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Busted budgets, failing schools, overcrowded prisons, gridlocked government—California no longer beckons as America's promised land. Except, that is, in one area: creating a new energy economy. But is its path one the rest of the nation can follow?

BY RONALD BROWNSTEIN

The California Experiment

AMID ALL THE starpower assembled in the White House Rose Garden on a crystalline afternoon last May, the unassuming gray-haired woman who sat beaming in a prime first-row seat went largely unnoticed. But if not for California state Senator Fran Pavley, none of the other people who had gathered might have been there at all. In 2002, as a first-term member of the California Assembly, she had steered through the nation's first law requiring automakers to reduce the tailpipe emissions of carbon dioxide and other gases linked to global warming. Fourteen other states indicated they planned to adopt the California law. But George W. Bush's administration refused to provide the federal waiver the state needed to proceed, and the major auto companies added new hurdles by challenging the state law in court. In January 2009, when Bush left office, the California plan was as stuck as a commuter caught behind a rush-hour pileup.

With the change of administrations, though, the road suddenly cleared. Candidate Obama endorsed the California initiative, and once he became president, his aides negotiated an agreement between the state, environmentalists, the auto-workers union, and the leading auto companies to use the California law as the basis for nationwide regulations to dramatically improve the fuel efficiency, and reduce greenhouse-gas emissions, of all new cars and trucks. The result was the unprecedented, almost unimaginable, scene that unfolded, fittingly enough, under perfect California weather that May afternoon in the Rose Garden. On the podium, President Obama stood flanked by senior executives from 10 global auto companies (including eight that the U.S. government did not own). In the chairs arrayed across the lawn, environmentalists mingled with auto-industry lobbyists, and Californians who had led the fight for stronger fuel-economy standards, like Pavley and Republican Governor Arnold Schwarzenegger, wedged in beside Michigan legislators who had fiercely resisted them. Obama didn't acknowledge Pavley by name, but he made clear that without California's "extraordinary leadership," the landmark environmental agreement he was announcing might never have been reached. Californians "have led the way on this," Obama said, "as they have in so many other efforts to protect our environment."

In politics and policy at large, the time is long past when the nation routinely looked to California, as it did in the 1960s and the '70s, as the most fertile incubator of new ideas. On many fronts, the state government appears almost dysfunctional, hobbled by constitutional constraints and partisan polarization. The collapse of the state's (latest) real-estate bubble has sent California's economy into free fall. A short list of the state's current problems would include surging unemployment, struggling schools, and a budget deficit larger than the entire budget in almost every other state.

But on energy and climate change, the story is very different. Ever since the first Arab oil embargo, in 1973, California has consistently defined the forward edge of energy-policy innovation in America. In 2006, California's per capita energy consumption was the fourth-lowest in the country. The state emits only about half as much carbon per dollar of economic

activity as the rest of America. It generates significantly more electricity than any other state from non-hydroelectric renewable energy sources like solar, wind, and biomass. California registers more patents associated with clean energy than any other state and attracts most of the venture capital invested in U.S. "cleantech" companies exploring everything from electric cars to solar power generation.

"I unequivocally believe we are a model for the rest of the country," says F. Noel Perry, the founder of Next10, a nonpartisan Silicon Valley–based think tank, whose "California Green Innovation Index" studies have tracked these trends.

Some of California's edge can be traced to the state's natural advantages, particularly a temperate climate that does not require as much heating in the winter or cooling in the summer as do many other parts of the country. But the difference is also rooted in conscious policy decisions. The American Council for an Energy-Efficient Economy, a leading nonprofit research group, recently ranked California first among the states in promoting energy efficiency.

"California has fouled up plenty of things," said John Bryson, the former chairman of both the California Public Utilities Commission and Southern California Edison, the major Los Angeles–area utility that is a national leader in energy efficiency. "But on this set of issues—the clean-energy issues, the kind of things that need to be done in terms of the risk of climate change—I think California is getting it right... More than any other state I know of, California has done already most of the things that need to be done."

