



2012
CALIFORNIA
GREEN
INNOVATION
INDEX

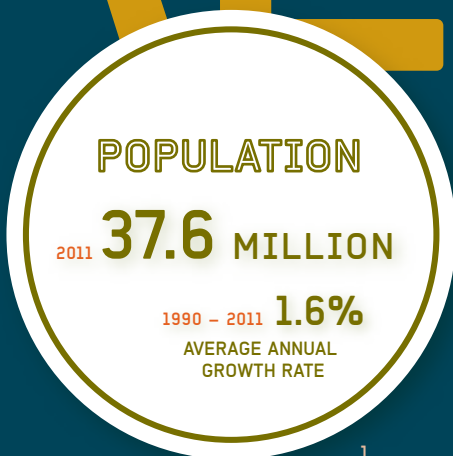
NEXT 10 IS AN INDEPENDENT NONPARTISAN ORGANIZATION THAT EDUCATES, ENGAGES AND EMPOWERS CALIFORNIANS TO IMPROVE THE STATE'S FUTURE.

NEXT 10 WAS FOUNDED IN 2003 BY BUSINESSMAN AND PHILANTHROPIST F. NOEL PERRY. NEXT 10 IS FOCUSED ON INNOVATION AND THE INTERSECTION BETWEEN THE ECONOMY, THE ENVIRONMENT, AND QUALITY OF LIFE ISSUES FOR ALL CALIFORNIANS. WE PROVIDE CRITICAL DATA TO HELP INFORM THE STATE'S EFFORTS TO GROW THE ECONOMY AND REDUCE GLOBAL WARMING EMISSIONS.

SINCE 2008, NEXT 10 HAS PUBLISHED THE CALIFORNIA GREEN INNOVATION INDEX. THE INDEX TRACKS CALIFORNIA'S PROGRESS IN REDUCING GREENHOUSE GAS EMISSIONS, IMPLEMENTING INNOVATIVE PUBLIC POLICY, GENERATING TECHNOLOGICAL AND BUSINESS INNOVATION, AND GROWING BUSINESSES AND JOBS THAT ENABLE THE TRANSFORMATION TO A MORE RESOURCE-EFFICIENT ECONOMY.

FOR MORE INFORMATION ABOUT THE CALIFORNIA GREEN INNOVATION INDEX, PLEASE VISIT US ONLINE AT WWW.NEXT10.ORG.

CALIFIFO



WWW.NEXT10.ORG

1.

PRODUCED BY: NEXT 10

F. Noel Perry
Sarah Henry
Marcia E. Perry

PREPARED BY: COLLABORATIVE ECONOMICS

Doug Henton	Tiffany Furrell	Jessie Oettinger
John Melville	Aris Harutyunyan	Clare Brown
Tracey Grose	Amy Kishimura	
Gabrielle Halter	Kim Held	

DESIGNED BY: CHEN DESIGN ASSOCIATES

GROSS DOMESTIC PRODUCT

(INFLATION ADJUSTED DOLLARS 2011)

\$1.97 TRILLION
2011
1.9% AVERAGE ANNUAL GROWTH 1990 – 2011

\$52,500
2011
PER CAPITA GDP

0.8% AVERAGE ANNUAL GROWTH 1990 – 2011

Gross Domestic Product (GDP) is a way of measuring the size of an economy, and is calculated by summing the value added from all industries in the economy. This measure can be used for a country as well as a state, in which case it can also be expressed as Gross State Product (GSP).

CALIFORNIA'S CARBON ECONOMY

RATIO OF GHG EMISSIONS (METRIC TONS) TO GDP (\$10,000)

1990 **3.26**
2009 **2.36**

CALIFORNIA'S GREENHOUSE GAS EMISSIONS

Gross GHG emissions includes fossil fuel carbon dioxide (CO₂), with electric imports and international fuels (carbon dioxide only) and non-carbon GHG emissions (in CO₂ equivalents).

TOTAL GHG EMISSIONS

1990 **427** 2009 **457**

0.3% AVERAGE ANNUAL GROWTH 1990–2009

(MILLION METRIC TONS OF CO₂ EQUIVALENT)

PER CAPITA GHG EMISSIONS

2009 **12.35**

(MILLION METRIC TONS OF CO₂ EQUIVALENT)

ASSEMBLY BILL 32

THE "CALIFORNIA GLOBAL WARMING SOLUTIONS ACT OF 2006"

Assembly Bill 32 (AB 32) was signed into California law in 2006. AB 32 has put California at the forefront of climate change policy by requiring the state to reduce its greenhouse gas (GHG) emissions to 1990 levels by 2020.

AB 32 TARGETS

TOTAL GHG EMISSIONS

2020 **427**

(MILLION METRIC TONS OF CO₂ EQUIVALENT)

1. Data Source: California Department of Finance

2. Data Source: California Air Resources Board, "California Greenhouse Gas Inventory – by Sector and Activity"; Moody's Economy.com

3. Inflation adjusted dollars (2011). Data Sources: Bureau of Economic Analysis; California Department of Finance

4. Data Source: California Air Resources Board, "California Greenhouse Gas Inventory – by Sector and Activity"; California Department of Finance



Dear Friends,

We are pleased to release the fourth edition of the California Green Innovation Index, which tracks the economic impacts of policies that reduce state carbon emissions. Since 2008, we have analyzed key indicators – including greenhouse gas emissions relative to economic growth, energy productivity, venture capital investment, and patent activity in clean technology. Our findings show that California's economy is gradually transitioning away from carbon-based energy toward a more energy productive future.

TOP FINDINGS OF THE 2012 INDEX INCLUDE:

Clean technology investment and innovation are driving growth in California's overall economy:

- » California attracted \$3.5 billion of cleantech investment in 2011, representing 25 percent of total VC investment in the nation.
- » California ranks first in the nation in green technology patents registrations, accruing 910 patents between 2008 and 2010.

Growth in California's renewable energy portfolio and energy productivity continues to outpace the rest of the nation:

- » California's energy generation from renewable sources increased 11.2 percent from 2009 to 2010, representing 13.7 percent of total energy production in the state. This increase was driven by a 44 percent jump in wind generation capacity.

California's dependency on carbon is shrinking:

- » Since 1990 California's per capita GDP expanded 16 percent while GHG emissions per capita fell 16 percent.
- » For every dollar of GDP generated in 2009, California required 28 percent less carbon than in 1990.

This year's special feature examines the state's solar sector, which is seeing major growth and development. We examine trend lines of cost, venture capital investment, patent registrations and market penetration. California recently surpassed 1,000 megawatts of solar energy capacity, putting our state in the company of top solar-adopting countries.

California's ability to foster and develop new ideas, markets and technology is unique. The purpose of the California Green Innovation Index is to document the impacts of California's efforts to transition to a low carbon economy in order to understand what works and what doesn't in driving innovation.

Sincerely,

F. Noel Perry
Founder, Next 10

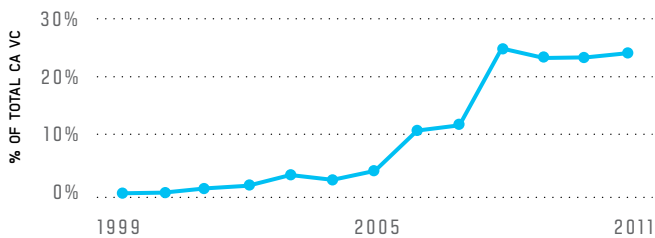
CONTENTS

Index At A Glance	4
California's Past and Future	6
Heritage of Technological and Social Innovation	6
California Policy Timeline	7
Dashboard Indicators	14
Green Technology Innovation	15
The Carbon Economy	26
Energy Efficiency	33
Renewable Energy	37
Transportation	44
Feature: Shedding Light on California's Growing Solar Industry	48
Endnotes	62
Appendix	63

INDEX AT A GLANCE

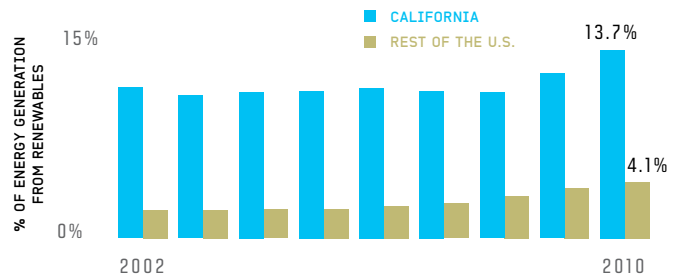
GREEN TECHNOLOGY INNOVATION: EVEN DURING THE ECONOMIC DOWNTURN, INVESTMENT CONTINUES IN CLEAN TECHNOLOGY, NEW TECHNOLOGIES EMERGE, AND ADOPTION RATES CLIMB.

CLEANTECH VC _PAGE 15



Over the last decade, investment in cleantech has grown as a percentage of total venture capital (VC) investment in the state. In 2011, 25 percent of statewide VC investment was awarded to cleantech companies, up from four percent in 2005.

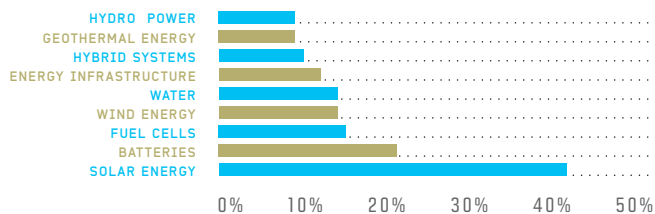
RENEWABLES _PAGE 37



Increasing three percent since 2008, 13.7 percent of California's energy was generated by renewable sources in 2010. Nationally, renewable sources represented 4.1 percent of total energy generation.

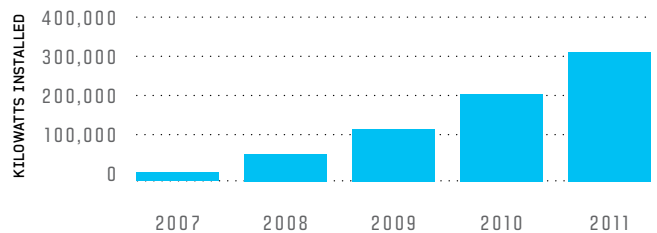
GREEN TECHNOLOGY PATENTS _PAGE 19

CA % OF U.S. PATENTS, 2008-2010



California accounts for a large and growing percentage of national green patent activity and the largest percent of registered patents in the nation for solar, water, energy infrastructure, and battery technologies. Forty-one percent of Solar Energy patents in the U.S. are registered in California.

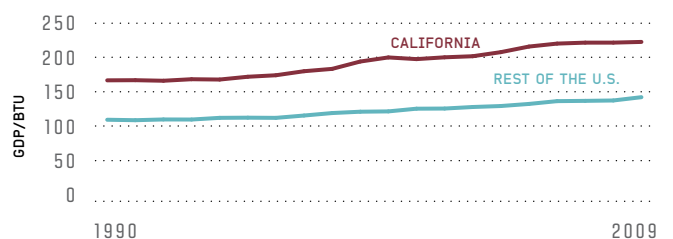
SOLAR CAPACITY _PAGE 42



New solar installations increased by 21 percent in 2011, representing an eight-fold increase since 2007. Solar patents have nearly doubled in the past two decades, contributing to the innovation and growth of the solar industry.

ENERGY EFFICIENCY: AS A RESULT OF ENERGY EFFICIENCY POLICIES ENACTED SINCE THE 1970S, CALIFORNIA'S ENERGY PRODUCTIVITY CONTINUES TO RISE. THIS MEANS THAT WHEN BUSINESSES AND HOUSEHOLDS SAVE MONEY ON ENERGY, THEY HAVE EXTRA MONEY TO SPEND ON CAPITAL UPGRADES OR NEW EMPLOYEES. ACROSS ALL SECTORS, VAST OPPORTUNITIES EXIST FOR NEW EFFICIENCY GAINS.

ENERGY PRODUCTIVITY _PAGE 33

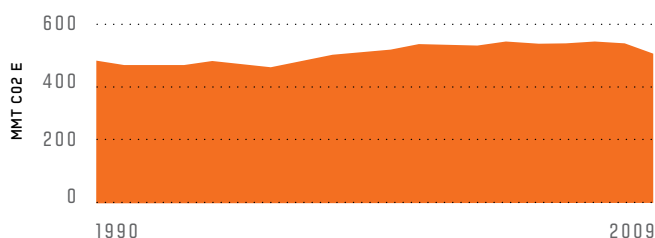


Energy productivity, measured as the ratio of energy consumed (inputs) to GDP (economic output), is 64 percent higher in California than in the nation as a whole. California's rising energy productivity since 1990 has outpaced that of the rest of the country.

THE 2012 CALIFORNIA GREEN INNOVATION INDEX PRESENTS A SERIES OF “DASHBOARD” INDICATORS THAT TRACK CHANGES OVER TIME AND A FEATURE ON THE SOLAR INDUSTRY IN CALIFORNIA. THE INDEX AT A GLANCE HIGHLIGHTS KEY AREAS PRESENTED IN THIS REPORT.

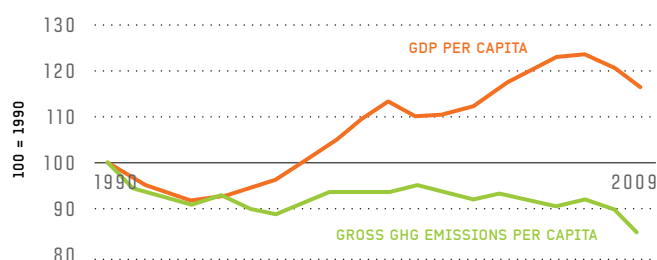
THE CARBON ECONOMY: CALIFORNIA'S ECONOMY IS REDUCING ITS RELIANCE ON CARBON AS TOTAL EMISSIONS BEGIN TO LEVEL OFF AND PER CAPITA EMISSIONS DROP.

GHG EMISSIONS _PAGE 31



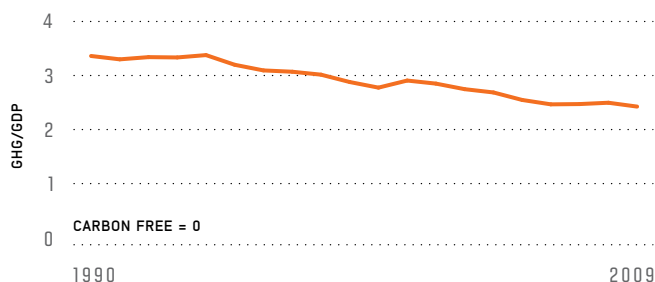
California's gross annual greenhouse gas (GHG) emissions in 2009 were five percent higher than 1990. After leveling off following 2001, GHG emissions fell six percent between 2008 and 2009 in part as a result of the economic slowdown.

GDP & EMISSIONS _PAGE 27



Although falling in 2009, per capita gross domestic product (GDP) was 16 percent above 1990 levels in 2009. Conversely, relative to 1990 levels, per capita GHG emissions have fallen 16 percent.

CARBON ECONOMY _PAGE 28



For every dollar of GDP generated in 2009, California required 28 percent less carbon than in 1990.

VMT & EMISSIONS _PAGE 44

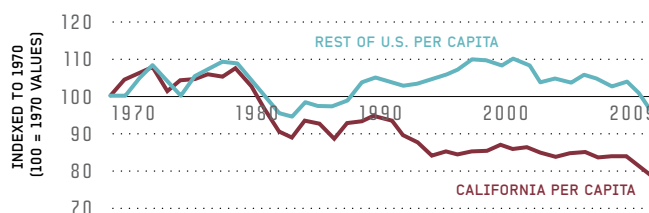
PERCENT CHANGE 2007-2009

VMT PER CAPITA	-3%
SURFACE TRANSPORTATION GHG EMISSIONS PER CAPITA	-9%

Both vehicle miles traveled (VMT) per capita and surface transportation emissions per capita have declined. From 2007 to 2009, VMT per capita dropped by three percent, while surface emissions fell by nine percent.

ENERGY CONSUMPTION _PAGE 34

TOTAL ENERGY CONSUMPTION RELATIVE TO 1970



On a per-capita basis, Californians have been consuming less energy over the long term. Energy consumption per capita is 24 percent below 1970 levels. Nationally, per capita consumption dropped below 1970 levels in 2009 for the first time since the recession of the 1980s.

CALIFORNIA'S PAST AND FUTURE

California has a heritage of being at the forefront of technological and cultural changes, and this is demonstrated in the growth of the green economy. With pacesetting research and development, precedent setting public policy and a population of early adaptors, California leads the way in green innovation.

HERITAGE OF TECHNOLOGICAL AND SOCIAL INNOVATION

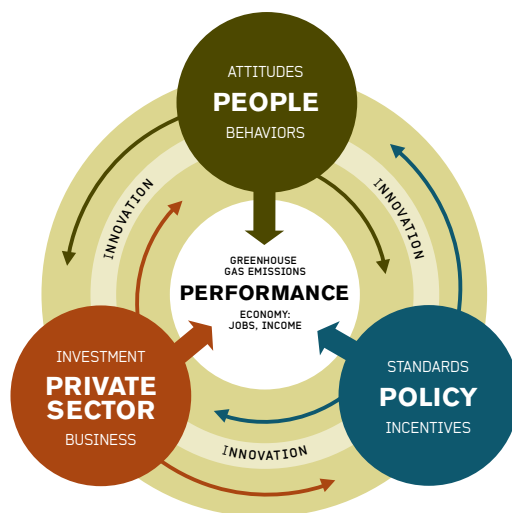
The California experience demonstrates that reducing greenhouse gas (GHG) emissions can be achieved while also growing the economy. It is not a choice between the economy and the environment. Our data shows that economic growth can be achieved while protecting our limited natural resources.

Innovation creates new means for creating new value. California needs to continue building on its tradition of innovation in order to grow prosperity while also reversing negative impacts on the environment. Improving efficiency in the consumption of energy and all natural resources enables us to do more with less. By generating less waste and pollution, we can spend less on costly mitigation efforts. By thinking creatively, we can learn how to do things differently. By investing in technological advances, the deployment of new technology and practices, and our talent base, California can remain a world leader in green innovation.

A virtuous cycle of green innovation develops through the actions of individual actors and the interactions between actors. Each actor has control over a certain scope of action. Each decision, whether a policy, purchase or production issue, will have an impact on the scope of action of another group of actors. As one action triggers another, momentum grows, and the innovation process is advanced. When actions are aligned around shared goals of growing the economy and reducing negative environmental impacts, then a virtuous cycle of green innovation develops.

Spurring California's green innovation requires the concerted efforts of multiple actors.

Government adopts policy innovations, which create an environment that encourages both private sector and individual innovation. At the same time, government policy is influenced by the emergence of new technologies, products, and business practices in the marketplace, which demonstrate what could be possible on a larger scale. Elected officials also pursue policy innovations in response to growing concerns from the public—interests shaped by the



media, consumer experience, and personal values as much as by government information and incentives.

