Finding the Sweet Spot:

Green Energy Incentives and Job Creation

A report prepared for the California Senate Rules Committee

April 26, 2012

Prepared by Nancy Vogel and Dorothy Korber

California Senate Office of Oversight and Outcomes

John Adkisson
John Hill
Dorothy Korber
Nancy Vogel

Finding the Sweet Spot:
Green Energy Incentives and Job Creation

APRIL 26, 2012

Prepared by Nancy Vogel and Dorothy Korber

California Senate Office of Oversight and Outcomes

Table of Contents

Executive Summary

As taxpayers and buyers of electricity, Californians collectively pay more than a half a billion dollars a year to foster and subsidize renewable energy. That public support helps make California the biggest generator in the nation of electricity from the sun, wind, earth's heat, and forest and farm waste.

California leads on a second front: It is a cradle of innovation, where scientists and engineers invent increasingly clean and inexpensive ways to generate electricity.

But most of the equipment California installs to generate green electricity is made by workers in other states and other nations. Wind turbine towers arrive here from Vietnam, solar panels from Malaysia, inverters from Colorado, fuel cells from Oregon. Solar and wind jobs in California mostly involve sales, design, installation, and maintenance – not manufacturing.

Nearly all of California's renewable energy incentive programs were created before the 2008 recession that drove the state's unemployment rate to 12 percent. The programs aim primarily to advance research or to fit rooftops with photovoltaic systems or wind turbines, not spur the creation of manufacturing jobs.

Could California have both? Is there a sweet spot where the state's public investment in renewable energy also captures the jobs associated with making renewable energy products?

On the flip side, can California protect itself from investing public money in doomed companies, such as Solyndra? The Fremont solar panel maker's 2011 bankruptcy cost California more than a thousand jobs – and cost federal taxpayers a $535 million loan that will not be paid back.

The Senate Office of Oversight and Outcomes, asked to look into these questions by the pro Tem's office, chose to examine how California encourages the adoption of renewable energy. We looked in detail at three of California's major renewable energy programs and their

connection to jobs. The three offer a wide perspective, with different sources of funding, administrative agencies, and goals.

We also cataloged renewable energy manufacturers in California and documented where subsidy recipients chose to locate jobs. We gauged the level of scrutiny California uses to screen companies receiving incentives. And we looked at how other states use incentives to compete for green manufacturing jobs.

Findings:

- Manufacturing jobs, subject to strong global economic forces, may be elusive or fleeting regardless of how much taxpayer money a state invests to keep them.
- The many California policies that favor renewable energy incidentally help generate thousands of jobs in sales, design, installation, and maintenance.
- Manufacturing jobs are a small subset of the state's renewable energy workforce (5,000 of 25,000 solar jobs, for example).
- The only ongoing California incentive program specifically aimed at green industry manufacturers – a sales and use tax exemption on equipment – has been used most heavily by solar companies that do small-scale production near their Silicon Valley research facilities. Meanwhile, most operate larger factories in other states or countries.
- In recent years, many California renewable energy companies announced plans to expand in Oregon, Mississippi, and other states offering lucrative incentives. Some of these out-of-state expansions have been withdrawn, delayed, or short-lived.
- Several solar manufacturing companies, stressed by global economic forces, have failed even to use the loans or tax breaks they were awarded by California.
- The Public Utilities Commission in 2010 awarded a massive $208 million subsidy to a single fuel cell company that now employs 1,000 in Sunnyvale – but also plans to open a 900-worker factory in Delaware. The report documents how the company that dominated the program benefited from tailored legislation and regulatory waivers.

Recommendations:

In general, the Senate Office of Oversight and Outcomes concludes that a safer bet of public dollars is to maintain the state's investment in the universities and basic research that feed our culture of innovation.

Still, the question remains: Can we boost the odds that technology invented in California also will be mass-produced here? The debate over how to accomplish that involves the cost of labor, housing, taxes, workforce and environmental regulations – and myriad other factors that together set the price of doing business. We think political leaders would do well to ask business leaders why they do not build their factories in California – then decide whether the price of changing that business calculation is one we want to pay.

In terms of programs, these are our recommendations for legislators and regulators:

- ✔ **Consider creating a public green bank that would offer loans to promising young companies facing the challenge of bringing a new technology to market.** The goal would be to help our innovators get their products from the laboratory into production in California factories. Initially, public money for the green bank could be redirected from existing incentive programs. That funding could be augmented with money from investors, which would leverage taxpayer dollars with private capital. Another advantage of the green bank is that loans -- unlike grants-- are repaid, creating a revolving fund for reinvestment.

- ✔ **Include "clawback" provisions in new incentive programs, whenever feasible, to ensure taxpayers are compensated if subsidized companies fail to deliver on promises.** New programs should also be transparent, to guarantee that the public can easily track expenditures and outcomes.

- ✔ **Review current incentive programs with a ruthless eye to effectiveness. Consolidate or redirect programs and funding – as in the green bank -- or return money to ratepayers and taxpayers.** Any new incentives should be funded with money already being collected. As Harvard Business School professor Josh Lerner wrote in *Boulevard of Broken Dreams*, his 2009 history of public efforts to boost entrepreneurship:

  The nations that have been most successful in public programs have been willing to end those that are not doing well, and to substitute other incentives. Even more powerfully, they have been willing to end programs on the grounds that they are too successful and hence no longer in need of public funding. Moreover, program rules may have to evolve, even if important classes of participants are thereby eliminated. If government is going to be in the business of promoting entrepreneurship, it needs some entrepreneurial qualities itself.

The report

The **first section** of the report gives an overview of what we call the green energy landscape. It examines the policies and programs that put California in the forefront of innovation and renewable energy. It also explores the challenges of anchoring manufacturing jobs here – and the competition posed by other states eager to bolster their own green workforces.

The **second section** details the operation of three major programs:

- The SB 71 sales and use tax exemption on green industry manufacturing equipment.
- The Alternative and Renewable Fuel and Vehicle Technology Program (AB 118).
- The Self-Generation Incentive Program.

The **third section** describes various approaches to structuring incentives, including a green bank. It examines three oversight mechanisms – due diligence, clawbacks, and transparency – and discusses the pros and cons of each.

A **fourth section**, called Supplements, provides material that augments the main report. It is arranged by numbered tabs that are referenced in boxes throughout the report. Included are a description of the major California policies and incentives that encourage renewable energy, a detailed list of green energy manufacturers in California, and the cautionary tale of a small state incentive program exploited by a wind turbine company. This section also has a sampler of quotes – "In Their Own Words" -- from business officials about what they would like from the state, as well as a concluding comment on "Tough to Do Business in California?" Finally, there is a chart showing recipients to date of the SB 71 tax break.

Throughout the report, boxes like this will guide you to relevant material in Section IV, Supplements.

In conclusion

This is a turbulent time in the realm of green economics, fraught with challenge but also full of promise. California, though in the forefront, is subject to forces beyond its borders – the ebb and flow of global markets, stiff competition from other states and nations, and federal policies. Meanwhile, our state struggles with the impact of a deep recession on its

citizens and on its depleted treasury. Policymakers must be informed and resourceful as they consider ways to harness renewable energy as both an environmental mission and an economic engine.

I. Overview of California's Green Energy Landscape: Strong Innovation and Deployment, Limited Manufacturing

No state rivals California as a place for the innovation and widespread installation of renewable energy technology. From investing public money in research to forcing utilities to buy sun- and wind-generated electricity, California policies incubate companies and create strong demand for clean energy. Research, sales, design, and installation jobs dominate the green energy industry in California, while manufacturers tend to go out of state in search of lower costs and government incentives.

California Leads in Venture Capital Funding, Patent Registration

California boasts something other states and nations can only hope to replicate: the Silicon Valley, one of the world's most robust technology innovation centers. Inventive scientists and engineers – many graduates of nearby Stanford University and the University of California, Berkeley – mix with lawyers, bankers, and investors in a business ecosystem that hatches cutting-edge electronics and energy companies. Dubbed the Silicon Valley in the 1970s because of its heavy concentration of semiconductor manufacturers, the Santa Clara Valley is understandably also home to many solar companies, as the materials and processes needed to make semiconductors and solar photovoltaic cells are much the same.

Evidence of the state's innovation prowess shows in the 450 green technology patents registered in California between 2007 and 2009 – more than any other state, according to Next 10, an independent, non-partisan group focused on improving California's economy and quality of life. The state ranks first, too, in the number of solar, wind and battery technology patents registered. California also dominates venture capital investments. According to a 2012 study by Ernst & Young, California companies gathered 57 percent of the $4.9 billion in venture capital invested in clean technology nationwide in 2011.

Consider the fledgling company Primus Power. Its 30 employees in Hayward work on battery systems to smooth the flow of sun- and wind-generated electricity onto the grid. Inventor Rick Winter launched the company in his garage with the help of a $95,000 grant from a ratepayer-funded, state-run energy research program. Primus Power has since attracted a $14 million federal grant and $15 million from venture capitalists, including top Silicon Valley firm Kleiner Perkins Caufield Byers.

"California has a fantastic ecosystem for innovation," Primus' marketing director, Alissa Peterson, told state lawmakers in a November 2011 hearing on the state's clean energy economy.

California innovation extends beyond the Silicon Valley. A 2010 analysis of "green" jobs by Next 10 found regional hubs of activity, such as green building in Sacramento, clean transportation technology in Orange County, wind energy in the Inland Empire, alternative fuels in San Joaquin Valley, and biomass in the Sacramento Valley.

California state government also innovates; its energy policies often lead the nation. And proponents of renewable energy generally praise the state for enacting basic policies that create a market for non-petroleum sources of energy.

For an overview of the state's renewable programs and policies, see Tab 1 in the Supplements section at the end of the report.

"California is doing more right than it is wrong right now," said Mignon Marks, executive director of the California Solar Energy Industries Association.

State Leads in Adoption of Renewable Energy

Not surprisingly, given its ambitious policies and big investment in renewable energy incentives, California boasts the nation's most diverse installation of renewable technologies. In 2009, roughly 12 percent of the state's electricity was generated by renewable sources, excluding large hydroelectric facilities.

California generates enough

California's Sources of Renewable Energy, 2010

(In 2010, the typical California single-family home used about 8.3 megawatt-hours)

Source	Megawatt-hours
Geothermal	12,740,000
Wind	6,172,000
Biomass	5,745,000
Small Hydro	4,441,000
Solar	908,000

Source: California Energy Commission

electricity to supply roughly 740,000 single-family homes a year with wind and 109,000 with solar. No state generates more solar electricity. California also takes advantage of its location on the borders of major tectonic plates to generate enough power for about 1.5 million homes annually by tapping the earth's hot water and steam at 43 different geothermal plants, most in Napa, Sonoma, and Imperial counties. Two-thirds of the nation's geothermal generating capacity exists in California, according to the state Energy Commission.

California also uses wood waste, garbage, landfill gases or other renewable sources of fuel to generate enough electricity to power roughly 700,000 homes for a year.

According to the U.S. Energy Information Administration, California generates more electricity from geothermal, solar, and wind energy sources combined than any other state.

California Tops Nation in Green Jobs

California legislators and regulators created green energy policies and incentive programs for environmental, economic, and national security reasons. In passing these policies, they said they want to wean the state of imported oil and natural gas, clean the air, and slow release of gases linked to the global warming that may jeopardize the state's water supply, major industries, and public health.

But California policymakers typically mention jobs, too, when they enact policies to foster renewable energy.

Consider the preamble to Assembly Bill 118, the 2007 law aimed at a creating a cleaner transportation industry:

> *"Research, development, and commercialization of alternative fuels and vehicle technologies in California have the potential to strengthen California's economy by attracting and retaining clean technology businesses, stimulating high-quality job growth, and helping to reduce the state's vulnerability to petroleum price volatility."*

In 2008, just as California launched many of its renewable energy policies and incentive programs, deep recession slowed the nation's economy. California's

See Tab 2 in the Supplements section for a tally of manufacturing jobs in three of California's green energy industries: solar, wind, and fuel cells.

unemployment rate jumped from 6 percent to 12 percent between 2008 and 2011. As of January 2012, at least two million Californians were out of work, according to the California Employment Development Department.

Given the state's annual investment of more than half a billion dollars of public money to foster renewable energy, policymakers understandably want to know first, whether this investment creates jobs in California and secondly, whether the state's policies and programs could be adjusted to help generate more jobs.

Not surprisingly, with its population, sunny climate, and enthusiastic embrace of renewable energy, California leads the nation in its sheer number of green jobs.

In a July 2011 report, "Sizing the Clean Economy," the nonprofit Brookings Institution ascribed the most "clean" jobs in the nation to California. The state ranked 14th, however, in the number of "clean" jobs as a share of all jobs. Alaska, Oregon, and Montana topped that list. The Brookings Institution defined "clean" jobs as those that produce goods or services with an environmental benefit, including those in mass transit, wastewater treatment, and garbage collection – not just those related to renewable energy.

More narrowly, in the solar sector, an extensive survey by the nonprofit Solar Foundation concluded that California is home to one-quarter of all the nation's solar jobs. The foundation's October 2011 National Solar Jobs Census surveyed more than 7,000 known solar businesses around the country, as well as a random sample of businesses in industries likely to have a solar connection, such as metal manufacturing.

The foundation put 25,575 of the nation's 100,237 solar jobs in California, the most of any state.

California boasts fewer wind industry-related jobs – roughly 4,000 to 5,000, according to the American Wind Energy Association. Texas, with more than three times as much installed wind capacity as California, has twice the number of wind industry jobs, according to the association.

What Kind of Jobs?

In the solar industry, the best-studied of California's renewable energy sectors, employment figures hide a complex picture.

More photovoltaic modules are manufactured in California than any

other state, according to federal statistics. In 2010, 24 percent of the modules made in the United States came from California, according to the U.S. Energy Information Administration's latest data. Ohio and Massachusetts followed with respective shares of 19 percent and 15 percent.

But overall, most solar systems installed in the United States are not made in California or even the United States. They are imported from China, the Philippines, Mexico, or other countries. The U.S. imported 1.7 million peak kilowatts of photovoltaic modules in 2010 and produced domestically about 1 million peak kilowatts of modules, according to the federal energy administration. To complicate matters, U.S. manufacturers also export, primarily to Germany, Italy, Canada, and Spain.

Most California solar jobs are not in manufacturing. According to the Solar Foundation's jobs report, 54 percent of the industry in California involves sales and installation. Nineteen percent of the jobs – fewer than 5,000 – are characterized as manufacturing, with another 13 percent in research and development.

Similarly, in 2008, a workforce research arm of the California Community Colleges surveyed the state's solar industry and concluded that at least 90 percent of the firms surveyed were not manufacturing. Most California solar workers, the report found, are installers, technicians or sales representatives.

"Manufacturing is a small percentage of the overall picture," said Andrea Luecke, executive director of the Solar Foundation in Washington, D.C.

Why is manufacturing such a small subset of California's solar industry? For one thing, making photovoltaic cells and modules is a highly automated process that does not require many workers. But solar company officials also cite many other reasons – including labor costs, regulations, and government incentives – to explain why they choose to manufacture elsewhere.

Policymakers seeking to both maximize the installation of renewable energy systems and create jobs should be aware that most California solar jobs involve sales and installation – not production. Solar companies serving California must necessarily have sales and installation employees in the state, while solar panels and wind turbines can be manufactured anywhere.

Chaotic Times Rock Solar Industry

These are turbulent times in the solar industry, in particular, and many California companies are struggling despite government incentives, as the Solyndra bankruptcy shows.

Several factors have forced a shakeout of the industry. Chinese manufacturers cranked up solar panel production after 2006, aided by free land and other government subsidies as well as low-cost loans from state-owned banks. As Chinese production shot up, the governments of Germany, Italy, and Spain tightened their generous solar incentives to encourage installation, which weakened the major solar market of Europe.

Also, a scarcity of polysilicon, a main ingredient of photovoltaic cells, was reversed after 2009, when new production plants opened. Polysilicon prices fell to record lows in 2011, allowing module manufacturers to produce ever-cheaper panels. Solar module prices have dropped by roughly half in the last couple of years, so that in some regions, solar may soon compete favorably with conventional sources of electricity – a holy grail that renewable energy proponents call "grid parity."

"You can practically watch it go down a penny or two a week for the modules," said Gary Gerber, founder of Sun Light & Power in Berkeley, a solar installation company.

Falling prices have helped installers such as Gerber, who can offer customers cheaper systems. But falling prices are brutal to manufacturers.

In October 2011, a coalition of manufacturers led by SolarWorld Industries America Inc. asked the federal government to intervene on their behalf. They argued that Chinese manufacturers are illegally dumping subsidized product. The Coalition for American Solar Manufacturing petitioned the U.S. Department of Commerce and the U.S. International Trade Commission to impose tariffs to counteract artificially low prices.

In a March 20, 2012, preliminary ruling, Commerce found that Chinese solar cells were illegally subsidized. Commerce imposed small duties of 2.9 percent to 4.7 percent on Chinese solar vendors. A ruling on the anti-dumping claim, which could involve additional tariffs, is expected in May 2012.

The SolarWorld petition argued that Chinese manufacturers have no inherent production advantage over U.S. solar manufacturers, as labor

costs make up a small portion of production costs, and the high cost of shipping modules overseas negates the cheaper cost of labor in China. Instead, they contend, the Chinese are selling solar products at artificially low prices.

The coalition's "fact sheet" states:

> *The continued push of massive volumes of dumped Chinese cells and panels, along with growing margins of underselling at artificially and illegally low prices, ultimately caused market pricing in the United States to collapse in 2011 – with an average worldwide price decline of 40 percent – despite a growing market for these goods. The resulting price collapse has had a devastating impact on the U.S. solar cell and panel industry, resulting in shutdowns, layoffs, and bankruptcies throughout the country. Over the past 18 months, seven solar plants have shut down or downsized, eliminating thousands of U.S. solar manufacturing jobs in Arizona, California, Massachusetts, Maryland, New York and Pennsylvania.*

SolarWorld's pursuit of tariffs has split the American solar industry. Installers, who benefit from falling prices, created their own group, called the Coalition for Affordable Solar Energy, to argue against tariffs. That coalition is led by Jigar Shah, the founder of solar services company SunEdison.

In a December 2011 letter to the president of SolarWorld Industries America Inc., Shah warned that if successful, the trade petition "will do far more damage than good to the U.S. solar industry as a whole" by raising solar cell prices and igniting a solar trade war with China.

