

## Case Study From



## Electricity Restructuring in California<sup>1</sup>

*California economy, which accounts for about 13% of the U.S. economy, was the fastest growing in the U.S. through the 1990s. The state restructured its electricity industry in 1996. Vertically integrated utilities were unbundled and most of their generation assets were divested. A wholesale power exchange (PX) was established as the sole medium of trading electricity. Many companies entered the market creating healthy competition and the rates fell. But, starting May of 2000, prices started to surge, hitting \$750/MWh wholesale price cap several times in early summer. By the end of 2000, ex-utilities, once considered as safe as treasury bonds, owed more than \$12 billion to power suppliers and PG&E declared bankruptcy. California officials accused some trading companies, including now-bankrupt Enron, for manipulating the market and causing the high prices. At the same time, the Department of Water Resources (DWR), a state agency, started to buy electricity under long-term contracts as spot trading died and PX went defunct. The summer of 2001 did not turn out to be as bad as some expected thanks to mild weather, increased retail prices, slowing economy, some new generation and conservation. Under these conditions, DWR's electricity remained much more expensive than the market's and the agency has been forced to sell back some of it at a loss. The state has been able to renegotiate some of the contracts with marketers. In early 2003, some market manipulation is confirmed by the investigation of the Federal Energy Regulatory Commission (FERC).*

- *What went wrong in California's electricity industry?*
- *How were these problems addressed by officials and regulators? Could/should they have done things differently?*
- *What does the California experience for others pursuing electricity restructuring?*

### Background

California covers an area of about 163,707 square miles and is home to more than 34 million people. In 1998, California's gross state product (GSP) was measured at more than \$1.1 trillion, which accounts for almost 13% of the U.S. GDP and ranks the state as the sixth largest economy in the world. Per capita income was roughly \$32,300. Unemployment is low at about 4.7%. The state's GSP is estimated at more than \$1.2 trillion for 2000.

California has played a significant role in the consistent high growth of the U.S. economy in the 1990s largely due to information technology businesses expanding in the Silicon Valley and its growing population. The state is one of the leaders of the "New Economy" and is the largest producer of electronic equipment components, computers, advanced instruments and aerospace equipment, including aircraft, missiles and spacecraft. The state is also the largest provider of computer services, including software, programming and the Internet. Biotechnology focusing in medical and agricultural applications is another industry that is expanding rapidly in California. Finally, the entertainment industry centered in Hollywood continues to be a significant revenue generator for the state.

<sup>1</sup> This case study was prepared using publicly available information.

### Fossil Fuel Reserves, Production and Consumption in California (2000)

	Proved Reserves	Production	Consumption
Oil	532 million t. (3.9 billion b.)	37.1 MT/yr (741,000 b/d)	85 MT/yr (1.7 mb/d)
Natural Gas	68 bcm (2.4 tcf)	10.7 bcm/yr (1 bcf/d)	67.9 bcm/yr (6.6 bcf/d)
Coal	None	None	5.8 million short tons

Sources: Energy Information Administration, California Energy Commission.

#### *Energy Sector*

California is a net importer of energy and in particular fossil fuels. Although the state has fairly large oil and gas reserves and more can potentially be developed, environmental regulations limit new E&P activity. Nevertheless, California produced 741,000 b/d of oil and 1 bcf/d of gas in 2000. Consumption levels were significantly larger with 1.7 mb/d of oil and 6.6 bcf/d of gas. The state does not produce any coal and imports small amounts of coal, used mostly in power generation.

#### **Electricity Industry in California**

In summer of 1999, the state had 53,157 MWs of installed capacity. The State generated 38% of its power from natural gas, 15% from hydro, 13% from coal, 16% from nuclear, 10% imports and the rest from renewable sources. Electricity demand increased by about 11% from about 228 TWh in 1990 to roughly 253 TWh in 1999, while generation capacity decreased by almost 2% during the same period. As a result, the state has become more dependent on power imports. Estimated load of 264 TWh in 2000 surpassed the state's generation and import capacity. At certain times in 2000-2001, California needed about 11,000 MWs of out-of-state capacity. Less than 4,500 MWs of new capacity is projected to come on line in California by 2004.