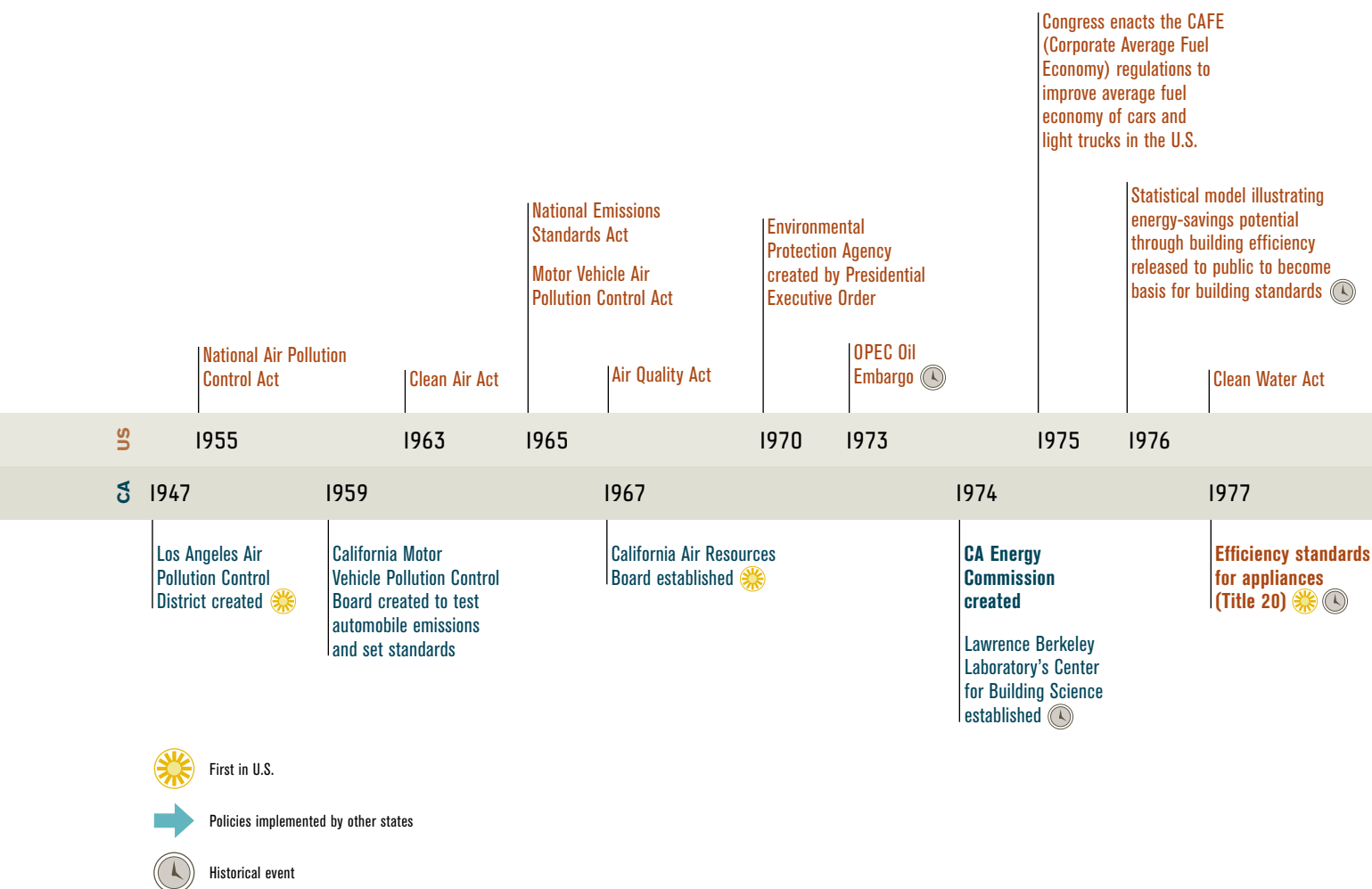
Private sector businesses respond to government standards and incentives, but also to global market forces (like the price of oil). Businesses pursue innovations to meet emerging industry and consumer demand for new green products and practices. These innovations not only help the bottom line of California businesses, but also create jobs, help inform policy, and change individual behavior by offering tangible applications of green innovation.

The private sector also includes a diverse mix of non-profit groups that promote changes in government policy, business practices, and individual behaviors. This “independent sector” of organizations is an important catalyst for green innovation.

Individuals not only respond to government incentives and the availability of new products, but also influence the direction of policy through the political process and generate demand for new green products in the marketplace.

California has a history of trailblazing pioneers, creative problem-solvers, outdoor enthusiasts and world-class businesses that are founded on forward-looking people who are open to trying new things. This is what innovation is about, and this is what can create economic prosperity in the new context of global climate change and diminishing natural resources.

As the application of Information Technology (IT) spread over the last several decades, labor productivity has achieved huge gains, transforming the economy, and spurring the growth of new markets. Over the last thirty years, new opportunities for cost savings and new product development emerged across industries, and the IT industry continued to grow and diversify offering wider ranges of products, services and employment opportunities. Similarly, the widespread application of products and services that improve resource efficiency and reduce negative environmental impacts will strengthen the economy and spur innovation.



CALIFORNIA POLICY TIMELINE

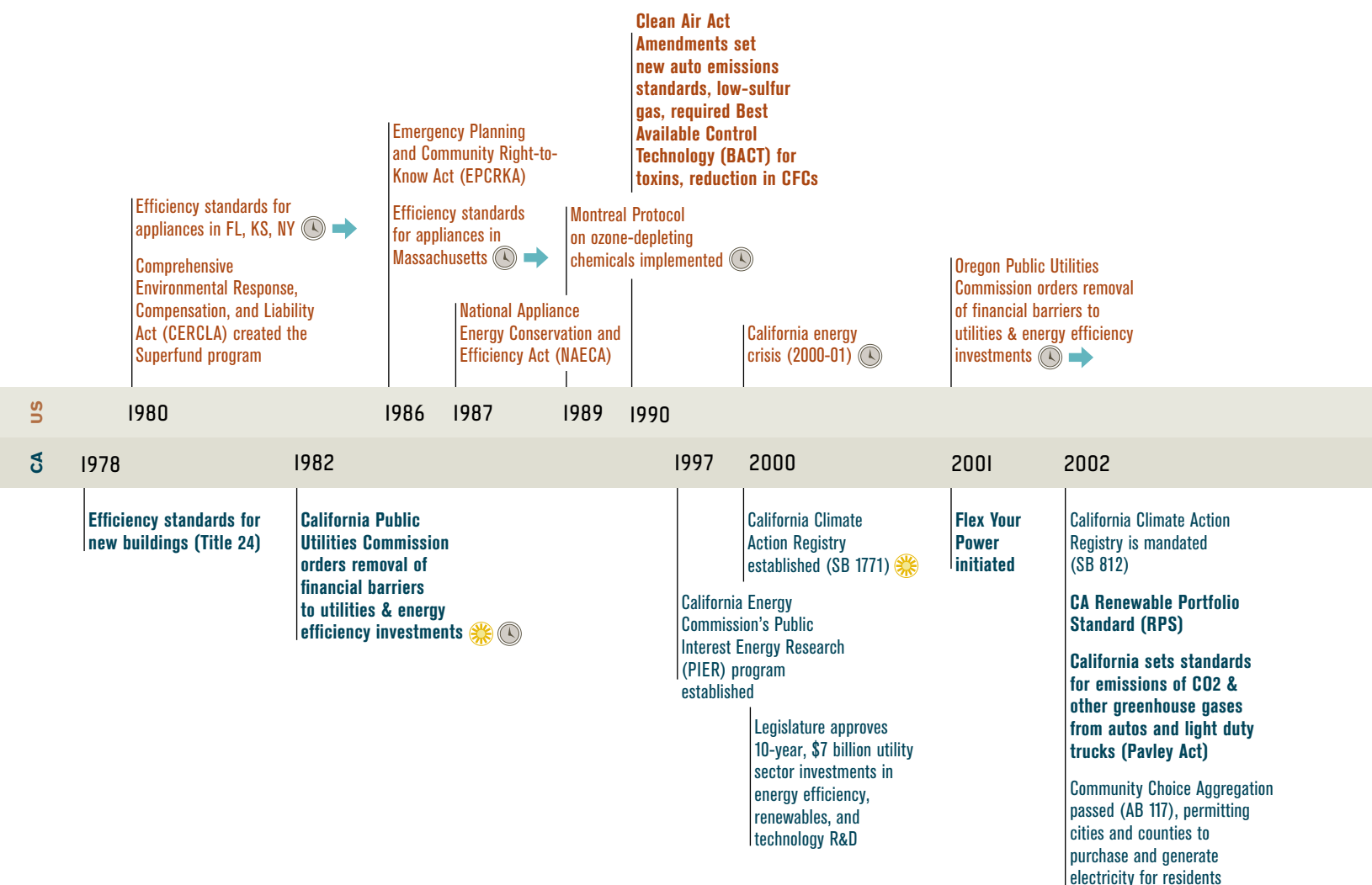
Innovative environmental policy has been a cornerstone of California's history since the establishment of the Los Angeles Air Pollution Control District in 1947, the first in the nation. Eight years after the formation, the nation passed the National Air Pollution Control Act.

California's pioneering legislative history has continued to develop over the decades, adapting to and addressing new challenges along the way. As a result of the 1973 OPEC Oil Embargo and the ensuing energy crisis, the state adopted energy efficiency reforms and established the California Energy Commission (CEC) in 1974 to reduce oil dependency and create renewable energy policies to resolve California's energy shortage. California has continued to be a national leader in environmental legislation with the creation of appliance and in the late 1970s, the removal of financial barriers to utilities and energy efficiency investments in the early 1980s, and in 2009 the Environmental Protection Agency (EPA) granted California's request to set its own auto tailpipe standards. Numerous states have modeled their policies after those created and tested first in California.

In recent years, California has been faced with ballooning gas prices, increasing threats related to climate change as well as the lingering effects of the economic recession. These realities have motivated citizens and policymakers to continue to look for innovative solutions that are both economically viable and environmentally sustainable.

Recent policy innovations and other milestones include the following:

- California's cap-and-trade program cleared its last regulatory hurdle** in December 2011, getting the green light from the state's Office of Administrative Law. The Air Board approved the final regulatory package in October following additional clean-up rulemaking activity throughout the year. The program is set to begin auctioning emission allowances in November 2012 before compliance obligations begin in 2013.
- California's Renewables Portfolio Standard Program (SB 2)** was officially extended in April 2011 by Governor Jerry Brown. This legislation increases the percentage of power generation from renewable sources from 20 percent to 33 percent by 2020 and follows an Executive Order issued by Governor Arnold Schwarzenegger in November 2008.



- California's net metering cap increased to five percent** to incorporate rapid growth in solar installations (AB 510). Previously, state legislation limited excess electricity generation to 2.5 percent of a utility's peak demand, but a number of the major California utilities had nearly reached this maximum. The new law doubles the amount of electricity utilities can purchase from customers who generate excess power, in return saving Californians money on their energy bill and encouraging renewable energy generation. The original net metering legislation was capped at half a percent of peak usage in 1996 and was later increased to 2.5 percent in 2006.
- California's Global Warming Solutions Act (AB 32)** goes through legislative review process. The San Francisco County Superior Court ruled in May 2011 that CARB had not adequately assessed alternatives to the mix of measures outlined in the 2008 Scoping Plan as required under CEQA (California Environmental Quality Act). CARB released a revised alternative analysis in June 2011 responding to the ruling, which the Air Board approved in late August 2011 and the court certified in December 2011.
- California announced it will link its nascent carbon market** with Quebec's recently-adopted cap-and-trade program as early as August 2012. Quebec is one of four Canadian provinces participating in efforts to expand regional efforts to reduce GHG emissions under the rubric of the Western Climate Initiative (WCI). CARB will assess the prospects for adding a trading partner through a formal rulemaking planned for Spring/Summer of 2012.

Governor's West Coast Global Warming Initiative (CA, OR, WA) 🕒 ➡	Idaho Public Utilities Commission orders removal of financial barriers to utilities & energy efficiency investments 🕒 ➡	Film Release: Who killed the electric car?, An Inconvenient Truth 🕒	Utah, Manitoba & British Columbia join Governor's West Coast Global Warming Initiative 🕒 ➡	Maryland Public Utilities Commission orders removal of financial barriers to utilities & energy efficiency investments 🕒 ➡	Commonwealth of Massachusetts v. Environmental Protection Agency 🕒
--	---	---	--	--	--

2003

2004	2005	2006	2007	2008
<p>Governor's Green Building Initiative executive order (S-20-04)</p> <p>California implements energy efficiency standards for commercial refrigerators and freezers 🌞</p>	<p>Governor Schwarzenegger executive order sets greenhouse gas emission reduction targets (S-3-05)</p>	<p>California Global Warming Solutions Act of 2006 (AB 32) 🌞</p> <p>California greenhouse gas performance standards for power plants (SB 1368)</p> <p>CA Solar Initiative</p>	<p>Western Regional Climate Action Initiative</p> <p>California Public Utilities Commission approves incentives for investor owned utilities in meeting energy savings goal</p> <p>California Renewable Energy Transmission Initiative is formed</p> <p>Solar Water Heating and Efficiency Act of 2007 is established with a goal of installing 200,000 solar water heaters by 2017 (AB 1470)</p> <p>California requires electric utilities to record energy consumption data for all nonresidential buildings to which they provide service, building owners will be required to share the data with prospective buyers and leasers (AB 1103)</p> <p>California Energy Commission adopts energy efficiency standards for general purpose lighting</p> <p>California Independent System Operator approves the Location Constrained Resource Interconnection, a new financing tool that improves grid access for new clean energy projects</p>	<p>California Public Utilities Commission approves feed-in tariff to incentivize the development of small-scale solar installations (AB 1969)</p> <p>California Energy Commission revises Title 24 to add new energy efficiency measures</p> <p>California Air Resources Board releases AB 32 Draft Scoping Plan</p> <p>California adopts solar loan law (AB 811)</p> <p>California adopts green building codes 🌞</p>

- **Energy Upgrade California** was launched in March 2011 by a collaboration of the CEC, the California Public Utilities Commission (CPUC), utilities, local governments, non-governmental organizations and the private sector to promote and finance energy efficiency and renewable energy projects in the state. With \$1.2 billion in leveraged funds, the program offers numerous consumer resources including utility incentives, local rebates, residential and commercial financing options, and scholarships and training programs for contractors. A versatile web portal was crafted to link energy efficiency upgrades, rebates and incentive programs offered throughout the state.
- **The California Public Utilities Commission approves Renewable Auction Mechanism program in December 2010**, requiring the state's three largest investor-owned utilities (IOUs) to collectively procure 1,000-megawatts of

power from solar projects and renewable energy projects. Each IOU must purchase power from renewable distributed generation projects (capacity below 20-megawatts) through semi-annual reverse auctions. This two year program will expand the state's renewable energy market by promoting competition, lowering costs for ratepayers, and will help IOUs meet the increased RPS standards. The first auction took place in November 2011 and the second is scheduled for May 2012.

- **With the passage of the green tech sales tax exemption (SB 71)**, all clean technology manufacturing equipment in California is exempt from sales tax. As part of Governor Schwarzenegger's California Jobs Initiative, this law was passed to help expand the state's clean tech industry, increase the number of green jobs and businesses in California and continue to grow the state's

U.S. Department of Labor to award \$500 million for green jobs initiatives

EPA will adopt more stringent tailpipe rules modeled after those of California's ➔

Advanced Research Projects Agency-Energy receives \$400 million to fund cross-disciplinary energy research

Cap-and-Trade bill passes U.S. Senate Environment and Public Works Committee (SB 1733)

U.S. Department of Energy to provide \$8 billion of loans for renewable energy projects

United Nations Climate Change Conference in Copenhagen, Denmark ⌚

Clean technology tax incentives included in American Recovery and Reinvestment Act. U.S. now on pace to double renewable manufacturing capacity by 2012

U.S. Department of Energy implements guaranteed loan solicitation for renewable energy manufacturing projects

U.S. Department of Energy announces \$30 million for energy-efficient housing partnerships

U.S. Department of Labor announces \$190 million in State Energy Sector Partnership and Training Grants for green jobs

EPA finalizes RFS (Renewable Fuel Standard) regulations, requiring the U.S. to produce a total of 36 billion gallons of biofuels by 2022

EPA and U.S. Department of Trade require automakers to meet a 35.5 miles per gallon standard by 2016

EPA issues final rule to reduce emissions on large industrial projects

2008

Land use strategy requirements mandated to reduce GHG emissions (SB 375)

Green Collar Jobs Council established (AB 3018)

California Public Utilities Commission adopts the California Long-Term Energy Efficiency Strategic Plan for 2009 to 2020

California Air Resources Board adopts plan to reduce greenhouse gas emissions levels to 1990 level by 2020

2009

California Air Resources Board adopts regulation to reduce carbon intensity of transportation fuel 10 percent by 2020

California granted waiver from EPA for more stringent vehicle emission standards

The California Public Utilities Commission (CPUC) initiates an Alternative-fueled vehicle rulemaking, in response to Senate Bill 626, to make sure the electric utilities the CPUC regulates are prepared for the projected statewide market adoption of electric vehicles (PEVs)

California increases feed-in tariff caps (SB 32)

California adopted efficiency standards for 23 categories of appliances including clothes washers and audio visual products

California utilities must reimburse customers for excess power generated from solar and wind power systems (AB 920)

California Energy Commission to establish regulation to increase building energy efficiency and lower operation costs (AB 758)

California Air Resources Board announces compliance rate of 97 percent in reporting of greenhouse as emissions by State's 600 largest facilities

California Air Resources Board accredits third party professionals to verify greenhouse gas emissions ☀️

The California Energy Commission set the world's most rigorous efficiency standards for televisions, cutting electricity needs for new flat-panel sets by about 50%

2010

California Air Resources Board finalizes regulation of Palvey Bill for greenhouse gas emissions for passenger vehicles ☀️

California launches California Green Corps using \$10 million in stimulus funds, providing green sector jobs for at-risk young adults

Clean technology manufacturing equipment is exempt from sales tax (SB 71)

Green Innovation Challenge Grant program to invest \$20 million training workers for jobs in cleantech industries

green economy. The California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA), the agency in charge of approving the sales tax exemption, recently put application approval on hold after Solyndra, a Fremont based solar panel manufacturer that had received sales tax exemptions, went bankrupt in September 2011. CAEATFA recently modified the SB 71 application and regulation processes in March 2012. These policies will expire in September 2012 unless extended. Applications are again being approved and the new policies clarify the length of time applicants are required to maintain their equipment (Qualified Property) in California. In addition, the regulations require applicants to provide information on financial assistance they receive from local governments, as well as define the time period CAEATFA has to re-convey the Qualified Property.

- **California must produce 20,000 new megawatts of renewable energy by 2020** to meet Governor Brown's goal proposed in his Clean Energy Jobs Plan. The plan calls for 12,000 megawatts to be generated from localized energy sources, which will not require new transmission line construction, a timely and environmentally impactful process. This localized energy goal extends Governor Schwarzenegger's 5,000 megawatt target by 2020 outlined in September 2010. Brown's eight point plan also includes building 8,000 megawatts of new large scale renewables, efficiency standards for new and existing buildings, stronger appliance efficiency standards and appointing a renewable energy jobs czar. This plan will increase renewable energy investment and help create more than half a million green jobs in the state.

GHG reduction targets set for SB 375 land-use strategies for 18 regions. Targets for 2020 and 2035 integrate land use, housing and transportation planning

Energy Department launches \$2 billion program to put 400,000 electric cars on the road in three years

U.S. House of Representatives pass bill providing over \$6 billion in rebates to homeowners who perform energy efficiency retrofits (HR 5019)

U.S. government approval of solar energy projects on 24 federal land sites may streamline the application and development process of renewable projects on public lands

Department of Transportation and EPA propose the first national GHG and fuel efficiency standards for trucks and buses

U.S. Department of Labor allocates \$40 million for Green Jobs Innovation Fund Grant competition to support green job training programs

Department of Transportation, EPA and California Air Resources Board announce single timeframe to establish GHG standards for cars model year 2017-2025

Obama seeks to increase U.S. electricity from clean energy sources to 80% by 2035

U.S. Commerce Department in partnership with U.S. departments of Agriculture and Energy, the EPA and the National Science Foundation commence \$12 million i6 Green Challenge to promote clean energy innovation and economic growth

U.S. Department of Energy launches SunShot Initiative to refocus \$200 million annual solar research budget to drive down the cost of PV solar systems 75% by 2020

U.S. Department of Energy announces \$170 million in available funding to advance solar energy technologies in expansion of the SunShot Initiative

2011

California raises cap on net metering from 2.5 % to 5% (AB 510)

California Energy Commission approves construction of Beacon Solar Energy Project, the first solar thermal power project permitted in 20 years

California Energy Storage Bill AB 2514 signed into law, requiring power providers to adopt energy storage technologies

California Air Resources Board passes cap-and-trade program to cut pollution 15% by 2020

California Energy Commission awards nearly \$9.6 million for eight grants to reduce petroleum use and advance biofuels and electric vehicle manufacturing

California Public Utilities Commission implements Renewable Auction Mechanism program, requiring the state's largest investor-owned utilities to purchase 1,000 MW of power from renewable projects

California implements federal law requiring improved light bulb efficiency a year before the rest of the nation

Air Resources Board and California Energy Commission propose to reduce petroleum fuel consumption to 15% below 2003 levels by 2020 and to increase alternative fuels to 26% by 2022 (AB 638)

California Energy Commission and the Public Utilities Commission launch Energy Upgrade California

California Legislation increases California's current renewables portfolio standard to require all retail sellers of electricity and all publicly owned utilities to procure at least 33% of electricity delivered to their retail customers from renewable resources by 2020, the most ambitious standard in the country

California legislation permitting electricity customers, including renters, to own solar generation in a shared facility (SB 383) passes Senate Energy Committee

California Legislation passes the Renewable Energy Equity Act (SB 489), which expands the Net Energy Metering Program to all eligible forms of renewable energy allowing small-scale renewable energy producers to participate

Zero-emission vehicle rebate demand exceeds allotted funding under the Clean Vehicle Rebate Project

Governor Brown announces Clean Energy Jobs Plan

- **U.S. Department of Energy (DOE) launched the SunShot Initiative in February 2011** to refocus their \$200 million annual solar research budget to drive down the cost of PV solar systems 75 percent by 2020. Two months later, the DOE expanded the initiative with an additional \$170 million in funding to advance solar energy technologies and \$110 million awarded to three SunShot Advanced Manufacturing Partners, two of which are based in Northern California, the Bay Area PV Consortium (Stanford University) and SVTC Technologies (San Jose).

