The California experience: From Deregulation Disaster to Flexible Power

Ted K. Bradshaw, University of California Davis, and
Woodrow Clark II, Aalborg Univ, Denmark

INTRODUCTION :

California has earned a deserved reputation for both catastrophe and innovation, and the recent world-wide attention given to its recent electricity crisis has components of both. In 1998, California was the first major state to implement sweeping deregulation, and while it followed a number of countries in Europe and elsewhere, it remained a significant early experiment in deregulation because of the size of the market and the speed with which it was implemented. During 2000-2001, what initially appeared to be a successful process of opening electricity markets to competition, turned sour, with 23? days of rolling blackouts through Spring 2001. Despite warnings that there would be persistent blackouts during the rapidly approaching summer, a crisis was avoided through interventions that put the state in a central role as energy purchaser, transmitter, and provider of conservation incentives.

While the story of who caused the crisis and what mitigated it is interesting[1], the purpose of this paper is more modest and forward looking. We will draw from a brief summary of what happened in California to distill some of the lessons that can be learned from the mistakes made, and then consider what the future will hold. While the restructuring experiment cost California billions of dollars in energy payments and many times that much lost to the economy, the crisis also provides the opportunity to refocus attention on the potential for a different and better future energy system that might enable the state to reach what the Governor calls "energy independence".

The future, we argue will be enhanced by the promotion of a flexible power system. In a complex society and economy, where energy uses and sources both increase rapidly, and where the environmental consequences of energy production are under increasing scrutiny, energy systems must be more than sustainable—it must be flexible to respond to the opportunities of sustainability and the challenge of complexity. We argue that a flexible power system is the next step in the transformation of power systems, which are now in a transitional phase that is displacing the vertically integrated utility system that served a specific locality. A flexible system is one that maximizes:

- Diversification with more renewable resources,
- Balance,
- Interconnection,
- Linkage to the community and economy, and
- Public good values.

The flexible power future is an emerging option, building on experimentation and policy being developed today. While the outline of the future flexible system is not yet clear or determined, steps being taken today assure that such a system will help California and other

[1] For more on this story see, WWClark and Ted K. Bradshaw, Flexible Energy Systems in Complex Societies (Elsevier forthcoming)

states or nations achieve independence from both bandits in the market and greedy regulated utilities.

CALIFORNIA UPDATE

Without repeating the statistics, it is worth noting that the State of California went into energy deregulation in a bi-partisan manner that substituted "public monopolies" for "private monopolies"(Lior, 2001; Woo 2001). Fully four years before (1997) the energy market in Calif was to be deregulated, the Public Utilities Commission ruled to move ahead in a unanimous decision to "throw open the state's $20 billion electricity market to competition will make California the first state to join a worldwide movement to deregulate utilities." (Marshall, 1997:1). In the optimism of the times, energy companies applauded the move.

Experts and politicians alike joined the band wagon which lead to deregulation along the laissez fair model established in the United Kingdom. " Competition should bring down prices and foster a host of new services -- along with new headaches for consumers who will have to chose among dozens of potential new suppliers." was the resounding chorus of approval. (Marshal, 1997, p.1). And in a fortuitous manner, a representative of Enron said: "We think the commission took a bold step. This hasn't been done anywhere else in the country." (Marshall, 1997: p.11)

As the then Governor Pete Wilson put it in 1996 in signing the AB 1890 bill to deregulate the California energy market:

> This landmark legislation is a major step in our efforts to guarantee lower rates, provide customer choice and offer reliable service, so no one is literally left in the dark" (Governor P. Wilson, 23 September 1996 Press Release)

Following the introduction of thousands of MW of independently produced power through the PURPA process, California's electrical system seemed to be balanced, with the extensive network of dispersed suppliers meeting demand, and concern at the Energy Commission diminished so much that forecasts and analyses stopped. Most of the fears of system control problems resulting from dispersed operation did not materialize (lots of small producers not under direct control of the utilities did not create management problems). However on the horizon were the immediate seeds of the current crisis. This series of events placed the California system clearly in the transitional phase, with the traditional vertically integrated utility no longer viable but the alternative not fully formed either. At least 7 system tensions were operating at this time.

1. Self generation and non-utility supplier pressure from large consumers

The lucrative contracts for independent producers who had cogeneration opportunities created an explosion in the knowledge and awareness of cogeneration opportunities. For example, The Chevron refinery in Richmond used about 5 percent of the total PGE capacity, and they planned to systematically add cogeneration capacity with a well publicized plan of self sufficiency. Moreover, the cost and efficiency of small gas turbine generators became so attractive that most large users of electricity at this time considered significant amounts of self-generation to be in their economic interest. The utilities panicked that their most lucrative market would vanish, and with PUC blessing instituted huge connection and backup power fees that by themselves largely removed the financial incentives for self generation. However, the large users did not accept these fees and immediately saw that the rates they were paying the utilities were much more than their non-utility options. Moreover, the large users saw that

wholesale prices out-of-state were low and they tried to find a way to get the power transmitted (wheeled) to them, but because of the utility monopoly on transmission these efforts were temporarily blocked.

