provider (ESP) for them. In case they didn’t choose an ESP, they received ‘default service’ from their local UDC. Each ADC’s price was set equal to the wholesale spot market price adjusted for physical losses and billing and metering costs. This was the ‘price to beat’ for ESPs.

The New Market Operating Arrangements

In this section, we examine the working and the nature of interaction among the various parts of the market.

As is commonly known, trade in commodities can take place in two kinds of markets: the spot market and the forward market. The spot market refers to the exchange of promptly available quantities of the good for immediate payment. Spot-market trading is the most flexible and the most volatile. Current market conditions can be easily taken into account in a spot market. The forward market refers to the exchange of goods for money at some specified date in the future between specific contracting parties at a given price. Forward contracting arose to address problems relating to specific requirements in commodities, rapid price fluctuations, and uncertainties about quality.⁷

As in commodity trade, for trade in electricity too there exist spot and forward markets. The spot market in electricity is termed as the real time energy market and the forward market in electricity generally takes the form of day-ahead or hour-ahead energy market. Consider Exhibit 3.

- It is evident from the Exhibit that the day-ahead, hour-ahead and real time energy markets formed an essential component in the functioning of the Californian Electricity Market. The Californian energy market was primarily structured as a day-ahead auction by Cal PX with bidders allowed submitting different quantities and prices for each hour. The hour-ahead auctions for energy were only supplementary and to provide for divergences in demand and supply from the day-ahead bids. The day-ahead and hour-ahead markets were independent, and were closed separately. Upon closing, the winners were financially and operationally obligated to provide the services selected by Cal ISO.

⁷ Encyclopedia Britannica CD 1999 Multimedia Edition

However, scheduled transactions seldom matched the actual load on the power system. In view of this, Cal ISO calculated, in real-time, the amount of energy that would be needed to balance the total system demand. It then conducted real-time auction for providing supplemental energy or for backing off demand to achieve this balance. Bidders submitted prices up to 45 minutes prior to the start of each operating hour. They indicated the prices at which they were willing to change their generation or purchases in real time. Cal ISO used these bids to balance total generation and load in real time. Prices were established in this market every five minutes.

- Scheduling Coordinators too participated in any or all of the day-ahead, hour-ahead, and real-time markets after due certification from Cal ISO. SCs were not required to schedule all of their expected load and generation in the day-ahead market. They could elect to bid for less than their expected load in the day-ahead market, and then cover their remaining load in the hour-ahead market. Deviations from day-ahead or hour-ahead schedules were allowed to SCs by Cal ISO, and were settled on the basis of real-time energy imbalance market prices. The Cal ISO, every day, collected energy schedules from the SCs and assessed the viability of each schedule. Individual schedules accepted by Cal ISO were then aggregated into a master schedule that was checked to ensure whether it could be accommodated by California's bulk power grid in a reliable and safe manner. If Cal ISO identified power system problems such as congestion in the grid, it provided the markets with an opportunity to adjust schedules so as to alleviate the problems.
- Besides the energy market described above, the markets for ancillary services and congested transmission capacity too were critical parts in the working of the market. ISO and PX operated these markets as per FERC regulations.
 - The ancillary services market involved the purchase of various ancillary services like frequency regulation, spinning reserves, non-spinning reserves, replacement reserves etc by ISO from generators in an unbundled manner through long-term contracts and competitive bidding. This was done to ably respond to unanticipated changes in demand or supply and thereby to maintain the short-term reliability of the network.
 - The market for congested transmission capacity involved Cal ISO holding an auction for allocating congested transmission capacity among the various system users after Cal PX had established preliminary hourly day-ahead prices for energy. To facilitate this allocation, Cal ISO accepted "adjustment bids" for both the day-ahead and hour-ahead markets. These bids reflected the prices at which SCs were willing to procure more energy or curtail loads from their preferred schedules. If market participants did not submit sufficient adjustment bids, Cal ISO levied a congestion management charge on the schedule that utilized congested transmission lines. All this was supposedly done to ensure reliable operation of the transmission grid.
- In addition to the centralized markets mentioned above, separate bilateral transactions-involving parties such as Californian generators who were not obligated to trade through the PX, out-of-state generators and Californian buyers other than the three UDCs-also formed an integral part in the functioning of the market.

The New Market Regulatory Framework

Like structural and functional changes, there were also regulatory changes in every phase of the Californian electricity market – be it generation or transmission or distribution. In this section, we study the rules and regulations that came to govern the post reform electricity market.

- PG&E and SCE were required to sell at least 50 percent of their generation plants to IPPs or place them in separate new companies. SDG&E was required to divest all of its generation assets. The purpose was to reduce their scope for anti-competitive self-dealing and thereby mitigate their market power. The generating capacity sold amounted to about 7,500 MW for PG&E, 10,600 MW for SCE, and 2,200 MW for SDG&E, totaling 20,300 MW. This way the ownership of about 40 percent of the total installed capacity in California was transferred to IPPs.
- The fossil fuel based power generation was subject to a strict and unique environmental regulation. A "cap and trade" system called Regional Clean Air Incentives Market (RECLAIM) was implemented to control emissions of NOx from power plants. Under this system, every plant was allocated a declining number of emission permits each year. Each plant was supposed to redeem these permits according to the amount of their NOx emissions. A plant that didn't require all of its permits could sell the excess permits to another plant, the emissions of which had exceeded the permit allocations. Hence,

the permits were tradable and there existed a market for them. These permits represented an opportunity cost for generators and increased their costs of producing electricity. The purpose of this regulation supposedly was to reduce urban smog in the area.