- **California legislation aims to reduce more than 15 million tons of pollution and waste annually (AB 341)** by establishing a new statewide goal of 75 percent source reduction, recycling and composting by 2020, the highest in the nation. This bill is similar to AB 939 (1989) enacted to divert 50 percent of solid waste from landfills. Currently California leads the nation in diverting 54 percent of all its waste.

U.S. Department of Energy awards over \$110 million to three SunShot Advanced Manufacturing Partners, two of which are based in Northern California

Private-public partnership formed between U.S. Department of Energy and the Appraisal Foundation to improve building efficiency nationwide

Department of Energy announced a \$60 million investment, through it's SunShot initiative, over three years for applied scientific research to advance cutting-edge Concentrating Solar Power technologies

Obama administration and 13 major automakers agree to raise fuel economy standards up from 27 to an average of 54.5 miles per gallon by 2025

Five million smart meters installed nationwide as part of Recovery Act-funded efforts to accelerate grid modernization

Energy Department announces over \$12 million to spur solar energy from the lab to the marketplace through their SunShot Incubator Program

The Western Climate Initiative Inc (WCI Inc.), a non-profit corporation with officials from the provinces of Quebec and British Columbia and the State of California, is formed to provide administrative and technical services to support the implementation of greenhouse gas emissions trading programs

Governor Brown focuses on solar power at UCLA conference to meet the state's 12,000 megawatts distributed renewable energy and 8,000 Megawatt's of large scale renewable & necessary transmission lines goals by 2020

California Air Resources Board approves revised Scoping Plan document (AB 32) in response to court ruling

California legislation extends the Self-Generation Incentive Program (AB 1150), which helps customers switch to clean energy and provides a bridge for clean energy technologies to scale up and drive down costs

The United States Department of Energy finalizes a \$1.2 billion loan to support the California Valley Solar Ranch Project, in addition to it's \$1.46 billion loan for the Desert Sunlight Project in Riverside County, California and it's \$646 million loan for the Antelope Valley Solar Ranch in North Los Angeles County

California Legislation aims to reduce pollution and waste by more than 15 million tons annually; establishing a new statewide goal of 75% source reduction, recycling and composting by 2020 (AB 341), the highest in the nation

California Energy Legislation calls for the Energy Commission to enforce energy efficiency standards for appliances and requires energy efficiency rebate recipients to certify that licensed contractors were used and permits were obtained (SB 454)

One in every four solar energy jobs in America is held by a Californian. National Solar Jobs Census 2011 shows California had an estimated 25,575 solar-related jobs out of 100,237 for all 50 states

California Air Resources Board approves \$15 million funding for Clean Vehicle Rebate Project, a three-fold increase from the 2010 to 2011 budget which exceeded its funding

California Air Resources Board approves \$15 million in its 2011-2012 budget for the Clean Vehicle Rebate Project, a three-fold increase from the 2010-2011 budget which exceeded its funding

- **The California Energy Commission approved nearly \$5 million to help bring natural gas-powered shuttle buses and large trucks to California's highways** in November 2011. These awards, funded from the Commission's Alternative and Renewable Fuel & Vehicle Technology Program, make cleaner fuels a viable alternative to conventional or diesel gasoline.
- **California's Air Resources Board reviewed and voted to maintain the stringency of California's Low Carbon Fuel Standard (LCFS) in December 2011**, part of California's strategy to reduce pollution under the state's global warming law (AB 32). LCFS is expected to produce roughly 15 percent of the reductions needed to return to 1990 levels of greenhouse gas emissions by 2020. The program is designed to incentivize all producers of motor fuels, including gasoline and corn ethanol, to reduce the

carbon intensity of motor fuels sold in California by 10 percent. LCFS is a performance-based standard that works by assigning a carbon intensity score to all transportation fuels and defining a trading system for credits. California's LCFS recently was put on hold after a federal district court judge ruled the program unconstitutionally interfered with interstate commerce. CARB has appealed the ruling and sought a stay of the district court's injunction in the Ninth Circuit Court of Appeals.

- **The California Air Resources Board adopted the Advanced Clean Car Rules in January 2012**, which establishes the next round of Zero Emission Vehicle (ZEV) requirements, criteria pollutant and GHG tailpipe emission standards. Under the new ZEV requirements, one-in-seven of new cars sold in 2025 will be an electric or other zero-emission vehicle. The plan also mandated a 75 percent

The California Energy Commission approves nearly \$5 million to pay the difference between a conventional vehicle and one powered by alternative fuels for California's highways

California's Air Resources Board reviewed and voted to maintain the stringency of California's low carbon fuel standard, part of California's strategy to reduce pollution under the AB32

California Air Resources Board passes the Advanced Clean Car Rules to be attained by 2025, including a mandate to have 1.4 million electric and hybrid vehicles on state roads, in addition to a 75 percent reduction in smog-forming pollutants and a 34 percent reduction in green house gas emissions

California Wind Energy Association releases data showing that California now gets about five percent of it's energy from wind, a milestone for California towards it's goal of having 33 percent power from renewable sources by 2020

reduction in smog-forming pollutants by 2025, compared to 2014 levels. As part of the National Agreement between the U.S. Environmental Protection Agency, Department of Transportation's National Highway Traffic Safety Administration, the State of California and 13 automakers, the California Air Resources Board also set GHG tailpipe emission standards resulting in a 34 percent reduction in greenhouse gas emissions by 2025. The Advanced Clean Cars Rules also combines the control of smog-causing pollutants and greenhouse gas emissions into a single coordinated package of requirements for model years 2017 through 2025.

- **The California Energy Commission adopted the world's first energy efficiency standards for battery chargers** in January 2012.

EVALUATING MULTIPLE ASPECTS OF CALIFORNIA'S GREEN INNOVATION DEMONSTRATES HOW THE STATE IS MAINTAINING ITS PACESETTER POSITION AND REVEALS EMERGING AREAS OF GREEN INNOVATION. THE DASHBOARD INDICATORS THAT FOLLOW MEASURE GROWTH IN ENVIRONMENTAL QUALITY, RESOURCE EFFICIENCY, AND TECHNOLOGICAL ADVANCEMENT.



DASHBOARD INDICATORS

DECLINES IN TOTAL EMISSIONS AND PER CAPITA EMISSIONS IN THE STATE VALIDATE CALIFORNIA'S CONTINUED EFFORTS TO REDUCE RELIANCE ON CARBON INTENSIVE ACTIVITIES. AS A RESULT OF ENERGY EFFICIENCY POLICIES ENACTED SINCE THE 1970S, ENERGY PRODUCTIVITY CONTINUES TO RISE, WHICH MEANS THAT BUSINESSES AND HOUSEHOLDS GET MORE FOR THEIR ENERGY DOLLARS AND THEREFORE HAVE MORE DOLLARS TO SPEND IN THE ECONOMY. VENTURE CAPITAL INVESTMENT HAS REMAINED STRONG IN CLEAN TECHNOLOGY DESPITE OVERALL SLOWING IN INVESTMENT AS A RESULT OF THE GLOBAL FINANCIAL CRISIS. NEW VALUE CONTINUES TO BE CREATED THROUGH THE ADOPTION OF NOVEL TECHNOLOGIES AND IMPLEMENTATION OF FORWARD-THINKING PUBLIC POLICY. THE DASHBOARD INDICATORS TRACK THE STATE'S PROGRESS IN GREEN TECHNOLOGY INNOVATION, THE CARBON ECONOMY, ENERGY EFFICIENCY, RENEWABLE ENERGY AND TRANSPORTATION. FOLLOWING THE DASHBOARD INDICATORS IS A FEATURE ON CALIFORNIA'S SOLAR INDUSTRY.



GREEN TECHNOLOGY INNOVATION

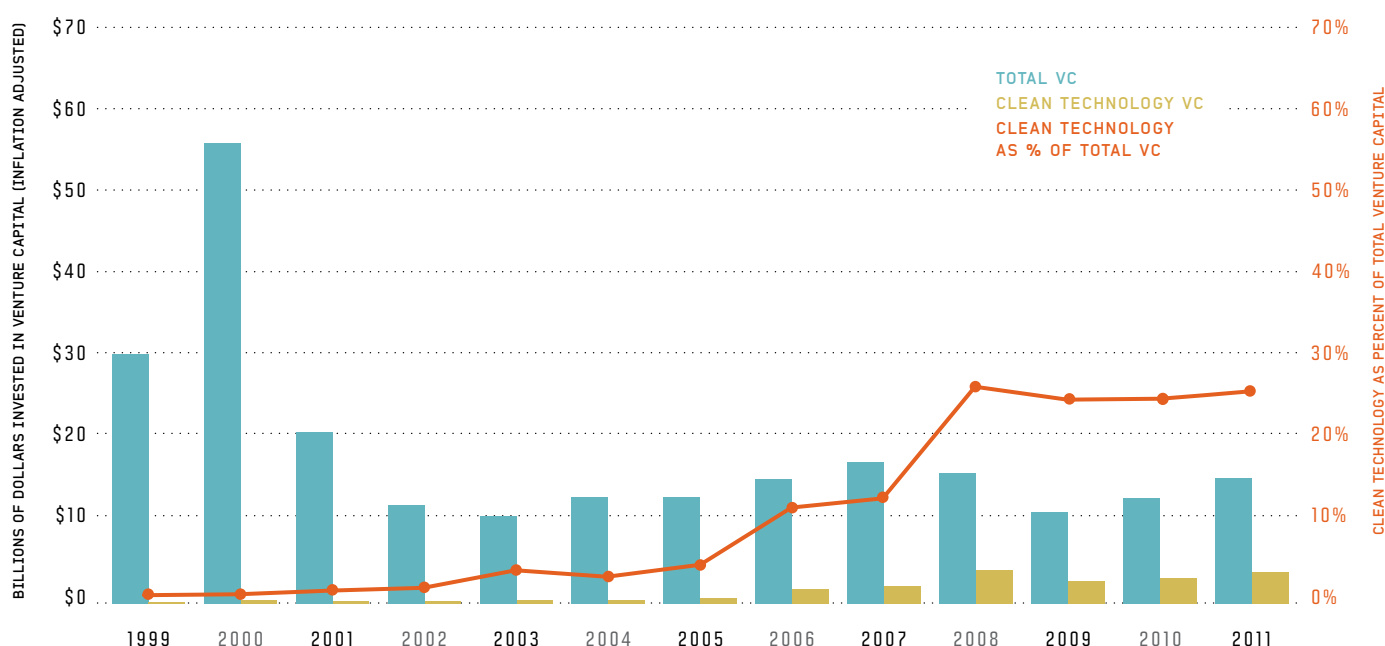
California is a global leader in the growing and diverse fields of clean technology and attracts the bulk of global venture capital (VC) investment in most technology areas.

Total venture capital investment in California increased 20 percent from 2010 to 2011, with \$14.5 billion invested in 2011. In the same time period, cleantech investment in the state increased 24 percent. In 2011, cleantech attracted \$3.5 billion dollars in venture capital investment and made up 25 percent of total VC investment in California, slightly up

from 24 percent in 2010. Cleantech as percent of total VC has leveled off in recent years mostly due to catchup growth in total VC investment.

In 2011, California made up 57 percent of total cleantech VC investment in the United States and 40 percent globally. Increasing by 26 percent to \$6.3 billion, the United States accounted for over 71 percent of all cleantech investment in 2011. Total world investment increased eleven percent in the same time period.

VENTURE CAPITAL CLEAN TECHNOLOGY VC & TOTAL VC INVESTMENT / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: PricewaterhouseCoopers/National Venture Capital Association MoneyTree™ Report, Data: Thomson Reuters; Cleantech Group, LLC Analysis: Collaborative Economics



As total cleantech VC investment increases, California's VC portfolio becomes more diversified. A thirteen-fold increase in Energy Storage investment over the previous year accounts for eleven percent of total investment dollars in 2011. Additional growth can be attributed to the larger segments of Clean Transportation and Energy Efficiency, increasing 37 and 38 percent respectively. Combined, the two sectors made up 45 percent of total cleantech VC investment dollars in 2011 and 40 percent of investment deals made. Similar to the prior year, Energy Generation attracted a total of \$1.2 billion.

After experiencing 25 percent growth from 2009 to 2010, cleantech investment deals slowed considerably; increasing

only four percent from 2010 to 2011. Clean Transportation, Energy Efficiency and Energy Generation constituted the bulk of recent cleantech investment, representing 19, 22 and 32 percent respectively of total cleantech investments.

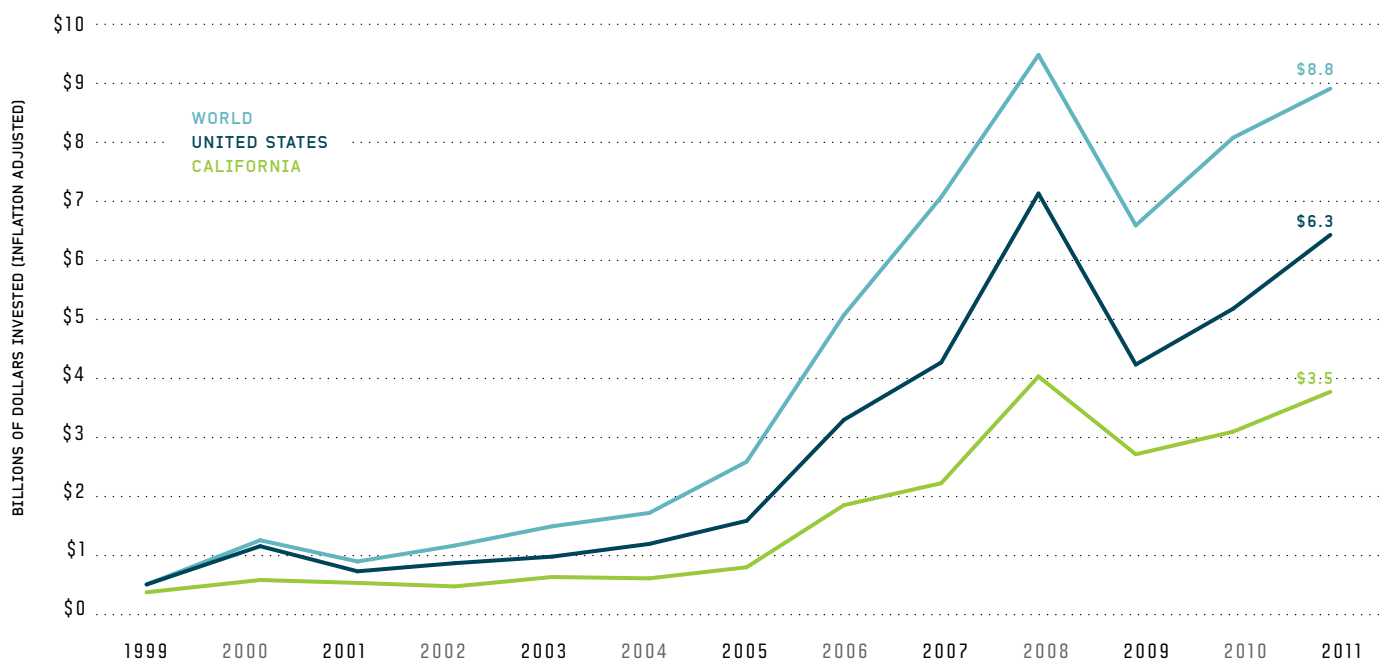
Silicon Valley attracts the strongest flows of cleantech VC funding in the state, representing 49 percent (\$1.7 billion) in 2011. The San Francisco Region without Silicon Valley follows with 22 percent of total investment. Investment in the San Diego Region nearly doubled in 2011 reaching a total of \$264 million and representing seven percent of total cleantech VC investment in the state.

TOP CLEANTECH VC SEGMENTS BY NUMBER OF DEALS

SEGMENTS	2010	2011	% OF TOTAL 2011
ENERGY GENERATION	48	49	32%
ENERGY EFFICIENCY	37	33	22%
CLEAN TRANSPORTATION	27	28	19%
			% Δ 10-11
TOTAL DEALS	145	151	4%

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Cleantech Group,™ LLC. Analysis: Collaborative Economics

VENTURE CAPITAL INVESTMENT IN CLEAN TECHNOLOGY CALIFORNIA, THE UNITED STATES & GLOBAL

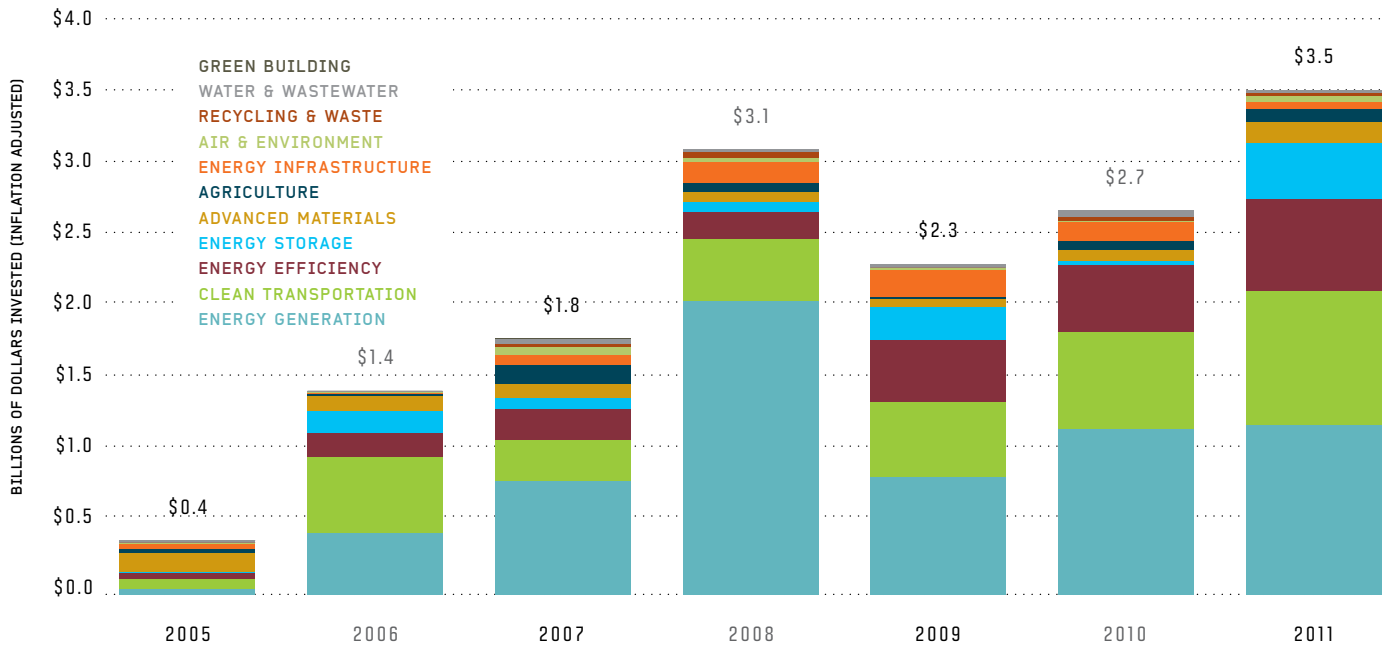


NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Cleantech Group,™ LLC. Analysis: Collaborative Economics



