

Was electric deregulation a bust?

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Last year, California was reeling from electricity deregulation. Was it deregulation's fault? Does physics play any role? We shall discuss these issues.

California players:

The governor
Gray Davis

The California legislature

The former governor
Pete Wilson

The former California
legislature

FERC—the Federal Electric
Regulatory Commission

The California ISO

(Independent System Operator)

Enron

El Paso

Williams Companies

Dynegy

Duke

Los Angeles Power & Light

etc.

Pete Wilson demanded deregulation, and the legislature went along. They were the first state to deregulate electricity, so they made it up as they went along.

Gray Davis wanted to ignore the problem and let the marketplace work, until it really hit.

Then **FERC** (with a little help from Dick Cheney) wanted the marketplace to work. Enron influence with the Bush administration led to dismissal of former FERC chair Curt Hébert and appointment of Patrick Wood, III in his place.

In 1996, George Dunn, then Governor Wilson's chief of staff, warned federal regulators that "parts of the proposed electricity market 'are invitations to classic gaming.'" The California ISO issued a report soon after the legislation passed that pointed to lagging plant construction, problems with the grid, and the "advanced age" of plants. The Power Exchange pointed to evidence of price spikes and advanced concerns about possible gouging.

Officials of the FERC, the California Public Utilities Commission, and the California Attorney General have found evidence that the state's utilities (and state coffers) were soaked by game-playing on the part of the utilities. The utilities played games by using the faults unknowingly written into the law as a result of lawmaker ignorance to force California's utilities to pay exorbitant prices (in some cases hundreds of times greater than normal).

On July 9, 1998, at a time when the electricity typically cost \$40 per megawatt-hour (4 cents per kilowatt-hour). All of a sudden, the cost went to \$2500, then to \$5000. Three hours later, it returned to its original cost. On July 13, the price rose to \$9999 for four hours before falling to \$10. Because the ISO needed the energy so badly, it actually paid the \$9999.

According to California Public Utilities Commission President Loretta Lynch “charts that track electricity prices and power generation at three plants on a single day last November [2000]. After the plants reduced production during the middle of the day, the graphs show, the state was forced to declare two separate power emergencies because electricity reserves had fallen seriously low. The shortfall in supply helped cause a spike in prices ... [and] ... the three plants suddenly increased their electricity production to almost full capacity, allowing them to capitalize on the much higher rates.”

In late 2000 and early 2001, the crest of the energy prices in California, one-quarter of the state's generating capacity was offline for both scheduled and unscheduled maintenance.

“Starting April 25, [2001] and continuing for about two weeks, Williams Cos. deliberately withheld power from two plants under contract to deliver electricity at set prices to the Independent System Operator, according to later findings by federal regulators. The ISO, which was set up to make certain lights stay on in this state, was forced to buy more expensive power from Williams at prices close to **\$750 a megawatthour.**”

D. Kasler, J. Hill, and S. Stanton, “Energy crisis built steam as officials mishandled it,” *The Sacramento Bee*, 23 September 2001.

Glenn Johnson, a certified power plant mechanic who worked for San Diego Gas & Electric and then for Duke, described the company's ramping in testimony “They were running the units like yo-yo’s. They would run them up, and run them down.”

Duke Energy destroyed working parts, withheld power supply, and took other actions to drive up the price of electricity.

Enron's internal memos show the foreknowledge behind their actions, and how strategies named "Fat Boy," "Ricochet," "Get Shorty," "Load Shift," and "Death Star" were designed to rig the system to enrich the company. "Load Shift," for example, involved falsified congestion that would allow the company to overcharge and "Death Star" involved faking the appearance of electricity transfers to relieve "congestion" without doing anything to actually relieve the congestion.

Enron liked the idea of these off-books companies so much they did it again.

Top secret transactions were indulged in solely to hide losses. These involved entities named “JEDI,” “raptor,” “grayhawk,” and “chewco.” The “grayhawk” partnership, for example, was designed to use insider information to buy and sell Enron’s own stock at a profit.

So, what *physics* is there in the crisis?

Very little directly. Some indirectly.

Direct:

“conservation voltage regulation”: voltage delivered to homes and businesses to be decreased from 120 volts to 118 volts or 116 volts, The idea was proposed by Bill Wattenburg, an engineer and consultant to the Lawrence Livermore National Laboratory.

Effects:

- Almost no noticeable change on appliances and computers, but could dim some lights.
- City residents might be at 120 V while a rural area could be at 115 V.

So, we know that

$$V_{\text{rms}} = I_{\text{rms}} R$$

and

$$P_{\text{rms}} = I_{\text{rms}} V_{\text{rms}}$$

where I_{rms} and V_{rms} are $2^{-1/2}I$ and $2^{-1/2}V$, respectively. So

$$P_{\text{rms}} = \frac{1}{2} I^2 R = \frac{1}{2} V^2 / R,$$

and

$$P_{\text{rms}} = V \cdot V/R = 2P_{\text{rms}} \left(\frac{V}{V} \right)$$

$$\frac{P_{\text{rms}}}{P_{\text{rms}}} = 2 \frac{1}{30} = \frac{1}{15} = 0.07 \\ = 7\%$$

Indirect:

Governments installed battery backups for traffic lights

LEDs were substituted for incandescent traffic lights (a permanent savings measure)

Broader use of radio-controlled switches (utility turns AC off when demand peaks)

Lots of solar installed in 2000-2001 California (Santa Rosa jail, for example)