During the recovery from the 1970s energy crisis California regulators used price signals to ensure conservation, instituting an inverse sliding scale of prices. Homeowners were given a low price base and then if they used above this the rate increased. Large users and businesses were perceived to have considerable conservation potential and were given the highest prices, in contrast to bulk discounts which were in operation in other parts of the economy. These higher prices also created an incentive for large users to be interested in decoupling themselves from the high priced utility grid.

In a regulated system the large users have significant political power, and in this case their interests were backed up by strong economic incentives to disconnect from the grid. However, the utilities, now awash in dispersed power and an inverted rate schedule needed the large users to help pay their costs. The utilities entered into a series of negotiations with the large users, and the regulators held hearings to try to resolve the potentially damaging crisis. Users pointed out the vastly lower electricity prices that their competition was paying out of state, and argued that the true cost of supplying them was greatly inflated in order to subsidize residential base lines.

The resolution came in the form of initiatives that lowered rates between the large users and the utilities on the promise that they would stay on the grid. Some customers developed cogeneration plants as well, but the threat of massive migration of large customers from the grid was effectively mitigated by sharply lower rates. More than anything else, the threat of self generation and the political power of the large users created a price pressure. The utilities needed to respond competitively in order to avoid loss of these customers entirely.

2. Out of state surplus

While California carefully scaled back its construction of new generation plants based on CEC initiated forecasting methodologies, other states continued to build excess capacity. By the mid-1980s California had a reasonable balance of supply and demand, while throughout the rest of the nation and west there was an enormous glut of electricity, and this had to be sold at bargain rates. California was a good market. Seeing the price pressure, California utilities quickly expanded their long distance transmission lines to bring this power into the state, and in a series of projects expanded links to Oregon/Washington and the Southwest. The out of state power was coming in at 1 and 2 cents per kWh where in-state generation was costing 2-3 cents and independent qualifying facilities had contracts from 5 to 20 cents, depending on peak load. Diablo Canyon cost at least 15 cents, though that did not cover the utility costs. In short, out of state power was a means by which the utilities could reduce their costs to meet the price pressure from the large users.

The surplus also contributed to the fact that during the early 1990s California had a large reserve margin due to contracts and high prices with qualifying facilities which translated into retail electricity rates that were up to 50 percent above nearby competing states (Faruqi et al, 2001 p 24). This became an economic development problem, especially as the state tried to pull itself out of the persistent recession that plagued it during the early 1990s.

3. Fuel costs fall

The Purpa contracts were calculated on the basis of steadily rising oil and natural gas prices in keeping with post- oil embargo experience. However, fuel prices fell instead, making the calculations in the standard offers seriously high

While utilities and all producers needed to make estimates of fuel prices under different scenarios, and the utilities participated in the calculation of fuel prices for the standard offers, the result was locked in for qualifying facilities that resulted in disproportionate costs. Moreover, there were no links to fuel prices for producers using wind and other renewable technologies. Thus, when fuel prices fell for gas fired utility plants, consumers benefited. But as fuel prices fell, contracts with many independent producers did not fall as well.

4. Nuclear plant Issues: Diablo Canyon

The Diablo Canyon nuclear plant was proposed by Pacific Gas and Electric as an attempt to produce low cost power. What started as a $300 million plant to generate 2000 MW turned into a $5.6 billion project. Upon completion, it became apparent that even under the most optimistic price forecasts this plant would not be able to compete with other options, but PGE was assured financial returns under return on investment regulation. After a series of regulatory hearings, PG&E was allowed to recover most of their costs and blend high priced power into their rate base for many years. While the issue of blame has not been fully resolved even yet, the cost implications for the state system remained and finding a way to merge high priced Diablo Canyon power into a system already perceived to be too expensive drove many policy decisions leading to deregulation.

It is fair to say that the enormous investment of capital in Diablo Canyon predisposed the California system to rely even more on low price out of state power to dilute prices, and finding a way to pay off debt from Diablo Canyon became a priority in the transition to deregulation. It also was the last major power plant constructed by the large California utilities, and its problems signaled to the utilities that the generation part of their operations would likely cease in the future and that their operations would be limited to transmission and distribution.

5. Dispersed system solutions abandoned

An immediate result of expanded power lines that could access very cheap power from out of state was that the marginal price for additional power now was lower than the average cost, while during the period when PURPA contracts were negotiated the opposite was the case—the marginal price for new production was higher than the average. As a result, conservation which had been a key piece of the California energy strategy no longer was as cost effective for the utilities who now needed sales volume to reduce costs. Not only did utilities pay more than 1-2 cents for conservation, they could dilute high price power from the independent producers and Diablo Canyon with the cheaper out of state power unless they increased demand.

Thus, the dispersed and renewable which had become a hallmark of the California energy system quickly vanished under the pressure of deeply discounted out of state power. Instead of an increasingly robust system instate, the utilities became dependent on short term opportunistic prices created by the out of state glut, and conservation started to make no sense.