VENTURE CAPITAL INVESTMENT IN CLEAN TECHNOLOGY BY SEGMENT

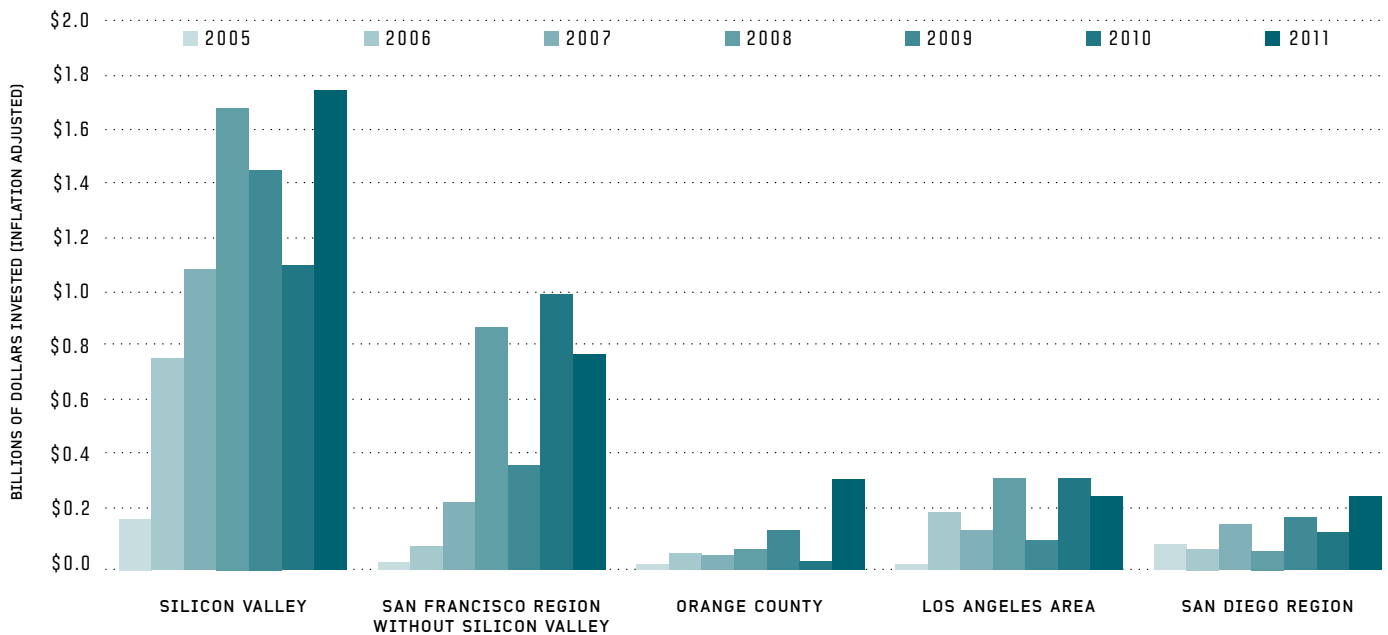
BILLIONS OF DOLLARS INVESTED / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Cleantech Group, LLC. Analysis: Collaborative Economics

VENTURE CAPITAL INVESTMENT IN CLEAN TECHNOLOGY BY REGION

BILLIONS OF DOLLARS INVESTED
SILICON VALLEY, SAN FRANCISCO WITHOUT SILICON VALLEY, LOS ANGELES AREA, ORANGE COUNTY, SAN DIEGO REGION & REST OF CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Cleantech Group, LLC. Analysis: Collaborative Economics



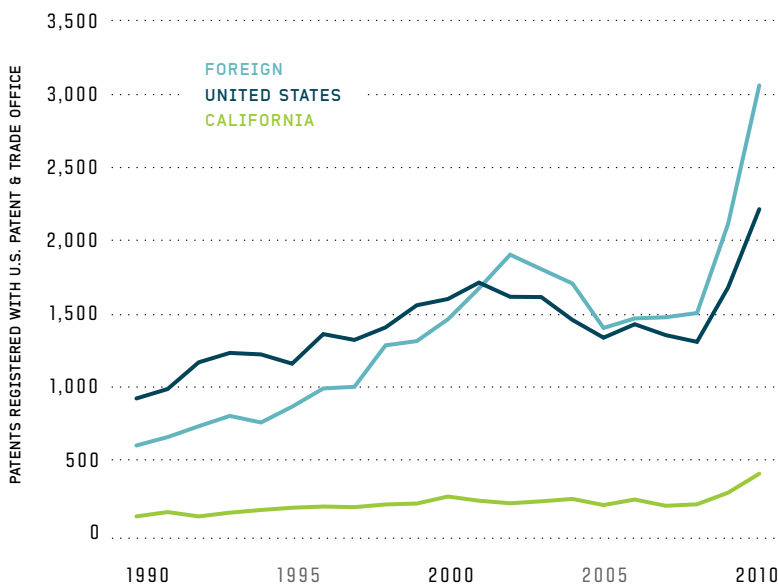
California accounts for 25 percent of total patents in green technology registered with the U.S. Commerce Department's Patent and Trademark Office (USPTO). With 910 green technology patents registered between 2008 and 2010, California ranks first in the United States. Total USPTO patent registrations from foreign and domestic inventors related to green technologies increased robustly in 2010. Patent filings rose 32 percent from U.S. inventors and increased 44 percent for foreign inventors from 2009 to 2010.

During the period 2008-10, California accounted for 41 percent of total Solar Energy patents (182 patents), up from 22 percent in the period 1990-92 (61 patents). In the most recent period, California accounted for 21 percent of all Battery Technology patents (258 patents), 14 percent of all Water patents (214 patents), and 12 percent of all Energy Infrastructure patent filings (34 patents).

California patent filings across all green technologies rose 41 percent during from the period 2005-07 to 2008-10 and expanded by 120 percent over the last twenty years. Accounting for 25 percent of total U.S. green patent activity in 2010, California leads the nation in patents registered in Battery Technology, Water, Solar and Energy Infrastructure. From the period 2005-07 to 2008-10, technology areas revealing the strongest growth in patents include Solar Energy (+117%), Hybrid Systems (+56%) and Batteries (+55%).

GREEN TECHNOLOGY PATENT REGISTRATIONS BY PRIMARY INVENTORS

CALIFORNIA, U.S. & FOREIGN INVENTOR PATENT REGISTRATIONS



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

TOTAL GREEN TECHNOLOGY PATENTS

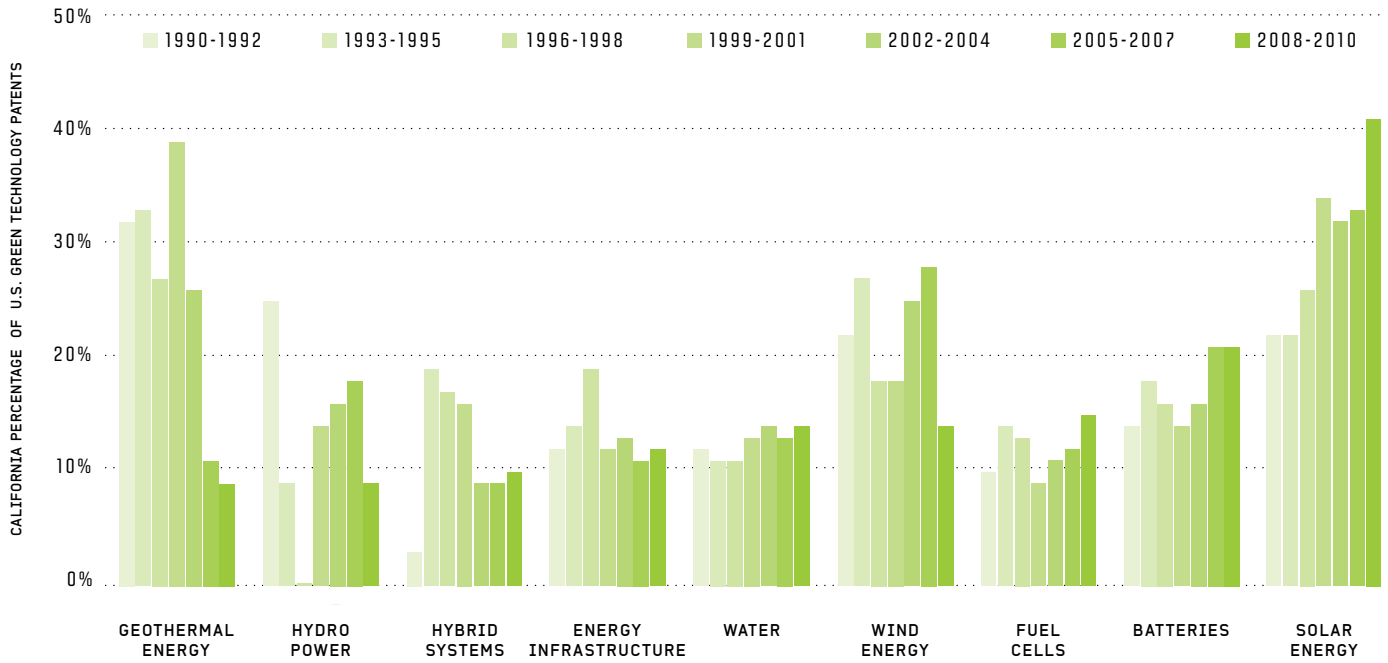
TOP RANKING STATES IN PATENTS REGISTERED

	NUMBER OF PATENTS	RANKING	
		2008-2010	1990-1992
CALIFORNIA	910	1	1
NEW YORK	475	2	6
MICHIGAN	469	3	10
TEXAS	293	4	3
OHIO	208	5	7
MASSACHUSETTS	199	6	9
FLORIDA	192	7	8
ILLINOIS	191	8	2
PENNSYLVANIA	186	9	4
MINNESOTA	184	10	13

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

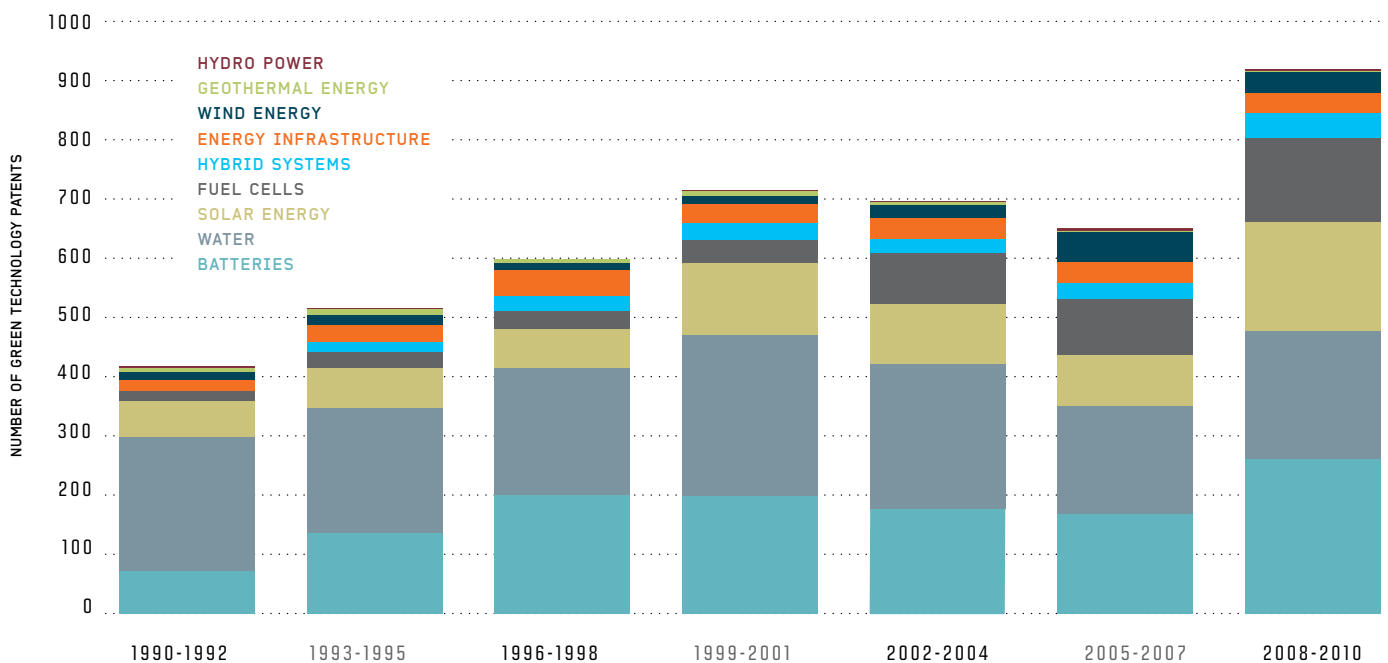


GREEN TECHNOLOGY PATENTS CALIFORNIA PERCENTAGE OF U.S. GREEN TECHNOLOGY PATENTS



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

GREEN TECHNOLOGY PATENTS BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

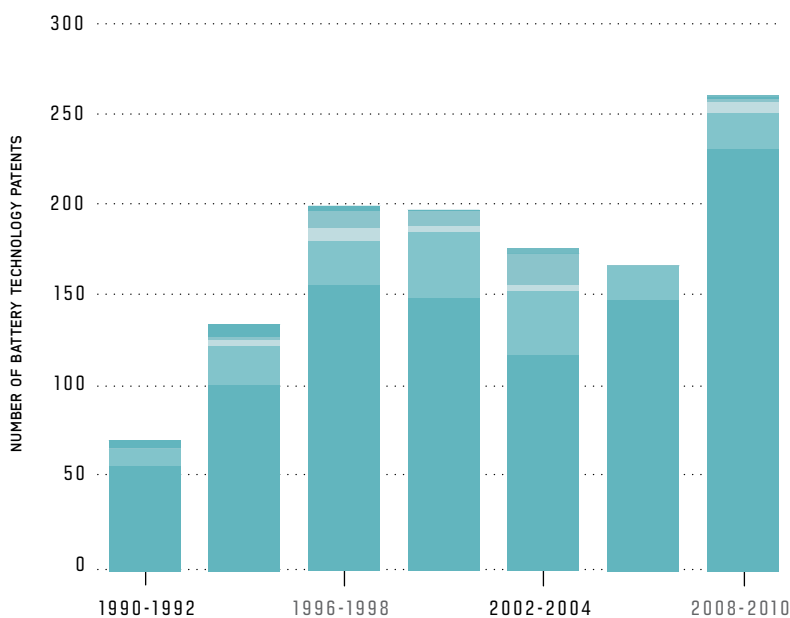


California has been a consistent leader in battery technology patent registrations. Reaching 258 total patents in the 2008-10 period, filings increased by 55 percent from the prior period. Lithium Battery represents the second largest category of battery patents. The largest category represents a mix of technologies.

Water technology patents registered in California peaked in the period 1999-2001 with 270 patents. Over the three year period 2008-10, 214 water technology patents were registered, increasing 18 percent over the previous period.

The number of new solar energy technology patents nearly tripled over the two decades, 1990-92 to 2008-10. A total of 182 new patents were registered in the 2008-10 period. Seventy-one percent of these patents are related to photovoltaic technology.

BATTERY TECHNOLOGY PATENTS BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

- NICKEL METAL HYDRIDE BATTERY
- NICKEL CADMIUM BATTERY
- LEAD ACID BATTERY
- EV/HYBRID BATTERY
- LITHIUM BATTERY
- MIXED BATTERY/STORAGE

BATTERY TECHNOLOGY

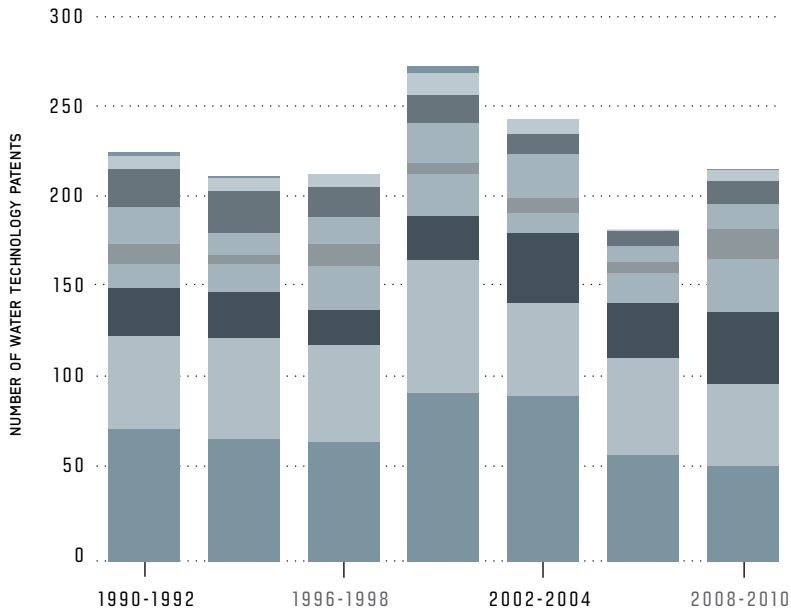
TOP RANKING STATES IN PATENTS REGISTERED

	NUMBER OF PATENTS	RANKING	
	2008-2010	2008-2010	1990-1992
CALIFORNIA	258	1	1
TEXAS	87	2	12
NEW YORK	75	3	11
MICHIGAN	73	4	10
OHIO	72	5	2
ILLINOIS	62	6	6
WISCONSIN	60	7	3
MINNESOTA	59	8	9
MASSACHUSETTS	56	9	8
MARYLAND	47	10	13

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics



WATER TECHNOLOGY PATENTS BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

- OTHER WATER FILTRATION/TREATMENT / ELECTROCHEMICAL
- OTHER WATER FILTRATION/TREATMENT / BIOLOGICAL
- WATER CONSERVATION
- OTHER WATER FILTRATION/TREATMENT / CHEMICAL
- DESALINATION
- OTHER WATER FILTRATION/TREATMENT / ALL OTHER
- WASTEWATER/STORMWATER TREATMENT
- OTHER WATER FILTRATION/TREATMENT / MECHANICAL
- OTHER WATER FILTRATION/TREATMENT / WAVE ENERGY

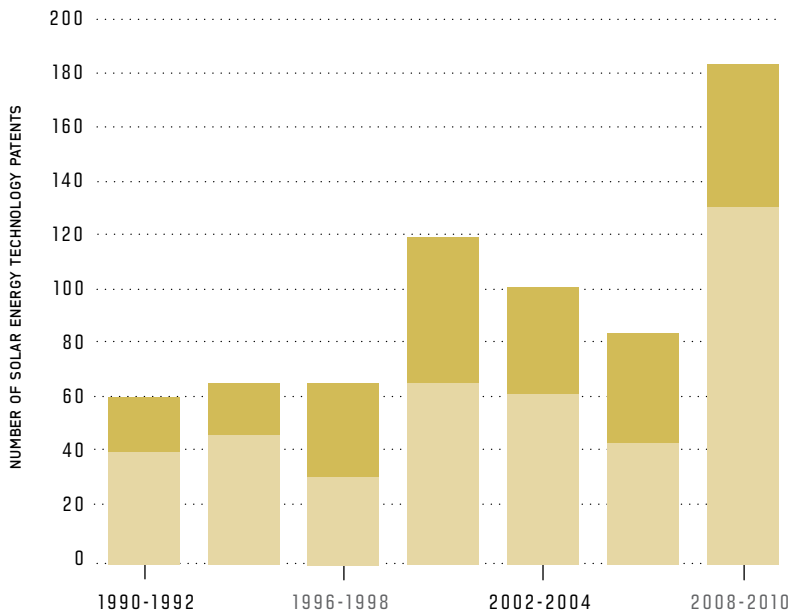
WATER TECHNOLOGY

TOP RANKING STATES IN PATENTS REGISTERED

	NUMBER OF PATENTS	RANKING	
		2008-2010	1990-1992
CALIFORNIA	214	1	1
TEXAS	114	2	2
FLORIDA	102	3	7
ILLINOIS	69	4	3
PENNSYLVANIA	65	5	4
MINNESOTA	61	6	12
MICHIGAN	58	7	9
OHIO	55	8	8
WISCONSIN	55	8	11
MASSACHUSETTS	52	10	10

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

SOLAR ENERGY TECHNOLOGY PATENTS BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

- OTHER SOLAR
- PHOTOVOLTAIC

SOLAR TECHNOLOGY

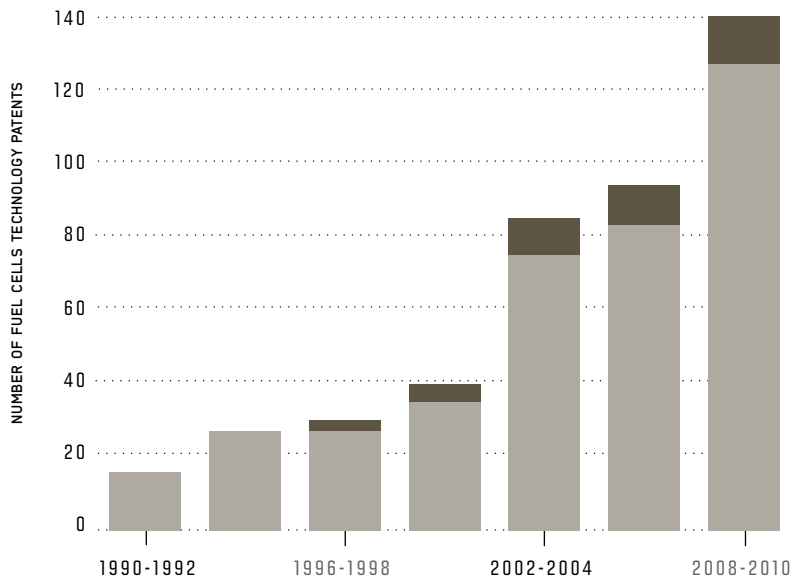
TOP RANKING STATES IN PATENTS REGISTERED