"CASE's membership is representative of 97 percent or 98 percent of America's solar industry, as the large majority of all U.S. solar industry jobs are downstream of solar panel manufacturing in project development, logistics, construction and installation," wrote Shah. "Every morning, thousands of hard-working Americans put on their tool belts and go build solar power plants. Our country needs more of those jobs, not fewer."

Commerce and the U.S. International Trade Commission also are investigating a petition that utility-scale wind towers from China and Vietnam are being sold in the U.S. at less than fair value.

States Vie for Green Jobs

While California's renewable energy manufacturers struggle to compete globally, other states and nations compete to lure them from California.

The result is that while California loses some manufacturing jobs, such as those at Solyndra, to business failure, others go elsewhere to take advantage of government assistance.

In these recessionary times, policymakers covet green manufacturing. Politicians jockey to associate themselves with job creation, especially blue-collar, goods-production jobs in a burgeoning, environmentally-friendly industry.

For a detailed look at how Mississippi and Oregon attract green manufacturers, see "The Lure of Other States" in Section III of this report, page 39.

For good reason, manufacturing jobs are seen as the backbone of the middle class. The total hourly compensation of a manufacturing job is, on average, 22 percent higher than a job in the services sector, according to a 2009 White House report on revitalizing the sector. Many economists also note that manufacturing and innovation go hand-in-hand; manufacturing firms invest heavily in research and development compared to other business sectors.

Furthermore, green jobs are widely seen as an increasingly strong, resilient sector of the economy. According to a February 2012 report by Next 10, the number of jobs in California's green economy grew 53 percent between 1995 and 2010, compared to 12 percent employment growth in the wider economy. And businesses that help reduce pollution or greenhouse gas emissions or conserve resources weathered the recession better, too, according to Next 10. Its research found that California's green economy shrank only 3 percent between January 2009 and 2010, while the state's overall economy retracted 7 percent.

Eager to attract jobs and make a name for themselves as a hotbed of green businesses, many states have wooed young California firms with tailored packages of financial aid.

Often, the states succeed. In 2010 and 2011 alone, for example, three California-based solar companies announced plans to open manufacturing facilities in Mississippi. The lure? Loans, tax breaks and other incentives of as much as $75 million per company. They include San Jose-based Stion, a maker of thin-film solar panels.

"Stion is a great example of the types of businesses we are focused on recruiting to Mississippi – an innovative company engaged in advanced manufacturing with advanced materials," said Leland Speed, executive director of the Mississippi Development Authority in September 2011. "I

wish the company many years of success in Hattiesburg."

Other nations, too, vie for the factories to mass-produce products designed and engineered in California. Many firms take advantage of cheaper labor in China, the Philippines, Malaysia, Vietnam and other countries to do large-scale manufacturing.

In May 2011, for example, Siliken Solar moved its 130-worker solar panel assembly operation from Otay Mesa in San Diego County to Tijuana. A company official told the San Diego Union-Tribune at the time that salary and benefit costs in Mexico would total $4 to $5 an hour, compared to $15 an hour in San Diego.

Similarly, Solaria Corporation keeps its headquarters in Fremont, but does most manufacturing in India. In October 2011, at a legislative hearing on a state sales tax break for green manufacturers, Senator Bob Huff asked Solaria human resources vice president Melissa Zucker why the company chose to produce solar modules overseas.

For more on the state's business climate and what entrepreneurs want, see "In Their Own Words" and "Tough to Do Business in California?" in the Supplements section, Tabs 3 and 4.

"Cost-competitiveness and an ability to scale in an environment where labor was less expensive, property was less expensive," answered Zucker. "We did receive incentives from the country which we were producing in which basically made it free for us for the first few months we were producing."

Zucker told lawmakers, "We found that in order to compete, that is what we needed to do."

"California is absolutely the place where we want to be from an innovation standpoint," she said. "We are able to attract incredibly smart, forward-thinking people who are passionate about the technology. It is a difficult state to manufacture cost-effectively in, as all of you are aware."

Zucker also noted that Oregon has offered Solaria a $20 million low-interest loan for manufacturing equipment and a $10 million tax credit to try to lure the company north.

"All, obviously, very attractive when you are in the spot that our industry is in and we are competing with countries like China bringing product to the market at very, very low cost," said Zucker.

II. In Detail: Three Renewable Energy Incentive Programs

(SB 71, AB 118 and the Self-Generation Incentive Program)

The stiff global competition and generous offers of aid from other governments described earlier play out in the programs California uses to foster renewable energy companies. The Senate Office of Oversight and Outcomes examined the jobs performance and taxpayer protections of three such programs in light of these larger forces. The Legislature created each of the three programs, but they vary greatly in terms of funding sources, administrators, and goals, thus offering a broad look at the mechanics of incentive programs.

SB 71 Tax Break Helps Level the Playing Field

California is one of only 12 states that charges sales tax on manufacturing equipment, according to the National Conference of State Legislatures. Of those 12, only Hawaii, Nevada, and South Dakota do not ease the tax with a reduced rate, rebate, or exemptions.

In 2010, the California Legislature carved out a small exemption to the sales and use tax on manufacturing equipment for renewable energy and clean transportation companies. Proponents touted Senate Bill 71 (Padilla) as a way to encourage the "clean tech" sector of California's economy without a huge cost to the state's general fund.

Since the program started in March 2010, 41 different solar, battery, biogas, electric car, and fuel cell companies have qualified for the sales/use tax exemption and promised to put the equipment they buy to work in California.

As of March 2012, the exemption had authorized these companies to avoid paying $136 million in sales or use tax; the companies had actually purchased enough manufacturing equipment to avoid $39 million of sales or use tax. State officials had anticipated that 8,723 people would be put to work on all the equipment authorized for a tax break.

SB 71 is administered within the State Treasurer's Office by the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA, pronounced "kate-fuh" by employees). This authority calculates that the financial benefit of the tax savings will spur companies to invest more heavily in manufacturing equipment – and therefore put to work hundreds of people who might not have been hired otherwise.

For a detailed list of awardees in the SB 71 program, see the Supplements section, Tab 5.

But the SB 71 story is complicated. Five of 41 companies, after qualifying for the sales tax exemption, scrapped their expansion plans and declined to take advantage of the tax waiver. Another three either went bankrupt or suspended operations, and a fourth revamped its project and successfully re-applied.

The solar companies that haven't pursued the sales tax break include Calisolar of Sunnyvale, whose executives chose to expand in Mississippi.

Calisolar chief executive officer Roy Johnson had heralded the new tax break in April 2010, when former Governor Arnold Schwarzenegger signed SB 71.

"Many believe it's not possible to be competitive manufacturing in Silicon Valley," stated Johnson in a company press release, "but with innovative technology and a level playing field created by this legislation, Calisolar is well positioned to effectively compete in a global market."

Rather than install new equipment and hire more workers in Sunnyvale, however, Calisolar shifted its business focus to solar silicon production in Mississippi. The company laid off more than 100 Sunnyvale workers. In February 2012, Calisolar even erased California from its name, changing it to Silicor Materials.

Four other companies awarded SB 71 tax breaks changed their projects so substantively that they must reapply for the tax break. One biogas project in Kern County failed to meet the required timetables, according to CAEATFA staff.

Two other SB 71 awardees went out of business before taking advantage of the sales tax exemption. Green Vehicles Inc., which intended to make three-wheeled electric vehicles in Salinas, shut down in July 2011 before buying the $3.7 million worth of surface grinders, robotic welders and other equipment the state approved for a sales tax exemption. And Soliant

Energy Inc. of Monrovia suspended operations in March 2011.

Paradoxically, the company that embraced the program first and used it most enthusiastically, Solyndra, filed for bankruptcy in August 2011 and fired more than 1,000 workers at its Fremont plant.

Besides state assistance, Solyndra had attracted tens of millions of venture capital dollars and a $535 million federal loan guarantee. But Solyndra officials said they simply could not compete with heavily subsidized Chinese solar panel manufacturers.

By the time the company shut down, Solyndra had used $25.1 million in sales or use tax exemptions, $11 million more than all the other SB 71-qualified companies combined had used by March 2012. CAEATFA had authorized the company to waive up to $35 million in taxes.

State officials said they did not expect reimbursement, because Solyndra had not duped the state. The company bought equipment, as promised, and put people to work on it – just not for as long as anyone hoped.

In fact, CAEATFA staff had visited Solyndra's factory in June 2011, two months before it filed for bankruptcy and noted that the company had purchased, installed and put to use about two-thirds of the equipment it said it would. They even reported being amused by the company's robots and forklifts, which played music while moving around the Solyndra factory.

California Hosts Pilot Production

A careful look at SB 71 reveals an important truism about green energy manufacturing in California: It tends to be small-scale, pilot production located near research and development facilities.

With only a couple of exceptions, the companies producing green goods that qualified for SB 71 exemptions do not have large operations cranking out products with thousands of California employees.

Consider, for example, SB 71 tax break recipient First Solar Inc. The Tempe, Arizona, company is one of the world's largest makers of thin-film photovoltaic cells. First Solar operates factories in Ohio, Germany, and Malaysia. Before SB 71 passed the Legislature in 2010, the company had about 130 employees in California, most in the San Francisco area working on project development.

With the passage of SB 71, the company decided to build a pilot

development and production facility in Santa Clara. Company officials told CAEATFA staff that they planned to invest roughly $40 million in the pilot plant and put 180 people to work.

First Solar had used nearly the entire $3.4 million sales tax exemption allotted it by CAEATFA when global forces triggered a restructuring.

In a conference call with investors in December 2011, chief executive officer Mike Ahearn noted that global solar production had effectively tripled in the last several years and "only the most resilient producers will remain."

He told investors First Solar must stop making so many modules and focus on selling utility-scale systems that do not depend on government subsidies. The restructuring would cost about 100 jobs, company officials said. In January 2012, they laid off 63 workers in Santa Clara, including engineers and technicians.

Another company doing only small-scale production in California is Solaria Corp. Thanks to SB 71, the company avoided use tax on equipment it brought to Fremont from its factory in India. It had used $258,678 of its tax exemption award as of March 2012.

Approximately 117 people now work at Solaria's Fremont plant near its research and development center, according to company officials. They say that they benefit from the synergy of doing at least some manufacturing near their innovation hub.

"There's no comparison to having the engineers being able to put on their lab coats and go in the back to see what's going on with the process," said Solaria President Suvi Sharma. "That is a very critical part in the lifecycle of development. High-volume manufacturing is a different entity altogether."

Similarly, SunPower Corp., based in San Jose, manufactures solar cells and panels in Malaysia and the Philippines. With the enactment of SB 71, the company opened a small production facility in Milpitas with 100 or so jobs – the company's first manufacturing operation in the U.S.

Six-year-old Stion Corporation considered building a large plant near its San Jose headquarters to manufacture thin-film solar modules. It opted instead to build a factory in Hattiesburg, Mississippi. The factory opened in September 2011 and is expected to eventually employ 1,000 people.

The Mississippi Legislature passed a $75 million loan package to help the

company, and Stion officials credited Mississippi economic development officials with doing "a phenomenal job" of helping them find a factory site quickly.

Stion is expanding in San Jose, too, although its Silicon Valley production capacity is one-tenth that of Mississippi. In September 2010, the California Energy Commission gave the company a $5 million, low-interest loan to install additional manufacturing and product development equipment. Company officials say the expansion should add 20 direct and 20 temporary construction jobs in San Jose.

Stion officials say they will also break ground this year on a factory in South Korea.

San Jose-based SoloPower Inc. similarly chose to put its biggest factory out of state. SoloPower announced in January 2011 that it would build a factory in Oregon to make flexible, thin-film photovoltaic modules. By March 2012, the company had begun to hire engineers and technicians for its Portland factory, which is expected to employ 450.

Far fewer people manufacture for SoloPower in California, despite state assistance. In August 2011, CAEATFA awarded SoloPower a sales tax exemption worth $681,000 to expand its small manufacturing facility in San Jose. The Energy Commission also loaned the company $5 million. As of January 2012, the company reported to state officials that its work to prepare for the installation of large pieces of manufacturing equipment involved 33 temporary construction jobs. Eventually, the assembly work at the San Jose plant will employ 30 people, according to information SoloPower reported to CAEATFA.

Only a couple of SB 71 beneficiaries do large-scale manufacturing in California:

- About 1,000 people work for fuel cell manufacturer Bloom Energy in San Jose, which was awarded a $3.4 million sales tax exemption in November 2010.
- Tesla Motors employs 1,335 people in California – 460 of them in manufacturing. In December 2011, Tesla was awarded a $24 million sales tax exemption on the purchase of equipment to make the electric Model S sedan and powertrain components. Tesla policy associate Daniel Witt said the company expects to add 700 more manufacturing jobs in California by the end of 2012.

What is the SB 71 Program?

Program purpose: SB 71 offers a sales and use tax exemption on manufacturing equipment used to design, manufacture, assemble or produce "green" alternative source or advanced transportation products. SB 71 is designed to encourage the location of manufacturing facilities and jobs in California and reduce greenhouse gas emissions. Examples of qualified companies include manufacturers of solar panels, electric vehicles, LED light bulbs, and biogas producers. State officials award sales or use tax exemption based upon whether projects are anticipated to produce a net benefit to the state. That analysis involves quantifying how many new jobs and other fiscal benefits the project is expected to create and the energy efficiency or greenhouse gas, air pollution, and water pollution reductions associated with the project.

Created: Enacted in March 2010 under Senate Bill 71 (Padilla, 2009).

History: California is one of only 12 states to charge companies sales or use tax when they purchase equipment on which to manufacture products, according to the National Conference of State Legislatures, and one of only four states to not ameliorate that manufacturing equipment tax with a reduced rate, exemptions, or rebates (other than SB 71). If all California manufacturing equipment sales were exempt from the 3.94 percent of the sales tax that goes to the state general fund, it would cost the state general fund roughly $500 million a year, according to the Board of Equalization. (The minimum state sales tax is 7.25 percent.) Padilla said he wrote SB 71 to minimize the impact to the state's budget while encouraging the many clean technology companies that do research and development in California to also manufacture here.

Administrator: The California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA), housed in the State Treasurer's Office, oversees and administers SB 71. CAEATFA was created in 1980 to finance alternative energy power projects. CAEATFA is governed by a five-member board of which the Treasurer is chair.

Source of revenue: None. SB 71 allows CAEATFA to waive the state and local sales tax when companies buy equipment or other property to be used directly for the design, manufacture, production, or assembly of alternative energy source products or advanced transportation technologies – such as solar photovoltaic panels or gas captured from decomposing landfill waste. CAEATFA's administrative costs are paid by fees charged to applicants and awardees.

Annual expenditure: As of March 2012, SB 71 had cost the state general fund $39 million in avoided sales or use tax payments. As of then, 41 companies had qualified for a sales or use tax exemption totaling $136 million on the purchase of $1.6 billion worth of equipment. By March 2012, nine companies had withdrawn from the program without using the sales or use tax waiver. Of the 32 remaining companies, only 21 had purchased any equipment that would qualify for the SB 71 tax break within the first year, and one of those –Solyndra – had declared bankruptcy after complying with SB 71 rules. Seven other companies

won extensions of time to use their sales/use tax exemptions.

Target businesses: Only designers, manufacturers, producers, or assemblers of "green" products – not electricity generators – qualify. Awardees include makers of solar photovoltaic panels, electric cars, lithium ion batteries, and fuel cells, as well as companies that capture and clean gas emitted by landfills and dairies.

Protections for public money: Companies qualify for the sales tax exemption based upon the economic and environmental benefits of their project, as determined in a public meeting by CAEATFA. Awardees get no benefit from the state until they raise the capital and purchase manufacturing equipment for their projects. Companies must use at least 25 percent of their sales and use tax exemption award in the first year after approval or ask for an extension. Companies must install and maintain the equipment for at least three years in California, and use the equipment to make what they promised to make or risk paying liquidated damages to the state. There is no limit on how much sales/use tax may be exempted, but CAEATFA must notify the Legislature when the total reaches $100 million annually.

Accountability: Unlike most state tax breaks, the SB 71 program is transparent. CAEATFA makes public a list of awardees, application summaries, requests for extensions, and other documents. In addition, CAEATFA conducts a net benefit evaluation on each application to determine whether the anticipated fiscal and environmental benefits outweigh the estimated sales and use tax that will be avoided. CAEATFA, however, is technology neutral and does not weigh the viability of a company before awarding the sales tax exemption.

Estimated number of jobs created: State officials anticipate that the financial savings of SB 71 will help the 32 actively participating companies to create 496 of the 5,382 jobs tied to the purchased equipment. (The state assumes that because companies save up to 8.1 percent buying equipment, they therefore purchase more machinery that creates additional jobs.) Those job-creation figures do not include the 225 jobs expected at solar company Solyndra, which filed for bankruptcy in August 2011 and laid off 1,100 workers.

Green benefits: CAEATFA staff use a complicated formula to calculate the environmental benefits of the marginal additional production resulting from equipment purchased with money saved through SB 71. The formula includes a dollar value on the pollution that is not produced as a result of the deployment of products made on the tax-exempt equipment. The total environmental benefit associated with the 32 actively participating companies is estimated at $68 million.

Fiscal benefits: CAEATFA calculates the fiscal benefit of a sales/use tax exemption by adding a pro rata share of corporate, personal, sales, and property taxes over the life span of the equipment that qualifies for the SB 71 exemption. The estimated fiscal benefit associated with the 32 actively participating companies is calculated at $111 million.

Bonus for California products or jobs? Under SB 71 rules, the manufacturing

equipment that qualifies for a sales/use tax break must be put to use in California. The program gives no extra incentive to companies that buy equipment made in California. But when calculating the fiscal benefits of a project, CAEATFA takes into account how much equipment a company plans to purchase in California.

Mechanism to recoup money? California may not recoup sales or use tax revenue waived under SB 71 so long as a company follows the rules of the program, even if it goes bankrupt. Solyndra – the biggest recipient of SB 71 exemptions – announced bankruptcy in August 2011. CAEATFA lawyers concluded that the state most likely could not recover any lost tax revenue unless it proved Solyndra officials made a material misrepresentation to the state, which was unlikely, because Solyndra purchased and put to use equipment as promised – just not as long as state officials had hoped.

Criticism of program: There is no way to know if SB 71 is responsible for attracting or keeping manufacturing jobs in California. Companies that qualify for the sales/use tax exemption may have purchased equipment regardless of the tax break. Furthermore, after three years of operation, companies may move out of state the equipment on which they paid no sales tax. CAEATFA requires three years of in-state use because, officials said, a longer term might hinder innovative upgrades in a rapidly-changing industry. The Legislative Analyst's Office points out that a state subsidy on equipment – and not labor -- may make a company more likely to invest in robots than workers. And finally, companies may qualify for the sales/use tax waiver by selling equipment among subsidiaries. Solar module makers Solaria and Solyndra, for example, both avoided paying use tax on equipment the companies purchased from sister corporate entities under SB 71.