#### *Key Characteristics of the Restructured Market*

After studying electricity restructuring around the world and in particular the UK experience, California passed *The Electric Utility Industry Restructuring Act* (Assembly Bill 1890) in September 23, 1996 to introduce competition in generation. The same year, Federal Energy Regulatory Commission (FERC) implemented Orders 888 and 889, which allowed for the wholesale trading of electricity and helped California to implement competition at the retail level. At the time, the average price of electricity sold in California was 9.48 ¢/kWh, the 10th highest in the U.S. (the average U.S. price was 6.86 ¢/kWh).

Before restructuring, a single, vertically integrated utility within a service area provided each customer with generation, transmission, distribution, metering and billing of electricity. This was a private monopoly regulated by the California Public Utility Commission (CPUC) and licensed to operate exclusively in a franchise area. Several such companies, called investor-owned utilities (IOUs) operated in California. In addition, there were several municipally owned utilities.

*Retail Choice.* The new structure allowed customers in most existing electric utility service areas to choose their electric service provider (ESP). Customers were no longer restricted to buying power from their local utility company. They could compare deals and pick the one which best meets their needs. However, this aspect of restructuring never took off in California, especially among the residential and small commercial users despite the creation of new market players called "aggregators" who could group the small users to benefit from economies of scale. Direct access was officially eliminated in September 2001 by the CPUC.

Transmission and Distribution Access. Transmission facilities were opened to power generators on a fair and nondiscriminatory basis, overseen by a new organization created by AB 1890, the Independent System Operator (ISO). The ISO, which is still active, is responsible for assuring reliability of the transmission system, and maintains reserve generators, which can provide additional electricity in the event that a generator owned by an ESP fails to operate or cannot deliver the required amount of power.

The IOUs retain ownership of their transmission facilities, but are required to transfer operational control of the facilities to the ISO. This transfer is designed to ensure that owners of the transmission system cannot favor their own generation facilities over competing generators in providing transmission access. Local utilities continue to operate the distribution system; but they are required to provide willing customers direct access to any seller of electricity operating in their area.

Power Exchange (PX). AB 1890 also created the Power Exchange (PX), modeled after the pool in the UK, to match buyers and sellers of electricity. The PX created a spot market where price information was publicly available. Electricity suppliers submitted bids on how much electricity and at what price they were willing to sell for each hourly period of the following day. The PX dispatched electricity from the lowest bid until the demand in any given hour was met. The price of the last unit dispatched became the market price for that hour. For the four-year transition period, the IOUs were required to bid most of their generation into the PX and buy the power they needed to meet their customer demands from the PX. In contrast, the new generators had the option to sell power directly to end-users. Following the problems in the California market, the PX is now defunct.

#### *Issues with Restructuring*

Stranded Investments. Before restructuring, the IOUs made investments in utility infrastructure, e.g., power generation stations and transmission lines, in order to comply with the CPUC requirements of reliable and sufficient supply. These investments were financed by the IOUs, based on the cost-of-service rate regulation, which allowed for the timely recovery of these investments. IOUs were concerned that, these investments could become obsolete or could not operate competitively in the new marketplace.

As a result, AB 1890 allowed for a competition transition charge (CTC) to recover these costs incurred by the IOUs on the behalf of the customers. If there were no restructuring, customers would continue to repay these costs to utilities through their normal electricity bills. Consequently, the CTC did not result in an increase in electricity rates from pre-restructuring levels.

Electric Rate Freeze and Reductions in Rates. Regulated IOU rates for agricultural, residential, industrial, and large commercial customers were frozen at their June 1996 levels until utilities recover stranded costs through the CTC or until March 31, 2002, whichever was earlier. Starting January 1, 1998, rates for residential and small commercial customers (defined as 20 kilowatts or less peak demand) were reduced by 10% and were to remain at that level until utilities recover stranded costs through the CTC or until March 31, 2002, whichever was earlier.

Old rate structures often bundled fixed costs with variable energy rate components. In the restructured market, rates were separated into generation, transmission, distribution, retail services, CTC, and public interest programs (energy efficiency, R&D, renewable energy, and low-income programs).

#### *The Crisis*

Starting in May 2000, California electricity prices started to surge and, before long, reached the \$750/MWh wholesale price cap (which was gradually reduced to \$250). The wholesale price averaged within the \$100 to \$200/MWh range each month during the summer and persisted at those levels throughout the winter months to the surprise of many observers. As the crisis evolved, the State accused the energy traders and generators for manipulating the market with trading schemes and withholding generation to raise prices.