California hasn't solved all the puzzles associated with replacing fossil fuels. And its successes cannot necessarily be easily replicated. But the state is grappling with every major energy-related issue that currently faces the country. Its experience doing so is also likely to shape an intensifying national debate, because so many key players have roots in the state, from Barbara Boxer and Henry Waxman, who chair the Senate and House committees that are considering climate change, to Energy Secretary Steven Chu. California's story illuminates some of the obstacles the nation will need to overcome as it seeks cleaner forms of power. But more broadly, California demonstrates how sustained political leadership can reshape how we produce, sell, and use energy—can "bend the curve," as they say in Silicon Valley.

The epicenter of California's energy revolution might justifiably be considered a roomy, dimly lit office in the bunker-like Energy Commission building in downtown Sacramento. There, behind a long conference table, surrounded by an untouched cup of chili and plates of apples, bananas, grapes, and tomatoes, sits Art Rosenfeld, at 83 years of age compact and contained, with thinning gray hair and a slight hunch. Looking natty in a hunter-green wool sport coat and a plaid shirt, Rosenfeld has hearing aids in both ears and a BlackBerry on his belt. Nothing about Rosenfeld is imposing, except his ideas, which for decades have earned him an audience at the highest levels of government. Former Vice President Al Gore, for one, described him to me as "a national resource. He's quite a thinker. I like him a lot." Then Gore laughed. "I also like that he starts to get more innovative as he gets older."

In 1973, Rosenfeld was working as a particle physicist at the Lawrence Berkeley National Laboratory. That September, the Democratic-controlled state legislature passed a bill creating a commission to manage California's energy policy. Ronald Reagan, then governor, vetoed it as an intrusion on free enterprise. But after the first Arab oil embargo caused energy prices to spike, two things happened. First, Reagan switched his position. Stung by popular discontent in car-conscious California, he agreed in 1974 to create what eventually became known as the California Energy Commission. Second, Rosenfeld shifted his focus toward energy efficiency, organizing a working group (which eventually became the Center for Building Science) at the laboratory. "I thought," he told me dryly, "we had better do such things as learning how to turn out the lights."

California's new commission was born with something of an identity crisis: environmentalists hoped it would promote conservation, while utilities wanted it to fast-track production (particularly of nuclear power) to close a potentially crippling

shortage in electricity generation. Rosenfeld, who had initially come to the commission's attention when he critiqued its first energy-efficiency standards for residential buildings, quickly proved instrumental in setting the agency's direction. In 1976, San Diego Gas & Electric Company asked the commission to approve a nuclear-power plant called Sundesert. Jerry Brown, the eclectic Democrat who succeeded Reagan as governor, didn't want to authorize the plant, but he faced pressure to close the anticipated gap between electricity demand and supply. Rosenfeld squared the circle for him, telling Brown that if the state imposed efficiency standards on refrigerators (which then consumed about 20 percent of a typical home's power), it would save at least as much electricity as Sundesert could produce. The state went on to block the Sundesert plant, and in 1977 the commission approved aggressive efficiency standards not only for refrigerators and freezers but also for air conditioners.

"Efficiency just gradually took over," Rosenfeld said. In the next decade, the Energy Commission followed with efficiency standards for furnaces, dryers, swimming-pool heaters, household cooking appliances, heat pumps, showerheads, and fluorescent-lamp ballasts, among other products. Those rules became models for use in other states and, eventually, for federal appliance standards. In 1978, using a pioneering computer program developed by Rosenfeld and his colleagues, the Energy Commission opened another front by approving more-sophisticated energy-efficiency standards for new buildings. Other states, and even other countries, followed.

Around the same time, an even more obscure California regulatory agency produced another landmark innovation. Utilities traditionally make more money when they sell more electricity, especially since the fixed investment of building power plants and transmission lines comprises such a large part of their costs. As a result, their natural inclination is to encourage their customers to use more. With the state trying to save energy through its efficiency standards, that incentive seemed increasingly perverse—especially after energy prices again soared after the second oil shock, in 1979. John Bryson, a founder of the Natural Resources Defense Council, whom Brown had appointed as chairman of the California Public Utilities Commission, began looking for ways to enlist the utilities in promoting efficiency.

"I thought it was evident that [they] could make a big difference," Bryson recalled. "But there was the fundamental fact that you were asking utilities, under the regime that existed at the time, to forego returns for their shareholders, because their returns were meaningfully based on increasing electricity sales."