Future of program: The program sunsets in January 2021. The Legislative Analyst's Office is due to report on the effectiveness of SB 71 by January 2019.

AB 118 Creates Jobs as it Fosters Cleaner Fuels and Vehicles

Given California's experience to date with the SB 71 sales tax exemption, the "clean" transportation industry appears a more promising source of jobs than solar manufacturing.

Some say the state is quickly becoming an industrial hub for electric vehicles and alternative fuels. According to the nonprofit group Next 10, in 2010 California accounted for 60 percent ($840 million) of the global venture capital investment in electric vehicle-related businesses. California tied Michigan in the number (300) of electric vehicle-related patents registered between 2008 and 2010, according to Next 10. The group estimated electric vehicle-related employment in California at nearly 1,800 in 2010. Experts say that an additional 10,000 jobs eventually could be involved in supplying and servicing Tesla Motors alone.

That promise is reflected in another of California's renewable energy incentive programs examined by the Senate Office of Oversight and Outcomes.

Officially called the "Alternative and Renewable Fuel and Vehicle Technology Program," the four-year-old program aims to help wean the state of petroleum-based transportation fuels. California motorists and boaters pay higher registration fees to fund it.

Jobs are not the main focus of the program, dubbed "AB 118" after its founding legislation. But the companies and public agencies awarded money through the program to date say they have or will create roughly 5,400 jobs as a result of the $197 million spent as of July 2011. Of those, 1,054 are manufacturing jobs. That makes the fuels and vehicle program a bigger generator of jobs than the SB 71 sales tax exemption for green manufacturers.

The Legislature created the fuels and vehicle program with Assembly Bill 118 (Nunez) in 2007. The legislation raised the car, truck, and boat registration fees paid by millions of Californians in order to generate roughly $160 million a year. Of that, the Energy Commission gets about $90 million a year for the Alternative and Renewable Fuel and Vehicle Technology Program. (Remaining funds are distributed by the Air Resources Board and Bureau of Automotive Repair.)

To win an AB 118 award from the Energy Commission, a company must have a business presence in California and carry out funded projects

here. The Commission also first screens projects based on their ability to "provide economic benefits to California."

Recipients of the grants include private companies and public agencies for projects to curb greenhouse gas emissions by cars, trucks, buses, trains, and other vehicles. Projects include the installation of electric vehicle charging stations, the conversion of food and animal waste into bus fuel, and development of electric heavy-duty truck engines.

Since 2008, the Energy Commission has targeted $26 million of its AB 118 revenue for manufacturers. It has distributed the money among 12 companies that make vehicles or vehicle components, such as lithium-ion batteries. Those dozen companies estimate the projects funded with AB 118 dollars will generate approximately 456 of the 1,054 manufacturing jobs attributed to the program.

The AB 118 manufacturing incentives to date have helped to attract several companies to California. Among them:

- Electric Vehicles International moved its headquarters from Toluca, Mexico, to Stockton in November 2009. The Energy Commission gave the company a $3.9 million grant in June 2011 to expand and modernize its production facility in Stockton. The grant "further supports our decision to relocate our headquarters and main manufacturing operations," company chief executive officer Rick Hanna said at the time.
- Boulder Electric Vehicle of Colorado, awarded a $3 million loan in July 2010, plans to open a manufacturing facility in Los Angeles later this year.
- Propel Fuels Inc. moved its company headquarters from Seattle to Redwood City in 2009. That year, the state Department of General Services was awarded $4 million in AB 118 money to build 75 ethanol fuel blend stations, with Propel conducting the work. Propel was also awarded $1 million to build 10 ethanol fuel blend stations in 2010.

In addition, a subsidiary of ECOtality Inc. moved its headquarters from Scottsdale, Arizona, to San Francisco in June 2010, after it won an $8 million award of AB 118 funds to install electric vehicle charging stations in San Diego.

"The Bay Area is a nexus for the electric vehicle industry," stated a company press release at the time, "and California is expected to be the largest EV market in the country . . . The company will also benefit from California's favorable incentives for renewable energy companies."

Every other awardee of the AB 118 manufacturing funds is based in California: Coulomb Technologies of Campbell, Envia Systems of Hayward, Leyden Energy of Alameda, Mission Motors Company of San Francisco, Quallion of Sylmar, Quantum Fuel Systems Technologies Worldwide of Irvine, TransPower of Poway, Wrightspeed of San Jose, and Zero Motorcycles of Scotts Valley.

One of the awardees, Green Vehicles of Salinas, went out of business less than a year after the Energy Commission awarded the firm a $2.1 million grant. Still, Californians lost only $187,205 on Green Vehicles. That's because the Energy Commission dispenses AB 118 revenue gradually, making payments only after a company submits invoices for equipment, labor, or other expenditures. Also, awardees for most projects must match at least a portion of the Energy Commission awards; Green Vehicles failed to generate the $2 million it pledged to match its state award.

The city of Salinas paid more heavily. It had given Green Vehicles $534,000 in aid, including a $234,000 general fund loan. In August 2011, the city sued the company for breach of contract and fraud. The case is pending in Monterey County Superior Court.

None of the other California manufacturers awarded AB 118 grants have gone out of business. Energy Commission officials said in February 2012 that all of the other funded projects are moving forward.

In fact, the Commission has already allocated another $10 million to help manufacturers and proposes another $20 million allocation in its draft 2012-13 investment plan.

What is the Alternative and Renewable Fuel and Vehicle Technology (AB 118) Program?

Program purpose: This eight-year-long program attempts to reduce greenhouse gas emissions in California by fostering cleaner fuels and vehicles to replace petroleum as the state's chief transportation fuel. It gives grants, loans, and other financial incentives to companies and public institutions.

Created: Under AB 118 (Nunez, 2007), which took effect July 1, 2008.

History: California's transportation sector – with more than 26 million registered vehicles – produces roughly 40 percent of the state's greenhouse gas emissions. Nunez co-authored California's historic legislation in 2006 to reduce greenhouse gas emissions by 2020 to 1990 levels. He wrote AB 118 to encourage adoption of cleaner fuels and vehicles that will help California meet its greenhouse gas reduction target.

Administrator: California Energy Commission.

Source of revenue: AB 118 imposes various increases, from $3 to $20, on annual vehicle registration fees, smog abatement fees, identification plate fees, and boat registration fees.

Annual expenditure: The increased fees generate roughly $160 million a year. Of that, approximately $90 million annually goes to the Energy Commission to spur deployment of new technologies under the Alternative and Renewable Fuel and Vehicle Technology Program. (Another $40 million a year goes to the Air Resources Board for projects that reduce air pollution, and the Bureau of Automotive Repair gets about $30 million a year to pay for the voluntary dismantling of high-polluting cars and trucks.)

Target businesses: The Energy Commission distributes its portion of the AB 118 revenue to companies and public agencies that develop, produce, manufacture, or deploy alternative and renewable fuels or vehicles. Some of the money is also used for research, workforce development, public outreach, and market analysis. Awardees include electric car manufacturers, ethanol producers, public utilities, universities, truck engine makers, transit districts, various cities, battery makers, biogas companies, hydrogen companies and alternative fuel distributors.

Protections for public money: Public or private entities may not get AB 118 money to do anything mandated by local, regional, state or federal laws or rules. Nor may they be awarded AB 118 money for projects that would help them meet government requirements to reduce air pollution or greenhouse gas emissions. Fleet customers who use AB 118 funds to lower the cost of alternative vehicles must use the vehicles entirely in California. Energy Commission staff evaluate the ability of applicants to perform as promised. Applicants for most projects must match between 20 percent and 50 percent of AB 118 awards, and they are judged in part on the amount of non-state matching funds that project sponsors can raise. The AB 118 money is paid to awardees based on invoices for items already purchased, and the commission may audit projects or suspend payments at any time for reasons such as shoddy performance or schedule delays. Electric car

manufacturer Green Vehicles of Salinas, for example, was awarded a $2.1 million grant of AB 118 funds in 2010 but had received only $187,205 based on invoices when the company shut down in July 2011. Energy Commission staff monitor projects through monthly and quarterly reports, but do not always visit projects because of limited funds for travel.

Accountability: The Energy Commission must consult with an expert advisory committee that meets publicly to discuss the Commission's annual investment plan, which identifies opportunities and priorities for program funds (such as electric vehicles, biofuels, natural gas, and propane). The Energy Commission approves awards to individual companies and agencies in public meetings. The commission must evaluate the benefits of AB 118 every two years and publish its findings.

Estimated number of jobs created: Based on an Energy Commission survey of AB 118 grant recipients with a response rate of 90 percent, the grants are expected to create 1,912 short-term jobs lasting 18 months or less and 3,482 long-term jobs lasting one to five years, for a total of 5,394 jobs. Several grant recipients have moved offices or operations to California.

Green benefits: Energy Commission staff estimate that AB 118 programs will support alternative fuels that can displace 2 percent to 6 percent of the 18 billion gallons of diesel and gasoline that would otherwise be used in the state in 2020. The AB 118 programs are expected to reduce transportation-related greenhouse gas emissions by 1 percent to 4 percent compared to a business-as-usual scenario for California in 2020.

Fiscal benefits: Besides creating an estimated 5,394 jobs, AB 118 programs handled by the Energy Commission have leveraged $375.5 million in non-AB 118 funds, much of it federal stimulus money.

Bonus for California products or jobs? One of the 11 criteria in AB 118 by which projects are supposed to be judged for funding is providing economic benefits for California "by promoting California-based technology firms, jobs, and businesses." The regulations written to carry out AB 118 state that projects considered for funding should be judged in part on how well they "provide economic benefits to California by promoting California-based technology firms, new job creation, new business development, economic benefit to low income communities, avoidance of disproportionate impacts to disadvantaged communities, and increased state revenue."

Mechanism to recoup money? Although the Energy Commission uses AB 118 money to reimburse grant recipients for payments they have already made and may stop such reimbursements at any time, the AB 118 regulations do not make clear if or how the Energy Commission could recoup money once it is given to a grant recipient. The Energy Commission has not attempted to recover any funds.

Criticism of program: Energy Commission staff say that ending California's reliance on petroleum will take many different types of alternative fuels and vehicles, and no single "silver bullet" exists. They call their approach to spending AB 118 funds "silver buckshot," and they aim to spend relatively small sums on a wide array of efforts. Others call that approach scattershot and disorganized. Also, the Energy Commission came under heavy criticism from environmentalists in 2008 for splitting $6 million in program funds among three California corn ethanol producers. The money is supposed to be repaid if or when market conditions make ethanol production profitable. Environmentalists complained that the environmental damage caused by growing corn to produce ethanol makes it a poor choice for government subsidies. In 2009, California used 962 million gallons of ethanol to blend as an oxygenate into its reformulated gasoline, 95 percent of it imported by railcar from the Midwest. Following clear feedback from the Legislature, the Energy Commission canceled any future funding for corn ethanol, and the 2012-13 Investment Plan includes no corn ethanol funding.

Future of program: The program sunsets January 1, 2016.

The Ever-Changing Self-Generation Incentive Program

The Self-Generation Incentive Program, managed by the Public Utilities Commission, has a tumultuous history. Founded during the electricity crisis, it languished for several years until the Legislature changed its mission in late 2009. The program offers a case study in why legislators should frequently revisit incentive programs to determine if they are achieving a clear goal in return for the millions of dollars that ratepayers and taxpayers could put to other purposes.

In 2010, SGIP awarded a single company – fuel cell manufacturer Bloom Energy – $208 million in utility ratepayer funds. No one company has gotten more financial assistance from California's renewable energy incentive programs than Bloom.

The Public Utilities Commission awarded Bloom the money at the last minute, as the SGIP was on the verge of expiration, with the assistance of tailored legislation and waivers granted by state regulators.

PUC regulators have since changed the rules of the program to prevent such large subsidies in the future. Nonetheless, the history of the program should be instructive to policymakers.

Case Study of a $208-Million Subsidy

The Self-Generation Incentive Program was established by the Legislature in 2001 in response to the electricity shortages and price spikes unleashed when California's newly-launched power market went awry. The Public Utilities Commission used SGIP money collected from utility ratepayers to offer incentives to customers who generated their own electricity.

During SGIP's early years, the focus was primarily on solar power. In 2006, solar energy was severed from the program with the adoption of the California Solar Initiative. That left wind turbines and fuel cells for SGIP – and not many takers.

In May 2009, the program was sitting on $310 million it couldn't give away. Half the unspent money had already been collected from California utility ratepayers. The remaining $155 million had also been authorized by the Public Utilities Commission, but the four utilities that administer SGIP had not collected it from their customers. The program was nearly moribund.

At that time, SGIP handed out the money on a first-come, first-served

basis, with 100 percent paid up front and no limit on how much could go to any one supplier. Fuel-cell maker Bloom Energy saw an opportunity. In 2010, with the $310 million carryover as a draw, the startup company moved rapidly to line up customers for its Bloom energy servers. Between April and December of 2010, Bloom received approval for $208 million in SGIP projects, two-thirds of the program's total grants for the whole year.

In preparation for its big push, Bloom supported and won a couple of other SGIP incentives that sweetened the pot:

- In 2008, the Legislature created a 20 percent "add-on" for California manufacturers. (Besides Bloom, only one other supplier qualified for this incentive, and that was for a single project.)
- In 2009, the PUC granted Bloom's petition for a renewable-fuel bonus of $2 per watt for using "directed" biogas – biogas purchased outside the state. (Previously, biogas had to be produced in California to qualify as renewable.)

In late 2010, SGIP's utility administrators grew concerned that one technology – fuel cells – was depleting the incentive program. They knew there would be major modifications to SGIP within the next year, changes that would recalibrate the program to focus on greenhouse gas reduction. Pacific Gas & Electric took the lead, arguing to the PUC that SGIP should be suspended immediately – as of December 22. According to PG&E's motion: "Unless a moratorium on new applications is put in place, projects of currently eligible technologies could consume all available SGIP funding."

Bloom objected, however, and successfully convinced the commission to use January 1, 2011, as the deadline. "The success of the SGIP is not a reason to halt its continuation, even temporarily," wrote Josh Richman, Bloom's head of business development, in a response to the PG&E motion. "After years of underutilization, the SGIP is now meeting the stated policy goals of the program, which calls for support and further investment in a program that is meeting its expectations."

The company made good use of the extra time. Bloom submitted $36.6 million in applications the final week of December 2010 – $29 million on the last two days of the year. When SGIP was finally suspended, all but $70 million of its $310 million carryover had been spent.

Senate oversight staff visited the Bloom facility in Sunnyvale in January 2012. Richman conducted a tour of the bustling factory. He talked about his company's utilization of SGIP and what the incentive program meant

to a fledgling manufacturer. Although SGIP does not have a specific job creation component, manufacturing jobs were certainly created at Bloom Energy. The company added 1,000 jobs as a result of the subsidies, Richman said.

"The SGIP incentive played a critical role for us – it provided short-term, critical help to scale up our business and achieve volume," Richman said. "We're a scrappy, entrepreneurial company. We would have survived without SGIP, but we wouldn't have been as successful as fast."

He also defended Bloom's domination of the program: "In 2009, SGIP was underutilized. What good did it do to have that money sitting in a utility's bank account? Without those sales, we wouldn't have bought the manufacturing equipment or hired the people."

In all, 96 Bloom projects were approved in 2010, with incentives ranging from $500,000 to $5.125 million per project. (Before 2010, only 28 fuel cell projects had been approved in SGIP's eight-year history.) One veteran energy observer said he found Bloom's run on SGIP surprising – but within the rules as they existed at the time: "What Bloom did in SGIP was very deft, astonishing, but not illegal."

Who received the 96 Bloom subsidies? PUC policy shields that information from the public. See "Transparency" in Section III, page 57

Bloom's SGIP incentives were substantial– typically more than half of a project's cost. When coupled with a 30-percent federal investment tax credit, many recipients saw nearly all the costs for their new energy systems borne by government subsidies. This heavy reliance on public dollars was cited in a bill analysis last year by Lawrence Lingbloom, consultant for the Assembly Natural Resources Committee. He wrote: "Rather than leveraging private investment to achieve a public benefit, in this case the public seems to be replacing private investment to achieve a private benefit."

The subject of the bill analysis, AB 1150 by Assemblyman V. Manuel Perez, authorized the PUC to continue to make SGIP collections from ratepayers through 2014. Lingbloom's analysis was critical of SGIP, raising questions about the Bloom rush and about the program in general. "The SGIP has operated as a vendor-driven free-for-all," Lingbloom wrote. "This is evidenced by the inequitable and arbitrary distribution of funds, which bears no direct relationship to electric system needs or other general ratepayer or public benefit."

Similar points were made Kellie Smith, chief consultant of the Senate Energy Committee, in her July 2011 analysis of the same bill. She wrote:

> *Many questions have been raised about the administration of the program, including geographic disparities (more than half the funds went to four counties), funding fuel sources at a Louisiana landfill, participant inequities with virtually all of the fund going to commercial customers and little or none to residential, and fund disparities between program vendors with one company driving the bulk of funded technologies….Should a program be extended that has a checkered performance history?*

AB 1150 was signed into law on September 22, 2011, extending ratepayer collections for SGIP another two years. It left intact previous statutory language that called for "an equitable distribution of the costs and benefits of the program." Also retained was SGIP's sunset date of January 1, 2016, with any unallocated money to be returned to ratepayers.

Throughout 2010, while Bloom and a few other fuel cell makers were dominating SGIP, it was common knowledge – and a matter of law –that SGIP was due for a dramatic change. SB 412 (Kehoe), which passed in 2009, gave the program a new focus: reduction of greenhouse gases. The law also limited annual SGIP collections from ratepayers to the amount collected in 2008, which was $83 million. And it required the PUC to "to ensure that distributed energy resources are made available in the program for all ratepayers."

Although SB 412 took effect on January 1, 2010, the PUC allowed SGIP to operate under the old rules until it suspended the program one year later. During that year, incentives totaling $321.7 million were approved – 64 percent of it going to Bloom Energy.