6. Deregulation debacle

The botched deregulation of California's electrical system that went into effect in 1998 is too large and long a story for this paper, but for now the key is to recognize that the preceding conditions led to many pressures on the California electric system that deregulation was thought able to resolve. While many contemporary critics argue that there was no reason to consider deregulation because the system was not broken, in fact, there were so many pressures on the regulated electric system that some kind of change was inevitable, deregulation being just one option. Based on local experiences at the time deregulation was proposed and on projections

about what was likely to happen, deregulation seemed like a solution that would resolve a cascade of problems including the tensions of high prices, inability to recapture the costs of Diablo Canyon, pressures from large users, and need to better capture low out of state prices. The deregulation strategy generated widespread support and AB1890 passed with unprecedented support from the industry and politicians who all believed that prices would fall rapidly.

Deregulation was first proposed by the Public Utilities Commission in 1994 and approved by the legislature in August 1996. The plan had the following characteristics.

- Consumers were free to choose their electricity supply company.
- Utilities would freeze their 1996 prices at 10 percent below previous levels for 4 years, through 2002. The rate reduction was paid for by the sale of bonds that will be repaid.
- Utilities would be reimbursed for "stranded assets" of plants that would not be competitive, such as Diablo Canyon and high cost PURPA contracts through higher retail prices. Once stranded assets had been recovered, the price freeze would end.
- Incentives would entice utilities to sell half or more of their generation capacity to assure competition among suppliers. By May 1999 utilities had sold 17,683 MW capacity, or about 40 percent of total generation of 55,000 MW. (Woo, 2001:752)
- Power purchases would not be from long term contracts but would be limited to the spot market (hour and day ahead markets). The structure of the market rose prices for virtually all electricity to the high Market Clearing Price.
- Renewable energy and demand side management (conservation) were to be subsidized until 2002, at which time all technologies were to compete on the open market.
- The state would set up an Independent System Operator (ISO) who would manage the high-voltage transmission grid, and the California Power Exchange (PX) that would operate the wholesale market.

However, now that deregulation has been in place for over three years the consensus is that it is seriously flawed and that deregulation is the immediate cause of the problems facing the state (Faruqui et al, 2001). During the first two years when supply was ample, utilities made money buying power on the low price spot market, and they sold their power plants for more than expected to companies interested in operating them, often headquartered out of state. They set up independent companies to own some of their assets, independent of their power distribution companies. Prices stayed low during these first years of deregulation, but consumers did not see price competition through this transitional period because the wholesale market was consolidated statewide, and all retail suppliers had to purchase power through the same pool and at the same price. Some supply companies signed up customers based on "green production," but these customers had to pay a premium. Most customers remained happy with the mandated 10 percent rate reduction.

By the end of 1999 some of the flaws in the California deregulation scheme began to be visible. San Diego was the first utility to recover costs of stranded assets, and their price cap was removed, but instead of offering lower prices, they started having trouble buying low price power and passed the increases to customers. Eventually wholesale price would increase everywhere causing problems unable to be fixed within the states regulatory scheme. Deregulation in other states has not had the serious problems that developed in California, but the consensus is that these other states are having problems and that they are taking strong steps to assure that they do not repeat what has happened on the West coast.

7. End of out-of –state surplus by 2000

Deregulation worked successfully for the first two years simply because the utilities were able to buy great amounts of out of state power at very low rates that kept other rates low. However, the surplus ended by 2000, and with the utilities owning very little instate capacity, they could not respond. The immediate end of surplus was a record dry year in the Pacific Northwest. With snowpack water content as low as 35 percent of normal, the state lost up to 3000 mw of power during the winter, equal to three nuclear plants. High gas prices also drove up prices and restricted supply from some plants in the southwest.

Rapid economic growth in California and other western states combined to increase demand. While the increased demand was gradual, and construction of new supply was stagnant, the late 1990s saw a general tightening of supply throughout the west. Interestingly, the first blackout actually occurred in Nevada (Las Vegas) rather than California. Moreover, this end of surplus was not undetected. Many analysts worried that the low prices associated with excess supply would create shortages, and the data were widely available to support these concerns. However, in the deregulated environment, no entity had responsibility for assuring adequate supply because the market was supposed to take care of it. Moreover, in deregulation with its reliance on short term spot markets for supply, there were no viable systems for assuring that reserve margins were maintained because they are not adequately valued in a system that only pays for power delivered.

Moreover, it is the end of the surplus that enabled new players such as Enron that entered the market as brokers in what is turning out to be both an unregulated and a scandalous strategy that manipulated shortages into crisis. The full story of the role that Enron and other large energy traders played in California is just now being told, and the role that they played in manipulating the market increasingly seems to be based on rules they helped create in shaping both the actual structure of the deregulation legislation in California, but also the federal role and response.