- There were certain stipulations in the transmission stage too. For instance, the purchasers of power plants from the IOUs had to sign Reliability Must-Run Contracts or RMR contracts with the Cal ISO. The “RMR” designation for a generating unit implied that the owner had to commit himself to maintaining the unit and to responding in the best possible way to a directive from Cal ISO to operate the unit. Such contracts were formulated with the purpose of maintaining system stability and to overcome local congestion on the transmission system. The owners of RMR units were required to bid their entire contracted capacity into Cal PX for a specified term.
- The IOUs too were compulsorily required to sell energy produced by them into the PX and then repurchase energy from PX to meet their default service obligations, that is, the electricity demand of all those who didn’t choose an ESP. The underlying assumption was that most consumers would migrate from the IOUs to ESPs during the 4-year transition period. However, no more than 12% of retail demand migrated to ESPs, leaving the utilities in tizzy.
- In the distribution phase, a competitive transition charge (CTC) was included in the electricity bills of customers. This was done to recover the stranded costs of IOUs, arising to them from the introduction of competition. The stranded costs referred to the large investments made by utilities in the pre reform electricity market and which became non-remunerative after restructuring. The CTC was computed for each user’s bill as the difference between the regulated rate and the cost of supply. The regulated rate was frozen for all retail users until the IOU that served them recovered its stranded costs. The recovery period was supposed to last till December 31, 2003, after which retail sales would no longer be frozen. Throughout the underlying assumption was that the wholesale prices would always be below the regulated retail rates. Nobody ever cared to broach the possibility of wholesale prices rising above the retail prices.
- Further, all residential and small users were granted a 10-percent rate reduction for four years starting from January 1, 1998. This reduction was funded through the issuance of \$6 billion worth of 10-year rate-reduction bonds by a state-authorized trust.
- FERC besides determining the transmission use fees also regulated the Cal ISO system operation fees and many of the operating, commercial and technical protocols of Cal ISO and Cal PX. The CPUC, on the other hand, regulated the distribution activities of UDCs. The distribution component of retail tariffs for the UDCs was regulated on the basis of performance-based ratemaking.

Snafu In California’s Electricity Market (2000 – 2001)

As the year 2000 began, the wholesale prices for generation service continued to be lower than the regulated retail prices, utilities were still amortizing their stranded costs, and there was a long queue of new generation projects for permits to enter the market. However, this was only the lull before the storm. California’s new market arrangement was waiting to collapse. And it did.⁸

The Market Meltdown Begins: May 2000 - September 2000

Consider Exhibits 4 and 5. In May 2000, wholesale electricity prices started rising and in June increased above historical peak levels. The wholesale prices stayed high for the rest of the summer. In contrast to wholesale prices, the retail prices were either unchanged or declining over the period 1998-2000. During June 2000 - September 2000, the wholesale prices rose far above the fixed retail prices utilities were permitted to charge.

SCE and PG&E were buying power at \$120/Mwh and selling it at \$60-\$65/Mwh. SDG&E’s retail prices were deregulated beginning 2000. But as it passed along the wholesale market cost to its default service customers, there was a loud negative public reaction that ultimately led to a cap on its default service prices at \$65/Mwh. By September 2000, utilities were paying nearly three times as much for wholesale

⁸ This section is largely based on the following research paper: Joskow, Paul L. “California’s Electricity Crisis,” Massachusetts Institute Of Technology, November 28, 2001 accessed at http://econ-www.mit.edu/faculty/pjoskow/files/CALIFORNIA_11-28-01.pdf

power than they could charge for retail power. They began to lose a lot of money, confront serious cash flow problems and borrow heavily.

SCE and PG&E started pleading with the CPUC for a lift in the retail rate freeze – an entirely legitimate demand. The utilities had met all the pre-conditions. The market value of their remaining plants had exceeded the book value and the collection of generation-related stranded costs was also completed. The CPUC refused to oblige and there were no retail price increases for the rest of 2000. The utilities were left dithered.

The Meltdown Continues: October 2000 - December 2000

As the peak summer season ended, the electricity demand in California tapered off. However, the wholesale electricity prices didn't fall. This was because an unusually large amount of generating capacity went out of service in the same period – due to continued rise in natural gas prices, low imports and high NOx credit prices. Exhibit 6 shows the average amounts of generating capacity offline on a monthly basis for the period 1999 - 2001. Power suppliers argued that their plants were down – due to overrun in the summer and due to environmental constraints (to have new NOx emissions control systems installed, for instance). The government officials cited strategic reasons for plants being out of service. Whatever the reasons, from November 2000 to May 2001, as much as 16,000 Mw of generating capacity within the CAISO area (about 35% of total capacity) was out of service.

