

POLICY MAKING AND IMPLEMENTATION PROCESS: THE CASE OF INTERMITTENT POWER

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Abstract

A direct result of de-regulation or privatization as it is called in Europe, was the selection of cheapest power supplies, meaning the more mature technologies applied to fossil fuels, rather than the selection of power from renewable or advanced clean technologies. Aside from dramatic cut backs from the investor owned utilities and only a fraction of funding available from the California Energy Commission (directed primarily to research and development rather than commercialization), renewable energy suffered from financial payment rules that penalized the very basis of renewable energy: that it is natural and dependent on wind and sun. If the wind did not blow or the sun was not shining, the intermittent resources provided to the central grid were fined. The renewable energy companies could not totally accurately predict their fuel supplies.

The result was an inherent constraint on intermittent energy. One solution was to change the rules for calculating the delivery of intermittent power. This was one avenue pursued by the State of California and necessitated extensive meetings between the wind industry and the Independent System Operators' staff to determine what would work reasonably, what rules needed to be changed, and what would be the business impact in bringing renewable energy into the power generation supply in California. All of this was accomplished over an eight-month period of time during 2001-02.

Key Words: intermittent resources, wind, solar, de-regulation, regulatory rules

Introduction

Over the summer of 01, the Economist ran one story about the California energy crisis, "How to keep the Fans turning" and another about the "California Economy: the real trouble." A third article after 911 in the 29 September 01 issue from the Science and Technology section on "Economic Man, cleaner planet" noted that market forces could play a significant role in a cleaner planet.

These together with several reports (e.g. Congressional Budget Office (CBO), "Causes and

Lessons of the California Electricity Crisis", 01) and other articles (e.g. "What Went Wrong in California's electricity Market", C-K Woo, 01) throughout 01 are illustrative about how a California, the fifth largest economy in the world, must cope with its vital public services under extreme conditions. The lessons are important for Americans and other nations, as severe security threats are now apparent in transportation as well as the energy and environment sectors. As Bachrach (01) illustrated in her analysis of various states and nations de-regulation laws and their impacts, market structural problems existed in all governmental entities.

Now (2002) two years after the energy crisis emerged in the Summer 00, most experts and commentators including the Economist, recognize what the California Governor and the citizens of California had been struggling with and had known: that de-regulation was not only flawed ("dysfunctional") but also was wrong in the first instance. Some scholars had issued warning signals in a variety of mediums (Isherwood et al. 00 and cited in Infrastructure, 01), including one international symposium dedicated to papers about energy and environmental planning, held in the California State Capital in the Spring of 1999. Climate change response and energy security are major objectives for energy policies in several western countries in the area of energy and environment. Both in Europe, Asia and in the USA the fulfilment of such objectives calls for integrated energy solutions with an emphasis both on energy conservation, energy efficiency and the utilisation of renewable energy sources. (Clark et al. 02).

Background

Subsequent events later in the fall of 01, provided more evidence on how wrong de-regulation had been in California. And perhaps, how wrong de-regulation was elsewhere.

The naive political promises of California administrations in the 1990s, as Republican Governor Wilson when de-regulation legislation was signed into law (AB 1890) in 1996:

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)

The facilities and flaws of de-regulation become apparent first with the events surrounding 911 and then later with the collapse of Enron Corporation in late 01. As most observers now agree, energy de-regulation was a failure in California, but the sector will not be re-regulated either. Neither will the energy sector be allowed to be subject to the so-called "market forces" "power" advocated by some economists. The past year in California was huge financial advantage taken by out of the state energy suppliers over the last year. The issue of energy generators reeking exorbitant profits can not be tolerated again under any political administration anywhere.

Yet as California has demonstrated those market forces must be structured in conjunction with the public sector. When market economist talk about incentives, they are referring to "government" at some level. Nevertheless this fact is never acknowledged or recognized for its valuable contribution to the market. What California experienced was a "transition" (termed used by senior staff at the California Independent System Operators - CAISO, and from the State's Department of Water Resources) to characterize the energy sector today.

As Democratic Governor Davis put it in his State of the State address in January (01), "a dysfunctional energy market, driven by out-of-state energy companies and brokers, is threatening to disrupt people's lives and damage our economy." The facts, documents and court records from the Enron bankruptcy case now concur with the Governor's analysis. Energy is a "common good" that can not be left to the devices of, as the Governor has stated and growing choruses of citizens agree, "skyrocketing prices, price-gouging and an unreliable supply of electricity."