THE CRISIS

Starting in the summer of 2000 deregulation became a problem rather than solution. Hot weather, drought in the Pacific Northwest, and population and economic growth in states that previously supplied California with surplus power reduced supply to narrow margins. With shortages and escalating prices, generators and brokers discovered that they could drive up prices by withholding some supply, and in documented but still being litigated moves, took power plants out of service for unscheduled maintenance or other reasons, exacerbating the shortages. Prices which had been one to three cents a KWh rose to 15 cents, and then climbed to 30 cents or more during January to March 2001, peaking at 75 cents during the top emergency hours. While prices toward the end of 2000 had been high, by early 2001 they had increased even more, which proved catastrophic and set in motion a system breakdown. Utilities had agreed to the cap on prices at the retail level, which on the one hand protected consumers from a pass-though of escalating prices paid to generators, on the other hand, the price cap reduced the utility ability to recover funds to purchase power. As the utilities defaulted on paying electricity producers, some independent suppliers withheld sales and others only continued selling because of court orders. The Governor ordered the state's Department of Water Resources to purchase electricity on behalf of the utilities, using the state's credit, to avoid total crisis. However, even with these efforts supply did not match demand, and the utilities were ordered to institute rolling blackouts in order to shed enough load to avoid system failure. By late Spring one cycle of blackouts had

affected virtually every customer, and forecasts were for frequent recurring blackouts all summer.

On April 6, 2001 the state's largest private utility, Pacific Gas and Electric--one of the largest in the nation, declared Chapter 11 bankruptcy. Southern California Edison was negotiating with the state to buy some assets, postponing similar insolvency. The state in order to maintain power supplies had in a series of steps purchased $7.6 billion of power with state funds that were to be repaid to the state by a bond offering that customers would then repay. As of now, the major utilities are still insolvent, the state is still buying power, and the bond to repay the state treasury has been postponed due to the weakening economy and disagreements over how repayment will be allocated.

The federal government and its regulatory arm, FERC, refused to assist. VP Dick Cheney commented in April of 2001 "Frankly, California is looked on by many folks as a classic example of the kinds of problems that arise when you do use price caps. Your problem is that your demand for electricity is up and your supplies have actually declined…Ultimately, of course, the peak power period this summer will exceed any capacity the state has and you'll end up in those rolling brownouts. There's no magic want that Washington can wave." (Shelton, 2002) Shelton and others report on "One particularly galling scheme was to buy electricity produced by California plants during blackout threats and sell it for huge profits in Oregon." (Shelton, 2002)

The financial pain for the state became enormously profitable for private companies. For example, Shelton calls Enron and other companies, "power pirates" and notes that they made from 400-600% profits. Not enough for Enron however. The price for electricity went from the average of $30 Megawatt to over $1000 in some cases but averaging about $300 Megawatt until the Governor imposed (against FERC wishes and threats) consumer price caps. The results was these energy suppliers and marketers or "gougers" as some now say "sucked $40 billion in excess profits out of California over a two-year period. . They broke Edison and PG&E and forced the state into power-buying business." (Shelton, 2002)

Transmission bottlenecks also emerged. The need to shift power from one part of the state to another and to tap out of state sources strained a number of sections of the grid, and in several cases power available in one part of the state could not get to people who were having blackouts.

During February 2001 the PX ended its role as wholesale purchasing agent, and changes took place in the market for wholesale power. In response to the crisis a number of efforts were done in order to avoid a total crisis during the approaching summer with its peak demand.

- The Governor and his staff negotiated long term contracts with many producers for significant amounts of power at around 6-7 cents per KWh, well below spot market prices of 15 to 75 cents. Many of these contracts extend for up to ten years at an estimated $43billion total cost.
- Legal and press scrutiny of producer and marketing companies increased, with concern over alleged unnecessary plant outages for repair or other reasons. Consequently, plants came back on line and fewer outages were experienced.
- Construction was completed on several major new power plants as well as peaking plants.
- Approval was speeded for new plants, and Construction was started on a variety of gas fired plants expected to provide adequate capacity over the next few years.

- The price cap was removed and consumer rates went up with surcharges, with large users having the highest increases.
- Consumers who conserved more than 20 percent compared to the same month in the previous year received 20 percent rebates on their electricity bills, and these price signals served to increase conservation. Estimates are that conservation reduced demand between 10 and 15 percent, with more during peak periods.

The claim has been made that California had not built enough new power plants since the early 1990s to meet demand. The state only added 672 MW in the last five years, compared to Texas which added 5700 MW over the same time period. (Woo quoted from Newsweek Jan 22 2001) While this indicates some lack of responsibility, it is important to keep in mind that the average retail price of power during the last five years was lower than utilities could build plants for, given the surplus power available. In other words, there was little need to build new capacity, and the fact that some plants were under construction indicates that planners recognized that supply may be getting tight. No one correctly estimated the extent to which weather, drought, mechanical problems, and the booming economy and population growth throughout the entire West would make the system so vulnerable so quickly, but this was not a simple problem on not building enough power plants. The point is simply that there had been so much surplus capacity that plant construction was delayed too long because of poor estimates.

The good news coming out of the crisis, if any, is that during the summer of 2001 supply has generally been adequate and forecasts of hundreds of hours of blackouts were wrong. Mild summer weather can be credited for helping avoid a summer crisis, but evidence is accumulating that the system is regaining stability and that many emergency responses have succeeded in stemming the crisis. For example, prices on the wholesale market have fallen to near what they had previously been, and power seems generally available at lower prices. However, the long term contracts negotiated with producers during the peak of the crisis now are higher than average spot market prices, leading to criticism of these long term contracts. The contracts, which are still not fully available to the public, are supposedly being renegotiated by the Governor's staff, though it is not clear whether this is either possible or feasible. While the legal issues raised by the crisis period of 2000-2001 will take years to resolve, it is becoming clear that California's electricity system has come back from the brink and is now entering a new rebuilding phase.