On November 15th, FERC came out with a report in which it admitted that California's electricity market was *fundamentally flawed*. It proposed numerous *reforms* for the state regulators to implement like increasing retail prices to reflect wholesale market prices, introducing real time prices at the retail level, allowing utilities to enter into forward contracts, speeding up permitting of new power plants, etc. However, Californian government officials were engaged in a mud-slinging match with federal regulators and did nothing during 2000 to respond to the emerging crisis.

In November and December 2000, wholesale prices soared to new heights. Retail price increases were still not permitted by CPUC. The utilities were paying almost \$400/Mwh for wholesale power and reselling it in the retail market for \$65/Mwh. By end December, the utilities were losing about \$50 million per day and had incurred financial obligations worth about \$12 billion to power suppliers. Ceaseless requests by IOUs to increase retail prices were either rejected or deferred by the CPUC. As time passed, PG&E and SCE started approaching insolvency. Several suppliers claimed that they were running up against internal credit limits and refused to supply further to the market unless payments to them were accelerated. This further reduced supplies to the market and aggravated the increase in wholesale prices.

The State Takes Over: January 2001 - June 2001

By the first week of January 2001, the utilities had plunged into grave credit problems. Power suppliers refused to offer supplies to them for fear of never getting paid. In mid-January, PG&E and SCE ceased making payments to power suppliers as bills from PX and ISO became due. By early January 2001, both PG&E and SCE were insolvent. Supply shortages followed. The credit of PX and ISO depended on the credit worthiness of the utilities that were their primary buyers. With utilities facing credit problems, the PX stopped operating its day-ahead market and filed for bankruptcy. The Department of Energy and the Federal Courts issued emergency orders compelling generators to continue their supply. The state was at its predatory best. What was supposed to be a successful electricity reform program had completely collapsed in six months.

By the end of January it became clear that suppliers would not generate electricity unless assured of payment by a credit-worthy entity. The utilities had no funds and therefore the state of California started buying power, through the California Department of Water Resources (CDWR). By May 2001, CDWR had spent about \$8 billion worth of taxpayer money doing this. CDWR also negotiated long-term contracts with generators and marketers. The purpose was to obtain better prices, to encourage generators to get their plants into service, to prevent exercise of market power, and to facilitate completion of new generating plants. These contracts, in aggregate, involved commitments of about \$50

billion spread over ten years. Had utilities been allowed to enter into long-term contracts at the time of restructuring itself, many of the problems that emerged later would never have arisen. Measures were also taken to speed up siting approvals for new generating plants and to encourage conservation. What's more, the retail prices were increased by 40%.

Despite these efforts, one third of generating capacity in the CAISO area continued to remain out of service. The availability of imports was also low. As a result, there were widespread electricity supply emergencies and several days of rolling blackouts. This can be seen in Exhibit 7.

The Californian government further intensified its efforts at conservation, speeded up the completion of new plants, and continued to enter into forward contracts with suppliers. Many electricity-generating plants were taken out of the RECLAIM program and the NO_x credit trading system was replaced with a penalty for exceeding emissions limits. FERC too responded by installing a new price mitigation plan that required generators to bid all of their unscheduled but available supplies into the ISO's real time market.

It was in early June 2001 that the first signs of change became evident. The wholesale prices registered a significant drop. This was the result of a combination of factors. The demand was low, the natural gas prices were significantly reduced, large amount of generating capacity had returned to service, and greater amount of imported power was available. That the average demand in the CAISO area fell for the first half of 2001 as compared to the same period in 2000 becomes clear from Exhibit 8. Consumers had, in a big way, responded to the price increases and the new energy efficiency programs of the state. In sharp contrast, generating capacity had increased and bidding had become competitive. This is evident from Exhibit 9. FERC's price mitigation program and intense scrutiny of suppliers by regulators, courts and media had induced suppliers to be on their best behavior. By July 2001, many in California had concluded that the crisis was over.

Reasons For The Crisis

The crisis in California was triggered off by a rise in wholesale electricity prices over and above retail prices in the summer of 2000. There were five interdependent factors responsible for this sky rocketing of prices and thereby for the debacle in California - rise in natural gas prices, increase in domestic demand for electricity, reduction in imports from other states, rise in the prices for NO_x emissions permits, and exercise of market power.⁹

Rise In Natural Gas Prices

Consider Exhibit 10. The exhibit depicts the spot market natural gas prices at Henry Hub (the most important natural gas trading hub in US) and the spot market price for natural gas delivered to Southern California. It is clear from the exhibit that from May 2000 onwards the natural gas prices across US were rising. Although natural gas prices soared to unprecedented levels throughout U.S. during the second half of 2000, the spot market prices for natural gas delivered to California rose to unusually high levels and stood five times higher than in the rest of U.S. in December 2000.

California was heavily dependent on natural gas fired generating capacity and this capacity was frequently used to balance supply and demand in the wholesale market. A mammoth rise in natural gas prices significantly increased the cost of electricity generation, which eventually was passed on as high spot market prices for electricity.