Meanwhile, the commission initiated a proceeding to reconfigure SGIP to reflect the new emphasis on greenhouse gas reduction. The modifications were adopted September 8, 2011, in a decision that significantly expanded the eligible technologies beyond fuel cells and wind turbines. At the same time, the commission "improved and streamlined its Self-Generation Incentive Program" (as a press release described it) in a number of ways, including these:

- No more than 40 percent of SGIP's budget may be allocated to any single manufacturer in a given year.
- Instead of a one-time, up-front payment of the entire incentive, now half the money will be paid over five years, based on performance. Incentives will be reduced or eliminated if

generation does not result in greenhouse gas reductions or perform as specified.
- The total amount for any single project is capped at $5 million.
- Only onsite and in-state biogas is eligible for SGIP incentives; biogas contracts must be for at least 10 years.

In an interview with the Senate oversight office, PUC energy staffers described the SGIP changes as a major improvement. "These modifications are a big step forward," said Melicia Charles, a program supervisor. "Whether or not we need to tweak and modify them further remains to be seen."

The changes do tighten up SGIP considerably – but the PUC's energy staff had called for even more rigorous oversight. In April 2011, staff proposed that the commission adopt three screens to determine eligibility for the new SGIP:

- the impact on greenhouse gas reductions;
- cost-effectiveness;
- and the need for financial incentives.

The cost-effectiveness screen "is intended to help ensure that SGIP funds projects that benefit society as a whole," according to the staff proposal. As far as screening applicants for need, staff wrote: "The SGIP incentives should provide sufficient payment to stimulate technology deployment without overpaying, and the SGIP incentives should not be provided to technologies that do not need them to earn a reasonable return investment of 15 percent."

The commission adopted only the greenhouse gas reduction screen, noting that it was required by SB 412, and rejected the other two as unnecessary and perhaps contradictory.

The modified SGIP is open for business. With its new emphasis and broader eligibility, the program that once could not give its money away is now drawing many applicants. The suspension was lifted November 17, 2011. By early February 2012, SGIP administrators had already received 190 applications. In all of 2009, SGIP received 22 applications statewide. In 2008, the program received just 10.

Anne Smart is familiar with SGIP's recent history. She is director of energy policy with the Silicon Valley Leadership Group, a business trade organization that advocates for open markets and free competition. She sees timing as key to Bloom's success, which she applauds.

"Much of my job is working with the end-users of energy -- big companies that want to be greener," Smart said in an interview. "A program like SGIP allows both end-users and manufacturers to benefit. As for Bloom Energy, it simply expanded faster than its fuel cell competitors, and both Bloom and Bloom's customers benefited from that."

Aided greatly by California ratepayers, Bloom has created at least 1,000 jobs in the state. Bloom will continue to invest here, according to Richman, the company's head of business development.

"This is where the innovation is – where the entrepreneurial fire is – and the state's green policies are great," Richman said.

Yet even an outsized SGIP subsidy and California's culture of innovation are not enough to keep all of the Sunnyvale company's manufacturing here.

For more information on Bloom Energy's deal with Delaware, see "Clawbacks" in Section III, page 55.

In mid-2011, after California awarded Bloom $208 million to lower the price of its fuel cells for customers, Bloom announced that it would build a fuel cell factory in Newark, Delaware. At full production, the factory is expected to employ 900 people. In a deal blessed by utility regulators, Delaware electricity customers will help finance Bloom's factory and buy electricity from clusters of Bloom fuel cells. The aid to Bloom will cost Delaware ratepayers on average $1.34 a month for 21 years.

Staff at the Delaware Public Service Commission concluded that without the 900 new jobs, the deal would be "highly favorable" to Bloom and "unfavorable to ratepayers." But if the jobs materialize, they said, Delaware would get hundreds of millions of dollars of economic benefits.

Even the public's watchdog at the commission agreed.

"If we do not invest in Delaware," wrote the public advocate in September 2011, "why would anyone else?"

What is the Self-Generation Incentive Program (SGIP)?

Program purpose: Currently, to incentivize "distributed generation" that helps to achieve the state's greenhouse gas reduction goals. (Distributed generation is installed on the customer's side of the utility meter and produces electricity for that customer.)

Created: Established in 2001 by the California Public Utilities Commission under AB 970 (Ducheny 2000).

History: Created to encourage electricity generation in response to the state's energy crisis. Solar power was severed from SGIP when the California Solar Initiative was adopted in 2006. In 2008, SGIP was further limited to wind and fuel cells. In 2009, SB 412 (Kehoe) modified the primary purpose of SGIP from peak load reduction to greenhouse gas reduction. The modified program became effective in late 2011.

Administrator: The PUC oversees SGIP, which is available to customers of four investor-owned utilities: Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric and Southern California Gas. The utilities administer their own programs, except in SDG&E territory, where the program is operated by the California Center for Sustainable Energy.

Source of revenue: Ratepayers of the four investor-owned utilities.

Annual expenditure: Ratepayer collections total $83 million annually. Of that, 75 percent goes to renewable and emerging technologies, 25 percent to non-renewable technologies, and 7 percent to program overhead. No more than 40 percent of the annual statewide budget can go to any one manufacturer. Maximum incentive for a single project is $5 million.

Target businesses: Eligible technologies include wind turbines, fuel cells, gas turbines, microturbines and internal combustion engines, organic Rankine cycle/waste heat capture, combined heat and power, advanced energy storage and pressure reduction turbines.

Protections for public money: Only 50 percent of each incentive is paid up front – the rest is paid incrementally over 5 years. Recipients are expected to pay a minimum of 40 percent of the total project cost themselves. (This means that the SGIP incentive cannot exceed 30 percent of the cost if the project also gets a 30 percent federal tax credit.)

Accountability: The PUC does not reveal identities of SGIP subsidy recipients, making it difficult to assess the equitability of the program or to measure its impact on greenhouse gas reduction, use of renewable energy, or the incentive to buy from California suppliers. The PUC contends that individual customer information is confidential and protected -- and cannot be released without consent of the customer. The fact that SGIP is a subsidy financed with public money argues for transparency, however.

Estimated number of jobs created: SGIP does not have a job-creation component and does not track how many jobs its incentives have created.

Green benefits: In 2010, SGIP projects

increased greenhouse gas emissions relative to the grid, emitting a net total of nearly 30,000 tons of GHG into the atmosphere (CPUC Self-Generation Incentive Program Tenth-Year Impact Evaluation, July 2011). Under SB 412's modifications, however, a major focus of SGIP is now greenhouse gas reduction.

Fiscal benefits: By the end of 2010, there were 441 SGIP projects online with about 227 megawatts of rebated capacity. That year, these projects provided over 680,000 megawatt hours of electricity in California -- enough electricity to meet the needs of 100,000 homes. For every $1 of SGIP incentives paid, about $2.60 of other funding was leveraged.

Bonus for California products or jobs? SGIP customers are eligible to receive a 20-percent increase in their incentive if they use a California supplier. To qualify, a firm must manufacture eligible equipment in California and either 1) have a permanent principal office in California or 2) for the previous five years, have a California business license, employ California residents, and own and operate a manufacturing facility located in California.

Mechanism to recoup money? Previously, 100 percent of the incentive was a one-time, upfront payment without further oversight. Under the new rules, 50 percent of the incentive is paid in increments based on performance over a five-year period. Incentives will be reduced or eliminated if energy generation does not result in greenhouse gas reduction or otherwise perform as promised.

Criticism of program: Funding for SGIP is disproportionately shouldered by residential ratepayers who have little or no access to the incentives. Last year, a bill analysis in the Assembly Natural Resources Committee had this to say about the program: "The SGIP has operated as a vendor-driven free-for-all. This is evidenced by the inequitable and arbitrary distribution of funds, which bears no direct relationship to electric system needs or other general ratepayer or public benefit."

Future of program: SGIP sunsets Jan. 1, 2016. Under AB 1150 (Perez 2011), the four electric utilities can collect from ratepayers through Dec. 31, 2014. Any unallocated money left in SGIP after it sunsets will be returned to the ratepayers.

III. Structuring Incentives: Improving Our Chances of Success in a Risky World

Some other states offer richer incentives than California to renewable energy manufacturers – notably Mississippi and Oregon – but such incentives do not guarantee jobs. California's incentives to date emphasize installation of renewable energy, with job creation an ancillary benefit, not the main focus. Efforts are underway to create a green bank in California that could loan money at low-interest rates to help more California startup companies bring their innovative technologies to market. Whichever incentives they embrace, California policymakers must weigh how much financial scrutiny to give potential awardees, how many strings to attach to the awards, and how much information to make public.

The Lure of Other States

Across the country, states tally long lists of incentives for companies they hope to attract: tax credits worth 75 percent of the company's employee income tax withholdings, customized job training, sales tax refunds tied to the number of jobs created, low-interest loans, and cash to build factory rail spurs, access roads, or parking lots.

In the last few years, Oregon and Mississippi have done especially well luring California companies.

Calisolar, Stion, Twin Creeks Technologies, Soladigm, Peak Sun Silicon Corp., Solexant, Solaicx, SolarWorld Industries America Inc., Sanyo Solar, and SoloPower have all moved to or opened operations in Mississippi and Oregon in recent years. Most of the companies started in the Silicon Valley.

The two states staked hundreds of millions of public dollars to attract the companies. But their experience shows that offering rich incentives to generate jobs is not for the faint-hearted. It remains to be seen whether Mississippians and Oregonians will enjoy the number of new jobs promised.

Former Mississippi Governor Haley Barbour and the Legislature crafted incentive packages of as much as $75 million each for solar manufacturers Calisolar, Stion, and Twin Creeks Technologies, and they put together a $40 million loan for Soladigm of Milpitas, which makes energy-efficient windows capable of switching from tinted to clear.

Oregon offered tax credits to cover half the eligible project costs, up to $20 million. The green companies could use the tax credits directly or use them to raise cash by selling them, at about two-thirds the face value, to other companies seeking to lower their own tax bill.

The Oregon Legislature changed the law in 2008 and provided for up to $40 million in eligible costs for a manufacturing facility, instead of the prior $20 million limit.

Oregon's "Business Energy Tax Credit" program awards tax credits only when projects are complete. Solaicx received $9 million in tax credits in 2008, $20 million was awarded to SolarWorld, and the Sanyo Solar factory in Salem received two $20 million tax credits. SoloPower has applied for up to $20 million in renewable energy manufacturing tax credits. Solexant applied for tax credits of up to $18.75 million. Oregon also gave Peak Sun Silicon Corp. of Carlsbad a $9 million tax credit and, through the Small-scale Energy Loan Program, a $12.1 million loan to help it build a factory near Albany, Oregon to manufacture silicon for crystalline solar cells. SoloPower has been approved for a similar $20 million loan.

But the incentives have proved no sure path to jobs, especially in the volatile solar manufacturing industry. Struggling to pay for essential services and uncertain of how many jobs the state gained as a result of its tax credit program, the Oregon legislature last year reduced the program dramatically – from a two-year investment of $300 million to a two-year investment of $3 million dollars. The renewable energy manufacturing tax credit is capped at $200 million for the current two-year state budget period and is scheduled to sunset at the end of 2013.

The curtailment followed reports in *The Oregonian* newspaper that the state's Department of Energy collected no firm data on the number on jobs attributed to the subsidies.

"Oregon has stopped throwing money at anyone who mouths the magic words: 'Green energy,'" stated a March 2011 *Oregonian* editorial.

However, some headaches linger for the state from its go-go incentive days. Oregon has gone to court to foreclose on Peak Sun, which defaulted

on its loan. State finance officials warned in January 2012 that taxpayers could be on the hook for $20 million to cover a spate of delinquent loans – including Peak Sun – in the state's Small-scale Energy Loan Program.

Not all of Oregon's proffered incentives have been utilized. Solexant, of San Jose, tabled its Oregon expansion plans despite an offer of $18.75 million in tax credits and a $25 million loan. Bruce Laird, a state clean tech recruitment officer, said the company is still in the laboratory phase in California.

Solaicx of Santa Clara did use the $9 million in tax credits Oregon granted in 2008 – but the jobs benefits didn't last long. Solaicx opened a Portland facility to produce silicon wafers for the solar industry. But MEMC Electronic Materials of St. Louis bought Solaicx in 2010, and in December 2011, MEMC reduced production at the Portland factory and laid off nearly 100 of 140 workers.

Other Oregon incentive gambits have generated jobs – at a cost to California.

SolarWorld, a German solar panel manufacturer, opened a large factory in Hillsboro, Oregon, in 2008 in order to consolidate its factories in Vancouver, Washington, and Camarillo, in Ventura County. SolarWorld now employs roughly 1,000 people in Oregon – just as it promised when it received $20 million in business energy tax credits in 2007.

Roughly 100 people still work for SolarWorld in sales and marketing in Camarillo, but 180 production workers lost their jobs when the company halted solar module assembly there in September 2011.

Similarly, Sanyo Solar USA opted to shut down its outdated solar wafer manufacturing plant in Carson, which will cost 140 workers their jobs in 2012. The company makes similar products at a factory it opened in Salem, Oregon, in 2009. A company official said Sanyo chose to expand in Oregon in part because of lower electricity rates, a skilled workforce, and a $40 million tax credit.

SoloPower announced plans in March 2012 to begin hiring engineers and technicians for a Portland factory. The plant is expected to begin commercial production of solar cells and modules later this year and eventually employ 450.

In Mississippi, some critics question the wisdom of the state's tailor-made incentives, especially since the Solyndra bankruptcy.

"Let's hope the recent scandal involving the Solyndra solar panel company isn't a sign of things to come in Mississippi," stated the *Biloxi Sun Herald* in a September 2011 editorial.

Mississippians have reason to be concerned that the companies to which they offered loans will generate the jobs promised. Calisolar, awarded its $75 million package of loans and grants in September 2011, has yet to launch a factory. (Chief executive officer Terry Jester said the company expects to start construction in May 2012, according to *The Dispatch* of Columbus, Mississippi.)

The Twin Creeks Technologies facility in Senatobia is finished but has not started large-scale hiring or commercial production, according to a company official.

Soladigm, a Milpitas-based manufacturer of "dynamic" windows that got a $44 million incentive package in July 2010, is still preparing to launch production at its Olive Branch factory, said a company spokesman. The company has not started hiring for production. Mississippi officials said they expect Soladigm to eventually create 300 jobs.

For a look at how a Buy California credit might work, see "In-State Incentives" in the Supplements section, Tab 6.

Stion Corp. of San Jose moved into a former Sunbeam appliance factory in Hattiesburg, Mississippi, and had hired 120 workers as of January 2012, according to the *Hattiesburg American*. Stion is expected to eventually employ 1,000 Mississippians, even as it breaks ground on a new factory in South Korea and adds new equipment to create another 20 jobs in San Jose.

"We hope to continue working productively with (California) as we expand our presence in the global solar market," wrote Stion director of business and development Frank Yang to the Senate Office of Oversight and Outcomes.

California Focuses on Research and Installation

For better or worse, California generally does not tailor sizable loans and subsidies for individual manufacturers in order to attract jobs.

To date, California's renewable energy incentive programs have focused on fostering innovation, with research and development grants, and

encouraging installation by subsidizing the cost of wind turbines, solar panels, and fuel cells.

Some experts find value in that approach -- if more is done to complement it.

"I don't know how strategic it is, but California has a very project-oriented approach," said Lewis Milford, founder of the Clean States Energy Alliance and a fellow at the Brookings Institution. "Your attitude is 'create the market, and the jobs will come,' and by and large that's been successful."

He said California may fare best by trying to expand its natural advantage in high-end research and development jobs and renewable energy installation and maintenance jobs. California could target more support toward old-fashioned economic development, growth of industry supply chains, and workforce training, said Milford.

Global competition for manufacturing jobs is so intense, he said, that California may not be able to hold on to them – or may spend too much money offering incentives trying to do so – if it does not also provide more fundamental economic development support.

Green Banks Nurture Promising Businesses

Is there an economic development sweet spot for California? Somewhere between watching our home-grown technologies bloom in other states and the Mississippi approach of risking tens of millions of taxpayer dollars on a single company's fortunes?

One idea gathering adherents in California is that of a green bank – a government or quasi-government agency that could stitch together several sources of money already dedicated to renewable energy (such as the $83 million levy on ratepayers to fund SGIP) and use it to offer loans to young companies at lower interest rates than they could get from banks. This bank might also grant affordable loans to homeowners and businesses to retrofit buildings to bring down electricity and gas bills.

A green bank could be created anew or housed within an existing state agency – such as the California Infrastructure and Economic Development Bank, a self-supporting agency that already loans money to city and county governments for streets, water treatment plants, public transit, and other facilities. Another possible home might be the California Alternative Energy and Advanced Transportation Financing Authority under the state Treasurer's Office.

In 2011, Connecticut became the first state in the nation to create such

In Brief: Green Bank

What? A public (or quasi-public) financial institution offering low-cost loans to developers of clean-energy projects.

Mission? To help promising young technologies survive the "valley of death" of commercialization and reach the marketplace.

Possible funding?

- Redirected money from existing green-energy programs.
- New money from Cap-and-Trade Program auctions.
- Private money from investors seeking conservative rates of return on long-term capital.

Advantages?

Unlike grants, loans are repaid, creating a revolving fund for re-investment.

Taxpayers' dollars would be multiplied by leveraging public investment with private capital.

The fruits of California's innovations – jobs and profits – would stay in California.

Cautions?

Inherent risk in financing emerging technologies.
Need to recruit staff with commercial banking and investment expertise.

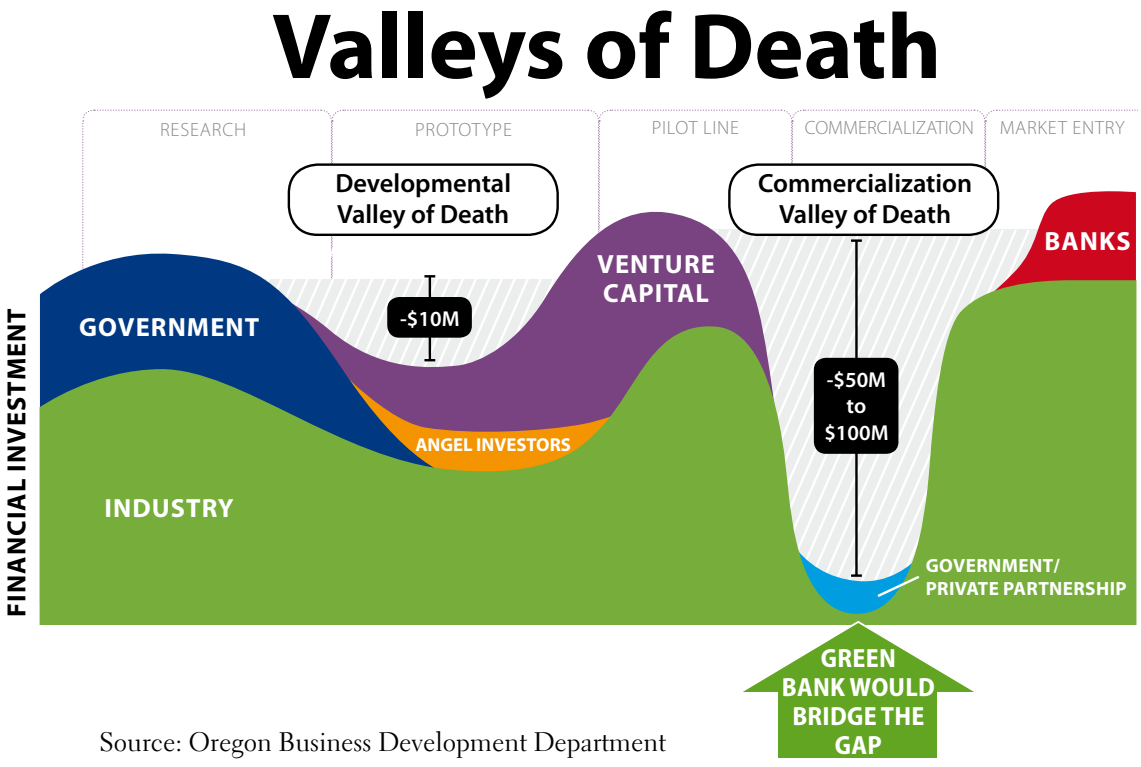
a state-level green bank, and efforts are underway to create one at the federal level.