	NUMBER OF PATENTS	RANKING	
		2008-2010	1990-1992
CALIFORNIA	182	1	1
NEW YORK	31	2	4
NEW MEXICO	24	3	19
MASSACHUSETTS	23	4	2
TEXAS	20	5	6
FLORIDA	17	6	5
MICHIGAN	17	6	3
UTAH	13	8	28
NEW HAMPSHIRE	12	9	39
NEW JERSEY	12	9	7
PENNSYLVANIA	12	9	14

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics



FUEL CELLS TECHNOLOGY PATENTS BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

■ FUEL CELL VEHICLES
■ FUEL CELLS (MINUS VEHICLES)

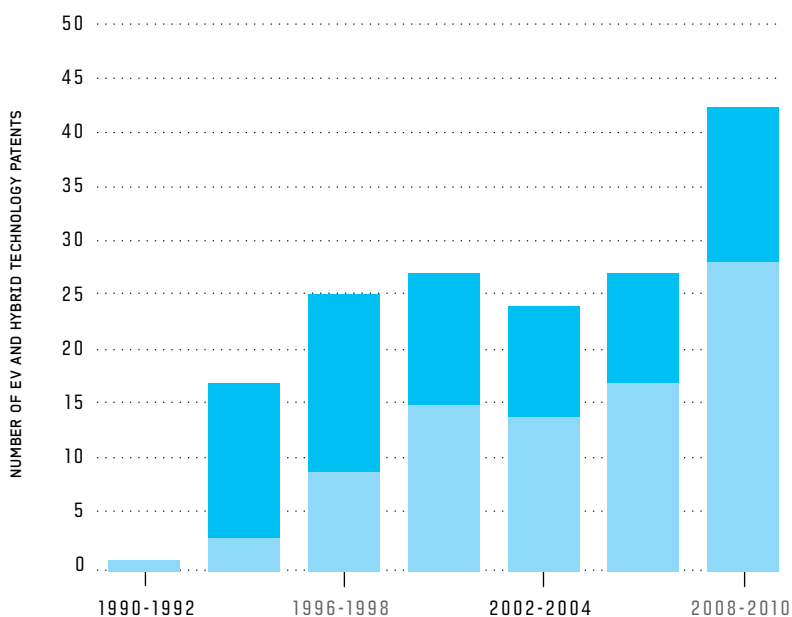
FUEL CELLS TECHNOLOGY

TOP RANKING STATES IN PATENTS REGISTERED

	NUMBER OF PATENTS	RANKING	
		2008-2010	1990-1992
NEW YORK	239	1	8
CALIFORNIA	140	2	3
CONNECTICUT	78	3	1
MICHIGAN	77	4	11
OHIO	41	5	5
MASSACHUSETTS	39	6	7
OREGON	37	7	25
MINNESOTA	35	8	25
ILLINOIS	31	9	4
PENNSYLVANIA	29	10	2

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

HYBRID & ELECTRIC SYSTEMS TECHNOLOGY PATENTS BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

■ ELECTRIC VEHICLE
■ HYBRID SYSTEMS

HYBRID SYSTEMS TECHNOLOGY

TOP RANKING STATES IN PATENTS REGISTERED

	NUMBER OF PATENTS	RANKING	
		2008-2010	1990-1992
MICHIGAN	227	1	1
CALIFORNIA	42	2	10
INDIANA	25	3	10
OHIO	16	4	10
ILLINOIS	14	5	10
NEW YORK	14	5	3
PENNSYLVANIA	11	7	10
MASSACHUSETTS	10	8	3
WISCONSIN	9	9	19
TEXAS	8	10	3

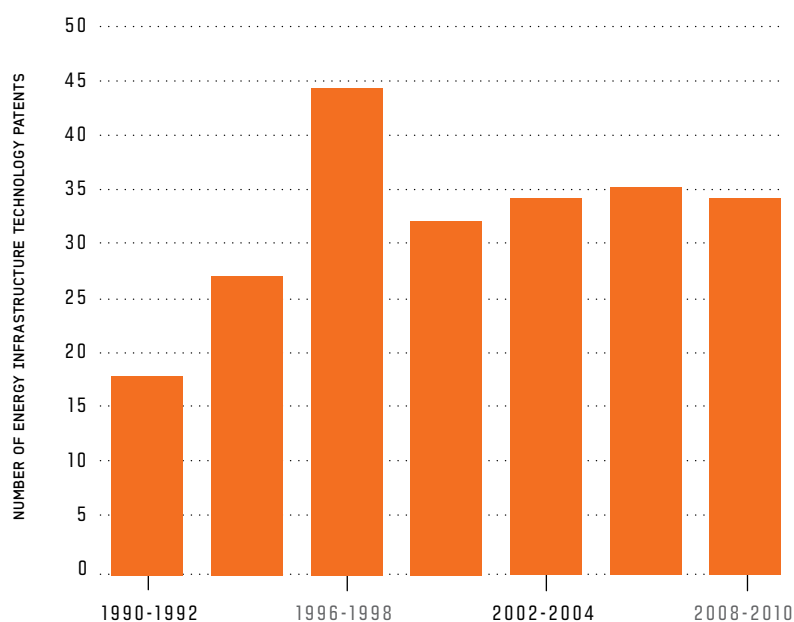
NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics



ENERGY INFRASTRUCTURE TECHNOLOGY PATENTS

BY TECHNOLOGY / CALIFORNIA

ENERGY INFRASTRUCTURE



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

ENERGY INFRASTRUCTURE TECHNOLOGY

TOP RANKING STATES IN PATENTS REGISTERED

	NUMBER OF PATENTS	RANKING	
		2008-2010	1990-1992
CALIFORNIA	34	1	1
NEW YORK	30	2	3
MARYLAND	29	3	16
TEXAS	18	4	5
MINNESOTA	16	5	22
GEORGIA	15	6	5
WISCONSIN	13	7	12
PENNSYLVANIA	11	8	7
WASHINGTON	11	8	12
FLORIDA	10	10	2

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File Analysis: Collaborative Economics

California is second to New York State in patent activity related to Fuel Cells. In the last two decades, filings increased more than eight fold surpassing second-ranked Connecticut. Patents in Fuel Cells increased 49 percent over the prior period, reaching 140 registrations.

Following Michigan, California is a distant second in U.S. patent activity related to Hybrid & Electric Vehicles technology. Patent filings related to Electric Vehicles made up a third of total patents in this category in California in the period 2008-10, and expanded by 40 percent over the previous period. Total California patents in Hybrid & Electric Vehicle technology increased by 56 percent during that same time frame.

Over the last twenty years, the number of patent registrations in energy infrastructure technology increased by 89 percent. In recent years, activity stabilized with 34 patent filings in 2008-10.

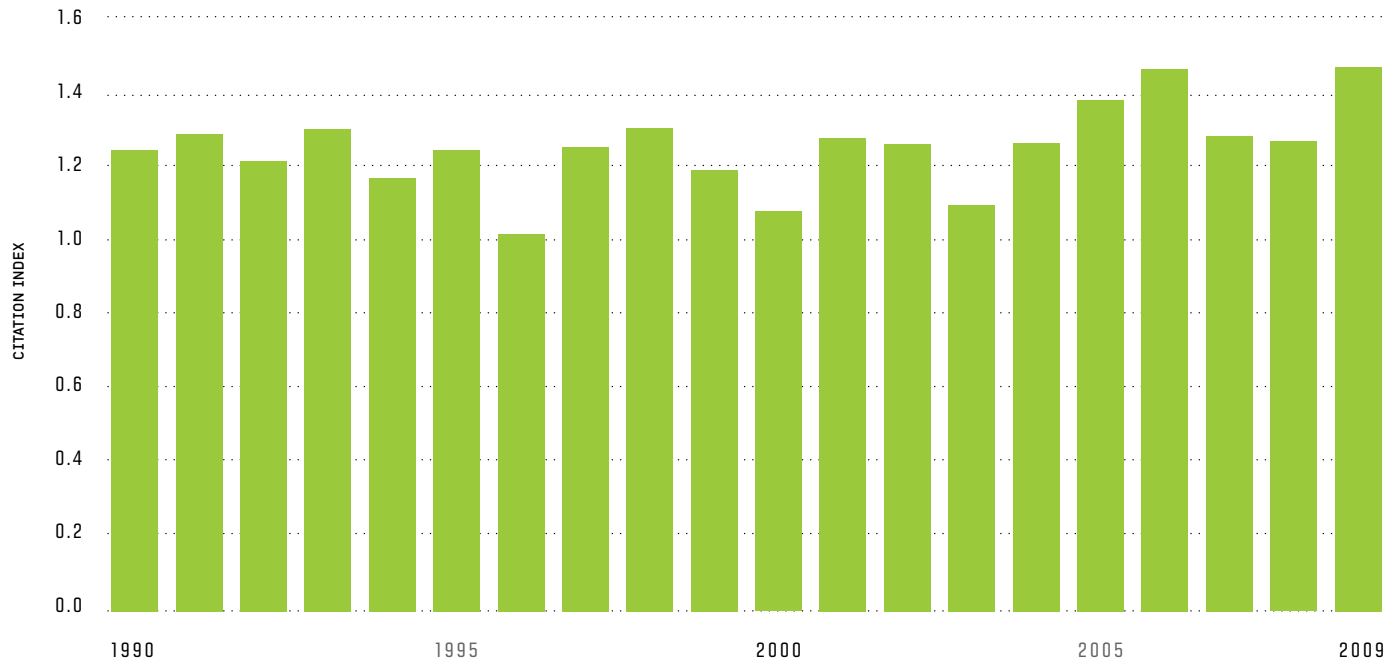
Patent citations can be used to measure both the return on R&D investment and the health of the technology commercialization process.² When a patent is cited in

a large number of other patents, this suggests that the patent reflects important ideas, which other inventors build upon. The citation index is derived by dividing the number of forward citations³ a patent has received by the average number of citations that a patent issued in the same year and in the same technology class has received.

In 2009, California was ranked thirteenth in the nation with a citation index of 1.48. Peaks in a technology's citation index reflect a period of technological impact in a region. In California, battery technology has the highest citation index when compared to the other green technologies in the state. In the years 2006 and 2009, the citation index for battery technology was particularly high, indicating a large number of patent citations in recent years. Citations for fuel cell patents peaked in 1997 with an index rating of 2.82 and remained highly cited in subsequent years. Wind technology patents have consistently been heavily cited. The wind citation index reached a high of 3.20 in 1993 and was 2.45 in 2008. Patents for water and solar technologies have been consistently cited in California from 1990 to 2009.



TOTAL GREEN TECHNOLOGY PATENT CITATIONS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

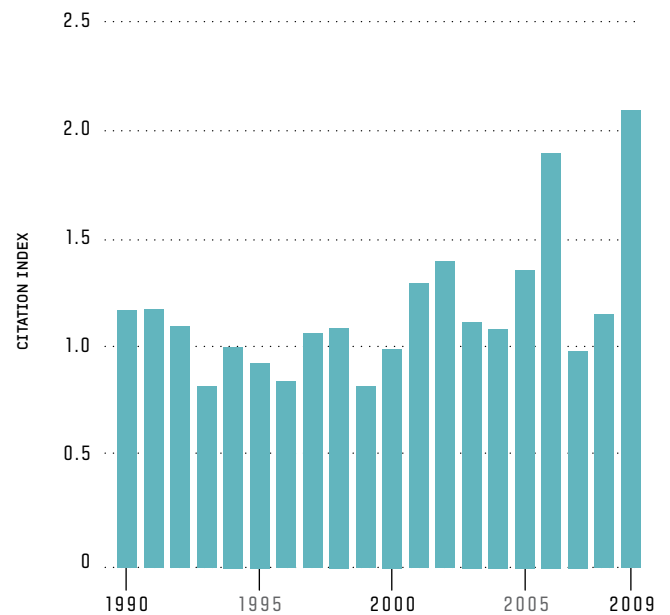
TOTAL GREEN TECHNOLOGY PATENTS CITATIONS

TOP RANKING STATES IN HIGHLY CITED PATENTS

STATE	2009	
	CITATION INDEX	RANKING
MAINE	4.88	1
NORTH DAKOTA	4.76	2
KENTUCKY	3.13	3
NEW MEXICO	2.70	4
HAWAII	2.61	5
TENNESSEE	1.96	6
COLORADO	1.90	7
MASSACHUSETTS	1.89	8
WYOMING	1.67	9
MINNESOTA	1.61	10
CALIFORNIA	1.48	13

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

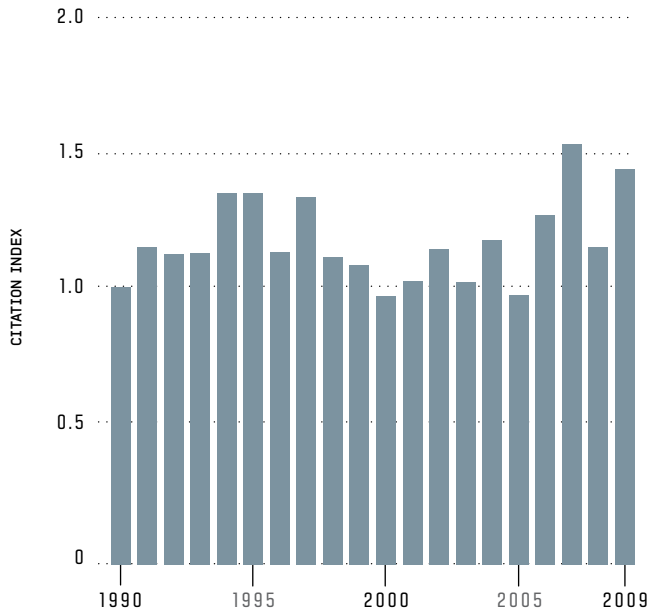
BATTERY TECHNOLOGY PATENT CITATIONS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

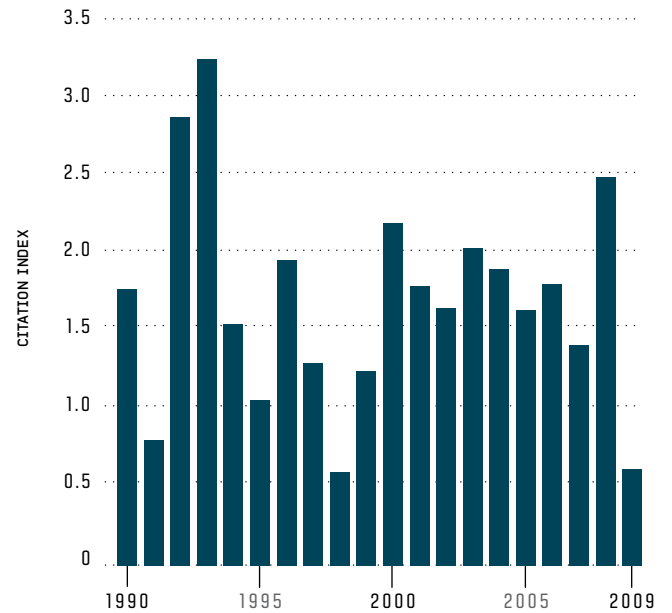


WATER TECHNOLOGY PATENT CITATIONS CALIFORNIA



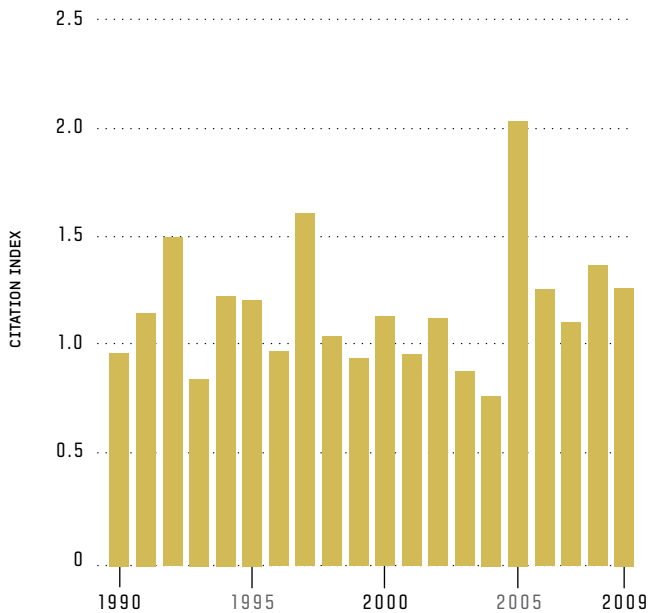
NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

WIND TECHNOLOGY PATENT CITATIONS CALIFORNIA



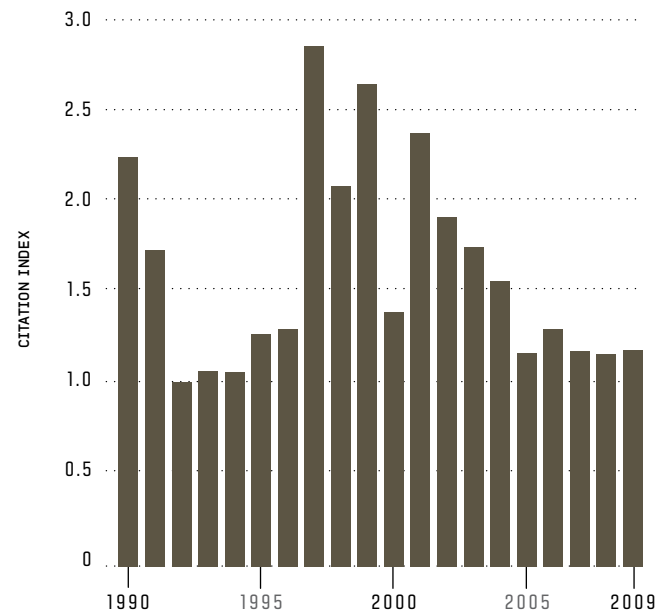
NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

SOLAR ENERGY TECHNOLOGY PATENT CITATIONS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

FUEL CELLS TECHNOLOGY PATENT CITATIONS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics



THE CARBON ECONOMY

Despite progressive carbon emissions reduction policies, California's economy is still largely dependent on carbon-based energy. Ocean shipping, air cargo, trains and the trucks that run up and down our vast interstate system are fueled by carbon based fuels and electricity generated by carbon emitting sources. In order to meet the environmental objectives laid out by the California Global Warming Solutions Act and other legislation, our economy must progress and evolve beyond its dependence on carbon.

Indicators relating to the Carbon Economy track this necessary shift. The indicators help elucidate the transforming relationship between economic performance and the generation of greenhouse gases. Other indicators help us track California's progress by comparing the state to other countries, the rest of the U.S. (i.e., excluding California) and supplementary large states. California is both a large

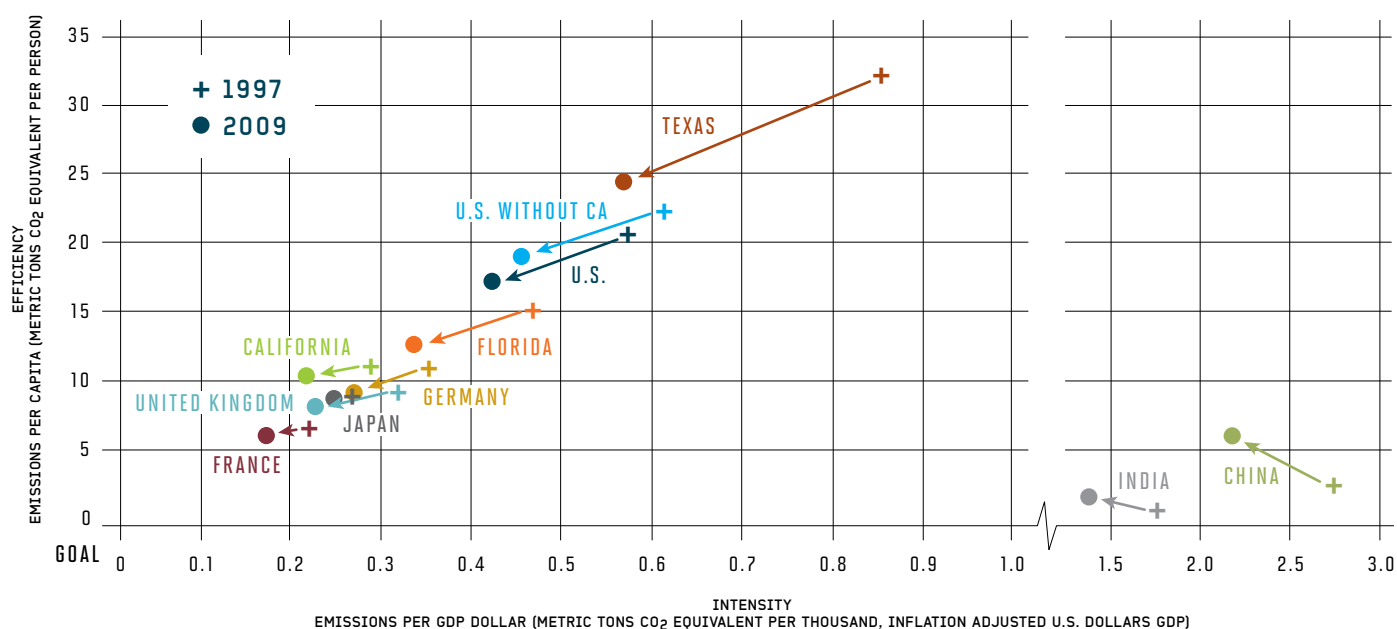
consumer of carbon-based fuels, and a leader in carbon reduction measures.