The solution was a policy known as "decoupling" because it severed the link between consumption and profits. Here's how it worked: the commission first set a revenue target for utilities by calculating how much money they needed to make to recover their fixed costs, plus an approved profit rate. Next, the commission estimated how much power it expected the utility to sell. Then, it established an energy price that would allow the utility to meet its revenue target at the expected level of sales. If the utility sold more power than it needed to meet its target, the difference was returned to consumers. If it sold less, rates were increased to make up the difference. Applied to natural-gas sales in 1978 and electricity in 1982, decoupling had a profound effect.

"Utilities were rendered indifferent to sales," says Ralph Cavanagh, a senior NRDC attorney and central figure in California energy policy since the late 1970s. "They couldn't make more money by selling more; they didn't lose money by selling less. Their addiction to increased sales was eliminated." In September 2007, the state utility regulators shifted the incentives for utilities further toward conservation by allowing them to split the savings with customers whenever energy use falls below state targets.

How much those twin rules—decoupling and decoupling-plus, as they are known—have changed the motivation of utility companies became clear when I visited Peter A. Darbee, the chairman, CEO, and president of Pacific Gas & Electric. Darbee works on the 24th floor of a San Francisco office tower in a glass-enclosed corner office that looks like a ship's bridge. The

office has panoramic views of the Embarcadero, and on the windy, sunny day we spoke, boats silently glided through the water in the distance, as if a painting had somehow been set into motion.

"I think the biggest key to the success in California was putting in place the right incentives for California utilities," Darbee noted. Echoing Cavanagh, Darbee said that decoupling made the utilities "neutral or indifferent" to sales; then decoupling-plus provided utilities "an incentive to sell less power rather than more." With those economic signals nudging the utilities, he continued, "all of a sudden you've unleashed the power of these huge organizations to work with you rather than against you." Darbee said that sometimes when he's out sailing with customers, they will say to him, "'Peter, you would love us, because we have all sorts of lights and air conditioning and we are using a lot of your power.' And I look at them and say, 'Well, actually I'd prefer that you use a lot less.' And they look at me like I'm crazy. And then I say to them, 'We actually make more money if we sell you less power, and we make less if we sell you more power.'"

Efficiency and decoupling have helped California to consume electricity far more thriftily than the rest of America. At the time of the 1973 oil shock, California used about 17 percent less electricity per person than the country at large. Since then, as Rosenfeld likes to point out in a chart that has been dubbed "the Rosenfeld Curve," per capita electricity use in the nation has increased by about 50 percent to about 12,000 kilowatt-hours annually. Meanwhile, over that same period, per capita electricity use in California has remained absolutely flat at about 7,000 kilowatt-hours per year. That means the average Californian today uses about 40 percent less electricity per year than the average American.

James Sweeney, who runs Stanford University's Precourt Energy Efficiency Center, has calculated with Anant Sudarshan, a colleague, that much of that difference can be explained by factors such as California's temperate climate, less heavy industry, and even smaller-sized households. But, Sweeney says, the state's policy decisions still account for a substantial amount—roughly one-fifth to one-fourth—of the gap in electricity usage between California and the nation. The focus on efficiency has produced huge savings: though per kilowatt electricity rates are higher in California than in most other places, consumers pay lower electricity bills because they use so much less power than people elsewhere. A few years ago, the California Energy Commission calculated that the state's efficiency efforts had preempted the need for 24 large-scale power plants and saved state consumers $56 billion.

Rosenfeld says the past generation's gains indicate the state can improve its energy intensity (the amount of energy required to produce each dollar of GDP) by about 30 percent every decade. "Efficiency," he says with a twinkle, "seems to be a renewable resource."

And there is the initial lesson from California's energy experience: efficiency is the foundation of any effort to reduce reliance on fossil fuels. As California has learned, the most cost-effective way to replace coal or natural gas or petroleum isn't to rely on solar or wind or biofuels; it's to squeeze more work out of less energy.

After the state's early breakthroughs, the 1990s were largely a lost decade for California on energy. The state detoured into a failed experiment with utility deregulation that produced price spikes and rolling blackouts, forced PG&E into bankruptcy, and helped to make Enron a household name. But even that disaster, which ended when the state legislature suspended the deregulation experiment in 2001, fueled another burst of energy innovation in California.