Increase In Domestic Demand For Electricity

Consider Exhibit 11. The exhibit shows the average monthly demand for electricity in California for the years 1999 and 2000. It is evident from the exhibit that electricity demand in California increased dramatically during the first eight months of 2000 compared to 1999. This increase in demand was attributed to strong economic growth and to an abnormally hot weather in the state.

⁹ Ibid.

With the supply of electricity stagnant, the tremendous increase in demand caused a significant rise in wholesale electricity prices. In the retail market, consumers served by UDCs were not supposed to pay prices that reflected movements in wholesale market prices and had no incentive to reduce demand. The unregulated ESPs were unable to compete with the fixed retail default service rates of UDCs and moved to the wholesale market where prices were much higher. The retail market crumbled and several entities suffered losses.

Reduction In Imports From Other States

Consider Exhibit 12. The exhibit depicts the average monthly imports of power into California for the years 1999 and 2000. It is apparent from the exhibit that the import of power into the wholesale electricity market came down in 2000 as compared to 1999.

The reason for this was the following. Heat waves had engulfed the entire region and as a result, the entire WSCC like California experienced a surge in demand. The out-of-state suppliers were occupied with catering to the increased domestic demand rather than supplying to California. The unusually low water levels in Northwestern U.S. further reduced the imports of hydroelectric power.

As mentioned earlier, the domestic supply of electricity in California was already low. With supplies from other states (on which California had historically depended) reduced, the supply situation worsened and contributed to price spikes.

Rise In The Prices For 'NO_x Emission Permits'

In an earlier section, I mentioned the RECLAIM system and the market for NO_x emission permits created therein. There were no problems with this market till early 2000. The prices of these permits were very low and permits allocated easily outnumbered plant emissions.

However, during April 2000 - September 2000, the gas-fired generators in Los Angeles started working much more than they ever had, to meet the increased electricity demand from the CAISO area. The emissions of NO_x by these plants increased. Consequently, the demand for permits increased even while the supply of permits declined as planned under RECLAIM. As a result, the prices of permits required to cover NO_x emissions from plants in Los Angeles multiplied ten times. This is fairly evident from Exhibit 13.

These natural-gas-fired generating units accounted for about 60% of the gas-fired capacity in California. With the prices of NO_x emission permits rising, the marginal supply cost for these units increased significantly. As these units passed on their increased costs, they caused a sharp rise in wholesale prices. How this happened can be seen in Exhibit 14. The exhibit depicts the marginal cost curves for all the gas-fired generating units in California taken together. The lowest marginal cost curve reflects gas prices prevailing in summer 1999. The next highest marginal cost curve reflects gas prices prevailing in early summer 2000. The highest marginal cost curve incorporates the effect of NO_x permit prices on the marginal generation cost. It is clear from the exhibit that at any given demand level, the competitive market prices would have been significantly higher.

Exercise Of Market Power By Generators

A firm is said to have exercised market power if it has raised market prices above competitive levels by reducing its output or by demanding an offer price (the minimum price at which it will sell its output) higher than its marginal cost.¹⁰

Paul Joskow and Ed Kahn have proved that about one-third of the wholesale electricity price in California during the high demand period of June 2000-September 2000 was due to the exercise of market power by certain generating units. Consider Exhibit 15. The exhibit presents estimates made by Joskow and

¹⁰ Borenstein S, Bushnell J and Wolak F. "Diagnosing Market Power In California's Restructured Wholesale Electricity Market," *National Bureau Of Economic Research* accessed at <http://www.nber.org/papers/w7868.pdf>

Kahn of the competitive wholesale market benchmark prices (the prices that would have prevailed under competitive conditions) and the average day-ahead PX prices that actually prevailed during May 2000 – September 2000. In the exhibit, a range of NOx prices has been taken by making alternative assumptions and the benchmark wholesale market price associated with the most appropriate NOx price for each month has been indicated in bold. It is clear that there is a significant gap between the competitive benchmark prices and the actual market prices for June, July and August 2000. The gap arises despite accounting for the effects of gas prices, load levels, import levels, NOx credit prices etc. Hence, the estimated price gap during this high demand period can, quite reasonably, be attributed to the exercise of market power (through the withholding of supply) by some generating units.¹¹

An example can be used to explain how this exercise of market power took place. Consider a situation wherein the demand for electricity is very high and inelastic, and the supply is tight with generators operating close to the overload point. In such a situation, a generator 'A' withholds a small amount of generating capacity. With the demand still high and supply reduced, the market-clearing price skyrockets far above the marginal cost of even the most expensive generator. This is precisely what transpired in California. Circumstances were such that even small individual suppliers came to possess and exercise market power without engaging in collusion and, as a result, prices were driven up.

Who Was Guilty – The Invisible Hand or The Visible Foot?

Having done all the analysis and examination of the crisis, the moot question can now be answered. Who was responsible for the ignominious debacle in California – the state or the market? Various academicians have hurled around all sorts of arguments, but these have only muddied the picture. A simple consideration of two bare facts tells us that it was the state that had acted culprit yet again.