Today, legal and political forums and investigations are showing what many had long suspected, California enacted a flawed system but the crisis was caused by greedy private companies gaming the system through rules they helped write. Garbesi and Ramo (2002) in a careful review of the crisis write that the "lack of competition in California's electricity market was less the fault of poor implementation of deregulation, than a flaw in the concept itself." Perhaps it is best said by Gary South Gov Davis' chief political strategist "This is going to be the most egregious example in history of greedy and unethical corporate interests -- with the complicity of the U.S. government -- going into a state and raping it economically." (Shelton, 2002)

STEPS TOWARD A FLEXIBLE POWER SYSTEM

From the mess that California got itself into, some good is emerging. We can not see the future clearly, but we can see that a potential is shaping up for a new type of state power system that solves the problems of the traditional rigid vertically integrated system while taking

advantage of technological breakthroughs that promise to make the old system obsolete. At the same time, the institutional and regulatory system is exploring options that will facilitate the transition from the current system to the future.

The result of the crisis in California is that the private regulated utilities are less powerful and significant than they were before deregulation, and their financial problems leave them in or near bankruptcy. In addition, the old utilities retain their position as distributors of power to the local consumer, though there is an apparently irreversible breakup of the previously vertically integrated functions. Equally significant, the state has had to take over many of the functions that were previously in the private domain such as assuring supply and running the transmission system. If the goal of deregulation was to reduce state involvement over prices and supply of power, exactly the opposite happened.

The amazing thing about the deregulation crisis in California is that many of the economists who once preached the doctrine of the value of competition to drive down prices and to achieve an efficient power system are starting to change their mind. Professor Peter Navarro (2002), one of the champions of deregulation, just recently published an opinion piece in which he said that "electricity markets are vulnerable to monopoly," and that the nation's energy markets cannot function properly without strong regulatory oversight." He went on to say that he could imagine no possible way to allow free competition that would avoid the abuses of monopoly power in a deregulated power system.

California seems to have no interest in either returning to the previous regulated model or of moving in the same direction of deregulation that already failed once. Today the mood in California is still trying to learn what went wrong and how to protect against making similar mistakes again. Looking ahead, the state is taking incremental steps to try to fix problems as solutions become obvious. The following review shows the steps California is taking toward a new regulatory model for flexible power systems.

Privatization or Democratization?

The transition from the traditional vertically integrated utility and the emerging flexible power system is a struggle between two different perspectives on how to increase the public good—on the one hand "privatization" and the other hand "democratization.[2]" Deregulation was proposed under the premise of privatization, which is the neo-classical economist view that competitive markets reduce prices and allow maximum choice, while providing optimum conditions for technological innovation. The belief has been a cornerstone of the Thatcher reforms as well as the philosophy behind relaxing regulations in many other industries from banking to airlines. In all these cases proponents look at the declining prices and innovation, but also have to acknowledge gaps in service and occasional scandals such as the collapse of the American Savings and Loan institutions. The failure of the California deregulation can be added to the list of failures.

In contrast, democratization is a more limited reduction of regulatory control, where the emphasis is on giving consumers real choices rather than a "free" market. The goal of increasing choices seems to be consistent with helping reduce prices and lead the market, while maintaining a watchdog who protects the public interest. Choices that are real and flexible do not have to be tied to a neoclassical free market where monopoly interests can quickly form to undermine competition. Choices do mean that the consumer can purchase alternative solutions to their personal and public needs, recognizing that there are many ways to provide services. In choices,

[2] This point was made by Clark and Lund with regard to the Danish restructuring.

the abuses of monopolies are controlled under the premise that the public interest should be represented in making key market forming decisions. Instead of open competition, the democratization model gives choices through regulated licensing combined with public participation as it is needed.

Of course, no market system is purely one or the other, and especially during the current transition phase where there are few choices, any program aiming at increasing choices will adopt a mixture of competition and nurtured option creation. However, we feel that the future will be much more like the controlled choices of a democratic system than the brutish competition of the unfettered market. Indeed, one can argue that in the cases where deregulation of the power system has succeeded, it succeeded because choices were introduced slowly and carefully, assuring the public good, and revising the rules as disparities are discovered.

The parallel to professional sports can be made. In team sports, competition and winning are all important, whether soccer, football, baseball, or other sports. However, sports have never let competition be completely one sided, with most successful leagues adopting detailed and growing numbers of rules with broader scope over the sport. New players are drafted in a controlled manner so that the teams with the lowest numbers of wins select the best players first, and rules are set to help increase competition, even to the point of revenue sharing. Increased competition among all teams is good for the entire sport, as well as fairness in rules that limit home team advantages and assure consistent judging. In power too, the competition will be enhanced by more public involvement rather than less.

On the way to a flexible power system, the model of restructuring is to increase choices but to avoid free market competition. California may be thought a poor place to look for lessons on successful regulation, and indeed these directions are still in formation. The most undeniable lesson from the bungled deregulation is that choices in retail power provision or generation were more limited during the deregulation period than before, and options are perhaps even more limited today. However, current debate is moving to take another approach to increasing viable options for California power consumers.