Proponents argue that a green bank is most sorely needed in the innovation greenhouse of California, where so many promising new technologies sprout – only to be transplanted elsewhere to grow in a more promising business climate.

Bridging the Valleys of Death

Green energy gurus have a bleak but apt image for the most challenging stages in a project's financial development – they call them "valleys of death." The first valley occurs early on, when seed money is staked to develop a new technology. This is the realm of private venture capital and of public incentives for research and development. The first valley is risky, with a high potential for failure, but the second valley of death is more formidable. It involves finding the money for commercial deployment of a technology once it has been proven.

"Venture capital plays more of a part in the productization and demonstration and is usually less than $25 million. Commercialization takes so much more money," explained Dan Adler, president of the California Clean Energy Fund. The nonprofit fund seeks to catalyze



Source: Oregon Business Development Department

private investment to foster the state's policy goals. "There's a big difference between first commercialization and getting to consistent, large-scale production."

In an interview with the oversight office, Adler talked about the valleys of death – and how to help companies survive them. "There is private money for just the first commercial stage, and that's probably the way it should be," he said. "You don't want to risk taxpayer money there. But, once a technology is proven and running in a government-created market, it's a challenge to get the money to ramp up into production. You've still got perception and skill problems with the banks. These projects make them nervous. So, even if you've got proven technology, you've got to raise money for the project."

Enter the green bank. Adler spoke with enthusiasm about the potential for a California green energy bank, as did several others interviewed by the oversight office. They see it as a way for the state to help struggling but worthwhile clean energy companies survive the Death Valley of deployment and reach the marketplace.

The green bank is a public financial institution that provides low-interest loans and other assistance to developers of clean-energy products. Funding could come both from existing state programs and from private investors seeking conservative rates of return on long-term capital. Unlike cash grants or most other state incentives, the loans would be repaid, allowing the bank to establish a self-sustaining revolving fund for reinvestment. And, by leveraging the public investment with private capital, every taxpayer dollar would be multiplied.

In California, the initial capital could come by redirecting existing streams of money. One potential source is the "public goods charge" surcharge on investor-owned utility customers that raises roughly $356 million a year.

Another source might be revenues generated by the auction of carbon allowances under the California Cap-and-Trade Program, scheduled to begin later this year. The Brown administration estimates those revenues to total $1 billion in 2012-13. The governor's January budget sets aside half the money for the General Fund, but the remainder would be invested in clean energy, low-carbon transportation, natural resource protection, and sustainable infrastructure development.

In October 2011, Adler testified at an oversight hearing held in the Silicon Valley by the Senate's Select Committee on Green Jobs and Clean Technology. He endorsed the idea of a state green bank, and had

this to say about the challenges facing California:

> *When it's just an innovation finance question, I agree that we have our edge and we'll probably maintain it. People come from all over the world trying to create the Silicon Valley in China or Europe, and it just doesn't succeed. The mysteries are locked up here in the soil, I think.*
>
> *But as the industry is maturing, it's going to be more about deployment, and those dollars are much greater. So, if we're comfortable with the methodology of "innovate it here, manufacture it there, and deploy it over there," then we're going to own the innovation piece but not very much of the rest. We're doing a decent job of deploying here; we're not doing a great job of manufacturing here. I think that's a large part of the conversation.*
>
> *But, at least if we continue to work on innovation finance, and really ramp up deployment finance through…some kind of green bank innovation that gets the money more liquid – then you can gradually develop the manufacturing investment in between those two nodes [of innovation and deployment]. We've got a good start at that, but over the long run where we want to be is more money going into infrastructure. That will make the innovation dollars look relatively small -- but we will have a burgeoning industry as a result.*

Adler is working closely with the Coalition for Green Capital, a nonprofit based in Washington D.C. that aims to establish green banks as a way of deploying clean energy across America and internationally. The coalition's effort to create a national green bank floundered in 2010 amid the partisan battles that divide Congress. When that happened, the focus moved to state-level green banks.

Ken Berlin, general counsel to the Coalition for Green Capital, has been meeting with Adler (along with energy experts at UC Berkeley and other Californians) to devise a battle plan for creating a green bank in the Golden State. In an interview, Berlin said California is the coalition's top priority.

"We haven't done enough groundwork yet in California to know exactly what is the best model for a green bank for the state," Berlin said in early March 2011. "Our work is ongoing. We think it's a great idea for California – but you have to figure out how to get through the politics."

The coalition claimed a major victory last year when Connecticut became the first state in the nation to establish a full-fledged green

bank. Supported by Gov. Dannel Malloy, the Connecticut legislature passed a bill setting up its green bank on a strong bipartisan vote. With its own budget outside of state government, the new bank is a quasi-public institution operated by the Clean Energy Finance and Investment Authority. Its initial capital comes from "repurposing" existing funding sources: $30 million annually from a surcharge on electricity bills and $18 million from the Connecticut Green Loan Guaranty Fund. The goal is to combine these public funds with money from private investors willing to accept a relatively low but stable rate of return.

"The idea is to take limited state funds and make them go farther," Berlin said. "In Connecticut, for example, we're able to match state funds with private funds. The private investors get a capped rate of return of 8 percent. We can lend the money out at a much lower rate, though, because the government money comes in at a zero percent return rate. So, generally, we charge a loan interest rate of 5 percent – with 1 percent to cover the state's expenses. The loan is paid back, the private investors get their 8 percent, and the state recovers all the money, which can be loaned out again."

Green Bank in the Golden State?

How much of an initial public investment would California need? "The amount needed really depends on how much you want to do," Berlin said. "The bigger it is, the easier it is to get private capital and to get good commercial bankers to run the bank. Everything becomes easier with more scale. In California, probably $100 million would be a good starting number."

Getting experienced bankers and other seasoned financial experts involved is critical – typically state government does not have a deep bench in this area. A 2010 article on green banks in the Energy Law Journal underlined that point: "Such staff should come from the investment banking, private equity and insurance industries, be qualified to assess the specific barriers to commercialization faced by different technologies, and be able to design products targeted at removing those barriers."

The article, which focuses on proposals for a federal green bank, noted that such a financial institution must be ready to manage levels of risk unusual for a government endeavor: "This need follows from the fact that the risk involved in financing emerging technologies yet to prove their efficacy on a commercial scale is higher than that associated with financing commercial technologies."

The Silicon Valley Leadership Group, a 365-member trade association, has put its considerable clout behind the idea of a green bank financed by some of the Cap-and-Trade revenues. Anne Smart, the group's director of energy policy, explained their vision.

"The green bank makes the state a partner," Smart said in an interview at the group's San Jose headquarters. "We need to have a giant package with many kinds of incentives. The offerings should be tailored to the customers' needs. You need to provide multiple options – some will be willing to pay more for loan interest, for example, because they don't have the track record to get conventional loans.

"What we'd like to see is a pool of money to fund incentives for companies to locate here. The green bank could provide loans or matching capital – whatever works best for the company at its particular stage of development. We already have research funding here to draw new businesses initially; what we need is something that keeps them here when they're ready to commercialize the product. Remember, too, that federal funding usually requires local or state matching money. The green bank could help meet that criterion."

Bloom Energy's Josh Richman also spoke of ways that a green bank could help his successful young fuel-cell manufacturing company.

"Our objective now is how do you drive down costs so we can be commercially viable without subsidies," Richman said. "We want to continue to scale and grow. A green bank would be helpful to us. There are a lot of definitions out there of what a green bank might be. It could play a critical role of supporting financing for these larger projects. Because of the perception of green tech as immature, debt is either unavailable or too expensive."

There's a bigger deployment problem than the perception of green energy as immature or risky, according to Ken Berlin. That problem is simple: Green energy costs consumers more than electricity generated by fossil fuels. "Energy is only a matter of electrons flowing into your house or your business – why should consumers pay more for one electron than another?" Berlin asked. "Although most new technologies have a long downward price curve, they still need financial help to be competitive with older technologies."

Bottom line, would a state green bank bring the jobs that California hungers for? Berlin thinks it might be the catalyst that makes manufacturing doable in California: "Essentially, if you have a big enough market and big enough rate of return, you should be able to

attract manufacturing," Berlin said. "California is a big market, obviously. But can investors get an adequate rate of return in California? Low-cost loans can significantly decrease the costs to make doing business in California viable."

Protecting the Public's Investment

If legislators and regulators are willing to risk public money trying to help green energy companies, they must figure out how to minimize those risks. Some governments give careful scrutiny to the finances and commercial prospects of companies. Others emphasize "clawback" provisions in their incentives that allow them to recoup money in case a company fails to deliver on jobs.

Neither approach is foolproof. Both due diligence and clawbacks add cost and complications to incentives.

Regardless of how incentives are structured, the Senate Office of Oversight and Outcomes urges government agencies to make information available to the public about the incentives, so that taxpayers and policymakers may weigh whether the money at stake is put to best use.

Due Diligence Tests Viability

The financial collapse of Solyndra sent shudders from Washington D.C. to Sacramento in the autumn of 2011, as policymakers struggled to explain how millions of dollars in government subsidies went to the now-bankrupt solar manufacturer. The Fremont startup had received a $535 million federal loan guarantee in 2009. In November 2010, California granted Solyndra a $34.7 million tax break under the SB 71 program, which exempts green technology companies from paying sales tax on manufacturing equipment. At the time of its bankruptcy, Solyndra had used $25.1 million of the tax exemption.

In the nation's capital, Solyndra's bankruptcy triggered a congressional investigation and an FBI probe. In Sacramento, it sparked legislative hearings asking how a company on such shaky footing could have cleared the hurdles to receive the SB 71 tax exclusion. The questions were pointed: How do we prevent another Solyndra? Where was the due diligence?

It seems obvious to ask about due diligence in programs that spend public money. In terms of the state's green-energy incentive programs, however, the answers are not always so obvious. For some subsidies, like the Self-Generation Incentive Program, public money is not paid until the project

is finished. Similarly, the Energy Commission does not hand out AB 118 grants until award winners prove, with invoices, that they have spent money on their project. This minimizes the financial risk that a failing company will collect the incentive but close before completing the work. In other programs, overly rigorous due diligence can eliminate some good applicants while rewarding strong companies that might need the incentive less. Finally, in a business sector with many fledgling companies and a high rate of failure, it may be impossible for state analysts to predict winners and losers.

Senator Alex Padilla, the author of SB 71, voiced this question at a Senate hearing called after the Solyndra bankruptcy: "Is there any due diligence that we do, or that we should do, to insure that the companies are doing things properly? Can we know that there's at least a 50/50 shot they'll be around in five years?"

The SB 71 program is administered by the California Treasurer's Office. Immediately after the Solyndra bankruptcy became public, Treasurer Bill Lockyer called for the temporary suspension of SB 71. In a written statement, he said: "In light of recent events, we owe it to taxpayers to see if there is more we can do to make sure we don't give their money to companies headed for a fall, or companies that take California's money and run to other states to create jobs."

But a month later, at the October 2011 Senate hearing, Lockyer had reached the conclusion that not much more can be done to assess the long-term viability of these new green businesses. Lockyer was the first witness at the hearing, convened jointly by the Energy Committee and the Governance and Finance Committee. In answer to Padilla's question about due diligence, the treasurer testified:

> *I don't know that we could guarantee anything like that, and probably we can't. We don't do what might be called a business viability test. It really would require a lot of intrusive effort by some state bureaucrat into these private businesses that probably is costly and for which no one in state government, except perhaps PERS [Public Employees' Retirement System] and STRS [State Teachers' Retirement System], has the requisite expertise. Even PERS, as well as lots and lots of private investors, invested in this company [Solyndra] before we ever got there. We're almost the last dollar in – we say to them, until you spend the money here, you don't get the tax benefit. The other programs provide benefits on the front end – we don't. The other programs could try to do some [due diligence]. We can't. I'm not aware of anyone in state government with those competencies. I think it would produce such substantial uncertainty*

to a business applicant that it would mean, basically, we wouldn't be doing this at all.

Lockyer explained that every green business that passes an environmental and fiscal benefits test automatically gets the sales tax exclusion on purchases of manufacturing equipment. "Now," he said, "some of these new businesses are going to fail. In fact, the unfortunate fact is that 70 percent of all new businesses don't make it to Year 8. That means there's going to be risk associated with this. The proper policy is to try to figure out how much is acceptable risk of taxpayer expenditures for these subsidies to induce needed jobs and business expansion in the state of California."

The Legislative Analyst's Office prepared a written report for the same hearing and sent Jason Sisney to testify. Sisney, deputy legislative analyst for local and state finance, shared Lockyer's view that state officials would not be good prognosticators of business success. He pointed out that alternative energy is an exceptionally volatile business sector.

"We find the notion of a viability test for companies problematic," Sisney said.

"The state government would not do a good job at figuring out which companies would be likely to succeed or fail. In fact, investors don't really do that good a job. CalPERS and CalSTRS, for instance, along with other investors, invest in a lot of startup companies and a lot of them, perhaps a majority of them, fail, too."

Sisney's argument is borne out by California's recent attempt to distribute $30 million of federal economic stimulus money to solar manufacturers.

In 2010, the Energy Commission paid for rigorous, detailed scrutiny of the companies applying to use some of the $30 million as a low-interest loan. Four financial development corporations hired by the commission used an underwriting process similar to what a banker considering a loan might do. They reviewed applicants' income statements, balance sheets, the financial condition of large owners in the company, credit history, etc. They calculated the applicants' debt-to-worth ratio and tallied collateral.

More than 20 companies failed to qualify for the federal loans. Of the nine companies that did qualify, five failed to use the loans -- and two of those five are now out of business. Only four loans are active, each roughly $5 million and secured by the companies' manufacturing equipment.

This due diligence cost the Energy Commission at least $800,000. But in the end, the Commission could not find enough qualified companies in a position to use all the money earmarked to help solar manufacturers. The Commission shifted $10 million of the unspent federal money to other energy programs.

"While staff continue to carry out thorough due diligence to try to ensure only loans for the strongest projects are approved," stated an Energy Commission staff memo on the program from October 2011, "risk perception remains high."

Clawbacks Recoup Some Losses

In the jockeying to attract green jobs, no state wants to lose out like Massachusetts.

In 2007, several states were vying to be the home of Evergreen Solar's planned manufacturing expansion. The company's home state of Massachusetts won out – Massachusetts offered $21 million in cash plus another $37 million in incentives, and in exchange, the company agreed to open a factory on a former military base in Devens.

Four years later, in January 2011, Evergreen shut the plant and cut 800 jobs. Seven months later, Evergreen filed for Chapter 11 bankruptcy. Public outcry ensued.

In exchange for Massachusetts' help, Evergreen had agreed to hire at least 350 people for seven years at the Devens factory. It created the jobs – but the jobs didn't last seven years.

Massachusetts officials said they hoped to recoup at least several million dollars from Evergreen. Success will depend in part on the strength of "clawback" provisions in the state's agreement with Evergreen. Clawbacks take many forms, but generally they require a company to return some government financial assistance if the company fails to meet certain targets such as job creation.

Economic development specialists call clawbacks a delicate art. Make them too restrictive, and the corresponding incentives may either go unused or be tapped by companies that didn't need financial help in the first place. Make them too loose, and risk losing taxpayer funds in firms that go bankrupt, fail to create jobs, or move operations elsewhere.

Many business leaders and government officials say it is simply unrealistic to expect companies – especially in the mercurial renewable energy

business – to predict future employment.

"It seems to us problematic to hold them accountable for the projection – which in some cases might just be a guess – of how many jobs they're going to create," Jason Sisney, who oversees local and state finance for the Legislative Analyst's Office, said at the October 2011 hearing to review SB 71. He cautioned lawmakers against amending SB 71 to require recipients to prove that they created a certain number of jobs. Clawbacks, Sisney warned, could drive away the same companies the state seeks to help.

He asked lawmakers to imagine what might happen if the state asked a distressed company to return money because it had not met its job target.

"That company could be placed into an even more desperate situation," said Sisney. "It might even be forced to close down or it might be forced to reduce its California workforce and look to expand in other states that have cheaper facility costs, cheaper labor costs."

But in some cases, clawbacks appear to work well. Consider the Massachusetts Life Sciences Center, a quasi-public agency created in 2006 to attract life sciences companies to the state. (It operates separately from the agencies that crafted the Evergreen Solar incentive package.)

The Life Sciences Center administers a competitive tax credit worth $25 million a year. Qualified companies must create at least 70 percent of the jobs they say they will within the first year and retain the additional jobs for least five years or risk "clawback" procedures. The Life Sciences Center works with the state tax agency to check payroll records each year to confirm whether companies reach their targets.

"We've had companies voluntarily terminate their agreement because they know they're not going to hit their goal," said center chief executive officer Susan Windham-Bannister. "We feel that it's better to have a company voluntarily withdraw than to have them ousted from the program."

Center officials calculate that tax incentives awarded thus far have created or are projected to create more than 2,000 jobs for roughly $25,000 in lost tax revenue per job.

"We can say that our program does not pay for jobs that are not created," said Windham-Bannister.

The statute that established the Life Sciences Center served as a model for legislation now pending in the Massachusetts Legislature that would

apply to all state economic development programs.