Fact 1: The electricity market in California was a 'sham' market

In 1996, the Californian legislature passed the electricity restructuring law. The law was passed unanimously by all Californian legislators – a rare phenomenon - probably a reflection of the fact that the law had something for everybody. Administrators were appeased with the institution of two new quasi-government organizations – the PX and the ISO. Consumer groups got an immediate 10% rate cut. Environmental groups were assured of stringent emission rules and zoning restrictions. The utilities were given strong financial incentives like allowing them to securitize a fraction of their stranded costs by issuing bonds whose interest and amortization were guaranteed by the state.¹²

The legislators called this *deregulation*, which in typical political duplicity meant *re-regulation*. The regulations didn't go away, they were only restructured. This becomes clear when the following instances of regulation in California's electricity market are considered:

- There were onerous environmental controls on electricity generation. The construction of nuclear power plants was blocked and the building of additional dams for hydroelectric power was prohibited. In fact, existing plants of these types were dismantled. In the last decade, only natural gas fueled power plants had come up, and by 2000 such plants accounted for most of the state's generating capacity. The natural gas fired power plants were more expensive to operate than other types of power plants, and were prone to be unprofitable when exposed to competition. For these reasons, investors underinvested in additional generating capacity in California. This government-caused dependence on natural gas as the fuel for power plants was also responsible for the sharp rise in natural gas prices.¹³

¹¹ Joskow, Paul & Kahn, Edward. "A Quantitative Analysis Of Pricing Behavior In California's Wholesale Electricity Market During Summer 2000," *National Bureau Of Economic Research* accessed at <http://www.nber.org/papers/w8157.pdf>

¹² Sennholz, Hans. "How to create an energy crisis," Ludwig von Mises Institute, *The Free Market*, Volume 19, Number 7, July 2001 accessed at http://www.mises.org/freemarket_detail.asp?control=361&sortorder=articledate

¹³ Reisman, George. "California Screaming, Under Government Blows," Ludwig von Mises Institute accessed at <http://www.mises.org/fullstory.asp?control=575>

- The state through its regulations effectively determined what businesses the utilities could be in. The IOUs were forced to divest a large part of their generating capacity. The utilities were also barred from seeking out competitive contracts on their own and had to compulsorily purchase electricity in the state operated PX. The centralized and mandatory power pool prevented buyers and sellers of electricity from trading directly and from hedging against high prices. Requiring utilities to sell off their generation plants, and requiring them to sell any remaining load into the power exchange, denied utilities a key means of protecting themselves from price volatility.¹⁴
- While the wholesale prices were deregulated, the retail prices continued to be controlled. The retail price controls caused serious problems. They discouraged new firms from entering the market so that the customers never really got meaningful choices among electricity providers. They also diminished incentives to invest in new electricity generation plants or in new transmission lines to import electricity. All signals about electricity shortages were blocked from reaching customers thereby failing to encourage voluntary and gradual demand reductions. A wedge was created between wholesale and retail prices that led to billions of dollars of losses for the utilities. Competition remained flimsy in the retail market.¹⁵
- In addition to these regulations were miscellaneous other regulations like prohibition of utilities from entering into long term contracts etc which contributed to the price fluctuations in the electricity market.¹⁶

Having established the regulated nature of the market, a note needs to be made as regards the exercise of market power by generators. It has been well founded that certain generators reduced their electricity production in a situation of extraordinarily high demand and tight supplies, and contributed to the price spikes. However, it becomes clear from the above discussion that it was the state with its insidious regulations that created a fertile ground for such an exercise of market power. Supply in the state became tight not naturally but due to silly state controls like environmental regulations.

The Center for the Advancement of Energy Markets, in July 2000, ranked state deregulation plans in US according to how effective they were at the transition from monopoly to competition and customer choice. The sham market that was California becomes evident from the fact that the CAEM ranked California at a pathetic 16th position. The CAEM rankings can be seen in Exhibit 16.¹⁷

Fact 2: The electricity market in Pennsylvania is a roaring success

Governor Tom Ridge signed the electricity deregulation legislation in Pennsylvania in December 1996 - the same time California's deregulation legislation was passed.¹⁸ The implementation of reforms in the Pennsylvanian electricity sector too was phased in the same period as the Californian reforms - during July 1998 to January 2000.¹⁹ However, the Pennsylvanian electricity sector didn't meet the same fate as its counterpart. On the contrary, Pennsylvania has done exceedingly well on the electricity front.

¹⁴ "Frequently Asked Questions About California's Electricity Crisis," Reason Public Policy Institute, accessed at <http://www.rppi.org/electricity/faq.html>

¹⁵ Ibid.

¹⁶ Coulter, Ann. "The Joy of Price Controls," National Review Online, February 5, 2001 accessed at <http://www.nationalreview.com/coulter/coulterprint020501.html>

¹⁷ This data is based on the following two sources: "Frequently Asked Questions about California's Electricity Crisis," Reason Public Policy Institute, accessed at <http://www.rppi.org/electricity/faq.html> and Malloy, Ken. "RED Index 2000," Center for the Advancement of Energy Markets accessed at http://www.caem.org/website/docs/Publications/Malloy_RED_Index_2000.ppt

¹⁸ Electricity Generation Customer Choice & Competition Act, at www.puc.paonline.com/electric/elect_comp.asp

¹⁹ Considine, Timothy J and Kleit, Andrew N. "Comparing Electricity Deregulation In California And Pennsylvania: Implications For The Appalachian Region, Final Report To Appalachian Regional Commission, January 15, 2002, accessed at <http://www.personal.psu.edu/faculty/c/p/cpw/resume/ARCFinalReportJanuaryRevision.pdf>

Performance of the Pennsylvania Electricity Market

Pennsylvania stands out as the most successful electricity deregulation effort in the United States till date. Its performance offers stark contrast to that of California.