Promote Renewable Technologies: choices

California was the leader in promoting and installing alternative and renewable technologies in the early 1980s following the first energy crisis. Under PURPA contracts were signed for over 15,000 MW of small scale, qualifying facility power generated largely by independent power producers. This equivalent of 15 nuclear power plants was designed and brought to contract within a period of just two years, overwhelming the utilities and causing an oversupply problem (Summerton and Bradshaw) However, under the pending deregulation, virtually all new construction came to a halt in the early 1990s. The major reason for this was that there was adequate power and with the changing regulatory scheme, no utility wanted to lock in any new production capacity, especially contracts which would be relatively expensive.

In the current regulatory climate, utilities and other generators have virtually no ability or interest in contracting for any new power, especially nontraditional or renewable power. To fill this gap the state is taking a multi-pronged public interest approach to increasing the production of renewable power. The immediate strategy for more power needs, however, to be incorporated into a long-term fuel source diversification strategy so as to limit future dependency on any one type of fuel. As Chart I indicates, the State by the spring of 2001 derived already 52% of its fuel supply from natural gas. All but one of the new power peakers and plants approved and funded are natural gas fired facilities. By mid-summer of 2001, 9000 MW of proposed new power plants

were natural gas fired. However, also my mid-summer, over 4000 MW of renewable energy facilities were under active negotiations to round out the California Power Portfolio.

The governor has declared the primary goal for the state of "energy independence" which means decreasing reliance on out-of-state generators and out-of-state natural gas for power production. While full independence is only a very long term goal, many steps are being taken toward the goal. Since the state is in the position of purchasing substantial portions of all the power distributed in the state since the collapse of the regulated utilities, this gives the state considerable leverage.

More importantly, several technologies are already nearly competitive with no further incentives. Wind power is the most attractive technology today, and while intermittent, it tends to be available most summer afternoons when most needed and new wind machines are being installed to replace smaller less efficient ones. Costs below 5 cents per KWh are common, and the lowest price examples are 3.5 cents.

Photovoltaic power is also getting a public boost. The California Net Metering Law (PRC 2827) allows utility customers who are self-generators to connect to the grid and to draw power from the grid when needed to supplement self generation, and then to run the meter backwards when the generator needs less than is produced. When the self-generator takes more from the grid than it put back they pay the difference. But when they generate more they do not get paid, but they donate it to the grid. A recent enhancement to the law balances these accounts over an annual period rather than month, which means that more self-generators are in closer balance at the end of the year. The maximum system size has also been increased from 10KW to 1 MW, making the California net metering law one of the most attractive in the country (Garbesi and Ramo, 2002:22) Current rebates of about half the purchase costs are boosting their applications—Assuming a 25 year life, photovoltaic power now costs about 8.5 cents after rebate, which displaces average consumer power costs of about 12 cents per kWh.

The state role in nurturing the expansion of these technologies is considerable. None of the proponents of wind or other technologies can solve all the problems alone—usually it takes several firms, long term contracts to assure financing, and assuring contracts and transmission links require brokering and problem solving.

However, the long term contracts and realization that demand is not as high as forecast, mean that the room for an aggressive addition of renewable and decentralized power is probably limited.

The future is enabled by technological changes which have added flexibility to the California power system, while many technological potentials promise to make the system more capable and robust than ever imagined. California has a large and growing renewable energy capacity, amounting to at least 5,500 MW of capacity (EPRI 2001 p 1-3). Geothermal and wind are largest of these, with substantially more wind being proposed. Most of the wind capacity was installed as part of the PURPA contracts with utilities, while geothermal projects somewhat preceded PURPA.

By all accounts, wind is the lowest cost new source of renewable power and it is competitive with fossil fuels.

California is developing a deep distrust of independent power brokers such as Enron, whose bankruptcy and subsequent evidence of price manipulation have enraged the public.

Expand Financing for clean power: The California Power Authority

The commitment to renewable and efficient power is serious and supported by the creation of the California Consumer Power and Conservation Financing Authority (CPA), a $5 Billion financing capacity in the state. The funds are expected to be leverages up two or more times, giving the state up to twice as much additional private funding. The funds will be used for a) clean energy financing, supporting renewable power and energy efficiency; b) strategic reserves for protection against future crises; and c) greening of public buildings. This initiative builds on the finding of a Gallup Poll that when asked if they favor different energy alternatives, the surprising finding was that more renewable sources scored the highest of all the options with 91% favoring it. Mandated appliance efficiencies scored second at 85% favoring and new plants at 81%. In contrast nuclear only had a 42% acceptance.

In order to expand the states grid based renewable capacity, two major barriers were noted by the Clean Growth report (2002:17): the lack of a wholesale market either with long term contracts or short term bidding opportunities. The second is the high cost of capital for financing projects compared to conventional power plants. The CPA is addressing the financing problem by making available some bond funding at lower rates to qualifying projects. In addition, the CPA is working to assure a market for the power if it were to be installed and start producing. Three actions to assure a market are to a) use the power for state facilities, b) require utilities to include a certain percentage renewables in their load mix, and c) have utilities offer "green power" alternatives to their customers. The latter is possibly significant since under the early part of the failed deregulation program in the state, up to 4 percent of customers were willing to pay a premium to get power from companies with "green sources".