Jamie Eldridge, the Massachusetts state senator representing the Devens area, figures that the Evergreen incentive package cost the state about $75,000 for each of 800 lost jobs. His bill would cap the state's subsidies at $35,000 per job and would require the state to recoup its investment when companies miss job-creation targets. It would also make details of the subsidy packages public and easily available and require uniform reporting by companies.

"Without this level of transparency and accountability," states Eldridge's summary of his bill, "neither the public nor the legislature can have confidence that we are spending our economic development dollars wisely."

Clawbacks and collateral became pivotal issues in Delaware last October as that state's Public Service Commission weighed a proposed deal with Bloom Energy.

The commission was considering approval of a surcharge on electric bills of Delmarva Power customers that was estimated to total more than $100 million over 21 years. The rate surcharge was part of a complex package of incentives that included subsidies for construction of a new manufacturing facility for Bloom fuel cells, as well as the purchase and installation of Bloom cells to provide 30 megawatts of electricity to the regional power grid. The lure for Delaware was 900 jobs at the Bloom factory – plus credits toward meeting the state's renewable-energy goals.

Three weeks before the commission was scheduled to vote on the rate hike, its staff released a detailed and critical analysis of the proposal. The report said that construction of the factory was key to the state's interest, and it expressed "strong concern" that ratepayers would be paying the surcharge for two decades even if the factory was never built. The report was a textbook example of due diligence.

In response, Bloom agreed to pay a $41 million penalty if the factory is not finished and operating by Dec. 31, 2013. The payment would be secured by "an unconditional, evergreen letter of credit." Bloom also agreed to pay a pro-rated penalty if the factory were to close over the next ten years. Finally, Bloom would be obligated to spend $36 million a year in payroll ($40,000 a year times 900 jobs) or else a clawback provision would be triggered and Bloom would owe the difference.

With these protections in place, the Delaware Public Service Commission unanimously approved the rate surcharge. Several

commissioners interviewed after the vote said Bloom's financial assurances were key to its passage.

Transparency Fosters Accountability

California collects at least half a billion dollars a year from utility ratepayers and taxpayers in order to encourage renewable sources of electricity. But good luck trying to learn how much is collected from whom and what has been accomplished with the money.

Nowhere does California consolidate such information about its various renewable energy programs. Information is available from the assorted agencies that run these programs – the Public Utilities Commission, the Energy Commission, the public and private utilities – but much of it is geared to potential applicants, such as the person considering solar photovoltaic panels for his roof, rather than a taxpayer curious about the achievements of each program.

The Senate Office of Oversight and Outcomes urges these agencies to make publicly available, with regular updates, the source of funding for each program, the amount spent to date, the goal of the program, and progress to date toward that goal. A citizen should not have to search dozens of websites and make several phone calls to try to piece together basic facts on the performance of these programs.

One program scrutinized by the Senate oversight office could serve as a model.

Nearly all information collected related to the SB 71 sales and use tax exemption on green industry manufacturing equipment is public – the names of the companies exempted from sales tax, the size of their exemption, a description of the equipment they intend to buy, summaries of applications, and other documents. Information is subject to the California Public Records Act, and the California Alternative Energy and Advanced Transportation Financing Authority has discretion to consider company requests to keep information confidential.

CAEATFA updates monthly its public spreadsheet showing how much each awardee has used of their tax exemption. The staff analysis of the anticipated environmental and fiscal benefits of each awardee's manufacturing project is also public.

In an October 2011 legislative hearing about the performance to date of SB 71, State Treasurer Bill Lockyer called SB 71 "a model for how tax expenditure statutes ought to be written."

"Our state currently provides 86 other tax breaks that result in state and local revenue losses of $43 billion," said Lockyer. "Now, that's $43 billion that no one asks these kind of questions about . . . This is the only tax break where someone tries to assess whether the benefits to Californians outweigh the tax subsidy granted by the statute."

The Legislative Analyst's Office views the effectiveness of SB 71 somewhat skeptically -- but agrees that it should be a model in terms of transparency.

"There's a lot of things this credit program does right," Sisney told legislators at the October 2011 hearing on the program.

Though it is a grant program, not a sales tax exemption, AB 118 is also administered with relative transparency. Energy Commission staff choose applicants and determine the size of awards, but each grant is approved by Commissioners in a public meeting. A large advisory body of experts meets publicly to debate broadly how the Energy Commission should target grants. The commission regularly publishes information about award recipients and assesses the benefits of the program.

In comparison, mystery shrouds the identity of recipients in the Self-Generation Incentive Program under the California Public Utilities Commission.

The PUC does not name the businesses awarded subsidies under the SGIP. The names of manufacturers and installers are publicly available, but not the identity of the "host customers" who actually receive the fuel cells, wind turbines, or other SGIP-eligible technology. The lack of transparency makes it difficult to assess either the effectiveness or the equitability of the program.

The PUC defends this secrecy as a matter of consumer privacy. In response to a Senate request for the information, commission energy staff responded: "The CPUC has long ruled in various regulatory decisions that individual customer specific information, i.e. names, address, billing usage information, etc., is confidential and protected, and cannot be publicly released without the consent of the customer." The staff also cited California statute that restricts the release of "personal information" by state agencies.

Recent SGIP projects, however, have not been designed for "personal" or residential use – the scale is much larger than that. In 2010, 122 applicants were granted SGIP subsidies that exceeded $1 million each. Judging from press releases and other non-official sources, incentives

have typically gone to large businesses such as AT&T or to public institutions such as university campuses. One might question the necessity for protecting the identities of these recipients. Meanwhile, the fact that SGIP incentives are wholly paid for by ratepayers argues that the recipients should be available for public scrutiny.

V. Supplements

Tab 1: State Policies Create Demand for Renewables

- Energy Efficiency
- Research and Development
- Renewable Energy Subsidies
- Requiring Utilities to Buy Green Power
- Slowing Emission of Greenhouse Gases Linked to Global Warming
- Various Rules to Benefit Renewable Power
- Incentives for Manufacturers

Tab 2: Tally of Green Manufacturing Jobs in California

- Solar Industry Manufacturing Jobs
- Wind Industry Manufacturing Jobs
- Fuel Cell Manufacturing Jobs

Tab 3: In Their Own Words: What Businesses Need

Tab 4: Tough to Do Business in California?

Tab 5: SB 71 Awardees

Tab 6: In-State Incentives

Tab 7: DyoCore Exploits State Subsidies

Tab 1: Many State Policies Create Demand for Renewable Energy

For at least a generation, California policies have encouraged frugal use of energy and greater dependence on non-petroleum sources of energy.

Energy Efficiency

Energy experts like to say that the cheapest megawatt is the one that doesn't have to be produced. California has long pursued energy efficiency through tough building and appliance standards.

The state first adopted **energy efficient building standards** 35 years ago. The periodic revision of those standards, with a goal of making new California homes energy neutral by 2020, helps explain why the state's per capita electricity consumption has remained relatively flat for decades.

At the same time, state policies have ramped up demand for solar, wind, and geothermal.

To pay for major investments in energy efficiency, renewable energy development and public-interest energy research, California imposes a surcharge on the monthly electricity bills of the customers of investor-owned utilities. These private, state-regulated utilities serve more than 11 million residential and commercial electricity accounts. The surcharge, dubbed the **public goods charge**, begun in 1996, raises $356 million a year. The Legislature allowed the charge to expire in December 2011, but at the urging of Governor Jerry Brown, the state Public Utilities Commission acted in December to continue collecting the charge from the customers of the private utilities they regulate.

The biggest share of the "public goods charge" revenue -- $250 million -- pays for energy efficiency programs run by the utilities. That funding is on top of roughly $600 million a year collected by the three biggest utilities in a separate charge on ratepayers to also fund energy efficiency programs. These programs include home energy audits, weatherization and rebates

on products such as dishwashers, insulation, and furnaces.

Research and Development

The utilities use the other roughly $100 million generated by the public goods charge to pay for energy research and development of renewable sources of power.

That includes the $86 million-a-year **Public Interest Energy Research Program**. The state energy commission distributes the money to universities, private companies, and utilities to research, develop, or demonstrate advances in electrical generation, energy efficiency, renewable energy, transmission and distribution, transportation, and climate change.

The natural gas customers of the investor-owned utilities fund research, too, through a $24 million-a-year charge on their bills.

Renewable Energy Subsidies

For 13 years, ending in 2011, the state also used some of the public goods charge revenue to help prop up approximately three dozen biomass plants, which burn agricultural or timber waste to generate electricity, and solar thermal plants, which use the sun's power to generate turbine-turning steam. These so-called **Existing Renewable Facilities Program** subsidies of roughly $14 million a year were not renewed because the Legislature failed to pass reauthorizing legislation. A biomass industry group has stated that the subsidies are no longer needed.

A second program, also funded by the public goods charge, subsidizes home and business owners who buy wind turbines or fuel cells which use a chemical process to convert renewable fuels to electricity. The **Emerging Renewables Program** pays $1.50 to $3 per watt, depending on the size of the energy system. (Such a rebate could reduce by a third the price of a $60,800 wind system.) Between 1998 and when the program was temporarily suspended in September 2011, about 577 customers had received a total of $8.7 million from the program. The energy commission suspended, revamped, and restarted the program in late 2011 after it was flooded with applications from customers of a small wind turbine company whose product had qualified based on performance claims that other wind experts called "impossible."

For a look at how one small company dominated the Emerging Renewables Program, see Tab 7 in this section.

In 2006, legislators imposed a separate charge on ratepayers' bills that raises approximately $250 million a year for solar incentives. By 2016, this **California Solar Initiative** (CSI) is supposed to lead to the installation of 1,940 megawatts of solar photovoltaic capacity. (A megawatt is roughly enough electricity to power 1,000 homes at any given moment.)

The budget for the private-utility portion of the CSI program is roughly $2.4 billion, and it has five parts. The biggest component aims to install new solar capacity on homes and business, nonprofit, and government buildings. By early 2012 – halfway through the 10-year CSI program – this major branch of CSI had installed 769 megawatts, or 44 percent of its goal. Another 376 megawatts worth of solar systems were at the application stage. The incentives paid through this program decline each year. Rebates that in the early years covered roughly 25 percent of a rooftop system's cost now cover about 5 percent of the total cost.

A subset of the California Solar Initiative offsets the cost of installing solar panels on newly-built, energy-efficient homes. The **New Solar Homes Partnership** program has collected $140 million from ratepayers, of which $26.3 remained as of February 2012. According to the Energy Commission, 14 megawatts of solar capacity have been installed under the program, with money committed to another 25 megawatts not yet installed.

Another $100 million of the California Solar Initiative, plus $250 million collected from utility natural gas customers, is available to subsidize buyers of solar thermal systems, which use the sun to heat either rooms or water for household use. Only about 100 Californians have taken advantage of the **CSI Thermal Program**. Utilities have spent $3.5 million administering the program -- more than the $2 million actually rebated to consumers as of the end of 2011, according to a quarterly report submitted by the utilities.

Percentage of electricity sold generated by renewable methods (as of 2011):

Pacific Gas & Electric – 16
Southern California Edison – 19
San Diego Gas & Electric – 12

Source: CA Public Utilities Commission

Ratepayers of publicly-owned utilities, such as the Los Angeles Department of Water and Power, are expected to contribute $784 million to the California Solar Initiative, making the total cost of the solar program approximately $3.3 billion over 10 years.

The Legislature imposed a separate charge on investor-owned utility ratepayers in 2001 to fund the **Self-Generation Incentive Program**. Ratepayers pay about $83 million a year for the program. Originally, the program aimed

to encourage homeowners and businesses to take pressure off the state's electrical grid by generating their own power. In 2009, lawmakers recast the program as an effort to also reduce emissions of greenhouse gases. The program was overhauled again in 2011 to support a wider range of technologies. Funding has been extended through 2014.

Requiring Utilities to Buy Green Power

More broadly, the state has imposed ambitious requirements on utilities to sell electricity that has been generated by renewable energy power plants, including solar, wind, geothermal, biomass, and small hydroelectric facilities, rather than natural gas, coal, or nuclear power plants.

In 2002, the California Legislature and governor went further than any state except Maine and passed a requirement that privately-owned utilities must increase renewable electricity generation by 1 percent a year until at least 20 percent of the electricity they sell is generated by renewable methods.

Four years later, California accelerated the requirement, requiring utilities to meet the 20 percent target in 2010. In 2011, the Legislature and Governor Jerry Brown raised the bar, enacting the nation's most ambitious **renewable portfolio standard**. California now requires all utilities, publicly and privately owned, to get at least 33 percent of the electricity they sell from renewable sources by 2020.

As a result, the utilities have signed many "power purchase agreements" with renewable energy producers. For example, in 2011 the French semiconductor company Soitec signed 25-year agreements to sell San Diego Gas & Electric enough electricity to power more than 60,000 homes from several solar arrays to be installed in the San Diego region. Soitec officials say they intend to open a factory in the area to make the solar panels later this year.

Slowing Emission of Greenhouse Gases Linked to Global Warming

California has also fostered renewable energy by regulating emissions of carbon dioxide and other gases that cause global warming.

California policymakers led the nation in 2006 by passing **Assembly Bill 32**, which gives the California Air Resources Board authority to regulate polluters in order to roll back emissions to 1990 levels by 2020. Regulation is expected to fall hardest on electric utilities, cement

factories, and oil refineries. By spurring utilities to replace coal- and natural gas-fired power plants with cleaner sources of electricity, AB 32 helps create demand for solar and wind energy.

Given that 40 percent of California's greenhouse gas emissions are tied to transportation, in 2007 the Legislature and governor enacted a separate program to help wean the state of gasoline. **Assembly Bill 118** raised registration and other fees on car, truck, and boat owners to generate roughly $160 million a year dispensed by the California Energy Commission as grants to companies and public agencies that develop, produce, or deploy alternative fuels and vehicles. Such grants, for examples, have been awarded to electric car makers and installers of hydrogen fuel stations.

Various Rules to Benefit Renewable Power

One of California's strongest renewable energy policies, however, is a largely hidden subsidy called **net metering**. Under this 16-year-old policy, California forces utilities to credit homeowners at retail rates for electricity they generate with solar panels or wind turbines. Net metering amounts to a subsidy for the homeowner, paid for by other utility customers, so state law limits how many net metering customers each utility must accept. In 2010, the Legislature and governor raised the cap from 2.5 percent to 5 percent of a utility's aggregate peak customer load. A new law in 2011 expanded the technologies eligible for net metering to include biomass, solar thermal, geothermal, renewable fuel cells, and landfill gas.

Other California policies that encourage people to install solar include:

- The 34-year-old Solar Rights Act, which limits the ability of homeowners' associations to block people living in planned developments from installing solar systems. It also prohibits local governments from unreasonably restricting solar installations.
- The Solar Shade Control Act, which protects rooftop solar system owners, in limited circumstances, from shade-casting trees planted after the solar system was installed.
- A property tax exclusion for the first owner of a rooftop solar photovoltaic system. A 2011 statute extended this tax exclusion to third-party-owned systems that are later sold to another group of investors.
- Tiered rates that charge people more for each additional increment of electricity they use. (A rooftop solar photovoltaic system helps homeowners avoid paying their utility's most expensive rates.)

- Standard rules for connecting small renewable energy systems to the electrical grid. California's streamlined rules were among the first in the nation.

In addition, the federal government allows people who install solar, wind, and renewable fuel cells to deduct 30 percent of the cost of the system from their federal taxes, and carry unused credit forward to the next year.

Finally, the federal government allows businesses that install solar systems to reduce taxable income by depreciating the value of the system over five years or less, even though such systems typically last for 25 years or so. This "bonus" depreciation expires at the end of 2012.

Though not specifically authorized by statute, many solar companies offer financing arrangements in which they help pay the upfront cost of a rooftop solar system, assume all of the federal and state financial benefits mentioned above, and charge a utility customer for the energy generated by the solar equipment. Often the solar companies convert the ownership of the solar system to a limited liability corporation, for which state income taxes are limited to $800 a year.

Incentives for Manufacturers

One of California's newest attempts to foster renewable energy is focused primarily on jobs. In 2010, the California Legislature and governor set out to encourage renewable companies to manufacture in California by enacting a tax break. **Senate Bill 71** allows biomass, solar, wind, and geothermal companies to avoid paying sales or use tax on the equipment they buy in order to manufacture green energy products, such as photovoltaic panels.

As of March 1, 2012, 41 companies had been awarded the tax exemption, worth $136 million on the purchase of equipment estimated to cost $1.6 billion.

Tab 2: Tally of Green Manufacturing Jobs in California

Solar Industry Manufacturing Jobs

Half the nation's solar electricity generation capacity exists in California, and one-quarter of all solar industry jobs nationwide are here, too.

One of the world's first automated factories to make solar cells opened in the Ventura County town of Camarillo in 1977. Today the nonprofit Solar Foundation, a research and education group, estimates that there are nearly 26,000 direct solar industry jobs in the state, with the sector adding jobs faster than the overall economy.

Most of California's solar jobs – 54 percent – are in sales and installation, according to survey data collected for the Solar Foundation. Another 19 percent involve manufacturing, and 13 percent are classified as research and development.

The Solar Energy Industries Association, a national trade association, lists 270 solar manufacturers in California. Many of the companies serve multiple industries. For example, Nanometrics Inc. of Milpitas makes products used by both the solar and semiconductor industries. Other companies listed by SEIA as California manufacturers keep only administrative offices in the state and operate factories elsewhere. For example, SunLink Corp. of San Rafael uses out-of-state contractors to make solar panel mounting systems.

The industry is in great flux, as companies struggle to survive competition from government-subsidized firms in China. The Senate Office of Oversight and Outcomes gathered the following list of solar companies manufacturing in California. The list may not be exhaustive and many listed companies also manufacture in other states and/or nations:

- **AQT Solar** of Sunnyvale, a maker of thin-film solar cells, had planned in 2011 to build a factory in South Carolina. But in January 2012 a company spokesman told *Bloomberg News*

that AQT had raised $18.7 million from investors to double its Sunnyvale production. Approximately 40 employees work at that plant. Company officials said they would clarify plans to manufacture outside of California "at a future date."