In July 2002, the legislature passed Fran Pavley's bill establishing the precedent-setting requirement for auto companies to reduce the tailpipe emissions of the gases linked to global warming, a standard the companies had been expected to meet primarily by improving the fuel efficiency of their vehicles. Since the Clean Air Act in 1970, California—alone among all states—has had the authority to impose pollution-control standards more stringent than the national rules, so long as the federal Environmental Protection Agency concluded that the regulations were not arbitrary or unreasonable. But the

lawsuits from the major auto companies, and the Bush administration's refusal to provide an EPA waiver, had prevented California from implementing the Pavley law until President Obama announced the breakthrough with the auto industry this May.

Those anticipating that the name *Pavley* is some clever policy acronym like CAFE or COBRA are sometimes surprised to find attached to the legislation the actual Fran Pavley. "It's really quite hysterical," she says. "I've been at some conferences and there will be legislators from different states and they will go around the room and they're like, 'We've adopted Pavley.' 'They killed Pavley.' 'I can't bring up Pavley.' And I'll go, 'I'm Pavley.' And they'll go, 'What?' I don't know what they thought."

Disarmingly informal and chatty, Pavley is in her spare but somehow homey office in the California Capitol in Sacramento, talking as if we were sitting across a kitchen table. Though we were deep inside the dusky Capitol building, a pair of sunglasses was improbably perched in her hair. Before going into state politics, first in the Assembly and now in the Senate, she had spent most of her career as a middle-school teacher. Even though she had accumulated some political and environmental background as a local mayor and a member of the state Coastal Commission, Pavley might have seemed an unlikely architect of such important legislation. In fact, she benefited from being underestimated ("First-term freshman, middle-school teacher—the opposition didn't show up in droves," she recalls), and ultimately she assembled a broad coalition.

Pavley also benefited from another factor she had not anticipated: California's legacy as an environmental pace-setter. That work dates back to the 1940s, when concern about smog in Los Angeles led the state to establish the nation's first county-level air-pollution-control districts. Rather than being intimidated by the prospect of setting a new national standard, legislators seemed to welcome that role, particularly after George W.Bush in 2001 renounced the global climate-change treaty. "They weren't going anywhere [in Washington]," Pavley said. "We had pushed the envelope on unleaded gas and catalytic converters. This was sort of the same." Governor Gray Davis signed the tailpipe bill into law in late July 2002.

Just weeks later, in September, Davis signed another landmark bill. This one required the state's three investor-owned utilities to generate 20 percent of their electricity from renewable sources like solar and wind by 2017. This wasn't the nation's first so-called Renewable Portfolio Standard for utilities, but it was among the most ambitious. After Schwarzenegger arrived, the state raised the bar on the utilities' renewable-power requirement twice more: the utilities must generate 20 percent of their power from renewable sources by 2010 and fully 33 percent by 2020.

The state approved its initial renewable-sources standards law soon after the collapse of the dot-com bubble. The new mandates on utilities to buy renewable power reinforced the nascent sense among investors and entrepreneurs that clean energy might be the Next Big Thing. From 2005 through 2008, the amount of venture capital flowing into cleantech start-up companies in California exploded from about $456 million a year to $3.3 billion. By one estimate, California was home to nearly three-fifths of all the U.S. venture capital invested last year in clean energy. With the investment spigots opened, the number of clean-energy companies in California increased by nearly 30 percent between 1995 and 2007.

All of this activity points to the second lesson from California's energy experience: regulations can create markets. "It's much easier to make a big investment knowing that there will be a market and an opportunity to participate in it," says Ellen K. Pao, a partner at Kleiner Perkins Caufield & Byers, a leading Silicon Valley venture firm. Initially, neither the utilities nor the investors seemed convinced that state regulators would enforce the renewable standards. But once the legislature and Schwarzenegger sent a clear message by toughening the requirements, the pace of activity enormously accelerated. Solar energy today provides less than 1 percent of the state's power, but over the past few years, PG&E and Southern California Edison have leapfrogged each other in signing contracts with start-up companies for what is planned as the world's largest solar production facility. (The California utilities find solar more attractive than wind because the sun's energy is available

on the hottest days, when demand is greatest, but hot days in California are usually still; the wind in the state blows mostly at night, when demand is lower.) Both SoCal Edison and, more recently, PG&E are also seeking approval from state regulators to operate their own large-scale photovoltaic arrays, many on the roofs of warehouses and other big commercial buildings.