Electricity Became Cheaper

The most significant and immediate benefit that came out of deregulation was that electricity became easy on the pocket for Pennsylvania. The electricity prices fell dramatically subsequent to deregulation. The customers saw an average price decrease of 30 percent. In one year, rates fell three percent saving customers \$3 billion. The drop in prices was almost 10 times faster in the one-year since deregulation than they had been in the five years before deregulation. Not only that, they fell by much more than was required by the price caps in the deregulation plan.

In addition, the total outlay on electricity exhibited a marked decline and there were cost savings. For instance, in Hershey in Pennsylvania, by September 1999, the total spending on electricity fell by more than \$18,000 a month.

Table 1²⁰ and Table 2²¹ show how Pennsylvania's 1998 deregulation dramatically accelerated the downward trend of prices as measured by revenue per kilowatt-hour.

Improved Customer Choice

A good indicator of the level of customer choice and service options provided by deregulation in Pennsylvania is the number of companies offering to serve the state residents. Following deregulation, many new companies entered the market to serve consumers. As of April 2001, 130 power supply companies were operating and competing for customers in Pennsylvania.²² The deregulation plan was, hence, aggressive and allowed all state residents and businesses to choose electricity providers. In California, on the other hand, few power suppliers entered the market, and most of them soon left after failing to win many customers. Pennsylvania did not have the stringent retail price caps and competitive transition charge that protected incumbents and discouraged entry in California.²³

Availability of "green" or "renewable" power

The most unique feature of the Pennsylvanian success story was the environmental aspect that it took into account. The customers were provided with the "green power" option. The option was able to win 20 percent of the customers who switched suppliers even though they had to pay a small premium for it. In addition, the largest wind farm in the eastern United States is now in Pennsylvania. Similarly, GreenMountain.com, which completed the eight-turbine project in April 2000, is all set to enter the Pennsylvania electricity market hoping that customers will pay a slight premium to switch to cleaner power.²⁴ It is only with deregulation that this "green power" option has become available to customers.

Customer Switching

Of all the states in US that deregulated wholesale and retail electricity markets, Pennsylvania had the highest rate of customers switching to alternate generation providers. In April 1999, it was reported that the number of Pennsylvanians shopping for electricity was much more than in other states. In September

²⁰ Annual Electricity Overview 2000 - State Profiles, Energy Information Administration, http://www.eia.doe.gov/cneaf/electricity/st_profiles & Electric Power Annual 1999, Energy Information Administration, <http://www.eia.doe.gov/cneaf/electricity/epav1/fig15.html>.

²¹ Kiesling, Lynne. "Getting Electricity Deregulation Right: How Other States and Nations Have Avoided California's Mistakes," Reason Public Policy Institute, Policy Study No. 281, April 2001 accessed at <http://www.rppi.org/ps281.pdf>

²² Chris Kraul, "Charges of Gouging as Power Costs Skyrocket," *Los Angeles Times*, August 28, 2000. In Ohio, where retail competition began just this January 1, 2001, nearly 40 energy suppliers have applied to serve customers in the state. *Marketing Electricity Today*, November/December 2000, p.5.

²³ Kiesling, Lynne. "Getting Electricity Deregulation Right: How Other States and Nations Have Avoided California's Mistakes," Reason Public Policy Institute, Policy Study No. 281, April 2001 accessed at <http://www.rppi.org/ps281.pdf>

²⁴ DOE Energy Information Administration, "The Changing Structure of the Electric Power Industry 2000: An Update," October 2000, Chapter 8, www.eia.doe.gov/cneaf/electricity/chg_stru_update/chapter8.html.

1999, it became known that 450,000 customers had switched to other suppliers and by July 2000, the number of consumers switching providers had increased to 528,000. PECO, the eastern Pennsylvania incumbent, declared that 45 percent of its industrial load, 44 percent of commercial load and 18 percent of residential load had switched to non-incumbent providers. Other incumbent utilities in the state reported somewhat smaller numbers but the magnitude of the change was substantial. As of April 2001, nearly 600,000 customers had switched providers. This was nearly three times the number of customers that switched suppliers in California in twice as long a period.²⁵

Customer satisfaction

In August 2000, a poll was conducted by Power Perceptions, a market research firm specializing in electricity consumer research, of 2,068 residential electricity consumers. In this poll, more Pennsylvanians said they were satisfied or extremely satisfied with their electricity service than the national average (31 versus 24 percent). In other words, Pennsylvania's customers express the highest satisfaction with their electricity services in the United States. "If the name of the game is customer satisfaction, then Pennsylvania is winning," said Stephen K. Carter, executive director of Power Perceptions and the principal investigator of the study. "Pennsylvanians expressed high levels of satisfaction in almost every aspect of their electric service," said Carter.²⁶