- **Alta Devices Inc.** of Sunnyvale has at least 102 full-time and 200 construction or temporary jobs at a Sunnyvale production facility making thin-film solar cells, according to information the company submitted in January 2012 to the California Alternative Energy and Advanced Transportation Authority (CAEATFA).
- **Amonix Inc.** designs and fabricates solar power generator systems in Seal Beach and Milpitas. According to information the company gave state officials in January 2012, Amonix employs 154 assembly-line employees and 52 managers, engineers, technicians and others.
- **Calisolar** opened a solar cell factory in Sunnyvale in 2009. In 2011, Mississippi approved a $75 million incentive package to help Calisolar build a factory there that promised to create nearly 1,000 jobs. Calisolar laid off 114 Sunnyvale workers in late 2011 and early 2012. In February 2012, the company changed its name to Silicor Materials.
- **Chromasun** manufactures rooftop solar concentrators that generate energy used to heat or cool buildings. The company employs 12 at its manufacturing facility in San Jose but recently won a $3.2 million grant from the Australian government to expand manufacturing there.
- **FAFCO Inc**. of Chico makes solar systems to heat pools and household water with 70 employees in Chico.
- **First Solar Inc.** of Tempe, Arizona, makes photovoltaic cells at factories in Ohio, Germany, and Malaysia. The company opened a pilot development and production facility in Santa Clara in 2010. The Santa Clara factory supported 91 jobs until January 2012, when 63 workers were notified of layoffs, according to the CAEATFA and the state Employment Development Department.
- **Heliodyne** of Richmond makes solar hot water systems with roughly 10 employees.
- **ISET** in Chatsworth employs 10 people, most in research and development, but the company is capable of doing a small amount of manufacturing.
- **Kyocera Solar** of Scottsdale, Arizona opened a solar module manufacturing line in June 2010 in San Diego with 100 workers. The company also operates solar module factories in Tijuana, China, Japan, and the Czech Republic.
- **MiaSole** operates a Sunnyvale factory and employs 350 people. The company produces photovoltaic solar panels using copper, indium, gallium and selenide (CIGS).

- **Morgan Solar**, based in Toronto, Canada, was awarded $5 million in federal stimulus funds from the California Energy Commission in order to help open a manufacturing facility in Chula Vista. Morgan Solar officials say the plant, which is ramping up, should eventually employ roughly 100 people.
- **Nanosolar Inc**. makes thin-film solar cells in San Jose and assembles modules at a factory in Germany. Approximately 220 people work at the San Jose facility, including research and development and assembly of solar cells, according to information submitted in January 2012 to CAEATFA. The company started in San Jose in 2001.
- **NuvoSun Inc.** of Milpitas has 60 full-time jobs at its Milpitas factory, according to information the company submitted in January 2012 to CAEATFA. The four-year-old company makes thin-film solar cells and modules.
- **Quick Mount PV** of Walnut Creek makes rooftop solar mounting systems with 60 employees, half of them involved directly in manufacturing, according to company officials.
- **Soitec** (**Concentrix**), a French semiconductor company, signed several agreements in 2011 to supply electricity to San Diego Gas & Electric from several local solar projects. Soitec officials said they intend to produce the project panels locally. Soitec purchased a manufacturing facility in the San Diego community of Rancho Bernardo in December 2011, with plans to employ as many as 450 workers and begin production by late 2012.
- **Solaria Corp**. of Fremont produced all of its solar modules in India until 2010, when it moved equipment from an offshore subsidiary to Fremont. As of October 2011, roughly 117 people work in production in Fremont, according to the legislative testimony of company officials.
- **Solarroofs.com** of Carmichael manufactures solar water heating systems with six employees.
- **Solexant**, with thin-film solar technology developed at the Lawrence Berkeley National Laboratory, has a small pilot production facility in San Jose that employed 40 people in 2010, according to the Berkeley lab. The company's plans to build a factory in Oregon are on hold, according to Oregon officials.
- **SoloPower Inc**. of San Jose makes solar panels for commercial and industrial rooftops in Portland, Oregon, but assembles some in San Jose. As of March 2012, the company had begun hiring some of the 450 people expected to work at its Portland factory. The California Energy Commission awarded SoloPower a $5 million low-interest loan to help fund the company's manufacturing expansion in San Jose. California also awarded SoloPower a $681,000 sales tax exemption on the equipment for

the San Jose expansion, which is expected to employ at least 30 people.
- **Stion Corp**. of San Jose, a maker of thin-film solar modules, does research and some module manufacturing with roughly 100 employees in San Jose. In September 2010, the state Energy Commission gave the company a $5 million loan to help pay for a manufacturing and product development expansion that will involve 20 direct jobs and 20 temporary construction jobs. In September 2011, Stion opened a much larger factory in Hattiesburg, Mississippi, that is expected to eventually employ 1,000 workers. Stion also plans to build a factory in South Korea this year.
- **SunEarth** of Fontana makes solar thermal equipment with 45 employees at a Fontana manufacturing plant.
- **SunPower Corp.**, based in San Jose, manufactures solar cells and panels in Malaysia, Mexico, and the Philippines. After the company qualified for a state sales tax exemption on manufacturing equipment in 2010, it opened a factory in Milpitas in April 2011 which employs more than 100. Another 850 or so people work at SunPower's Bay Area locations, including San Jose and Richmond.

Wind Industry Manufacturing Jobs

California pioneered large-scale wind farms in the 1980s. Now the state ranks third nationally in terms of overall wind installation, behind Texas and Iowa. Slightly over 3 percent of California's electricity is generated by wind, according to the American Wind Energy Association.

Most California wind farms are located in the mountain passes of Altamont, Tehachapi, and San Gorgonio. Components of most of the state's more than 13,000 wind turbines were made in other countries or states and shipped to California.

Only a few companies manufacture wind energy equipment in California. They include:

- **Ameron International Corp**., which builds wind turbine towers at a factory in Fontana that employs 150 to 300 people, depending on demand.
- **GE Energy**, which assembles wind turbines at a factory in Tehachapi with roughly 60 employees.
- **Molded Fiberglass Companies**, which makes nose cones and turbine housings at a factory in Adelanto with roughly 50 employees.

- **Northern Power Systems**, which makes wind turbine blades in National City with fewer than 20 employees.

The wind industry supported 4,000 to 5,000 California jobs, directly or indirectly, in 2010, according to the American Wind Energy Association.

Though wind energy manufacturing jobs are scarce in California, many companies that design, develop, construct, operate, and manage wind farms are based here. These include EnXco (San Diego), Oak Creek Energy Systems (Escondido), and Coram Energy Group (Mojave). Clipper Windpower LLC manufactures wind turbines in Iowa but maintains its headquarters in Carpinteria. Many energy companies headquartered elsewhere keep offices in California, including AES Wind Generation, Mitsubishi Power Systems Americas, and Terra-Gen Power, LLC.

Fuel Cell Manufacturing Jobs

Although fuel cells are sometimes touted as high-tech marvels, their basic technology was first demonstrated in 1839, when Welsh scientist William Robert Grove unveiled his "gas battery." A century and a half later, NASA brought fuel cells into the modern era when it installed them on manned spacecraft to provide electricity in flight. Until now, though, fuel cells have not achieved broad commercial success because of their relatively high cost.

"Think of a fuel cell as a continuously operating battery," explains the California Stationary Fuel Cell Collaborative. "Whereas a battery stores and eventually runs out of electrical power, a fuel cell can generate electricity indefinitely, as long as it is provided with a fuel and oxygen. Simply put, a fuel cell is an electrochemical device that converts the chemical energy in a fuel such as hydrogen to electricity and thermal energy without combustion."

The collaborative – a public/private partnership administered by the California Air Resources Board – promotes fuel cell use "as a means of reducing or eliminating air pollutants and greenhouse gas emissions, increasing energy efficiency, promoting energy reliability and independence, and helping the state of California move closer to realizing a sustainable energy future."

Based on our survey of the industry in California, only three companies manufacture stationary fuel cells in the state. Together, they employ roughly a thousand workers statewide, the vast majority working for one company. These are the three:

- **Bloom Energy**, which makes solid oxide fuel cells in its facility in Sunnyvale. Boosted tremendously in 2010 by $208 million in subsidies from the Self-Generation Incentive Program, the privately-held company employs about 1,000 workers. Bloom's large energy servers, dubbed "Bloom Boxes," have been deployed at numerous businesses and government locations around California. Bloom crossed a new threshold in October 2011, when the state of Delaware reached a multi-million-dollar deal with Bloom to provide energy to the state's general power grid. As part of the deal, Bloom agreed to open a manufacturing plant in Delaware that would employ 900 workers.
- **Altergy Systems**, which manufactures proton-exchange membrane fuel cells at its site in Folsom. Altergy fuel cells offer 8 to 48 hours of backup power; their small size makes them practical for rooftops and tight spaces. The company, which boasts the first high-volume robotic assembly line for PEM fuel cells, employs about 60 workers.
- **Jadoo Power**, which makes light-weight fuel cells in Folsom. The company was hit hard last year by reductions in federal defense contracts. As a result, Jadoo reduced its workforce from 31 in October 2011 to just 8 employees by January 2012.

A note on mobile fuel cells: Oorja Protonics, based in Fremont, manufactures methanol-powered fuel cells for forklifts and other small vehicles. Also, automobile makers developing fuel-cell-powered vehicles plan to fabricate the fuel cells at their own facilities.

Tab 3: In Their Own Words: What Businesses Need

Culled from interviews and hearings, here's what some green entrepreneurs say would incentivize them to establish their businesses in California – and keep them here.

"You can give all the manufacturing incentives you want – nobody would put manufacturing in California without demand. Give us long-term demand, and investment will follow." – Julie Blunden, executive vice president for corporate communications and public policy, SunPower Corporation.

"Some type of push, whether it be from the state or local economic development authority, is key, because there needs to be somebody behind the scenes, putting it all together. Because I think at the end of the day, small companies like ourselves are always time- and resource-limited, so I think the ability to get these deals done quickly – especially in an environment where the industry is changing every day – is extremely important." – Frank Yang, vice president of business development and marketing, Stion Corp.

"If government wants to get into this game, they're going to have to accept failure . . . Government shouldn't be more prescient than anybody else." – Dorothy Rothrock, senior vice president for government relations, California Manufacturers & Technology Association.

"The worst thing I've experienced with government is an apparent lack of awareness of how severely they are tossing businesses right and left with ever-changing policies." – Gary Gerber, founder of Sun Light & Power.

"We see the best role for the state is in regulatory streamlining. That's key to keeping companies here – in most cases, a company will look at multiple locations and that's where streamlining makes a difference." – Anne Smart, director of energy policy, Silicon Valley Leadership Group.

"Fuel cells are the new kids on the block. The more we build, the

cheaper they'll be. But, for the next three to five years, incentives will mean a lot to us while we get our volume up." – Mickey Oros, senior vice president of business development, Altergy Systems.

"It's more effective if the money goes to projects rather than businesses. This enables the deployment in a wider-scale way. Also, a buy-California incentive encourages business to stay here and grow here." – Josh Richman, head of business development, Bloom Energy Corp.

"In terms of all the different incentives, grants are preferable to loans. Also, enhancing the state R and D [research and development] tax credit – if we could increase it from the 15 percent that it currently is now here in California to match the federal level of 20 percent, we think that would be very helpful….And I do want to underscore this: Predictability and stability in the market is key. So having long-term policies in place that enable that investment, so you feel good about putting that money in, is really important." – Mike Mielke, senior director for Environmental Programs and Policy, Silicon Valley Leadership Group.

"Give me a loan! Give me five years' time and not only am I going to pay back your loan, I'm going to give you a good return on your loan." – Dr. Vijay K. Kapur, founder, International Solar Electric Technology.

"California could do something much more targeted: an equipment bottleneck loan. The slowest-moving part of a factory limits production. The state could provide bottleneck loans, in the $10-$20 million range, to buy machines to release the bottleneck and that would help increase production." – Brian Sager, founder of Nanosolar.

"I can tell you that financial incentives are way down on the list of priorities for investors. That's because nobody believes that the government programs will continue." – Winston Hickox, partner with California Strategies (and former director of the California Environmental Protection Agency).

Tab 4: Tough to Do Business in California?

While the focus of this report is to assess California's renewable energy incentive programs, not its business climate, policymakers hoping to generate jobs need to consider factors -- apart from incentives -- that attract or repel businesses.

Many company officials expressed the opinion to the Senate Office of Oversight and Outcomes that manufacturing in California does not make financial sense because of regulatory hassles and the cost of labor, energy, real estate, and taxes.

Not all offered specific examples to back up their claims, but the oversight office found a widespread perception of California as a costly place to do business.

"Our company won't even consider building a factory in California," said Gary Kanaby, director of wind energy sales for Ohio-based Molded Fiber Glass Companies. The company has made wind tower nose cones and the fiberglass housings for turbine machinery at a small factory in Adelanto in San Bernardino County for 25 years, Kanaby said. But when the company needed to expand, the winner was South Dakota, where the company recently built two factories with a workforce of more than 350.

Kanaby said South Dakota's location near the windy Great Plains helped. But he noted that the governor spent a day golfing with Molded Fiber Glass officials and other business leaders to try to convince them to locate in his state. "The governor was involved and showed his backing and support," said Kanaby.

SMA Solar, a German manufacturer of inverters for solar photovoltaic systems, maintains its U.S. headquarters in Rocklin. But in 2009, when the company sought to expand manufacturing in the U.S., it chose Colorado, not California.

"Some of the states really rolled out the red carpet," said SMA spokesman

Jeffrey Philpott. "They made a distinct effort to win our business, while other states showed surprisingly little interest."

SMA could not find a suitable building for production in Central California, said Philpott. The company weighed many factors, including labor pool and incentives, he said, and "Colorado came out on top."

Manufacturers shy away from California for reasons that include taxes, regulation, and a lack of government incentives, said Ed Bee, president and owner of Taimerica Management Company in Mandeville, Louisiana. He helps companies figure out where to locate and helps communities attract employers.

"It's not just one thing," said Bee. "It's a whole complex of issues that have made California uncompetitive."

Some business owners said that manufacturing costs simply do not favor California.

Steve Taber founded Nordic Windpower in Berkeley in 2007 to make two-blade, utility-scale wind turbines. He located the company headquarters in the Bay Area and said that he considered locating the manufacturing in California. But after analyzing costs, his investors chose factories in Pocatello, Idaho, and Kansas City, Missouri. In 2011, after Taber left the company, his successors moved its headquarters from Berkeley to Kansas City.

Taber noted that the cost of keeping a skilled technician on the factory floor is high in California. But he praised the state's forward-looking policies and innovative business environment.

"It may be inevitable that middle-wage factory jobs leave California," said Taber, "but the state's strong commitment to renewable energy and its wealth of creative and intelligent people will still be an engine for growth."

Top concerns of the California Manufacturers & Technology Association include the state's sales tax on manufacturing equipment (California is one of only 12 states with such a tax) and the time and uncertainty associated with permitting, said Dorothy Rothrock, senior vice president of the association.

California needs to analyze the costs of its regulations, she said, so policymakers can eliminate those that are counter-productive. Government incentives will not heal wounds created by bad policies, said

Rothrock: "If you're using that kind of approach as the basis for bringing back your economy, you're on the wrong track."

The owners of companies that do manufacture in California say the reason they stay is not always the bottom line.

Claudia Wentworth runs a Walnut Creek company, Quick Mount PV, that manufactures the mounting systems for solar panels. She calls the level of taxes she pays "not manufacturer-friendly," and said she had to hire an employee just to deal with regulatory compliance issues. But she expanded her 60-employee company last year and does her best to buy from nearby suppliers, she said, because "we are committed to being made in the U.S.A. and supporting local businesses whenever possible."

"I really love what California offers," said Wentworth. "I've got an incredibly diverse group of people who work here. We're like a family, and in a great living environment."

"If I were extremely miserly and focused only on the bottom line," she said, "I wouldn't be in California."

Tab 5: Table Showing SB 71 Awardees

Sales Tax Exemption on Manufacturing Equipment for Clean Energy or Transportation Companies under SB 71 as of March 2012

Applicant	Location	Anticipated STE Amount	STE Used to Date	Expected Total Jobs*	Portion of Expected Total Jobs from SB 71**
Bowerman Power	Irvine	840,840		30	3
ABEC Bidart Stockdale	Bakersfield	102,974	77,827	26	3
First Solar Inc.	Santa Clara	3,430,700	3,409,567	174	17
The Solaria Corp.	Fremont	709,800	258,678	180	17
Nanosolar Inc.	San Jose	12,757,099	3,928,099	410	36
NuvoSun Inc.	Milpitas	1,820,000	756,150	160	18
Bloom Energy Corp.	Sunnyvale	3,407,740	807,488	1,004	83
Ameresco Butte County	Paradise	98,785	43,722	12	1
Ameresco Crazy Horse	Salinas	141,820		12	1
Ameresco Forward	Manteca	202,711		11	1
Ameresco Johnson Canyon	Gonzales	69,733	33,899	12	1
Ameresco San Joaquin	Linden	156,837		12	1
Ameresco Vasco Road	Livermore	166,367		11	1
BioFuels Point Loma	San Diego	567,478	180,523	25	3
Alta Devices Inc.	Sunnyvale	3,716,895	509,299	322	37
CA Institute of Technology	Pasadena	1,219,400	184,394	133	15
SunPower Corp.	Milpitas	728,000	704,816	94	11
Simbol Inc.	Calipatria	3,866,060	117,212	212	23
Leyden Energy Inc.	Fremont	118,894	9,843	26	2
MiaSole	Sunnyvale	2,374,372	881,599	56	3
Alameda-Contra Costa Transit	Emeryville	490,303	362,320	6	1
Mt. Poso Cogeneration Co.	Bakersfield	1,308,034	1,164,294	97	11
Recology East Bay	Oakland	336,981		46	5
DTE Stockton	Stockton	920,920		62	7
SCS Energy	Fresno	255,579	247,020	9	1
CE Obsidian Energy	Imperial	14,130,772		381	39
SoloPower Inc.	San Jose	681,310	120,507	40	1
Amonix Inc.	Milpitas	638,253		200	12
Zero Waste Energy Development	San Jose	1,389,707		174	17
Tesla Motors Inc.	Hawthorne	23,652,000	42,450	1,237	108
Stion Corporation	San Jose	519,843		28	3
Soraa Inc.	Fremont	4,617,199		180	14
TOTAL		**85,437,406**	**13,839,707**	**5,382**	**496**

Applications Previously Approved -- Inactive

Applicant	Location	Anticipated STE Amount	STE Used to Date	Expected Total Jobs*	Portion of Expected Total Jobs from SB 71**
ABEC Bidart Old River	Bakersfield	431,158		50	6
Gallo Cattle Co.	Atwater	113,295		30	3
Solyndra	Fremont	34,741,616	25,127,322	2,084	225
Stion Corp.	San Jose	9,598,080		493	47
Calisolar Inc.	Sunnyvale	3,549,000		273	13
Quantum Fuel Systems Technologies Worldwide	Irvine	814,073		94	11
Green Vehicles Inc.	Salinas	337,433		126	14
Soliant Energy Inc.	Monrovia	906,952		38	5
Amonix Inc.	Seal Beach	207,380		153	2
TOTAL		**50,698,987**	**25,127,322**	**3,341**	**326**
GRAND TOTAL		**136,136,393**	**38,967,029**	**8,723**	**822**

* The estimated number of people to be employed on equipment eligible for sales tax exemption.