On a world scale, the carbon efficiency (emissions per capita) and the carbon intensity (emissions per dollar of GDP) of California, the U.S. and other developed economies has been improving while developing economies such as India and China remain the most carbon intensive, generating more carbon emissions for every unit of economic value produced. While significant improvement is being made on this front, carbon consumption per capita has been climbing as impoverished populations enjoy heightened standards of living.

In the global context, California is situated among the more efficient and less carbon intensive countries such as Germany, Japan and the United Kingdom. In 2009, the state posted 10 Metric Ton Carbon Equivalent (MTCO₂E) per person and 0.22 MTCO₂E per dollar GDP.

GLOBAL FOSSIL FUEL COMBUSTION IN CALIFORNIA AND OTHER REGIONS

CARBON INTENSITY AND EFFICIENCY 1997 TO 2009



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: U.S. Department of Energy, Energy Information Administration, International Energy Statistics and State CO₂ Emissions; Bureau of Economic Analysis, U.S. Department of Commerce; U.S. Census Bureau, Population Estimates Branch; The California Department of Finance. Analysis: Collaborative Economics



Domestically, California surpasses the national average as well as other large states in both measures of efficiency and reducing intensity, although strong gains by other states are evidenced. Florida is the only other large state to exceed the nation in carbon efficiency and reducing intensity.

While extremely inefficient and trailing the nation, the Texas economy has made solid progress in improving its carbon efficiency over the twelve-year period, dropping from 33 MTCO₂E per person to 24 MTCO₂E.

For the last two decades, California has been growing its energy productivity; significantly decreasing its carbon intensity. While total annual greenhouse gas emissions have risen five percent over the last 20 years, they have grown at a slower rate than both the population (+25%) and the state's GDP (+45%). Since 2004, after reaching peak total GHG emissions of 488 million tons, the state has since been showing a general downward trend in total emissions.

California has effectively reduced greenhouse gases in the state while continuing to grow the economy. While GDP dropped during the recent economic downturn, per capita GHG emissions fell at a faster rate as a result of the

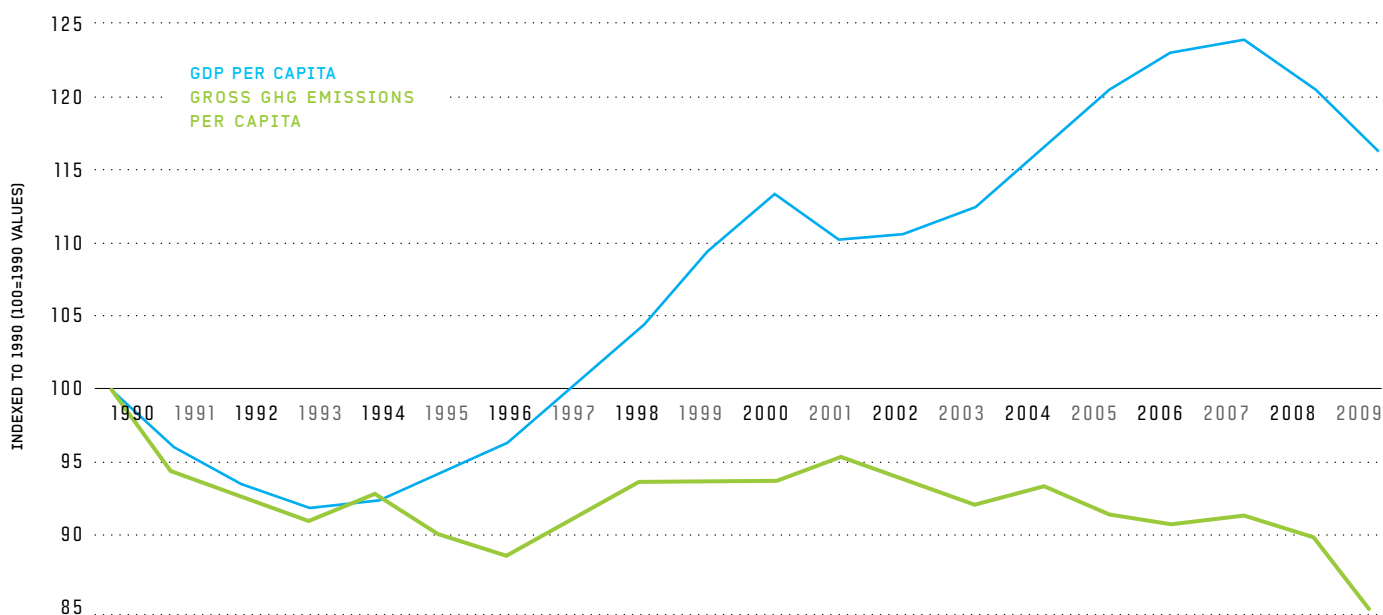
state's energy efficiency policies. These standards helped to insulate the economy, protecting it from price hikes, and making it more efficient, while reducing GHG emissions. Efficiency standards for buildings and appliances, coupled with multi-billion dollar utility investments in cost-effective energy efficiency, have contributed significantly to the drop in emissions per capita. From 2008 to 2009, California's per capita GDP shrank by four percent, while per capita emissions dropped by six percent. Between 1996 and 2004 California's GDP grew at more than twice the rate of the GHG emissions, increasing 45 percent. Relative to 1990, per capita gross domestic product (GDP) increased 16 percent while per capita GHG emissions fell 16 percent.

GHG emissions also slowed in recent years, related to the global economic downturn. From 2008 to 2009, California's GHG emissions dropped six percent, the largest drop in the observable period going back to 1990. Total GHG emissions in 2009 were equivalent to 1999 levels.

This is an important trend since total emissions must start dropping in order to reduce emissions to 1990 levels by 2020 as mandated by California's Global Warming Solutions

GHG EMISSIONS & GROSS DOMESTIC PRODUCT

CALIFORNIA'S RELATIVE TRENDS SINCE 1990 / GROSS GHG EMISSIONS & GDP DOLLARS PER CAPITA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Air Resources Board, California Greenhouse Gas Inventory- by Sector and Activity; Bureau of Economic Analysis, U.S. Department of Commerce; California Department of Finance. Analysis: Collaborative Economics



Act (AB 32). The leveling out and drop in emissions in recent years reflects multiple factors including the onset of the economic recession, fuel price hikes and a noticeable drop in on-road transportation.⁴

The California economy's dependence on carbon-based energy continues to lessen. Reported as gross GHG emissions relative to GDP, the state's carbon economy has dropped three percent between 2008 and 2009, from 2.43 to 2.36 metric tons of carbon dioxide for every \$10,000 of GDP generated. This represents a drop of 28 percent since 1990. Once the relationship reaches zero, the state's economy will be completely free of its carbon dependency.

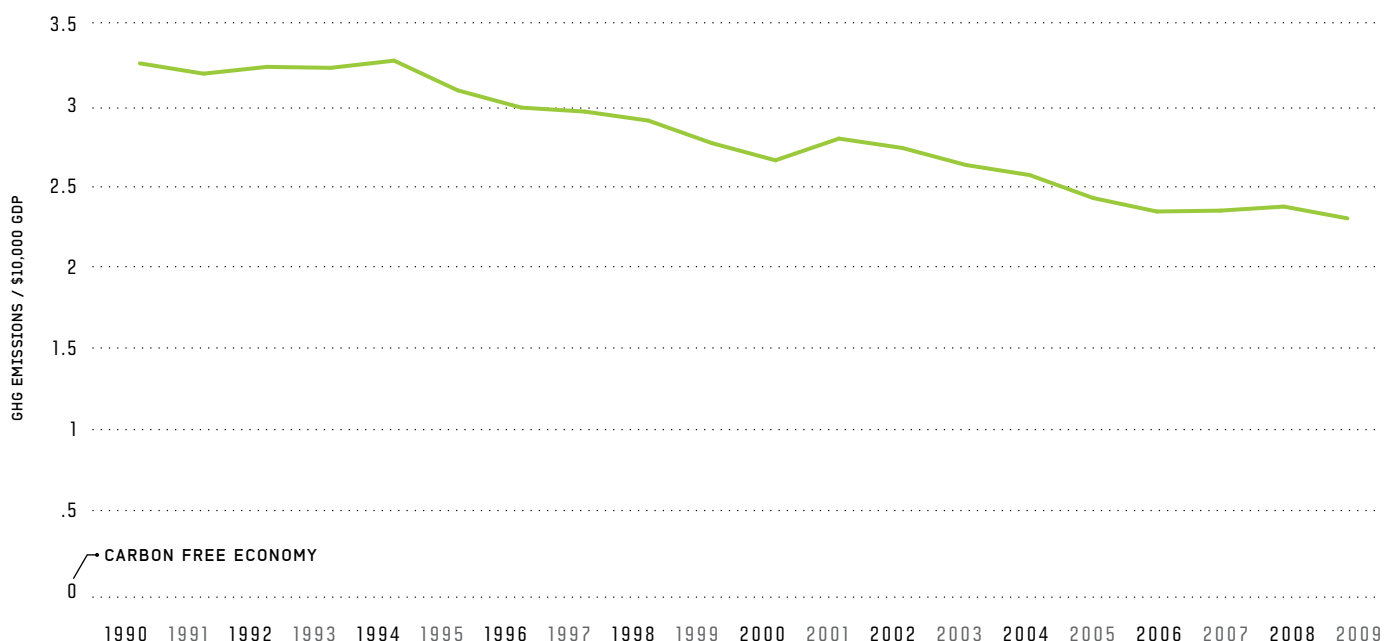
In 2009, California was found to have the sixth least carbon dependent economy in the nation, following New York, Connecticut, Delaware and Massachusetts. New York was the least carbon dependent state due in part to its diverse portfolio of renewable energy sources, the Green Jobs – Green New York Act and the passing of new policies, such

as the Power New York Act of 2011. Wyoming was found to have the most carbon dependent economy in the nation.

California's carbon intensity is lower than other large states such as Florida and Texas. For example, in 2009, Texas' carbon economy was more than two and a half times higher than in California. Though Florida is the only other large state to surpass the nation, Florida's economy was nearly 52 percent more carbon intensive than that of California. The nation's carbon economy as a whole (not including California) was two times higher than California.

Over the long-term, progress has been made in California and other states toward a less carbon-intensive economy. Since 1990, the carbon economy has dropped by 29 percent in California and the rest of the nation while Florida dropped by 31 percent and Texas by 41 percent. Most recently, from 2008 to 2009, California's carbon economy shrank by 0.5 percent, trailing the rest of the nation (6.1%), Florida (4.2%) and Texas (1.3%).

THE CARBON ECONOMY GROSS EMISSIONS RELATIVE TO GROSS DOMESTIC PRODUCT / CALIFORNIA

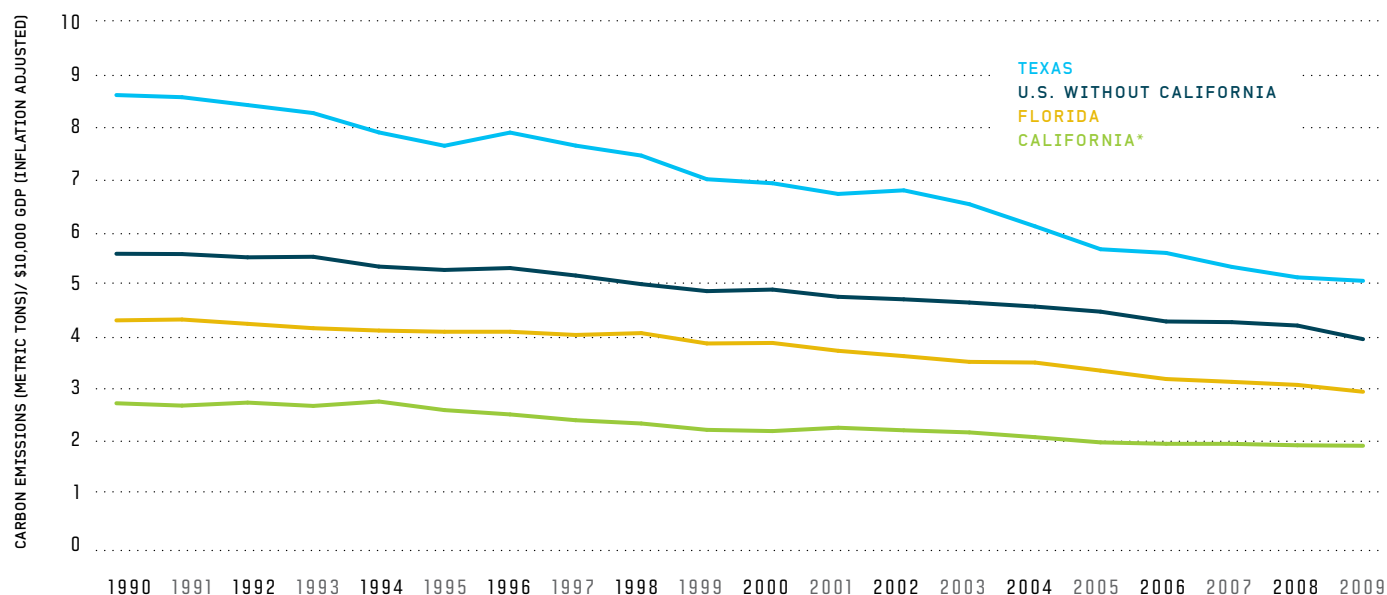


NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Air Resources Board, California Greenhouse Gas Inventory- by Sector and Activity; Bureau of Economic Analysis, U.S. Department of Commerce; California Department of Finance. Analysis: Collaborative Economics



THE CARBON ECONOMY IN CALIFORNIA & OTHER STATES

CARBON EMISSIONS (METRIC TONS) PER 10,000 DOLLARS GDP (INFLATION ADJUSTED)



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. *GHG emissions data that allows for state-level comparison is from the Energy Information Administration and is limited to carbon emissions (fossil fuel combustion). Therefore, data represented here differs from analyses represented in other charts of total GHG emissions for California. Data Source: Energy Information Administration, U.S. Department of Energy; Bureau of Economic Analysis, U.S. Department of Commerce. Analysis: Collaborative Economics

NATIONAL CARBON ECONOMY RANKING

2009 LOWEST CARBON ECONOMY (EMISSIONS/GDP)

NEW YORK	1
CONNECTICUT	2
DELAWARE	3
MASSACHUSETTS	4
CALIFORNIA	5
FLORIDA	16
TEXAS	32

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Energy Information Administration, U.S. Department of Energy; Bureau of Economic Analysis, U.S. Department of Commerce; Analysis: Collaborative Economics

2009 NATIONAL RANKING

	GHG EMISSIONS PER CAPITA	GDP PER CAPITA	% OF TOTAL U.S. GDP
CALIFORNIA	5	12	13%
TEXAS	37	21	8%
FLORIDA	11	37	5%

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Energy Information Administration, U.S. Department of Energy; Bureau of Economic Analysis, U.S. Department of Commerce; Population Division, U.S. Census Bureau; California Department of Finance. Analysis: Collaborative Economics

PERCENT CHANGE / 2008-2009

	GHG EMISSIONS PER CAPITA	GDP PER CAPITA
CALIFORNIA	-4	-4
TEXAS	-7	-6
FLORIDA	-6	-2
U.S. WITHOUT CALIFORNIA	-8	-2

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Energy Information Administration, U.S. Department of Energy; Bureau of Economic Analysis, U.S. Department of Commerce; Analysis: Collaborative Economics



Transportation accounts for the largest source of GHG emissions in California (38%), followed by Electric Power (23%) and Industrial (20%). Together, these sources represent 81 percent of the state's total emissions. The California Air Resources Board (CARB) collects GHG emissions data by direct source of emissions rather than by end-user. The figure on page 31 depicts California's GHG emissions by detailed source:

Transportation 38%: Emissions from all transportation sources account for 38 percent of California's total GHG emissions. Emissions include the following sources: on-road passenger vehicles, on-road heavy duty trucks, ships & boats, locomotives, non-road transportation, and domestic (intra-state) aviation. If the emissions from petroleum refining (in the industrial sector) were included, it would be 44 percent. On-road passenger vehicles account for 93 percent of transportation emissions.

Electric Power 23%: In-state electric power generation (including natural gas and other fuels) accounts for 54 percent of electric power emissions, while the remaining 46 percent is from electric power imports. Electric power emissions encompass total emissions related to electricity generation.

Industrial 20%: Roughly 20 percent of California's emissions are from industrial activities. Emissions from industrial sources come from petroleum refining, oil & gas

extraction/supply, general fuel use, cogeneration heat output, cement plants, landfills, and other process emissions.

Agriculture & Forestry 7%: Emissions from Agriculture & Forestry account for seven percent of California's total emissions and are from livestock, soil preparation and fertilizer application, tractors, agricultural pumps & other fuel use, crop growth & harvesting, and wildfires.

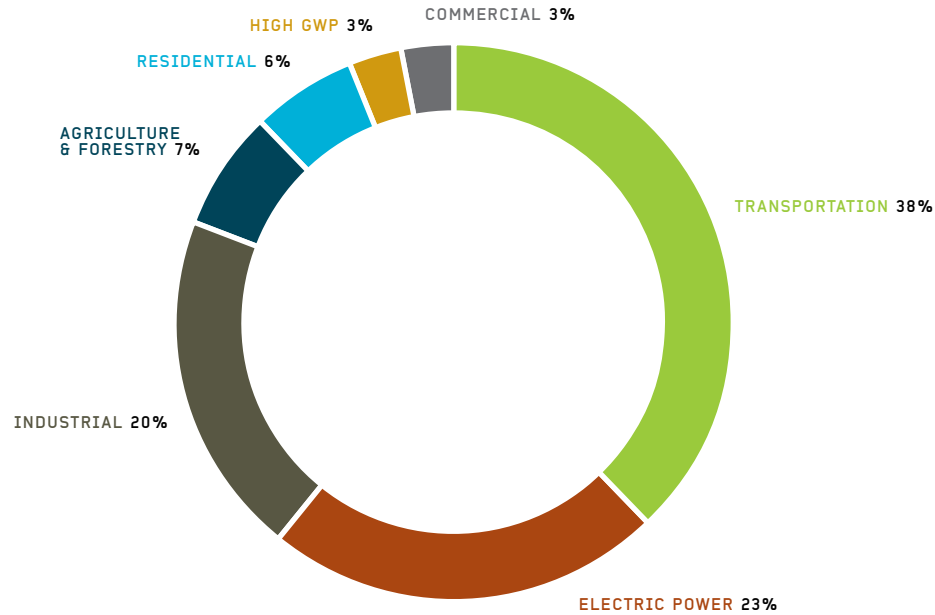
Residential 6%: GHG emissions from the residential sector account for six percent of total emissions in the state. GHG emissions in the residential sector are from fuel combustion from natural gas and other fuel use. Fuel is burned in order to heat houses and buildings, prepare food, and for hot water.⁵

Commercial 3%: Emissions from commercial fuel combustion and cogeneration heat output account for three percent of emissions statewide. The vast majority of emissions are from fuel combustion from natural gas and other fuel use. Similar to the residential sector, fuel is burned in order to heat buildings, prepare food, and for hot water.