The type of commitment to support of green solutions to the power crisis are illustrated by several additional efforts by the CPA. They have a program called "Greening the Peak" which aims to find renewable solutions to peak needs. Both an advanced load shedding program made possible by automatic meters and the use of renewable sources to supply peak power have been proposed. For example, some biogas operations with limited production are economical if they operate only on peak

The CPA will also finance and promote conservation and demand side financing. In total the CPA with a $5billion bonding capacity will be able to stimulate investment of over $17 billion and achieve a total contribution of 8,000 MW to the state.

Lead by example: State buildings

The goal of energy independence is being pursued by aggressive programs that require energy investment in state buildings. This program is aimed at creating a market for renewable technologies. The state invests over 2.5 billion annually on state facilities, and they are a major energy consumers. In total state buildings cost over 600 million in energy, water, waste disposal. While not all this can be eliminated, the investment potential to save and to lead by example is substantial. A number of specific projects are important (Sustainable Building Task Force, 2001).

- Sustainable building design program which will encourage state design teams to increase energy and materials efficiencies.
- A new state office building, the Capital East End project is being designed using state of the art technologies, with an expected savings of $400,000 annually.
- The Leadership in Energy and Environmental Design program developed by the US Green Building Council rates buildings, and the state has a supplement to that rating.

- The Fuel Cell Collaborative is working on fuel cell technologies which can be used both in cars and then hooked to buildings to provide distributed power in a community.
- The greening the Capital project seeks to define sustainable energy, water, and waste projects that can be championed by state agencies.
- The University, State University, and Community colleges have over 200 campuses which are major power users, and each is targeted to adopt energy efficient technologies. The university systems comprise nearly half of all state buildings, and they will become leaders in energy efficiency.

These various programs for the building program have been linked into a state infrastructure investment plan that sees state spending as a resource for sustainability and economic development.

These state building programs have a dual objective. They need to set standards that demonstrate that energy efficiency is viable and cost effective. Second, they will create a market for photovoltaic cells, better lighting, and efficient heating and cooling equipment. The greater market will entice manufacturers to drop prices and will encourage private sector buildings to adopt similar standards.

Expand interconnections between technologies

Woody, I do not have much here

Linking technologies together,
Finding environmental solutions
Dealing with pervasive uncertainty in system design

Aggregation

Under deregulation, consumers could form groups to purchase power from suppliers in the expectation that they could negotiate better prices. This process is called aggregation, and it includes
Woody, I have a recent PUC report on this

CONCLUSION

What does this all add up to? The goal of deregulation was to create competition whereas the goal of flexible power is to create more options. These options are a direct consequence of regulatory and policy intervention on behalf of the public interest. However, the new regulatory and policy role in California is not a restoration of the old regulatory scheme, it is a proactive set of policies on behalf of the civic culture in which the power system serves the goal of sustainability and environmental responsibility. California in this way is forging a new model of restructuring based on choices that support sustainable development

Choices in power supply. The state is moving boldly to assure that consumers have more options in terms of power generation. The emphasis on 20 percent renewable power sources by 2010 assures that the monopoly of natural gas fired central power plants will be weakened, and eventually reduced further.

Choices in self-generation. California is encouraging greater use of dispersed production that allows customers to supply greater proportions of their own power either through photovoltaic installations at their property or through cogeneration (heat-power) systems. Since self-supply requires some backup and grid connections, these contractual barriers are being broken down so that generators can contribute to the grid when they have excess power and draw from it when they do not. This is especially important with intermittent power sources.

Choices for conservation and load management. The state is also expanding the public interest programs in conservation through a variety of programs including the California Power Authority and fees charged to consumers. For the most part these programs provide incentives to increase important conservation activities that lower overall demand, especially at peak times.

In addition, it is likely that consumers will have more choices of rate schedules based on time of day pricing. The extent to which time of day will include "real time" costs based on the actual blend of contractual and spot market costs is not clear, though the largest purchasers are already operating with similar contracts.

Choices in retail provider. The state is continuing to see the value in offering a greater range of choices among retail providers, but it is not clear how fast this will expand. On the one hand, large industrial customers are already able to select from alternatives to the local utility, and this may expand. On the other hand, there is no immediate plan to open the system to presumed widespread retail competition. The state appears to be working with the nearly bankrupt utilities to assure that they recover and for the most part it is likely that they will continue as major retail providers. What will probably happen is that the previous utilities will retain their role as a regulated monopoly or near monopoly for the distribution of power to the local customer, but they will not have a monopoly over supply of power. New suppliers will be probably be added incrementally under the principles of aggregation where members of communities and industry associations or other bargaining groups will secure supplies to be transmitted and distributed by existing regulated utilities to final demand.