At the same time, high prices were usually explained by a fundamental imbalance in the demand and supply of electricity in California, exacerbated by the increased inelasticity of both demand and supply at high levels of consumption. As a result of a rapidly growing economy, electricity demand in California increased quite rapidly in the 1990s. This growth happened at the same time as a shift in thinking about electric power supplies – a belief that the state could rely on imported electricity from the surrounding states, and that a restructuring plan to facilitate more competitive markets would enhance electricity imports by California customers.

The state maintained one of the strictest sets of environmental regulations and opposition to industrial sites and in particular power plants could be significant at the local level. This investment environment, coupled with uncertainty associated with the transition from a regulated industry to competitive markets, discouraged investment in new capacity. Generation capability in California decreased from 55,134 MWs in 1988 to 53,157 MWs in 1999. Above normal temperatures during summer 2000 and extended drought that impacted hydroelectric supplies in the Pacific Northwest only added to the growing tightness. Imports from other states were also limited due to not only the limited capacity of interstate transmission lines but also increased demand in other states. Wholesale prices started to rise in the PX.

In 1996, IOUs owned about 81% of the total capacity. After divestiture under AB 1890, in 1999, this share was down to 46%. Competing non-utility generators owned remaining 54%. In addition, companies were required to sell their generation into the PX and buy what they needed from the PX. As a result, utilities became dependent on the PX to satisfy their legal obligation to serve all of their customers.

However, with the existing California market design, utilities could not pass on price fluctuations in the wholesale market to their retail customers. Retail prices were capped at much lower rates than the wholesale prices. Wholesale prices exceeded \$100/MWh on average in the summer of 2000, yet utilities could only charge \$50 to \$60/MWh to their retail customers. As a result, California utilities continued to lose money. By the end of 2000, utilities were in more than \$12 billion in debt.

<b>Summary of key factors in California's electricity crisis</b>
<b>Demand &amp; Supply</b>
<ul style="list-style-type: none"> <li>• Demand grew quite rapidly in the 1990s.</li> <li>• Supply contracted               <ul style="list-style-type: none"> <li>• Disincentives for market entry                   <ul style="list-style-type: none"> <li>• price caps,</li> <li>• no retail competition,</li> <li>• regulatory uncertainty before AB 1890, and so on</li> </ul> </li> <li>• Environmental regulations and local opposition</li> <li>• Transmission constraints</li> </ul> </li> <li>• Inability to import as much as needed</li> <li>• Market manipulation</li> </ul>
<b>Market Model</b>
<ul style="list-style-type: none"> <li>• Compulsory trading from the power exchange</li> <li>• Wholesale-retail price gap: wholesale price cap is much larger than retail price</li> </ul>

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<b>Regulatory Environment</b>
<ul style="list-style-type: none"> <li>• Too many entities with conflicting positions: PUC, CEC, ISO, PX (now defunct), FERC.</li> </ul>

San Diego Gas & Electric (SDG&E), which divested virtually all of its assets by the spring of 1999, announced that it would pay off its stranded costs, ending the price-cap in July 1999. This allowed SDG&E to charge market prices and pass on to its customers the actual costs of the electricity. A study by UC-Berkeley showed that customers in San Diego reacted to higher prices by lowering their consumption – an estimated average decrease in demand of 1.6% to 9% – before AB 265 was enacted (see below). This decrease, most of which occurred in peak hours, would have cut the price electricity by almost 50%. Other IOUs (i.e., PG&E and SCE) were, however, under severe constraints since they could not pass on the actual costs to customers and had to absorb the associated losses. Governor Davis repeatedly stated that “If I wanted to raise rates, I could solve this problem in 20 minutes,” indicating that rate increases were not a politically acceptable solution.

To prove this political reluctance, the State enacted legislation (AB 265) in September 2000 to re-cap rates at 6.5 ¢/kWh for SDG&E customers (to be retroactively effective for selected customers from June 1, 2000). Acknowledging the supply side of the problem, another law (AB 970) authorized various agencies in the State to issue permits to operate power plants where necessary and to expedite the permitting process for new power plants. In early January 2001, the State granted temporary rate relief to PG&E and SCE to reduce the losses they sustained. The State also stepped in to buy power directly and make it available to the utilities at cost, which added up very quickly to about \$28 billions for just 2000. The Governor offered 20% rebates to those who could cut their consumption by 20% in the summer of 2001 relative to the summer of 2000. Finally, there were (and still are) efforts to expand real-time pricing to increase demand responsiveness.