Governor Davis further agreed with several commentators who noted that the real issue was the energy infrastructure. In fact, soon after his election, Davis formed a Commission for the Building of the 21st Century (Infrastructure,01) whose final Report was issued in the fall 01. The Commission addressed all the sectors (energy, water, transportation, education, etc) that are commonly identified and concluded much the same: "lousy infrastructure already costs money" hence infrastructure needs public-private partnerships to improve and rebuild. What that means for California, as the Economist concluded in its "The Fans are Turning" (01) article, is "By trial and by error, California continues to light the way for the rest of America." Perhaps the world, as the most dynamic industrial economy confronts and solves the energy crisis by turning it into an energy challenge and opportunity.

Since most economists' view markets in terms of supply and demand, consider both sides now that the summer of 01 has come and gone without the predicted energy crises occurring in California. The future of California can be seen in the programs, plans and policies instituted by the Government. Prior to the summer of 01, almost every analyst predicted that California would be about 5500 MW short of power from its total consumption of about 55,000 MW capacity.

The CBO is typical in its post-summer assessment: California's mild summer weather along with conservation and increased efficiency measures provided the state with enough power. However, for another series of *explanations* see the California Energy Commission *These* are two key elements and in fact the latter was the immediate policy focus for the Davis' administration unlike the initial skepticism voiced by Vice President D. Cheney in his "Energy Plan". Clearly, the citizens conserved energy at the average rate of over 10% per month (government and public building were at an even higher rate) over the spring summer supported by the State's "Flex your Power" program that gave incentives, rate reductions, and buy-back programs. The energy savings from all California's balanced the State's capacity and predicted shortfall such that no blackout occurred.

Nevertheless, the CBO and other economic assessments mistakenly argue that "the prospects for successful restructuring would also improve if consumers faced the full costs of electricity and were able to adjust their use of power in response to changing prices." It is this typically narrow economic analysis that is the problem. As Woo notes, the solution in California and other nation-states might well be in "a reversible regulatory system" which is "a safe alternative to an irreversible market system"

On the supply side, traditional economists have argued too that market power must be free or un-regulated to function properly. Again the CBO notes for example that "removing regulatory restrictions on the sale of power throughout the broad western (USA) market ... would help make the supply of electricity more responsive to changes in prices." Reality and facts prove a different cause and conclusion however.

What the State of California discovered, the California Public Utilities now has under investigation and the Federal Energy Regulatory Commission acknowledges was that the California energy suppliers were "gaming" the market such that they reaped enormous profits. While the legal and regulatory issues have not been solved yet, the need for stable and reliable market prices was solved in large part by the Governor in an Executive Order requiring the Department of Water Resources becoming the stable purchaser of power under long-term contracts. Granted that much of the power were immediate natural

gas fired "power peakers" for the summer and fall of 01. The market responded by lower natural gas prices creating a stable energy system.

Nevertheless, the long-term strategy required a more diverse energy portfolio and back-up or reserve power plan. Hence the Governor and legislature created the California Power Authority (PA) with \$5 billion in bond funds to build a long term, diverse and stable energy system. The PA only began operations in the fall 01, but its impact has already been felt. It has built upon the Governor's successes in renewable energy power generation systems and advanced new technologies. For example, the Wind Forum yielded over 1500 MW of new wind contracts which almost doubles the current 1700MW installed in the State. Even more significantly, the Wind Forum spun off a Working Group that successfully solved the issue of how to account for "intermittent power" (wind, solar and run of the river) by bringing industry, government and the CAISO staff together.

According to an audit of the CAISO: A state-appointed board should be disbanded and a new, independent panel should take the helm at the Independent System Operator, which runs most of California's power grid, a federally ordered audit recommended Friday. The in-depth study of CAISO operations, commissioned by the Federal Energy Regulatory Commission, could heighten a state-federal clash that has been simmering for more than a year over who holds the reins at the Folsom-based ISO. (Peyton, 1996)

Implementing Public Policy -- Intermittent Resources: the case of Wind

Intermittent generating resources (such as wind and solar) are fundamentally different than conventional resources with regards to how they affect the operation of the electricity grid. The difference results from the fact that unlike conventional generators, whose output is controlled by the operator, intermittent generators produce electricity in amounts that are dependent on factors beyond the operator's control, such as wind speed or cloudiness. The problem rest within the bureaucracy and ideology of government workers who were now either entrenched in organization like the California Energy Commission or the CAISO.