High Global Warming Potentials (GWP) 3%: High GWP and other GHG emissions make up three percent of California's total GHG emissions. For the purposes of this chart, High GWP is a measure of ozone depleting substance (ODS) substitutes emitted in 2009.

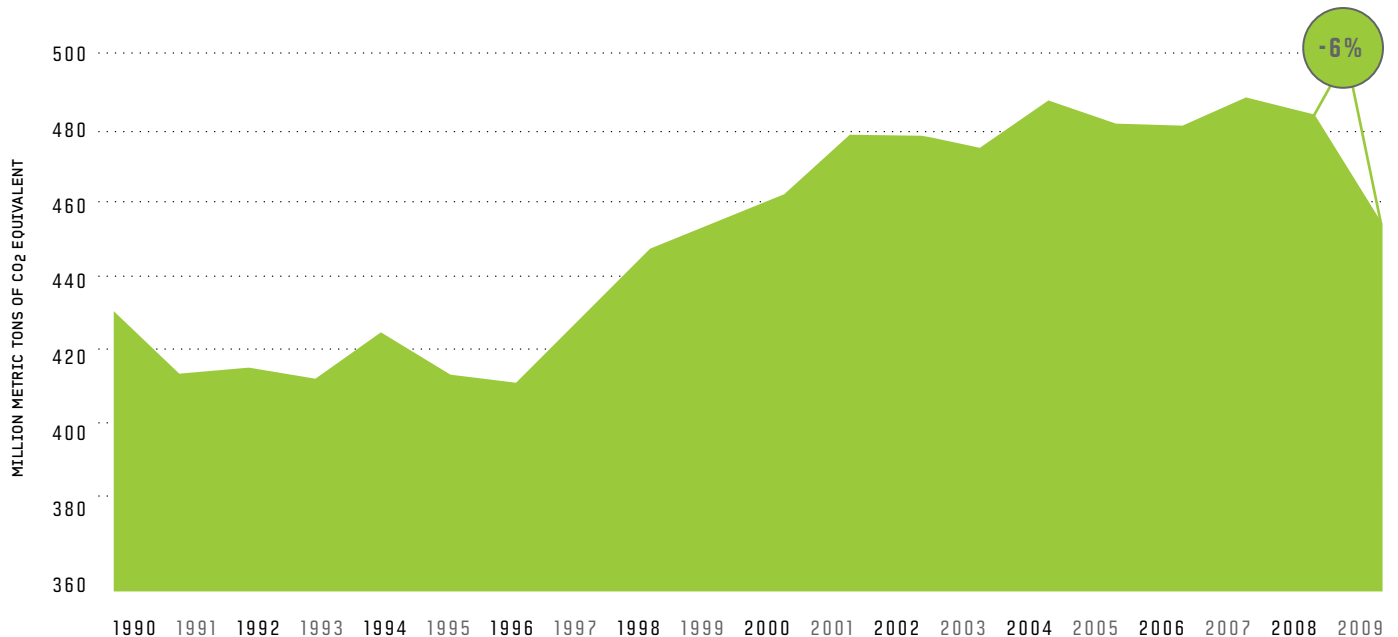


GREENHOUSE GAS EMISSIONS BY SOURCE CALIFORNIA 2009



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Air Resources Board, California Greenhouse Gas Inventory- by Sector and Activity. Analysis: Collaborative Economics

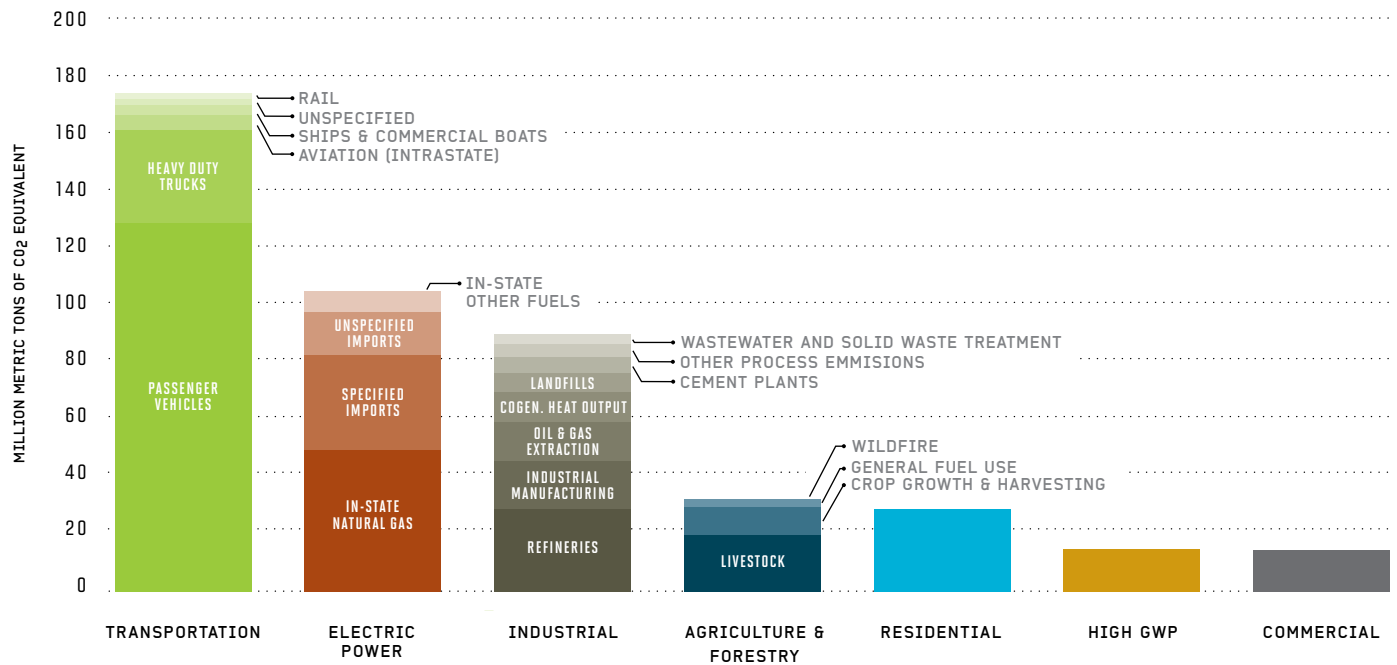
TOTAL CALIFORNIA GREENHOUSE GAS EMISSIONS GROSS ANNUAL EMISSIONS



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Gross greenhouse gas emissions (GHG) includes fossil fuel CO₂, with electric imports and international fuels (carbon dioxide equivalents) and noncarbon GHG emissions (in CO₂ equivalents). Noncarbon GHG emissions are made up of Agriculture (CH₄ and N₂O), Soils, ODS substitutes, Semi-conductor manufacture (PFCs), Electric Utilities (SF₆), Cement, Other Industrial Processes, Solid Waste Management, Landfill Gas, and Wastewater, Methane from oil and gas systems, Methane and N₂O from Fossil Fuel Combustion.
Data Source: California Air Resources Board, California Greenhouse Gas Inventory- by Sector and Activity. Analysis: Collaborative Economics



GREENHOUSE GAS EMISSIONS BY DETAILED SOURCE CALIFORNIA 2009



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Air Resources Board- California Greenhouse Gas Inventory-by Sector and Activity. Analysis: Collaborative Economics



ENERGY EFFICIENCY

Following the energy crisis in the 1970s, California has implemented a number of efforts that have resulted in improving energy efficiency and raising energy productivity in the state. Effective energy conservation efforts, such as continuing to raise building and appliance efficiency standards have not just yielded cost savings for Californians, these efforts have improved the resilience and competitive advantage of businesses in the state.

Energy productivity, measured as the ratio of energy consumed (inputs) to GDP (economic output), was 64 percent higher in California than in the rest of the country in 2009. In other words, California produced \$2.35 of GDP for every 10,000 British Thermal Units (BTU) of energy consumed. In comparison, the rest of the U.S. produced \$1.43 of GDP for every 10,000 BTU of energy consumed.

Since 1990, energy productivity increased 37 percent in California and 35 percent in the rest of the country. Most recently, from 2008 to 2009, energy productivity increased

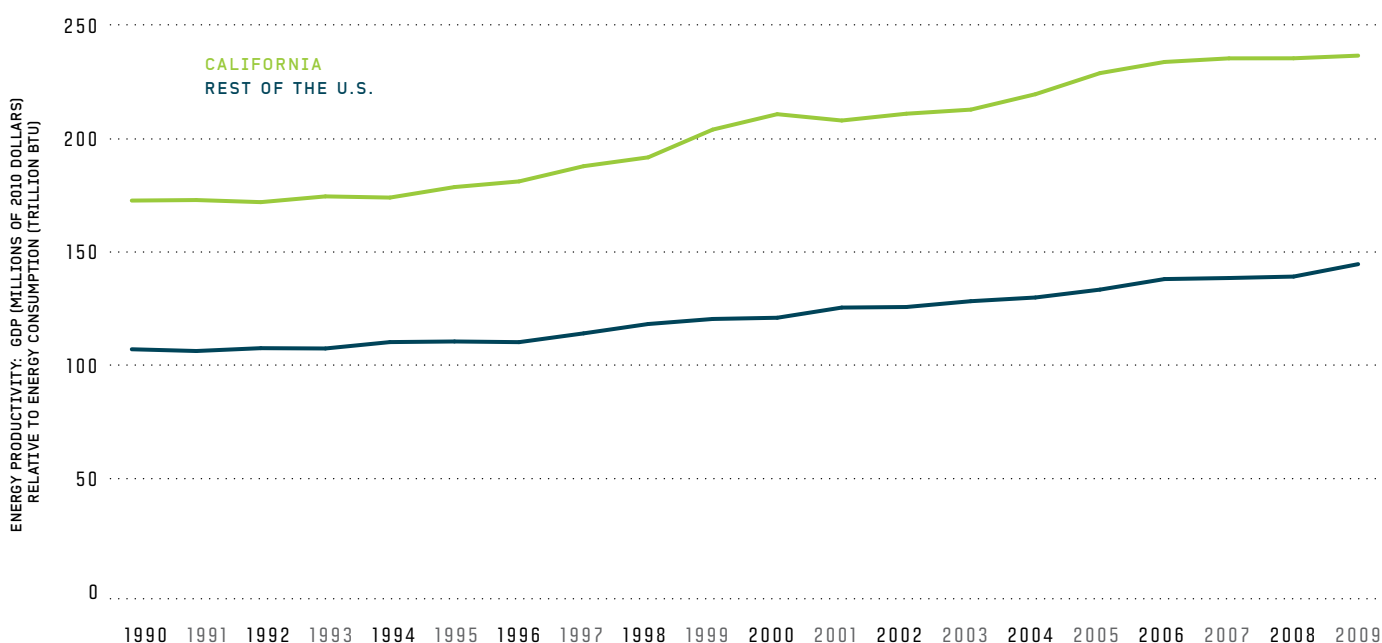
half of a percent in California and four percent in the rest of the United States.

Energy efficiency continues to improve in California as demonstrated in its per capita consumption. Relative to 1970, the state's per capita consumption dropped by 24 percent. Nationally, per capita consumption dropped below 1970 levels in 2009 for the first time since the recession of the 1980s.

Despite these gains, total energy consumption has continued to grow, driven primarily by population growth. The recent economic downturn has triggered a drop since 2007.

Per capita electricity consumption in California has remained close to 1990 levels, dropping during periods of economic decline. In 2010 per capita consumption was three percent below 1990 levels. Total electricity consumption is another story as the state's population has grown by 26 percent since 1990. After peaking in 2008, 27 percent above 1990 levels, total electricity consumption in 2010 was 22 percent above consumption levels in 1990.

ENERGY PRODUCTIVITY GDP RELATIVE TO TOTAL ENERGY CONSUMPTION / CALIFORNIA & REST OF THE U.S.



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: U.S. Department of Energy, Energy Information Administration; U.S. Department of Commerce, Bureau of Economic Analysis
Analysis: Collaborative Economics



Since 2008, total electricity consumption dropped by 3.6 percent and per capita consumption fell 4.9 percent. This drop in electricity consumption is due in part to recent economic conditions causing lower personal income growth and lower industrial and commercial sector output.⁶ Additionally, increased building and appliance energy efficiency programs have impacted statewide energy consumption.⁷

The Commercial sector, the largest consumer, accounted for 37 percent of electricity consumption in the state in 2010, followed closely by the Residential sector with 32 percent. The Industrial sector consumed 15 percent and Agricultural sector consumed eight percent of total electricity in the state in 2010.

While electricity rates are higher in California, because of the state's high efficiency standards for buildings and appliances and utility energy efficiency programs, average electricity bills are actually lower than in most other states. In addition, California's electricity bills have declined more than most states since 1990. California maintains average monthly residential electricity bills that are lower than 42 states, even while rates are higher than 41 states.

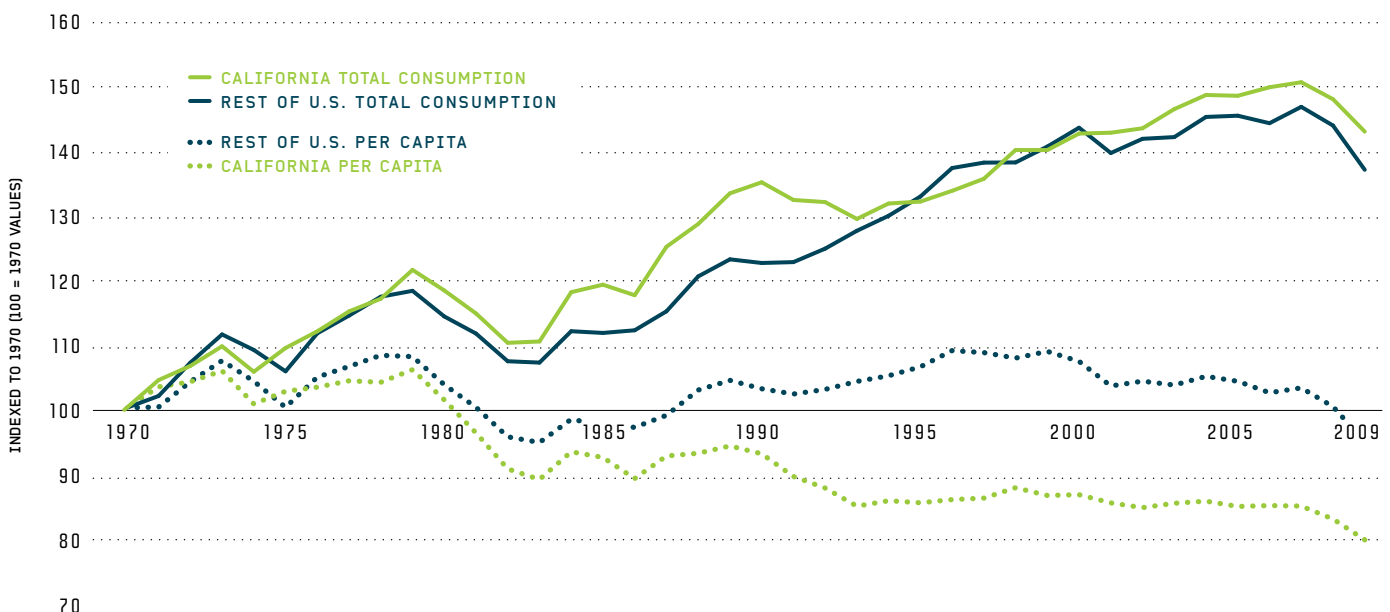
Residential electricity bills in California are 23 percent lower than the rest of the nation. The average monthly residential electricity bill in California dropped six percent, from 91 dollars in 1990 to 85 dollars in 2010. California's average monthly residential electric bills remained 26 dollars lower than the national average in 2010.

How much of a state's economic output that goes toward paying for electricity costs offers an indication for the economy's energy productivity? Money not spent on energy costs, whether by a household, business or public entity, can be invested in capital upgrades that boost productivity or can be invested in the creation of new jobs. In 2010, California's statewide electricity bill equated to 1.8 percent of the total state economy (GDP) compared with 2.4 percent in 1990.

The statewide electricity bills of other large states are much higher. In Florida it equates to 3.3 percent of the economy, and in Texas the percentage of GDP spent on electricity costs equates to 2.8 percent. Nationally, electricity cost equated to 2.7 percent of GDP in 2010.

TOTAL ENERGY CONSUMPTION RELATIVE TO 1970

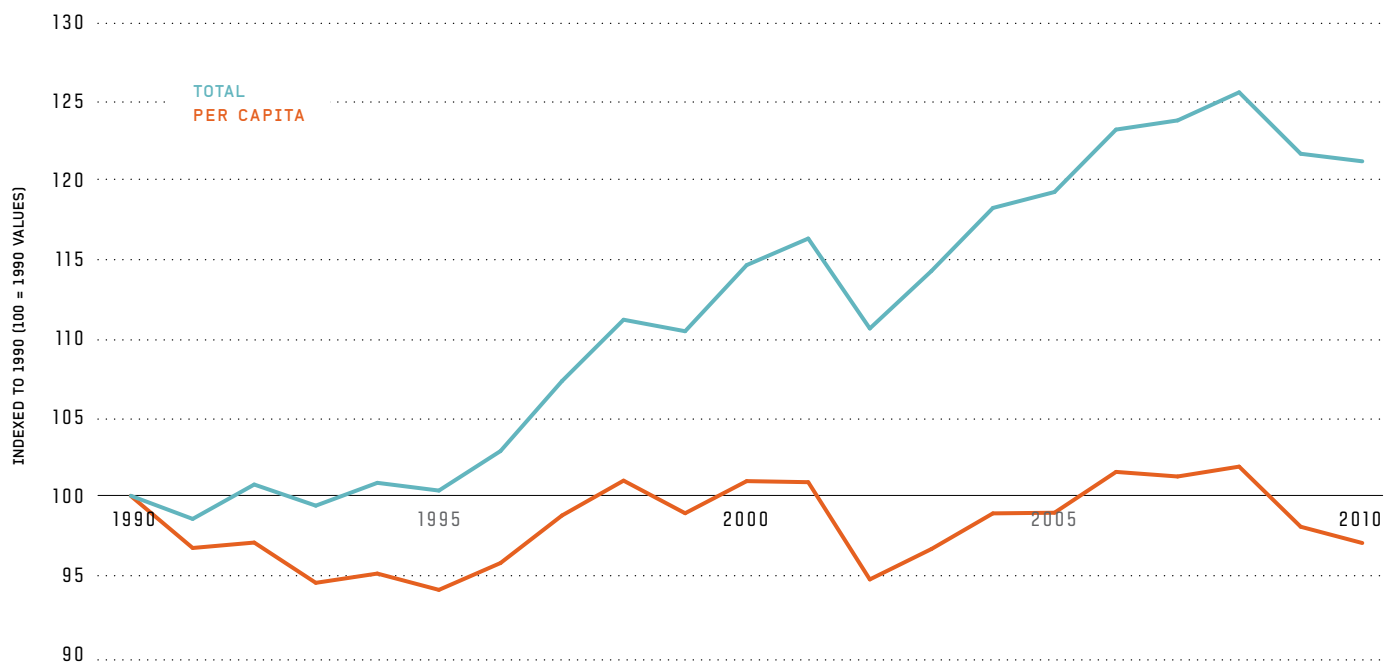
TOTAL CONSUMPTION & PER CAPITA / CALIFORNIA & REST OF THE U.S.