The slow start, and the long lead time needed to construct large renewable facilities and the associated transmission lines, mean the utilities are unlikely to reach the state's 20 percent threshold by 2010. But most experts believe they will meet the goal not long thereafter. And the tilt in the utilities' priorities toward alternative energy now appears irreversible.

"There is a smattering of activity in other states... but not what you'd call a marketplace with a recurring flow of opportunity," says Mike Ahearn, the CEO of First Solar Incorporated, which is manufacturing thin-film solar panels for SoCal Edison's rooftop project. "California is *the* solar market in the United States."

Storm clouds, both literal and metaphoric, were buffeting the Capitol building on the blustery day when I met with Schwarzenegger to discuss the state's energy strategy. Schwarzenegger and Democrats in the state legislature were still locked in a budget standoff with legislative Republicans. (The immediate impasse was finally broken two days later, but the state didn't reach a final resolution on the budget until this summer, after voters rejected all but one of the ballot initiatives central to the original agreement.) We met in a tent Schwarzenegger has had constructed, complete with Astroturf flooring, in an interior courtyard of the Capitol building, where he can smoke cigars without violating the building's no-smoking rule. When I arrived, Schwarzenegger, in a blue suit and cowboy boots emblazoned with the California state seal, was contentedly puffing a stogie. For a man facing fiscal meltdown, he appeared remarkably relaxed, though the weather seemed to be offering its own commentary: the torrential downpour lashing Sacramento that day drummed on the tent so loudly that at times it was hard to hear him talk.

Schwarzenegger had pledged to advance environmental causes during his initial gubernatorial campaign in 2003. But when he arrived in Sacramento, environmentalists and legislative Democrats were skeptical about the commitment of a Republican governor whose most prominent previous association with energy issues had been to encourage General Motors to adapt the Humvee for civilian use. "They felt ... when I came here, 'Oh, here's a Republican, he is going to set us back seven years, so let's not hope for much,'" Schwarzenegger told me. Legislators may have heard all his campaign promises, but "they thought it was just stuff that you say in order to get elected."

In fact, Schwarzenegger would bang heads with environmentalists and their legislative allies on some regulatory issues. But on questions surrounding the transition toward a new energy economy, no governor would prove as visionary or determined. Ambitious new initiatives have cascaded out of Schwarzenegger's office—including the two measures raising the renewable-power requirement on utilities, a state subsidy program to encourage the installation of electricity-generating solar panels on 1 million California roofs, and in January 2007, an executive order establishing the nation's first "low-carbon fuel standard," which requires a reduction of at least 10 percent in the carbon emissions from transportation fuels by 2020.

"People make decisions in this building, a lot of times, based on what is their term," he told me, gesturing with his cigar toward the offices around him. "So they make a decision, what can be done in the next four years ... I always look 50 years ahead, because to me, I cannot think just about what can I accomplish while I am in office. The thing that is important is, what should the state look like 20, 30, 40 years from now." The search for a new energy strategy also spoke to Schwarzenegger's desire to define California (and undoubtedly himself) as the forward edge of innovation. "My idea [was] that you shouldn't just do it for California, that everything we do, we should use as a way of pushing the rest of the world, because I am a big believer in marketing," he said.

Schwarzenegger's interest in big, course-changing initiatives, and the continuing desire among Democratic legislative leaders to challenge then-President Bush's energy policies, converged to produce yet another landmark initiative in 2006. After some occasionally tense maneuvering, the legislature passed and Schwarzenegger signed a Pavley-sponsored bill imposing the nation's first mandatory statewide reductions in greenhouse-gas emissions. The bill required the state by 2020 to roll back its emissions to the 1990 level—a reduction of about 15 percent from the current level. (By separate executive order, Schwarzenegger also committed the state to an 80 percent reduction by 2050.) Environmentalists had been promoting exactly those goals as national policy without success under Bush. Once again, the stalemate in Washington emboldened Sacramento. California acted, Schwarzenegger told me, "because we saw no hope on the national level." It was, he continued, "very important to let Washington know, 'Look, you are not the one making all the decisions.'"