The State also started buying electricity via the Department of Water Resources (DWR) from suppliers via long-term contracts. In early 2001, DWR entered into about 38 contracts ranging from 5 to 20 years with a total value of \$45-50 billion, which yields an average price of about \$70/MWh. The contracts involved a mix of fixed and flexible prices with many having take-or-pay clauses. In July 2001, DWR bought electricity at prices ranging from \$22 to \$75/MWh according to these contracts but was forced to sell at \$2/MWh at certain times as the market was saturated. The State claimed that it was taken advantage of during the signing of these contracts. In April 2002, the State was able to renegotiate some of the contracts and save \$3.5 billion. For others, legal action is under consideration in addition to appeals to the FERC.

The Federal Government and the U.S. Department of Energy (DOE) have also been actively involved with the situation in California. FERC made recommendations and issued a set of directives aimed at fixing malfunctioning markets in the State during the last few months of 2000. The impact of these efforts was to permit PG&E and SCE to supply their electricity demands from the generating plants they still owned as well as through long-term, fixed-price contracts rather than having to buy and sell in the PX. FERC also put in place a “soft” price cap of \$150/MWh in November 2000 replacing the variable price cap scheme proposed few weeks back by the board of directors of the ISO. Finally, FERC criticized the governing boards of the ISO and the PX as unmanageable and unrepresentative of the interests of 35 million California citizens.

In addition, the DOE has issued a rarely used emergency order to electricity suppliers to continue supplying power to the utilities, despite the risk of the large debts that the utilities

were amassing. Suppliers of natural gas, whose price had also risen sharply due to a supply shortage, were also precluded from withholding deliveries to the utilities.

Despite these measures, California continued to face the threat of shortages and rolling blackouts even in winter months (with reserve margins as low as 5% at times) when demand is usually significantly less than the summer peak. Not surprisingly, the price remained high. Normally, the state would have sufficient generation capacity for the winter months, but;

- The extended use of the power plants during the summer of 2000 to avoid blackouts resulted in a high level of planned and unplanned outages as well as refueling (nuclear plants) during the winter (as much as 12,000 MW).
- The extended use of the power plants during the summer of 2000 also caused some plants to deplete their allotted emission allowances. Emission allowances were available at high cost. As a result, some plants were forced to shut down.
- The increase in natural gas prices (caused by unusually cold winter and constraints on pipeline capacity to California) raised the cost of power from the gas-fired plants.

Consequently, California started to look for imports, but,

- One of California's major import sources is hydro generation in the Northwest, where a lack of precipitation lowered the amount of electricity produced from the hydro units.
- The state started to reach the limits of the interstate transmission lines as well as to have intrastate congestion between the south with excess supply and the north with excess demand.

After long resistance, the PUC raised the rates first in January 2001 about 9% and then between 25-50% (varying across customer types) in May 2001. These price increases along with the state officials' persistent calls for conservation are credited by significant decreases in demand from 2000 to 2001, estimated at 10% to 15%. Mild summer weather, slowing economy, some new generation and FERC's price mitigation plan have also contributed significantly to avoiding a much anticipated disaster during the summer of 2001.

### *Market Manipulation*

Throughout the crisis, the State claimed (and continues to claim) that energy traders took advantage of the market and used trading schemes to raise prices. State officials also accused generators for intentionally withholding capacity to create shortages and push prices higher. The State also had a case against El Paso, the company responsible for the operations of the east-west natural gas pipeline.

In early 2003, the case against El Paso was settled among the parties. In March 2003, FERC issued its *Final Report on Price Manipulation in Western Markets* concerning the other claims of California. FERC concluded that "The underlying supply-demand imbalance and flawed market design greatly facilitated the ability of certain market participants to engage in manipulation. In addition, the ability to pass through gas prices in electric power prices provided no check on gas buyers' willingness to pay."

Hence, FERC confirmed market manipulation while acknowledging the tight market conditions and flaws in market design as major facilitators of this manipulation. Accordingly, FERC authorized refunds to California although the refund amount of roughly \$1.5 billion is much less than the \$9 billion demanded by California. FERC also asked companies involved to defend their actions.

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