

Reprinted from THE WALL STREET JOURNAL.

TUESDAY, FEBRUARY 20, 2001

© 2001 Dow Jones & Company, Inc. All Rights Reserved.

Saving Gracefully

California's Shortages Rekindle Its Efforts To Conserve Electricity

Dr. Rosenfeld Tests Solutions He Says Won't Require State to Sacrifice Comfort

White Roofs, Digital Meters

By JOHN EMSHWILLER

Staff Reporter of THE WALL STREET JOURNAL

SACRAMENTO, Calif.—With unruly white hair and a mildly absent-minded manner, 74-year-old Arthur Rosenfeld looks like the retired physics professor he is. But these days he has a new career: developing stealth weapons to help keep electricity shortages from short-circuiting California this summer.

Dr. Rosenfeld's humble proving grounds are Building G, a somewhat grimy one-story structure owned by the Sacramento Municipal Utility District, and a spiffier Kaiser Permanente medical office building 10 miles away. There's nothing remarkable about the two facilities—except that both have slashed their electricity demand for lighting and air-conditioning by as much as 30%, largely without their occupants noticing the change.

To cut its consumption, Building G used a combination of digital electric meters and basic physics. The Kaiser office's method was even less sophisticated; it simply replaced its flat dark roof with a flat light one.

Can simple and unobtrusive conservation measures like these be the best way to attack an electrical-power crisis? "That's exactly right," says Dr. Rosenfeld. And, as the newest member of the five-person California Energy Commission, he is in a strong position to influence other energy policy makers in the state.

He may find a receptive audience. That's because the electricity crisis that erupted here last summer and gave rise to rolling blackouts across the state last month has thrust electricity conservation back near the top of the state's political agenda, after a lengthy hiatus. Now, amid the sky-high wholesale power prices and the shortages wrought by the state's flawed 1996 electricity deregulation law, Gov. Gray Davis has vowed to slash the state's electricity consumption this summer by more than 3,200 megawatts, or about 7%. To set an example, he has sharply turned down his thermostat at home and the lighting in his office.

But Dr. Rosenfeld isn't a big fan of the self-deprivation approach to electricity savings. He argues that the best kind of conservation, and the kind people are most likely to accept, "doesn't affect how you live." For more than a quarter century, he has been pursuing ways to put that theory into practice.

By summer, when Californians switch on their air conditioners and the state's electricity demand peaks, Dr. Rosenfeld hopes to have tens of thousands of commercial buildings outfitted with new meters and vanilla roofs. Though some energy-industry officials say that goal is far too ambitious, Dr. Rosenfeld and others say his plan could reduce electricity demand statewide by hundreds of megawatts or more, possibly enough to avert some rolling blackouts.

'Spectacular Savings'

"Art is a visionary," Loretta Lynch, president of the California Public Utilities Commission, says of Dr. Rosenfeld. His present efforts, she adds, could help produce "really spectacular savings."

Really spectacular savings would be really helpful if California is to weather its electricity woes. Paying for high-priced wholesale power already has left the state's two biggest investor-owned utilities, PG&E Corp.'s Pacific Gas & Electric Co. and Edison International's Southern California Edison unit, on the edge of bankruptcy and put the state on the hook for billions of dollars in power purchases.

In an effort to help stem the drain, the state legislature is looking to roughly double the state's \$400 million in annual conservation-related spending. Its kilowatt-cutting plans range from rebates on energy-efficient refrigerators to radio spots urging citizens to do their laundry after 7 p.m., when electricity demand is lower.

With California desperately trying to build electricity-savings momentum, Dr. Rosenfeld is ready with some practical

ideas, such as "cool roofs," that he worked on for years at the University of California at Berkeley. His new public role is something of a reprise from a decade ago. Then, as a private citizen, he helped lead a largely aborted statewide search for electricity savings, a commodity one of his associates dubbed "megawatts." If pursued, the program could have left California in a much better power position than it is now, but it ultimately became a casualty of the deregulation push.

Since the mid-1980s, Dr. Rosenfeld has worked with the Heat Island Group at the Lawrence Berkeley National Laboratory to investigate ways to reduce temperatures in urban areas. Researchers there found that a white roof can be as much as 90 degrees cooler than a black one and reduce the energy needed to air-condition a building by up to 40%. Cooler roofs also mean cooler outside air. That could help reduce smog, which forms more readily at higher temperatures.

Dr. Rosenfeld says white roofs are generally no more expensive than dark ones. Nonetheless, the California Energy Commission is offering \$10 million to encourage commercial building owners to switch. The 10-cents-per-square-foot subsidies would help cover 100 million square feet of roof space. Dr. Rosenfeld says more state money might be coming soon. And with about five billion square feet of commercial roofing in California, he believes there's a lot more room for lighting to strike.

The physicist is even more enthusiastic about digital electric meters. Traditional meters, with little clock faces on the dials, only keep a running total of electricity use, to be measured when a meter reader comes calling. The new digital meters can track consumption during intervals of a few minutes and transmit the reading to the utility via phone lines.

Dr. Rosenfeld says that providing something close to "real-time" metering is extremely important, because the cost of electricity varies widely during the day, fluctuating with demand. Under deregulation, retail rates in California have been largely frozen, so that consumers don't see the soaring cost of electricity reflected in their bills. However, he hopes that one day rates will reflect real-time costs and that meters will be part of consumer efforts to regulate demand in response to fluctuating prices.