Once California had passed its greenhouse-gas-emissions law, Schwarzenegger deputized Terry Tamminen, his key environmental adviser, to encourage other states to follow. That effort has been a striking success: six states, and four Canadian provinces, have joined with California in the Western Climate Initiative, which has pledged to impose mandatory greenhouse-gas-emission reductions comparable to California's 2020 goal through a market-based regional cap-and-trade system.

The passage of California's climate-change legislation captured a third major lesson of the state's experience: just as regulations create markets, markets create constituencies. Much of the state's business establishment opposed the bill. But the legislation drew countervailing support from the state's cleantech community, which was growing partly in response to the state's earlier alternative-energy initiatives. At a critical moment, a delegation of Silicon Valley venture capitalists and entrepreneurs led by John Doerr of Kleiner Perkins Caufield & Byers visited the Capitol to declare that the greenhouse bill would, in the group's words, "stimulate innovation, efficiency, and economic benefits." "It changed the whole dynamic," Pavley said. "Before, all the papers were [saying], 'This is an environmental bill,' and businesses were opposed. After that... It changed the whole discussion." Schwarzenegger meanwhile helped coax support from more-traditional business interests, including PG&E.

Peter Darbee, a self-described conservative, has become an ardent proponent of mandatory carbon-emission reductions. After assuming PG&E's top job in 2005, he convened a series of meetings for senior executives with scientists on both sides of the climate issue. The conclusion he reached was unequivocal: "The Earth was warming, mankind was responsible, and the need for action is now." And partly because of the utility's experience at meeting the state's energy-efficiency goals, he said, he also concluded that while there will be "some cost" to reducing greenhouse-gas emissions, "that cost is very small, compared to the cost of not doing something. If people approach this, as we have, as an opportunity, it could actually have zero or little cost, or [produce] a net benefit."

Darbee's optimism reflects a larger truth about the politics of energy in California: unlike in most states, enough industries in California have found ways to profit from the state's first waves of reform to create a durable constituency for continued change and innovation.

As a result of the climate-change bill, the state is several years ahead of the country again, this time in exploring what reducing carbon emissions will actually take. "There was no model to work from," said Mary D. Nichols, the chairwoman of the California Air Resources Board, which has been tasked with administering the climate bill. Last December, the board approved a "scoping plan" that offered the most detailed road map any government agency has yet charted for reducing greenhouse emissions. It pointed to a fourth major lesson from the California energy experience: moving toward a low-carbon economy will require attacking the problem from almost every conceivable angle.

The plan anticipates that the largest reductions will come from the major reforms the state has adopted in recent years,

including the Pavley emissions law, the renewable portfolio requirement, and the cap-and-trade system itself. But it also envisions renewed efficiency efforts, improved regional planning to reduce sprawl, more installation of distributed solar power on rooftops, changes in forestry and water-distribution practices, and so on.

For all of the changes required, Nichols is confident the state is on course to launch its cap-and-trade system one year early (in 2011) and to meet its 2020 carbon-reduction goals. Still, California's experience highlights several obstacles the country may face in any transition toward a lower-carbon economy. Foremost among these, ironically, may be the environmental challenges of producing more renewable power. Large-scale solar arrays consume substantial amounts of land. As plans move forward for new facilities in the Mojave Desert and elsewhere, environmentalists are uneasily monitoring the potential impact on sensitive habitats. Even more daunting are the extended permitting and regulatory processes for building the transmission lines required to carry wind and solar power to population centers.

"Transmission is the biggest constraint," says Michael R.Peevey, who is the president of the California Public Utilities Commission. Typically, he says, it takes eight to 10 years to plan, permit, and build a high-voltage transmission line. The commission has projected that California will need to build five such lines to meet its 2020 renewable-power goals. The likelihood that that will happen is even lower than the likelihood that Los Angeles will ban Botox.

Another challenge is the precarious financial condition of some of the start-up alternative-energy companies that the California utilities are relying upon to deliver wind and solar power. Even before the credit crunch, skeptics questioned whether the new energy companies possessed the financial, engineering, and logistical capacity to fulfill their agreements with state utilities to build huge generation plants. The difficulty in obtaining credit will likely make it harder for some suppliers to reach the size required to deliver their technologies at an industrial scale. Some analysts think many of the alternative-energy start-ups may instead need to license their technology to the utilities, which can more easily raise the money to build generating facilities themselves. But while more direct ownership by the utilities (or, for that matter, oil companies) might speed the deployment of alternative energy, it would also raise concerns about concentrating control over the next century's energy supplies in the same behemoths that dominated the fossil-fuel era.