However, a very important caveat on retail choices is that all consumers, with the possible exception of municipal utilities (and their pre-deregulation customer base) that were not part of the original deregulation will have to share in the costs of the crisis purchases of power and the uncompetitive costs of the long term contracts that were negotiated by the state. The total costs of these statewide expenses will be a non-bypassable assessment on future energy sales. How these costs will be computed and allocated is still unknown, and any estimate of the costs will depend on the outcome of the current legal uncertainty over the contracts given the increasing evidence that Enron and other firms manipulated the market.

In addition, the expansion of power providers must resolve several problems created by the energy crisis, and it is not yet clear how these will be resolved. First, the state now holds long term contracts for about a third of the power that will enter the grid. It purchases power into a common pool from which distribution utilities draw, and it controls supply to balance the system demand so that the transmission lines do not get overloaded. How choice will be increased while the state controls so much power that will need to be shared by all consumers is still not resolved. Similarly, the current system still has not figured out how to assure that the capacity is built and maintained ready to meet the very top of the peak demand[3]. Peak demand

[3] Some peak demand is shaved by conservation or load shedding, while other demand is met by hydro plants and old of less efficient plants which are reserved just for peak periods. Utilities also meet peak demand through long distance transfers from other states where night has already fallen, or where weather differences result in less demand. However, it remains uneconomic to build or maintain peaking plants for the very highest loads.

means that capacity has to be available to serve demand for only a few hours on that hottest summer afternoon. This is very expensive, indeed, and no clear plan exists for meeting the demand under current models.

In sum, the evolution of the California deregulation debacle has moved in the direction of flexible power, which is about choices, rather than deregulation, which is about competition. The California experience has shown that deregulated competition leads to instability and fewer choices, whereas the current response is to carefully use regulation in the public interest to increase choices.

CONCLUSION CHAPTER 15: FLEXIBLE POWER IS A BETTER THAN THE OPTIONS TO MEET THE NEEDS OF THE FUTURE

Compared to the restructured but business as usual option, flexible energy objectives are clearly superior. Based on the five criteria we established to define flexible power, the advantages are significant:

- By relying on diversified and renewable sources through the transition period, the type of flexible energy systems we have described will be more reliable and less vulnerable to disruption. These systems will also be more environmentally friendly. The restructured centralized utility system without additional incentives will be large and centralized with several competing units providing power through traditional technologies. These power providers run the risk of dependence on fuel shortages and price increases as with oil and increasingly natural gas. The ultimate objective of diversified renewable sources reduces dependence on distant suppliers.
- Flexible power emphasizes outcomes from power use, thus balancing supply with conservation to achieve an optimum output for the need which is being met. The traditional business as usual competitive system has every interest in selling power and lots of it, and has no financial incentive to propmote conservation and reducing consumption, or even of shifting to less demanding periods or fuel types. A flexible system tries to meet consumer objectives at the lowest price which often means selling less power. Restructuring has systematically undercut demand management, but we argue that it has to take precedence over supply.
- The strength of flexible power is that it looks at energy system needs as an interconnected and interchangeable whole, so that fuels, electricity, and waste are all in dynamic balance. In the traditional power system the provision of electricity is separated from heat systems, but it should not be so. We need more cogeneration, but we also can save huge amounts by looking at the pairing of technologies so that they increase efficiencies for each other. For example, wind systems that produce storable electricity in the form of hydrogen that can be later used in a fuel cell, or photovoltaic systems that pump water into reservoirs at a higher elevation, achieve system efficiencies well above that of any single technology. In the traditional deregulated system these linkages are often made difficult by short term competitive market pressures.
- Flexible systems are closely connected to the community and to the economic development objectives of the community. Power should no longer be something that is distant from communities but it should be central to their economic development and

community objectives. Communities seem to want to be involved in their power systems, and there is currently new interest in public power. But, we argue, the form that more and better public involvement takes should look to new structures besides forming more traditional municipal utilities.

- In the post-restructuring world, flexible power is a public good to which private competitive firms play a part. Flexible power meets the goals of restructuring in that it gives each person, group, community, and nation the power to chart their own course and achieve maximum benefit at the lowest costs. It is highly competitive in that there is no one way to obtain power, but it relies on the public to define their public goals.

References

Clark W W, Jensen J D , The Role of Government in Privatization: An Economic Model for Denmark. International Journal of Technology Management Vol 21 Nos.5/6, 2001

Clark, Woodrow W. and Henrik Lund, "Civic markets:the case of the California Energy crisis", International Journal of Global Energy Issues. Indescience, London, UK, Dec, 2001.

Isherwood, William, J. Ray Smith, Salvador Aceves, Gene Berry and Woodrow W. Clark with Ronald Johnson, Deben Das, Douglas Goering and Richard Seifert, "Economic Impact on Remote Village Energy Systems of Advanced Technologies", University of Calif., Lawrence Livermore National Laboratory, UCRL-ID-129289: January 1998. Published in Energy Policy, Fall, 2000.

Marshall, Jonathan, "Electricity Monopoly Ends Jan. 1 (1998), San Francisco Chronicle, May 7, 1997, Headline Story. pp. 1 & 11.

Skelton, George, "Smoking Gun Shoots Down Bush View of Power Crisis", Los Angeles Times, May 13, 2002, p. B5.

Wilson, Governor Pete, Press release, "Energy Deregulation", Governor's Office, Sacramento, CA.