Employment Opportunities

Notwithstanding the aforementioned benefits, the Pennsylvania electricity deregulation is also set to bring certain unusual benefits. The Pennsylvania Department of Revenue has predicted that electricity competition would generate 36,000 new jobs by 2004.²⁷ According to Robert Judge Sr., the Pennsylvania Secretary of Revenue, this job creation is a result of the multiplier effect. The electricity deregulation by bringing about huge cost savings and thereby allowing consumers and businesses to have more money to spend on more products has facilitated the creation of more jobs.²⁸

If there was something intrinsically wrong with electricity markets as was claimed by many politicians and economists in California, the electricity market in Pennsylvania would have failed as well. But, it didn't. How come the electricity market crumbled in California and worked in Pennsylvania? What made the difference? The answer is the degree of deregulation. As against its counterpart, Pennsylvania fully implemented deregulation for all customers of electricity.²⁹ While California's electricity market was phony, Pennsylvania was blessed with an extraordinarily free electricity market. Far fewer micro-managed political machinations characterized the Pennsylvania electricity sector.

In the Retail Electricity Deregulation (RED) Index released by the Center for the Advancement of Energy Markets in July 2000, Pennsylvania ranked the highest by far in progress toward customer choice. The report ranked the deregulation success of various states based on 18 attributes, and Pennsylvania ranked first in both their February and July 2000 studies. This has been shown in Exhibit 16.³⁰

Features of Pennsylvania's Electricity Market

The Pennsylvania restructuring plan was akin to the Californian plan in several ways. As in California, in Pennsylvania too the consumers could choose an electricity generator to provide them with power, but transmission and distribution continued to occur through regulated utility companies.³¹ Arrangements

²⁵ Kiesling, Lynne. "Getting Electricity Deregulation Right: How Other States and Nations Have Avoided California's Mistakes," Reason Public Policy Institute, Policy Study No. 281, April 2001 accessed at <http://www.rppi.org/ps281.pdf>

²⁶ www.powerperceptions.com

²⁷ www.db.state.pa.us/ctc/data/20000804.002.htm.

²⁸ PR Newswire, August 4, 2000.

²⁹ Kiesling, Lynne. "Getting Electricity Deregulation Right: How Other States and Nations Have Avoided California's Mistakes," Reason Public Policy Institute, Policy Study No. 281, April 2001 accessed at <http://www.rppi.org/ps281.pdf>

³⁰ Malloy, Ken. "RED Index 2000," Center for the Advancement of Energy Markets accessed at http://www.caem.org/website/docs/Publications/Malloy_RED_Index_2000.ppt

³¹ Electricity Generation Customer Choice & Competition Act, at www.puc.paonline.com/electric/elect_comp.asp

were also made to pay off electric utilities' stranded costs. What's more, prices to consumers were lowered and fixed for a limited period of time.³²

There were, however, important dissimilarities between the Californian and Pennsylvanian market structures that made all the difference. These have been outlined below.

Market-based default (or standard offer) prices

Like California, Pennsylvania too had retail price caps. But while California introduced low caps on retail rates or low default prices, Pennsylvania set higher default prices. Pennsylvania used market models and forecasts to set the standard offer price. Hence as against California, no undue benefits were given to incumbents. Alternative companies were free to offer competitive prices and this resulted in higher competition. With no price hurdles on the way, the alternative electric suppliers tried to attract customers with various incentives like different pricing packages and billing options, frequent flyer miles, better customer service etc.³³

Another difference was that the Pennsylvania legislation provided for retail price caps that varied by utility, depending on the Public Utility Commission (PUC) approval. For the total power bill and the non-generation portion of the bill, the rate cap was to remain in place for 54 months or until the utility in question has paid off its stranded costs. An additional rate cap stipulation states that for nine years or until stranded-cost recovery, the generation portion of the bill cannot exceed a PUC-approved rate for the generation.³⁴ The rate caps are embodied in the mandated rate reductions of four to 12 percent in 1999, depending on the utility.³⁵

Non-mandatory divestiture of generation

An additional difference was that the Pennsylvania legislation did not order the incumbent utilities to divest their generating capacity. The electric utilities were free to divest themselves of facilities or to reorganize their corporate structures. The only requirement was the unbundling of services i.e. the separation of services, for example, the separation of generation from distribution.³⁶ Although the legislation did not mandate that utilities sell their generation capacity, many did so as part of restructuring. For example, in December 2000 Duquesne Energy (DQE) completed its first phase of restructuring by selling its generation plants for \$1.7 billion. This sale accelerated its recovery of stranded costs well beyond expectations, and helped DQE cut residential rates 21 percent in by 2002.³⁷

Accelerated phase-in of all customers

This was an important deregulation achievement of Pennsylvania. Pennsylvania rolled out deregulation in January 1999 and by January 2000 all consumers in Pennsylvania were choosing their electricity generator. This two-phase process brought all of the state's consumers' competitive choices more quickly than in other states.³⁸