Other technological challenges also loom—from upgrading the electricity grid so it can handle the intermittent nature of solar and wind power, to developing the battery capacity required to make electric cars more than a niche competitor. But the greatest unknown may be whether the state's energy agenda will eventually provoke a backlash among voters. To meet the greenhouse-gas reduction targets, the state may need to consider measures that average families might consider too intrusive, like imposing fees on the owners of cars that emit the most carbon dioxide. Energy prices are another wild card. If household utility bills noticeably rise, the political calculus might change, particularly if the economy remains weak.

Yet, for now, the key to energy politics in California is that the state has transcended the assumption, common in many other regions, that sustainability requires scarcity. The California perspective reflects the fusion of the state's long-time environmental ethos with the techno-optimism of Silicon Valley. "We look at this as an economic opportunity," says Doug Henton, an economic consultant to Next 10 and the chairman and CEO of Collaborative Economics. "What's been holding back other states and [the nation] is this fear that we're going to lose more than we gain."

Clearly, some structural advantages have encouraged that attitude in California. It is easier for California to shift toward renewable sources of electricity, for instance, because it never relied as much as most states on low-cost coal (even including its imports of coal-generated power from neighboring states); it also has an unusually favorable climate for generating solar energy.

"This isn't something you can design as an exact blueprint, a cookie cutter that is applicable everywhere," says Mary D. Nichols. But in moving toward a low-carbon future, California has its own unique challenges, starting with its excessive reliance on cars. On balance, the state's energy successes have been shaped less by the state's underlying circumstances than by the public policies California has pursued.

The big lessons of the California energy experience—rely on efficiency first, use regulation to create markets, use markets to create constituencies, attack the problem from all angles—might be implemented in different ways, but their basic principles can be applied everywhere. California's experience says the evolution to a lower-carbon, more energy-efficient economy is possible and compatible with economic growth, but that the change requires endurance, consistency, and flexibility. Schwarzenegger captures the point with a characteristically personal metaphor:

"The key thing with everything is not to concentrate so much on the process but to concentrate on the goal. When I said I am going to be Mr. Universe, and I was 15 years old in Austria, I had no idea how to train and how to get there. But I had the fire in the belly, and I had the will to say that I will be the world champion even though it was not an Austrian sport, and no one had ever done it in Austria ... The will was there. So the same is here. We have the will to get there by 2020 ...and therefore we are going to ... make decisions based on getting there."

No one exemplifies that spirit of persistence more than Art Rosenfeld. He has been around long enough that as a graduate student he studied under Enrico Fermi. The wall of Rosenfeld's office is covered with awards that stretch back decades. Yet, at 83, he has a new passion. Rosenfeld is crusading to replace dark roofs, which trap most of the sun's heat, with white or "cool" roofs that are far more reflective, and thus save energy by keeping the building below cool. California has accepted his logic by requiring all newly constructed commercial buildings with flat roofs to use white. In 2010, Energy Commission rules will encourage new homes and remodeling projects in the state's five hottest regions to use "cool color" roof surfaces in green, brown, or other shades that reflect more heat than dark roofs.

Rosenfeld finds those rules a little disappointing, because the cool-color roofs reduce energy use by only about one-third as much as white roofs, but he understands the need to ease homeowners into a new approach. And even those requirements could yield substantial reductions. Rosenfeld has calculated that a global conversion, over the next 20 years, to white flat roofs and cool-color sloped roofs as far north as Chicago and as far south as Buenos Aires would reduce carbon emissions by an amount equivalent to taking about one-half of the world's passenger cars off the roads. Rosenfeld is content to start small but, as always, he's thinking big. To him, after all, it seems an eminently reasonable proposition that one American state can prompt the entire country, if not the world, to save massive amounts of energy and combat climate change, by reconsidering a central pillar of how buildings have been designed for centuries. Based on California's experience over the past 35 years, I wouldn't bet against him.