Though he can't do much about the current retail rate freeze, Dr. Rosenfeld has been pushing for programs to pay electricity customers for voluntarily cutting



Arthur Rosenfeld

(over please)

their consumption during peak demand periods. In keeping with his conservation-without-deprivation approach, he arranged for pilot programs last summer at Building G and at another location.

During test periods in the summer, the thermostats in the buildings were turned up four degrees and lighting reduced 30%. Most commercial buildings tend to be overlit, and the laws of physics dictate that once a building is cool, it will stay cool for a while. So, Dr. Rosenfeld hoped the buildings' occupants wouldn't notice the changes. Indeed, they didn't seem to. "It wasn't a problem," says Harlan Coomes, a senior demand-side specialist for the Sacramento municipal utility who worked on the test.

Armed with his data, Dr. Rosenfeld began proselytizing state and utility-industry officials. With \$40 million, he calculates, the state could install 40,000 digital meters at large commercial sites. Combined with financial incentives to get businesses to adjust their thermostats and reduce their lighting when requested, he figures the program could reduce state-wide demand by perhaps as much as 2,000 megawatts during peak hours, all without inflicting any hardships.

Partly spurred by Dr. Rosenfeld's efforts, the California Independent System Operator, which runs the state's electricity grid, has begun voluntary demand-reduction programs that pay electricity users for cuts. Under one such program, commercial building owners who agree to reduce their electricity use during peak hours on a tight-supply day are reimbursed a set amount for every kilowatt-hour they save. "Art has been very passionate in trying to get people to pay attention," says Don Fuller, the ISO's director of client relations.

A not-so-brief overview of some of Dr. Rosenfeld's other passions can be viewed on the California Energy Commission's Web site. Entitled "The Art of Energy Efficiency" and initially prepared for an academic publication, it runs 49 pages, including footnotes.

After earning a bachelor's degree in physics at age 18, he received his Ph.D. at

the University of Chicago, studying under the legendary physicist Enrico Fermi. He later moved to U.C. Berkeley, where he was part of the research team that helped Prof. Luis Alvarez win the 1968 Nobel Prize for physics.

Dr. Rosenfeld was teaching and doing research in particle physics at the Lawrence Berkeley lab in 1973 when his life took an abrupt turn. The Arab oil embargo and subsequent energy crisis spurred him to begin exploring energy-efficiency ideas. Initially, he thought those ideas would occupy him for only a few months. Then it was a few years. "I completely misjudged how interesting it would be," he says.

At Lawrence Berkeley, he helped assemble a diverse portfolio of energy-efficiency research projects. Work at the lab contributed to the development of electricity-saving compact fluorescent lights and super-insulating windows. And Lawrence Berkeley estimates that a research investment of \$70 million has produced billions of dollars of energy savings nationwide.

Along the way, Dr. Rosenfeld met Amory Lovins, already well-known in energy circles for his insistence that inexpensive efficiency improvements could eliminate the need for tens of billions of dollars worth of planned power plants. The two men helped persuade PG&E and others that energy efficiency offered substantial potential savings. By the early 1990s, California had established a program that allowed utilities to charge higher rates if they agreed to pay rebates to ratepayers who bought energy-efficient appliances or took other conservation steps.

In January 1991, PG&E announced plans to invest \$2 billion over 10 years to reduce projected demand by 2,500 megawatts. Under the initiative, electric customers got rebates for buying more efficient appliances, lighting or air conditioners, and the utility established a \$7.5 million center to teach contractors and architects about new energy-saving building designs.

PG&E recruited Messrs. Lovins and

Rosenfeld for a \$10 million project to apply the best in energy-efficiency ideas to a half-dozen new or existing buildings. "Amory was going all over the country spouting off" about the potential for huge demand reductions, recalls Carl Weinberg, the retired manager of research and development for San Francisco-based Pacific Gas & Electric. "I said let's test it, [and] if you don't prove this, I want Amory to shut up." The project produced electricity savings in the range of 50%, and Mr. Lovins kept talking.

One of the project's most interesting discoveries was "that you could get most of the savings with very basic off-the-shelf technologies" by carefully integrating them, says Chris Chouteau, former head of energy-efficiency activities at PG&E and now an outside consultant to the company. For instance, more efficient room lighting not only uses less electricity but produces less heat. That in turn reduces the amount of power needed to air-condition a building. And, in newer, better-insulated buildings, it might even reduce the size and expense of the air-conditioning systems required to cool them.

Some argued that the rebates unfairly favored the well-to-do, who could better afford to replace their old appliances. However, the effort soon tripped over a much bigger obstacle. Under the California deregulation plan, begun in the mid-1990s, conservation would largely be taken out of the hands of utilities and left to the marketplace. Some people who took part in the process say that years of progress were lost in the transition. Utilities cut back their conservation efforts, but new players didn't immediately take their place.

If utilities' energy-efficiency efforts hadn't been disrupted, California's electricity demand could have been reduced by as much as 1,100 megawatts from its current level, according to one estimate from the state's Energy Commission. By comparison, the recent rolling blackouts in the state were caused by shortages of several hundred megawatts.