The use of regional markets and financial instruments

A final distinction was the use of regional markets and financial instruments permitted by Pennsylvania. There was no state-created system operator in the state to merge the system operations of utilities. In the eastern part of the state, the utilities had pooled their system resources into the PJM system

³² Considine, Timothy J and Kleit, Andrew N. "Comparing Electricity Deregulation In California And Pennsylvania: Implications For The Appalachian Region, Final Report To Appalachian Regional Commission, January 15, 2002, accessed at <http://www.personal.psu.edu/faculty/c/p/cpw/resume/ARCFinalReportJanuaryRevision.pdf>

³³ www.powerperceptions.com

³⁴ General Assembly of Pennsylvania, Electricity Generation Customer Choice and Competition Act, House Bill 1509, 1995, www.puc.paonline.com/electric/elect_comp_act.asp

³⁵ DOE, Energy Information Administration, www.eia.doe.gov/cneaf/electricity/chg_str/retail.html

³⁶ DOE Energy Information Administration, "The Changing Structure of the Electric Power Industry 2000: An Update," October 2000, Chapter 8, www.eia.doe.gov/cneaf/electricity/chg_stru_update/chapter8.html

³⁷ DOE, Energy Information Administration, www.eia.doe.gov/cneaf/electricity/chg_str/retail.html

³⁸ Kiesling, Lynne. "Getting Electricity Deregulation Right: How Other States and Nations Have Avoided California's Mistakes," Reason Public Policy Institute, Policy Study No. 281, April 2001 accessed at <http://www.rppi.org/ps281.pdf>

operator, and in the western part of the state, the utilities coordinated their own systems. In 2001, the Western utilities too entered into an extension of PJM. Thereby, almost all utilities ended up participating in this regional market operated by the PJM.³⁹ PJM's market, in operation since 1927, acted as a clearinghouse for generator supply and wholesale demand. PJM members were free to enter bilateral contracts and could purchase or sell power to meet unanticipated changes in demand through a spot market. These transactions enabled the participants in the electricity market to manage price volatility and provide reliable service. By late 2001, all of Pennsylvania's utilities were members of PJM.⁴⁰

Miscellaneous

There were sundry other dissimilarities. Unlike California, the state was not highly dependent on natural gas fired power plants. Power generation in the state largely came from coal-fired generators. New power plants were also allowed into the system. The Pennsylvanian generators were free to sell power either on a spot basis or on long-term basis as per their own best interest. The independent power producers were given the right to access the power grid with their own production, and many did so.⁴¹

The PUC has continuously tried to refine the deregulation framework, maintaining benefits for consumers but still creating an environment that is sufficiently attractive to potential entrants to generate true competition. For example, in July 2000 the PUC increased the default service rate that incumbents could charge, removing the incentive for customers to switch from entrants to incumbents for the summer months when rates typically rise.⁴² Pennsylvania also allowed competitive third-party metering service, which fostered competition.⁴³

The aforementioned factors together encouraged alternate providers to enter the market, diversify service offerings and create real competition thereby benefiting Pennsylvania's consumers.

Conclusion

It was mentioned earlier how the problems in California's electricity market have generated doubts about the benefits of electricity reform and deregulation. However, California's experience is neither representative of the recent deregulation efforts in the United States or abroad nor of the consequences of deregulation. In fact, the success stories of other states in US and abroad show that when done well electricity deregulation can greatly benefit both consumers and innovative sellers. It can not only deliver a business climate that encourages entrepreneurship but also consumer choice and consumer savings. In many jurisdictions that have initiated electricity reform, consumers are finding that deregulation has given them more bang for their buck. It is the method and manner in which the reforms are executed that is the determining factor. California's chaotic implementation of electricity restructuring should not deter us from bringing the benefits of the market process to our own electricity industry.

³⁹ Considine, Timothy J and Kleit, Andrew N. "Comparing Electricity Deregulation In California And Pennsylvania: Implications For The Appalachian Region, Final Report To Appalachian Regional Commission, January 15, 2002, accessed at <http://www.personal.psu.edu/faculty/c/p/cpw/resume/ARCFinalReportJanuaryRevision.pdf>

⁴⁰ Kiesling, Lynne. "Getting Electricity Deregulation Right: How Other States and Nations Have Avoided California's Mistakes," Reason Public Policy Institute, Policy Study No. 281, April 2001 accessed at <http://www.rppi.org/ps281.pdf>

⁴¹ Considine, Timothy J and Kleit, Andrew N. "Comparing Electricity Deregulation In California And Pennsylvania: Implications For The Appalachian Region, Final Report To Appalachian Regional Commission, January 15, 2002, accessed at <http://www.personal.psu.edu/faculty/c/p/cpw/resume/ARCFinalReportJanuaryRevision.pdf>

⁴² DOE, Energy Information Administration, www.eia.doe.gov/cneaf/electricity/chg_str/tab5rev.html.

⁴³ Malloy, Ken. "RED Index 2000," Center for the Advancement of Energy Markets accessed at http://www.caem.org/website/docs/Publications/Malloy_RED_Index_2000.ppt