Nor most of these government experts, public policy was to provide a stable and reliable base load. Known as "integrated resource management" this meant that energy supplies had to be dependable and cost effective. At this time in history with the development of fossil fuels being very cost effective that natural gas, for California for example, would be far more cost competitive and lower than any renewable energy source. The key, as in any business operation, was to have a more

diverse fuel source, rather than (as seen below) be dependent on one main source such as natural gas.

The energy resource mix of today stands in sharp contrast to people's preferences. Fossil fuels and nuclear supplies 75% of California's energy today, a level of dependence that has serious implications for national security. An additional 16% comes from hydroelectric power, most of which is from large dams. Hydroelectric power brings with it a much larger share of the risk associated with traditional generation because of the annual uncertainty of the water availability.

This uncertainty can have significant consequences in the capacity capability and the energy availability between one year and the next. Another 2% comes from biomass, much of which is from direct combustion waste-to-energy plants. Only 7% of the energy comes from the cleanest renewable sources – geothermal, wind, and solar energy. (CPA, 02:8). The California Energy Commission (CEC) forecasts 7000 MW of load growth through 2006, which requires at least 8000 megawatts (MW) of capacity to maintain reserve levels. The CPA demonstrates, as seen below:

found that there is sufficient opportunity in energy efficiency, load management, renewables and decentralized generating resources to meet all of the projected load growth. In addition, to maintain a 22% reserve for California in 2006, the CPA believes it should facilitate adding 8000 MW. CPA can facilitate meeting the projected load growth or reserve margin gap by doing "business as usual" or by following a new "clean-growth" strategy. (CPA, 02:4)

Further the CPA argued that the "Business as usual" model would require 10-14 natural gas-fired power plants and essentially no new renewables.

A "clean-growth" strategy would provide essentially all of the needed growth in supply through efficiency, load management, distributed generation and renewables. Any natural gas-fired plants added would address specific reliability problems. Furthermore, the demand-side projects (efficiency and load management) can be stopped at little or no cost if loads do not grow because of larger than expected conservation or a sluggish economy. (op.cit., 4)

However, to develop such planned systems requires State planning and some control over energy supply. "The development of such integrated energy systems calls for new advanced technologies and radical technological changes. And the implementation calls for public regulation initiatives with respect of market economy and democracy." (Clark et al. 02)

Intermittent Energy Resources: wind generation in California

By the mid-1990s wind was supplying approximately one percent of the total state electricity supply. PG&E and SCE were accepting wind and solar power on an as-generated basis, and, in effect, using the rest of the system, most of which consisted of their own dispatchable generators, to balance supply and demand. The penetration levels of intermittents in their systems (PG&E 1.5% wind, SCE 2.25% wind and 0.67% solar) was accommodated easily by the grid operators using the traditional regulated-utility model of operations.

Deregulation separated electricity generation from transmission and distribution (T&D). An independent agency, the CAISO, was created to run the transmission system. The ISO has no generating units of its own, nor is it a load serving entity. It runs by the grid on behalf of generators and load-servers through a system of rules and protocols that require Scheduling Coordinators (SCs) to submit hourly balanced schedules of load and supply. Real time adjustments due to deviations from schedules are made by the CAISO, and their cost is charged to the relevant party(ies).

The scheduling rules developed by the CAISO required rigid scheduling of all generating sources, imposing significant charges on generators that either over or under supply from their scheduled deliveries. This is an onerous requirement for intermittent generators.

The rules did allow SCs to balance generating sources within their own portfolios. When deregulation went into effect all of California's existing intermittent generators were classified as "utility resources" because the state's two large IOUs purchased all of this power under long-term PPAs. Thus all of the state's intermittent power was being scheduled by the SCs for PG&E and SCE against their respective loads. The utilities continued to serve most of the load in the state, continued to accept intermittent energy on an as-delivered basis, and continued to balance their own portfolios to accommodate the unpredictable variability of their intermittent resources. Thus, the transition to the ISO had little impact on the existing intermittent generators in the state.

While existing intermittent generators could live with the scheduling rules imposed by the new ISO, potential new intermittent generators could not. New intermittent generators would not be classified as utility resources, even if they sold their output to the utilities. Therefore, the utilities would not be willing to use their other resources to accommodate the unpredictable output of a new intermittent generator. And nobody else would either, or even could. Result: there was no market for new

intermittent resources in California, even during the height of the energy crisis.

Solution to the Problem

New scheduling rules for intermittent resources were a necessary prerequisite to the development of new wind and solar generating capacity in California. The rules had to allow intermittents to schedule their energy output in the ISO's forward markets without penalizing them for uncontrollable deviations from scheduled output. The amount of deviations would be minimized by the application of sophisticated forecasting, and the residual cost of accommodating intermittents into the system would be spread across the system.