** The estimated number of workers attributed to money saved through SB 71.

Source: California Alternative Energy and Advanced Transportation Financing Authority

Tab 6: In-State Incentives

At least five states have tried to help manufacturers – or attract others – by paying a bonus for electricity generated on locally-made equipment.

That's according to the North Carolina Solar Center, which is funded by the federal government to track state renewable energy incentives.

Paying more for equipment made in-state appears to have helped only a handful of companies in Delaware, Massachusetts, Minnesota, New Jersey, and Washington. It's not clear how an in-state bonus would play out in California, home to more manufacturers and a bigger market. But business groups warn that unintended consequences – such as higher prices and retaliation by other governments against California companies – could destroy, rather than create, California jobs.

Delaware utilities pay renewable energy project developers an extra 10 percent for their power if at least 50 percent of the equipment that generates it was made in Delaware or at least 75 percent of the labor and construction involves an in-state crew. In the state of Washington, utilities pay nearly four times as much for electricity generated on equipment manufactured in-state.

In both Delaware and Washington, the bonuses appear to have improved business for a handful of companies. But neither has drawn a rush of manufacturers.

In Delaware, only two manufacturing companies and several installation companies qualify for the two-year-old bonus.

"The bonuses have not yet attracted any manufacturers to Delaware," wrote Delaware Public Service Commission official Pamela Knotts to the oversight office, "but they may be helping the in-state companies get more business."

That's true, said Dave Holleran, senior manager of sales for Motech Americas, LLC, the only company making solar modules in Delaware.

"I wouldn't go so far as to say that the reason we're in Delaware is because of the in-state incentive," said Holleran, "but it does help. We're getting lots of calls from companies preparing for the SREC (solar renewable energy credits) auction."

The in-state incentive brings the price of Motech's panels closer to those imported from China, he said.

State tax officials in Washington say their seven-year-old in-state bonus has so far attracted two solar module companies, which then expanded into inverter manufacturing as well. One of those companies – Silicon Energy of Marysville, Washington – recently opened a factory in Minnesota in order to qualify for utility incentives there for in-state manufacturers. That new Silicon Energy factory is now one of only two solar manufacturing facilities in Minnesota.

Mark Bohe at the Washington Department of Revenue said approximately half of the people buying solar photovoltaic systems and seeking the state tax credit are buying Washington-made systems.

For many reasons, California has not embraced an in-state incentive. The only similar bonus exists in the state's Self-Generation Incentive Program, which pays a 20 percent bonus for fuel cells and other eligible technologies manufactured in California. So far, that bonus has not attracted any new manufacturers to the state.

Since 2007, the Los Angeles Department of Water and Power, a publicly-owned utility, has offered to pay more for electricity if it is generated on solar photovoltaic systems made in Los Angeles. But that extra 60 cents-per-watt bonus so far is moot – no company manufactures solar panels in the city of Los Angeles.

In 2011, Senator Ellen Corbett, whose district includes the Silicon Valley home of several solar manufacturers, carried a bill that would have given a 5 percent advantage to California companies bidding to supply state agencies with solar photovoltaic systems.

"This will create both construction and permanent manufacturing jobs in California," stated the bill, SB 175. Supporters included Nanosolar, Solyndra, and Solaria.

SB 175 died in the Assembly Business, Professions, and Consumer Protection Committee.

The bill was opposed by the California Chamber of Commerce and the

California Manufacturers & Technology Association. While they said they shared the author's desire to spur job creation in California, leaders of the business groups argued that an in-state bidding preference would limit competition, resulting in higher prices on the contracts, leaving less money to spend on renewable energy installation.

The business groups also warned of a broader potential problem with an in-state incentive: the risk of retaliation from other states and countries that might penalize California for its protectionist stance.

"This practice creates a patchwork of reciprocity and retaliation that makes it difficult for California businesses to contract with other states," states a memo from the business groups urging opposition to the bill.

Tab 7: DyoCore Exploits State Subsidies

In the 1980s, the solar thermal industry boomed, thanks to generous state and federal incentives. Thousands of Californians installed the technology to harness the sun to warm water for their homes.

But some slipshod sales companies joined the rush for subsidies, leaving many Californians with leaky or poorly-operating systems. The incentives – which had no performance requirements – ended after a few years, and the solar thermal industry has suffered since from homeowners' bad experiences.

The more recent experience of another California renewable energy subsidy program shows that the overseers of incentives must be constantly vigilant about the performance of the technology they subsidize – or risk wasting public dollars, hurting consumers, and besmirching an entire industry.

Consider how last year a small San Diego County wind turbine company exploited one of California's smaller renewable energy incentive programs, prompting the California Energy Commission to temporarily shut the program and install better safeguards.

Millions of customers of California's major investor-owned utilities pay for the 13-year-old Emerging Renewables Program. As of June 2011, nearly $38 million was available to be distributed between it and another program designed to encourage installation of solar systems on new homes. The Emerging Renewables Program gives consumers rebates that reduce – but do not eliminate – the cost of small wind turbines and fuel cells powered by renewable fuel.

In early 2011, Energy Commission staff recognized that the rebates were paying for nearly the entire cost of wind turbines sold by DyoCore of Carlsbad – and that DyoCore systems were being installed in places with weak wind. In a complaint filed against the company in July 2011, staff calculated that the Commission had paid out more than $515,000

in rebates on DyoCore turbines. Another 249 applications had been approved worth $6.4 million, and 1,069 applications worth $31.2 million had been received but not reviewed.

Wind industry experts had alerted the Commission to the DyoCore problem in November 2010, five months before the Commission suspended the program in order to investigate DyoCore.

"DyoCore is claiming approximately twice the total kinetic energy in the wind," wrote Mike Bergey, president of Bergey Windpower Co. in Norman, Oklahoma, in an e-mail whose recipients included the Energy Commission employee managing the rebate program. "Impossible."

The Energy Commission complaint describes how things went so wrong in the Emerging Renewables Program.

In February 2010, DyoCore asked to be listed as eligible for rebates under the program, according to the complaint.

DyoCore officials originally described their turbine's performance to the Energy Commission as 800 watts at 12 mile-per-hour winds. The company submitted supporting data, as required by the program rules. In March 2010, the Energy Commission contractor administering the program, KEMA Inc., listed the DyoCore turbine as eligible at such a performance rating.

A few weeks later, however, the DyoCore executive officer claimed that his company's turbines actually produced 1,600 watts at 18 mile-per-hour winds. A KEMA representative initially challenged that claim, but accepted it after DyoCore provided some new data showing higher output.

In the meantime, KEMA and Energy Commission staff noticed a surge in applications for DyoCore turbines, some in wind-poor locations and some involving rebates big enough to cover the whole cost of the wind turbines. The Commission took the drastic step of suspending the program in March 2011 "so that it may address deficiencies with the program requirements."

The Distributed Wind Energy Association, a national trade association, strongly backed the suspension, saying DyoCore caused "tremendous turmoil in the marketplace."

"The DyoCore unit has been portrayed by its supporters as a technological breakthrough that radically reduces costs and will allow wind power to be

used on thousands of homes where conventional wind turbines would not work," wrote Bergey, the DWEA acting president, to the Energy Commission in April 2011. "Nothing could be farther from the truth . . . DyoCore has all the markings of a scam and it is giving the small wind industry and the CEC a significant black eye."

He recommended many changes to the program, including a contract with the Small Wind Certification Council for technical advice on proper due diligence.

In November 2011, the Energy Commission reactivated a revamped Emerging Renewables Program. New program rules require energy systems to be certified by an independent, third-party certification body, such as the Small Wind Certification Council, before they can qualify for a rebate. Rebates are also limited now to half of the cost of a system.

Also in November 2011, the Commission resolved staff's complaint against DyoCore by stripping the company of eligibility for rebates. DyoCore stipulated that it submitted inaccurate data, and the Commission acknowledged that the stipulation "is not an admission of wrongdoing."

Experts on small wind energy systems continue to raise concerns with the Energy Commission about the eligibility of and capacity ratings for three of the turbines currently listed as eligible for the Emerging Renewables Program rebates. They also question the technical expertise of KEMA, the company that continues to manage the program under contract to the Commission.

VI. Sources

Individuals

Dan Adler, president, California Clean Energy Fund

Beverly Alexander, UC Berkeley Energy Institute, program co-director, cleantech to market

Mike Anderson, vice president, communications, SPI Solar

Phil Angelides, former California state treasurer and director, BlueGreen Alliance

Ed Bee, owner, Taimerica Management Company

Christine Bennett, public relations manager, Enphase Energy

Ken Berlin, general counsel, Coalition for Green Capital

Julie Blunden, executive vice president for public policy and corporate communications, SunPower Corp.

Mark Bohe, tax policy specialist, Washington Department of Revenue

Severin Borenstein, co-director, UC Berkeley Energy Institute

Robert Burris, senior vice president, Sacramento Area Trade & Commerce Organization

Deana Carrillo, program manager II, California Alternative Energy and Advanced Transportation Financing Authority

Neel Chaudhury, chief of staff, Office of Massachusetts Senator Jamie Eldridge

Melicia Charles, program and project supervisor, energy division, California Public Utilities Commission

Tim Carmichael, president, California Natural Gas Vehicle coalition

Dan Carol, director of multi-state issues, Oregon Governor John Kitzhaber

Carrie Cornwell, chief consultant, California Senate Transportation and Housing Committee

Dale Davis, president, Delaware Solar Energy Coalition

Diana Enright, division administrator, Oregon Department of Energy

Aaron S. Fowles, manager, corporate communications, Sanyo North America Corporation

Gary Gerber, founder and president of Sun Light & Power

Mike Gowrylow, communications director, Washington State Department of Revenue

Erin Grizard, senior manager, regulatory and government affairs, Bloom Energy

Stanton Hazelroth, executive director, California Infrastructure and Economic Development Bank

Robert Hedrick, counsel, California Alternative Energy and Advanced Transportation Financing Authority

Amy Heinemann, policy analyst, North Carolina Solar Center

Dave Holleran, senior sales manager, Motech Americas LLC

Gary Kanaby, director of sales, Molded Fiberglass Companies

Vijay K. Kapur, founder and president, International Solar Electric Technology

Pamela Knotts, public utilities analyst, Delaware Public Service Commission

Bruce Laird, clean tech recruitment officer, Business Oregon
Lawrence Lingbloom, chief consultant, California Assembly Committee on Natural Resources

Bill Lockyer, California State Treasurer

James Loewen, senior analyst, California Public Utilities Commission

Andrea Luecke, executive director, Solar Foundation

Mignon Marks, executive director, California Solar Energy Industries Association

Jan McFarland, private energy consultant and board member of Center for Energy Efficiency and Renewable Technologies

Shyam Mehta, senior analyst, GTM Research

Lewis Milford, founder, Clean Energy States Alliance

Patrick O'Keefe, sales manager, Ameron Wind Towers

Mickey Oros, senior vice president, Altergy Systems

Pat R. Perez, deputy director, fuels and transportation division, California Energy Commission

Nancy Pfund, founding partner, DBL Investors

Mandy Rafool, fiscal affairs program, National Conference of State Legislatures

Sanjay Ranchod, director of government affairs and senior counsel, SolarCity

Neal Mark Reardon, regulatory analyst, energy division, California Public Utilities Commission

Heather Rhoads-Weaver, principal, eFormative Options, LLC

Josh Richman, head of business development, Bloom Energy Corporation

Dorothy Rothrock, senior vice president, government relations, California Manufacturers & Technology Association

Brian Sager, co-founder, Nanosolar

Ehren Seybert, energy division, California Public Utilities Commission

Suvi Sharma, president, Solaria

Jesse Shroyer, government relations and incentives manager, Smith Electric Vehicles

Anne Smart, director of energy policy, Silicon Valley Leadership Group

Kellie Smith, chief consultant, California Senate Committee on Energy, Utilities, and Communications

Robin Smutny-Jones, assistant executive director, California Energy Commission

Jan Smutny-Jones, executive director, Independent Energy Producers

Christine Solich, executive director, California Alternative Energy and Advanced Transportation Financing Authority

Shane Stephens-Romero, manager, research development and external relations, National Fuel Cell Research Center, University of California, Irvine

Henry Stern, principal consultant for energy and environment, Office of California Senator Fran Pavley

Claudia Wentworth, chief executive officer, Quick Mount PV

V. John White, executive director, Center for Energy Efficiency and Renewable Technologies

Susan Windham-Bannister, president and chief executive officer, Massachusetts Life Sciences Center

Daniel Witt, legislative and policy associate, Tesla Motors

Peter Wong, solar technology expert, U.S. Energy Information Administration

Frank Yang, director of business and development, Stion

Nick Zanjani, legislative liaison, California Public Utilities Commission

Melissa Zucker, vice president, human resources, Solaria Corp.

Documents

Advanced Biofuel Market Report 2011: Meeting the California LCFS. Environmental Entrepreneurs, August 2011.

Advanced Transportation and Alternative Sources Manufacturing Sales and Use Tax Exclusion Program: Reviewing SB 71. California Senate Committee on Energy, Utilities and Communications and Senate Committee on Governance and Finance, October 11, 2011.

Alternative Energy Manufacturing Sales and Use Tax Exclusion (SB 71) Program. Legislative Analyst's Office, October 19, 2011.

Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed. Josh Lerner. Princeton University Press, 2009.

California's Green Economy: Summary of Survey Results. State of California Employment Development Department, Labor Market Information Division, October 2010.

California Energy Commission:

Clean Energy Business Financing Program Notice of Proposed Awards. January 27, 2011.

Commission Adoption Order Docket No. 11-CAI-03, In the Matter of the Complaint Against DyoCore Inc. Brought by Energy Commission Staff. November 2, 2011.

Complaint Against DyoCore Inc. July 26, 2011.

Draft Investment Plan 2012-2013, Alternative and Renewable Fuel and Vehicle Technology Program. February 2012.

Investment Plan 2011-2012, Alternative and Renewable Fuel and Vehicle Technology Program. September 2011.

Regulations, Alternative and Renewable Fuel and Technologies Program. April 2009.

Renewable Energy Program 2011 Annual Report to the Legislature. December 2011.

Renewable Power in California: Status and Issues. December 2011.

Emerging Renewables Program Guidebook. November 2011.

California Public Utilities Commission:

2011 Annual Report. Division of Ratepayer Advocates, January 2012.

California Solar Initiative Thermal Program, Quarterly Progress Report (July 1, 2011 – September 30, 2011). November 15, 2011.

Decision Granting Petition to Modify Self-Generation Incentive Program Regarding Renewable Fuels. Sept. 24, 2009.

PG&E's Motion on Behalf of All the Self-Generation Incentive Program Administrators, Requesting a Temporary Suspension of the Program. Dec. 22, 2010.

Response of Bloom Energy, Inc., to PG&E's Motion. Jan. 6, 2011.

Administrative Law Judge's Ruling Requesting Comments on Revised Staff Proposal Regarding Modifications to the Self-Generation Incentive Program. April 21, 2011.

CPUC Improves and Streamlines Self-Generation Incentive Program (press release). Sept. 8, 2011.

Decision Modifying the Self-Generation Incentive Program and Implementing Senate Bill 412. Sept. 16, 2011.

A Clean Energy Deployment Administration: The Right Policy for Emerging Renewable Technologies. Allison S. Clements and Douglass D. Sims. Energy Law Journal, Vol. 31, No. 2 (2010).

The Competitiveness and Innovative Capacity of the United States. U.S. Department of Commerce and National Economic Council, January 2012.

How to Grow Jobs and Investment in California's Green Economy. California State Assembly Select Committee on California's Green Economy, November 2010.

Legislative Update 2012. Report of the Oregon State Debt Policy Advisory Commission, January 2012.

Leveraging State Clean Energy Funds for Economic Development. Lewis Milford, Mark Muro, Jessica Morey, Devashree Saha, Mark Sinclair. The Brookings-Rockefeller Project on State and Metropolitan Innovation, January 2012.

Many Shades of Green 2012: California's Shift to a Greener, More Productive Economy. Next 10, February 2012.

National Solar Jobs Census 2011. The Solar Foundation, October 2011.

Oregon's Solar Advantage. PowerPoint presentation by Bruce Laird of the Oregon Business Development Department. August 2011.

Powering Innovation: California is Leading the Shift to Electric Vehicles from R&D to Early Adoption. Prepared by Collaborative Economics for Next 10, December 2011.

Sizing the Clean Economy: A National and Regional Green Jobs Assessment. Mark Muro, Jonathan Rothwell, and Devashree Saha. The Brookings Institution, 2011.

Solar Photovoltaic Cell/Module Shipments Report, U.S. Energy Information Administration, January 2012.

State Support for Clean Energy Deployment: Lessons Learned for Potential Future Policy. Charles Kubert and Mark Sinclair, Clean Energy States Alliance. National Renewable Energy Laboratory Subcontractor Report, April 2011.

Statewide Self-Generation Incentive Program Data. California Center for Sustainable Energy. (Database of all SGIP projects.)

Who's Winning the Clean Energy Race? The Pew Charitable Trusts, 2011.

Winning the Race: How America Can Lead the Global Clean Energy Economy. Matthew Mayrl and Phil Mattera. Apollo Alliance and Good Jobs First, March 2010.

Senate Office of Oversight and Outcomes

1020 N Street, Suite 560

Sacramento, CA 95814

Telephone: (916) 651-1518

Facsimile: (916) 324-5927

http://www.sen.ca.gov/oversight

Special Counsel John Adkisson • john.adkisson@sen.ca.gov

Executive Assistant Monique Graham • monique.graham@sen.ca.gov

Principal Consultant John Hill • john.hill@sen.ca.gov

Principal Consultant Dorothy Korber • dorothy.korber@sen.ca.gov

Principal Consultant Nancy Vogel • nancy.vogel@sen.ca.gov

1517-S
Additional copies of this publication may be purchased for $6.25 per copy
(includes shipping and handling), **plus current California sales tax**.

Senate Publications & Flags
1020 N Street, B-53
Sacramento, CA 95814
(916) 651-1538

Make checks or money orders payable to **Senate Rules Committee**.
Credit cards not accepted.
Please include Stock Number **1517-S** when ordering.