According to the CPA (02:12), new plant that has come online since 1999 or is currently under construction is 96% natural gas, 2% wind, 1.2% geothermal, 0.6% biomass, and 0.1% hydro. Continuing in this direction will further increase risk and insecurity in the California electricity market, contrary to the preferences of Californians.

The consensus solution was to create a statewide independent forecast of intermittent output that would be used as the basis for scheduling these resources into the grid. The forecast would be provided on a timely basis to allow day-ahead and hour-ahead scheduling of intermittent energy. Intermittent generators that use the official hour-ahead forecast for their schedule are immune from hourly charges for deviations from schedule. A monthly tracking account will be used to ensure that deviations from schedule are random and due to natural variability. Based on initial modeling, the deviations are expected to be small, and the costs spread to load will be minimal.

Public Policy Process Implementation

Initial meeting between Governor's Office and CAISO in April 2001. CAISO states that our proposal to spread the special costs inherent to intermittency across load rather than charging it to the intermittent generators would not fly. The CAISO's initial counterproposal: Relieve new intermittent generators of all scheduling requirements by having them sell their electricity into the ISO's real-time market as a price-taker, rather than selling it in the market to users or providers and scheduling it against the buyer's load. This proposal had no chance--new intermittent projects would not be financable on this basis, and intermittent generators are ill suited to the needs of the real-time market. Even the willingness of the CAISO to impose a zero floor price for intermittents did not make this a viable solution.

Continued meetings with some Broad representation lead to the development of a statement of principles to create special scheduling rules for new intermittent generators. An initial attempt for CAISO Board action on June 21, 2001 was delayed, and the parties instructed to work towards building a consensus approach.

A consensus statement of principles was adopted as a CAISO Board Resolution on July 25, 2001, and a working group process was created to craft a program that would implement the statement of principles. The Intermittent Resources Working Group's charter was: to establish a common understanding of the direction provided by the preliminary principles adopted through the Board of Governors' resolution, and to define assignments and a schedule of milestones necessary to present a complete consensus proposal, including tariff language, at the September Board meeting. (CASIO, Notes, 01-02)

The working group's consensus proposal was adopted unanimously by the Board on September 20, 2001, and CAISO staff were instructed to draft tariff language to implement the proposal. The tariff amendments should have been submitted to the FERC in January 2002, for adoption sixty days later. On March 28, 2002 FERC ruled in favor of the CAISO Tariff and Rule Changes stating:

The Commission commends the Cal-ISO's efforts to facilitate entry of intermittent resources, and to develop the Intermittent Resource Proposal through extensive collaborative discussions between the Cal-ISO, regulators, utilities, and other market participants. With this proposal, the Cal-ISO provides a fair and effective means of accommodating the scheduling needs of intermittent generation, while avoiding imposing additional costs on other market participants. (FERC, March 28, 2002)

As the American Wind Energy Association Press Release noted about the historic FERC decision, it's hard to overstate the importance of this to the wind energy industry. We were subject to unfair penalties of up to 100% of the cost of our product under the traditional system, which was a terrible economic burden and a potential show-stopper for future development in California. Instead, FERC has found that wind energy's transmission needs can be met fairly, without extra costs for either the transmission system or for owners of other types of power plants. (AWEA, 02)

Conclusion and Future Impact

Proper implementation of these new scheduling and tariff rules will open the California market to new intermittent renewable generation. And as James Caldwell, Director of Strategic Planning for the American

Wind Energy Association notes, the FERC ruling "should help wind's chances of obtaining similar nondiscriminatory treatment in other major areas of the country, such as the Pacific Northwest and the Midwest, where the penalty issue has yet to be resolved." (AWEA, 02). The benefits of low environmental impact, rural economic development, and source diversity for the state greatly outweigh the small cost of accommodating intermittent generators into the electricity grid.

The term "Grid Renewable Energy" is used to describe large renewable projects installed at a centralized location, where there is a high concentration of the renewable resource (e.g., wind, geothermal, biomass, solar). Many sources of grid renewable power are competitive with the 8 cents¹ per kWh that the CEC forecasts will be the generation component of the retail rate for IOU customers over the next decade.

California appears to be the first nation-state to define and implement "sustainable development". Its citizens and leaders are ready. As the Economist has noted before, the world is watching for California to take the lead again.

References

Abraham, Spencer, "Deregulation is Working", LA Times, January 14, 02: A17.

American Wind Energy Association, "FERC endorse Fair treatment of wind in wholesale electricity Markets", Washington, DC. Press Release, March 28, 2002.

Bachrach, Devra, "Energy Matrix", University of California, Berkeley, (March 01)

Bay Area Economic Forum, "California at a Crossroads: Options for the Long-term reform of the Power Sector", McKinsey & Co. San Francisco, CA. October 2001, pp.1-56.

Borenstein, Severin, James Bushnell, Christopher R. Knittel, and Catherine Wolfram, "Trading Inefficiencies in California's Electricity Markets", University of California, Energy Institute, Power Working Papers Series, October 2001

California Energy Commission. Natural Gas Infrastructure Issues: Committee Revised Final Report. Sacramento, CA. September 2001.: pp. 1-122.

California Energy Commission. Investing in California. Sacramento, CA. June 2001.

California Energy Commission. Summer 2001 Conservation Report, Sacramento, CA January 2002.

California Independent System Operators (CAISO), Report Series from "Intermittent Resources Working Group: Board Resolution on Imbalance Rules, Consensus Proposal and Tariff Revision Filing, and Wind generation forecasting" August-November 2001.

California Independent System Operators (CAISO), Report Series from "Intermittent Resources Working Group: Purpose and Notes. July 2001-February 2002.

California Consumer Power and Conservation Financing Authority (CPA), "Clean Growth: Clean Energy for California's Economic Future," Sacramento, CA.: Feb 15, 02, pp.1-39.

Clark, W W., Henrik Lund, Ted Atwood and Bryan Jenkins (eds). Energy and Environmental Planning: toward a more sustainable world. To be published by Elsevier Press, 2003.

Clark, Jr., WW and Henrik Lund, "Civic Markets: the case of the California Energy Crisis", International Journal of Global Energy Issues, UK: Interscience. December 2001.

Clark, Jr. W W.: "Publicly-Funded Environmentally Sound Technologies: The Case of the US. Report for United Nations (one of ten industrialized country studies). New York, NY and Geneva: 1998.

Clemmer, Steven, Deborah Donovan, Alan Noguee, and Jeff Deyette. Clean Energy Blueprint: a smarter national energy policy for today and the future. Union of Concerned Scientists with American Council for an Energy-Efficient Economy, Tellus Institute, Cambridge, MA 2001, pp. 1-39.

Congressional Budget Office (CBO), "Causes and Lessons of the California Electricity Crisis," September 01.

Economist, "How to keep the Fans turning," (July 01)

Economist, "California Economy: the real trouble" (August 01)

Economist, "Economic Man, cleaner planet," (Sept ember 01)

Electric Power Research Institute, "California Renewable Technology Market and Benefits Assessment, Final Report to the California Energy Commission", November 2001.

Federal Energy Regulatory Commission (FERC), California Independent System Operators, "Intermittent Resources Ruling" Docket Nos. ER02-922-000 and EL02-51-000) <<http://cips.ferc.fed.us/cips/default.htm>> March 28, 2002.

Infrastructure Commission Report: Building for the 21st Century, Governor Gary Davis and Co-Chaired by Secretary Maria Contreras-Sweet and Lieutenant Governor Cruz Bustamante, Sacramento, CA 2001. Web site: <www.bth.ca>

Isherwood, William, J. Ray Smith, Salvador Aceves, Gene Berry and Woodrow Clark with Ronald Johnson, Deben Das, Douglas Goering and Richard Seifert, "Remote Power Systems with Advanced Storage Technologies for Alaskan Villages", (University of Calif., Lawrence Livermore National Laboratory, UCRL-ID-129289: January 1998), London: Elsevier, Energy Policy, 2000.

Kerry, Senator John, "Energy Security is American Security" Center for national Policy, Washington, DC. Jan 22, 02.

Lund, Henrik, and Woodrow Clark, "Management of fluctuations in Wind Power and CHP comparing two possible Danish Strategies", Energy Policy, UK: Elsevier Press, 2002.

Martin, Mark, "California system was easy pickings: Enron helped build market, then exploited weaknesses," San Francisco Chronicle, San Francisco, CA. Feb 3, 02: p.1.

Peyton , Carrie , "Audit urges new leadership for power grid", Sacramento Bee, Sacramento, CA, January 26, 2002: 1.

"Pumped Storage: integrated pumped storage and wind energy overview 20020305" Confidential Report. California Wind Developer. February 2002.

State of California, "Strategies for a Climate change Initiative", Draft internal document Climate Change Interagency Task Force, December, 22. 2001: pp. 1-25.

Woo, C-K, "What Went Wrong in California's electricity Market", Energy, August 01.