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Energy Information Administration, U.S. Department of Energy; Population Division, U.S. Census Bureau; California Department of Finance
Analysis: Collaborative Economics

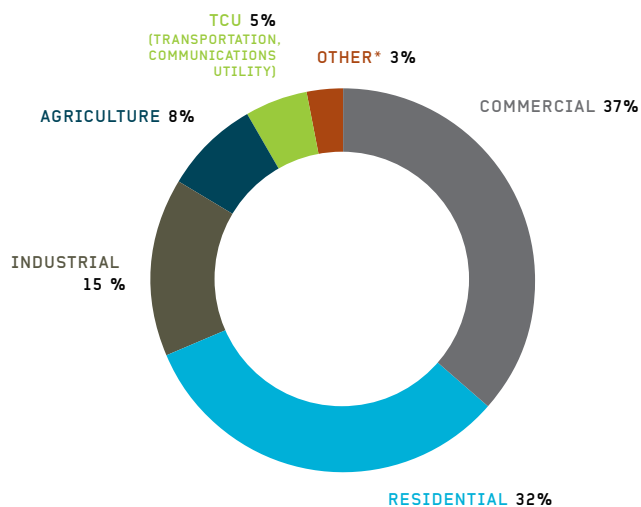


ELECTRICITY CONSUMPTION RELATIVE TO 1990 TOTAL & PER CAPITA / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: U.S. Department of Energy, Energy Information Administration; The California Department of Finance. Analysis: Collaborative Economics

ELECTRICITY CONSUMPTION BY SECTOR COMMERCIAL, RESIDENTIAL, INDUSTRIAL, AGRICULTURAL, TCU, OTHER (BY GWH) / 2010



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX: *Other includes Street Lighting and Mining
Data Source: California Energy Commission. Analysis: Collaborative Economics

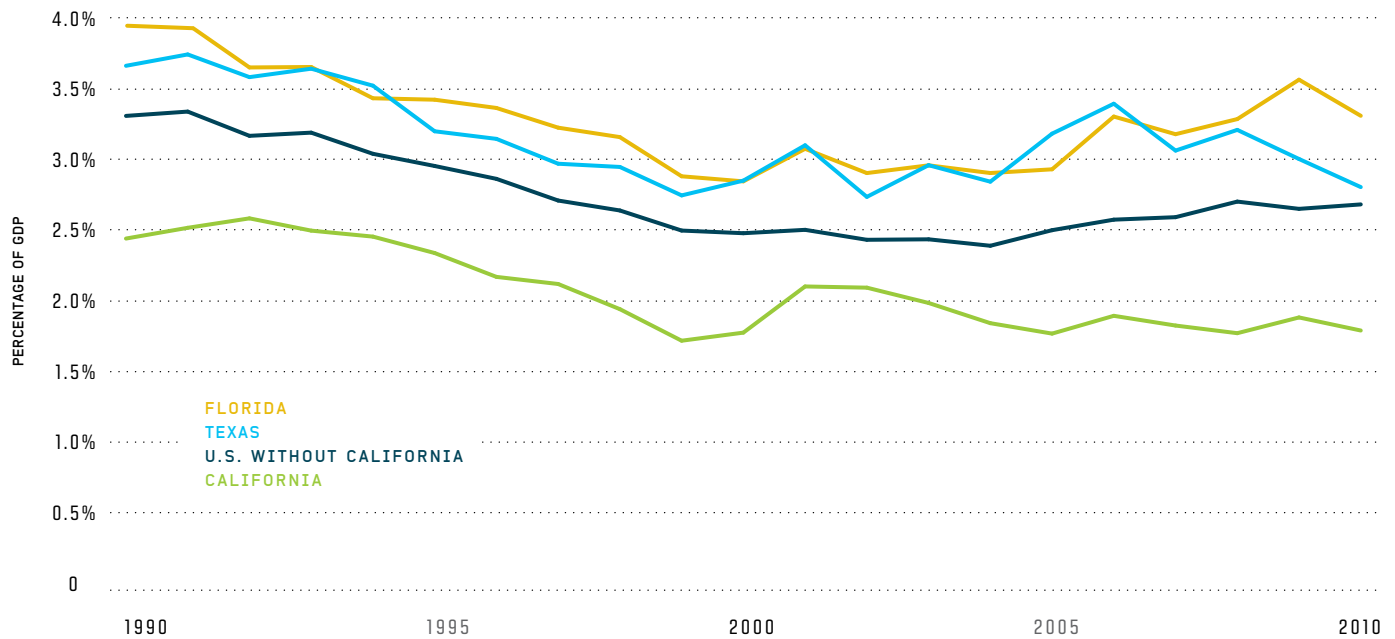
ELECTRICITY PRICES AND BILLS (INFLATION ADJUSTED) BY SECTOR CALIFORNIA AND THE REST OF THE U.S.

		PRICE (CENTS PER KWH)	AVERAGE MONTHLY BILL		
		2010	1990	2010	% CHANGE 1990-2010
RESIDENTIAL	CALIFORNIA	\$0.15	\$91	\$85	-6%
	REST OF THE U.S.	\$0.12	\$103	\$111	8%
INDUSTRIAL	CALIFORNIA	\$0.10	\$15,412	\$5,526	-64%
	REST OF THE U.S.	\$0.07	\$15,751	\$14,974	-5%
COMMERCIAL	CALIFORNIA	\$0.14	\$781	\$752	-4%
	REST OF THE U.S.	\$0.11	\$605	\$674	11%

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Price statistics for the U.S. without California are the national average price. Data Source: Energy Information Administration, U.S. Department of Energy. Analysis: Collaborative Economics



STATEWIDE ELECTRICITY BILL AS A FRACTION OF GDP CALIFORNIA, TEXAS, FLORIDA & REST OF THE U.S.



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: U.S. Department of Energy, Energy Information Administration; U.S. Department of Commerce, Bureau of Economic Analysis
Analysis: Collaborative Economics

ENERGY EFFICIENCY'S RETURN ON INVESTMENT

Mi Rancho, a 70-year old family business based in San Leandro, makes retail tortilla products and distributes nationwide. Following an investment of \$17,000 in energy efficiency upgrades in 2011, the company has added \$210,000 each year to their bottom line since. This savings allows the company to increase employment, invest in new manufacturing equipment, and consider further expansion possibilities. Mi Rancho's focus on sustainability is an important part of their business model.
www.miranchoretail.com

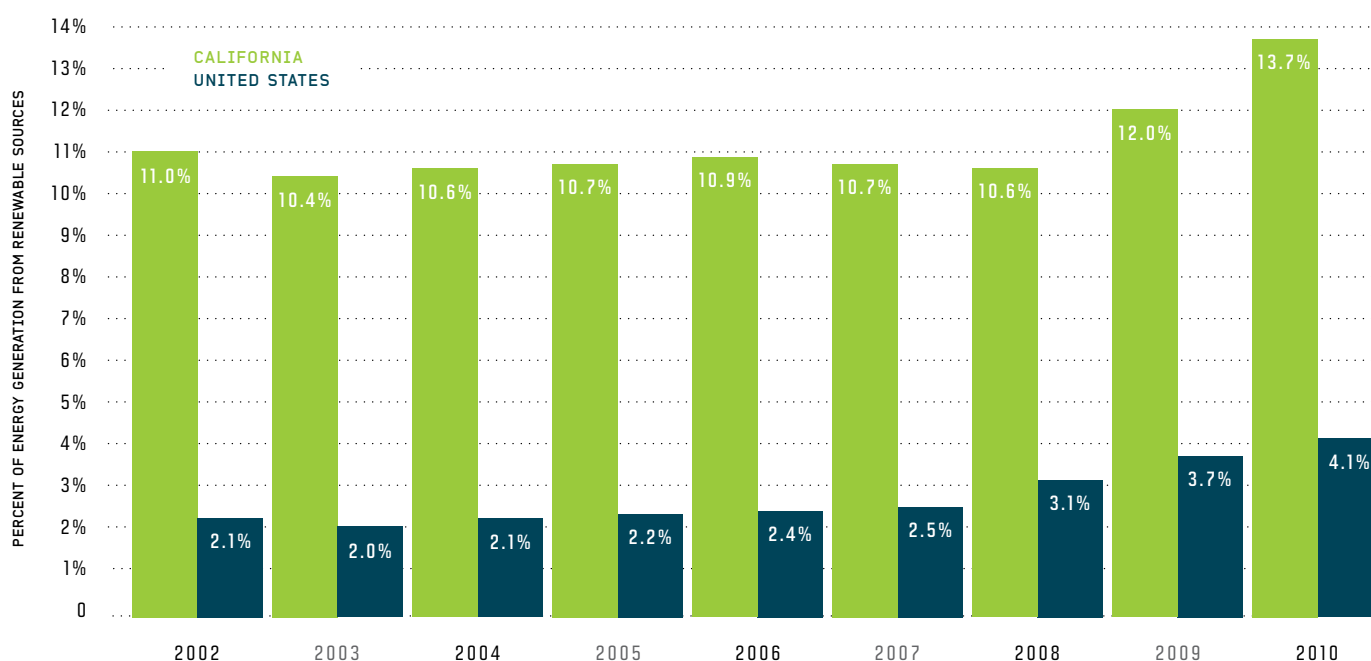


RENEWABLE ENERGY

Renewable energy generation witnessed robust growth in California and nationally in recent years. In California, renewable energy accounted for 10.6 percent of total

generation in 2008 and 13.7 percent in 2010. Nationally, levels increased from 3.1 to 4.1 percent over this period.

PERCENT OF TOTAL ENERGY GENERATION FROM RENEWABLE SOURCES CALIFORNIA AND UNITED STATES



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Energy Commission; Energy Information Administration, U.S. Department of Energy. Analysis: Collaborative Economics

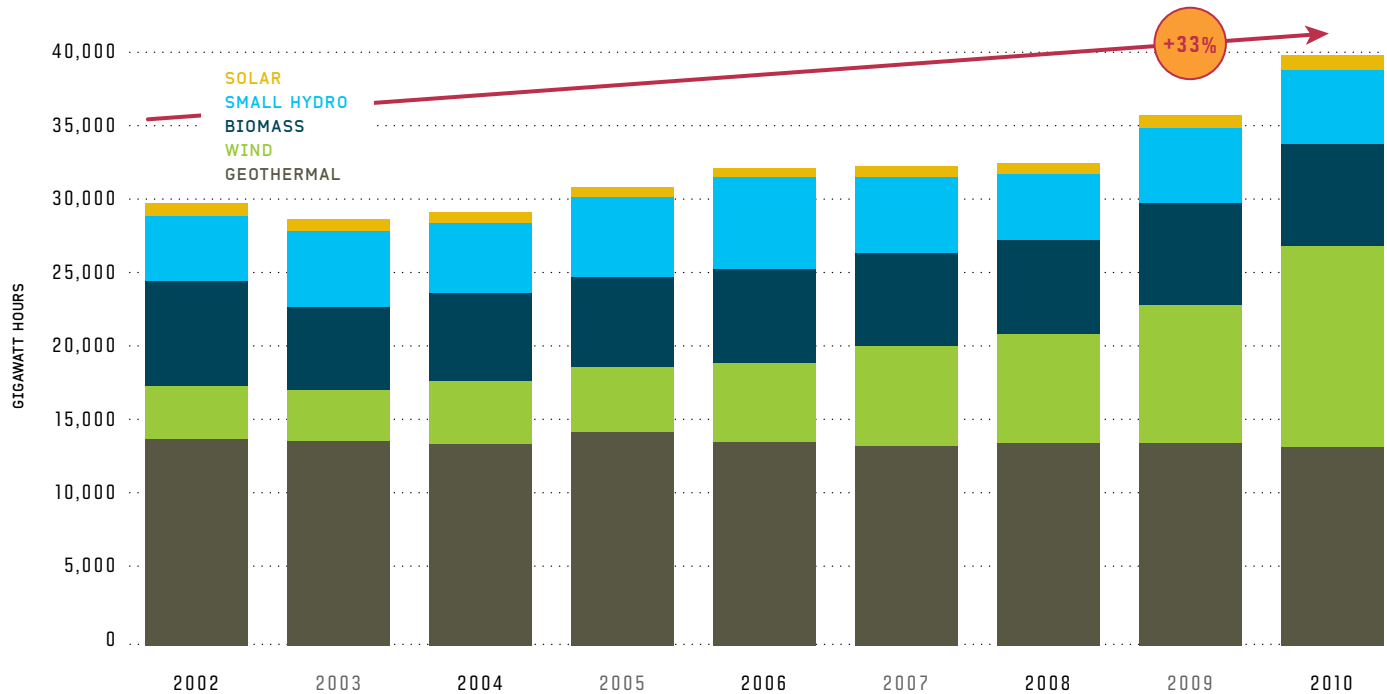
California's Renewables Portfolio Standard (RPS) was established in 2002, requiring investor-owned utilities (IOUs), electric service providers (ESPs) and community choice aggregators (CCAs) to increase electricity procurement from renewable sources by an additional one percent each year, with a target of 20 percent of total electricity procurement from renewable sources by 2010. The goal was set higher in November 2008 when Governor Schwarzenegger signed an Executive Order to accelerate the RPS target to 33 percent by 2020. This legislation, in addition to RPS standards for publicly owned utilities (POUs), was later signed into law by Governor Jerry Brown in April 2011 (SB 2).



Since 2002 California's energy generation from renewable sources has increased 33 percent, and it is projected to continue strong growth into the near future. From 2009 to 2010, energy generation from renewable sources increased 11.2 percent, marking the largest percentage growth in a given year over the observable time period.

Wind generation increased more than threefold in the long run and jumped 44 percent from 2009 to 2010. While declining slightly in 2010, geothermal energy generation contributes the second largest percentage of total renewable energy generation in the state, closely trailing wind energy.

CALIFORNIA RENEWABLE ENERGY GENERATION GIGAWATT HOURS BY SOURCE



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Energy Commission. Analysis: Collaborative Economics

CALIFORNIA'S IOU RENEWABLE ENERGY GENERATION PERCENTAGE OF TOTAL ENERGY GENERATION

INVESTOR OWNED UTILITIES	2003	2010	2011
PACIFIC GAS & ELECTRIC COMPANY	11.5%	17.7%	19.4%
SAN DIEGO GAS & ELECTRIC COMPANY	3.7%	11.9%	21%
SOUTHERN CALIFORNIA EDISON	16.6%	19.9%	21%

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Public Utilities Commission. Analysis: Collaborative Economics

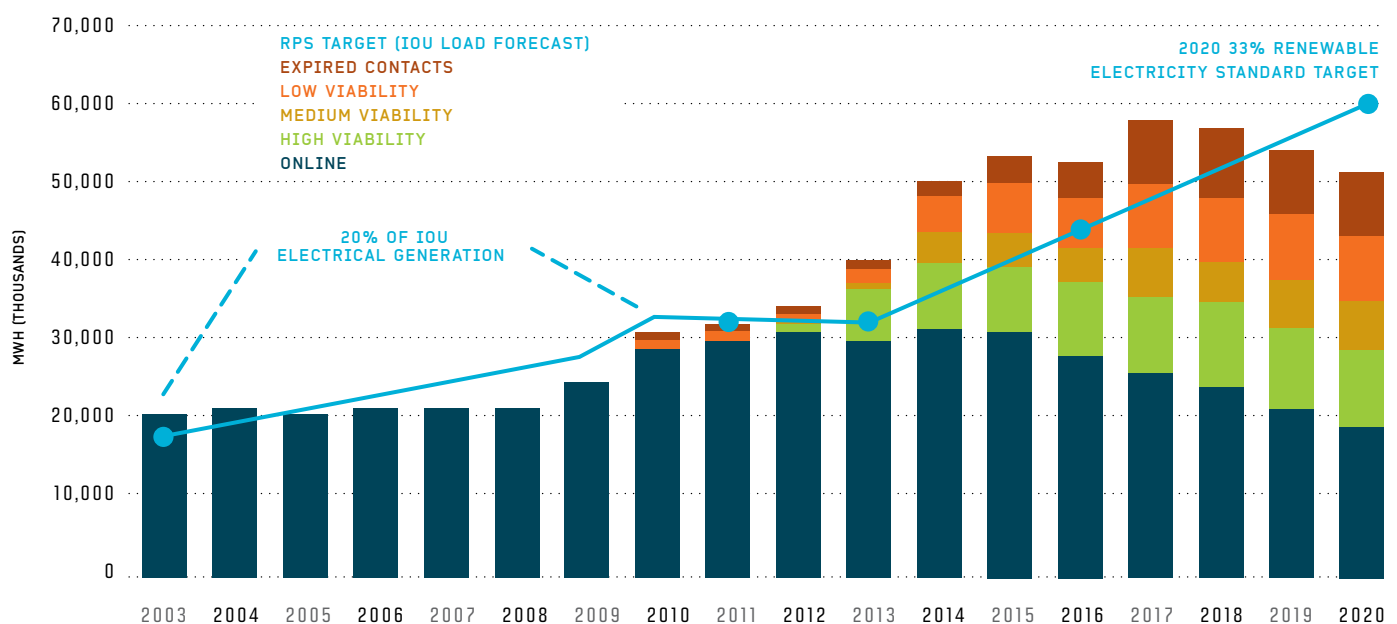


One of the most ambitious renewable energy standards in the country, California's Renewables Portfolio Standard (RPS) requires investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020. The state's RPS has been a major driver of the state's clean energy resources.

The 2011 forecast for RPS contracts in California includes contract viability to assess the probable success of signed contracts, as well as those under negotiation and pending approval based on utility forecasts. In 2010, California's Investor Owned Utilities (IOUs) collectively procured 17 percent of their electricity from renewable sources, a two percent increase from 2009 figures.⁸

In 2011, the state's three largest investor-owned utilities neared or surpassed the goal of procuring 20 percent of their power from renewable sources, a major milestone as they push to reach 33 percent by 2020. While originally scheduled to reach this level by 2010, the state's Legislature extended the deadline adding that each utility average 20 percent renewable procurement between 2011 and 2012. Each utility has increased energy from renewable sources in the recent time period, with San Diego Gas & Electric (SDG&E) experiencing the largest leap. SDG&E renewable energy generation jumped nine percent over the previous year due to the addition of 17 power contracts with solar and wind energy sources. PG&E credits its 1.7 percent growth to new wind, solar geothermal, biomass and small hydroelectric projects.⁹

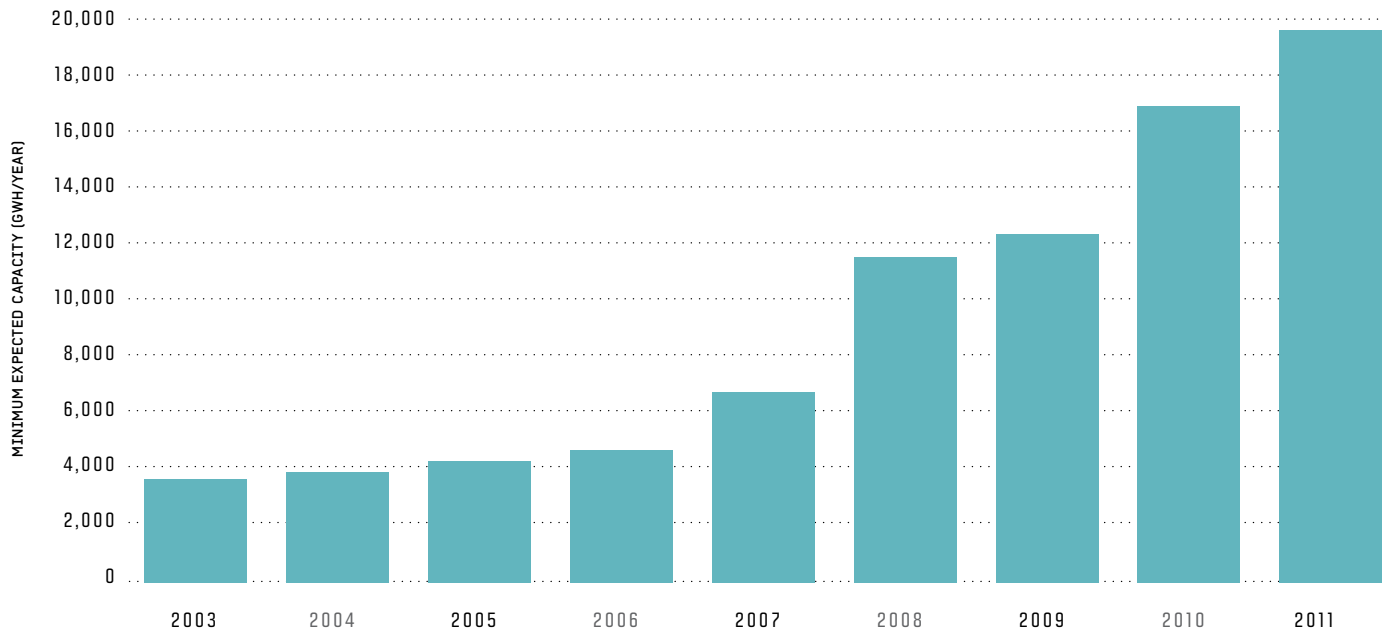
RISK PROFILE OF FORECASTED RPS GENERATION BASED ON EXECUTED CONTRACTS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Chart provides a forecast of IOU RPS generation from online projects and all executed RPS contracts as reported in the August 2011 RPS Compliance Filings. In November 2008, Governor Schwarzenegger signed an Executive Order to accelerate the RPS target to 33% by 2020. This was later signed into law in April 2011. Data Source: California Public Utilities Commission, Renewables Portfolio Standard Quarterly Report, 3rd Quarter 2011. Analysis: Collaborative Economics

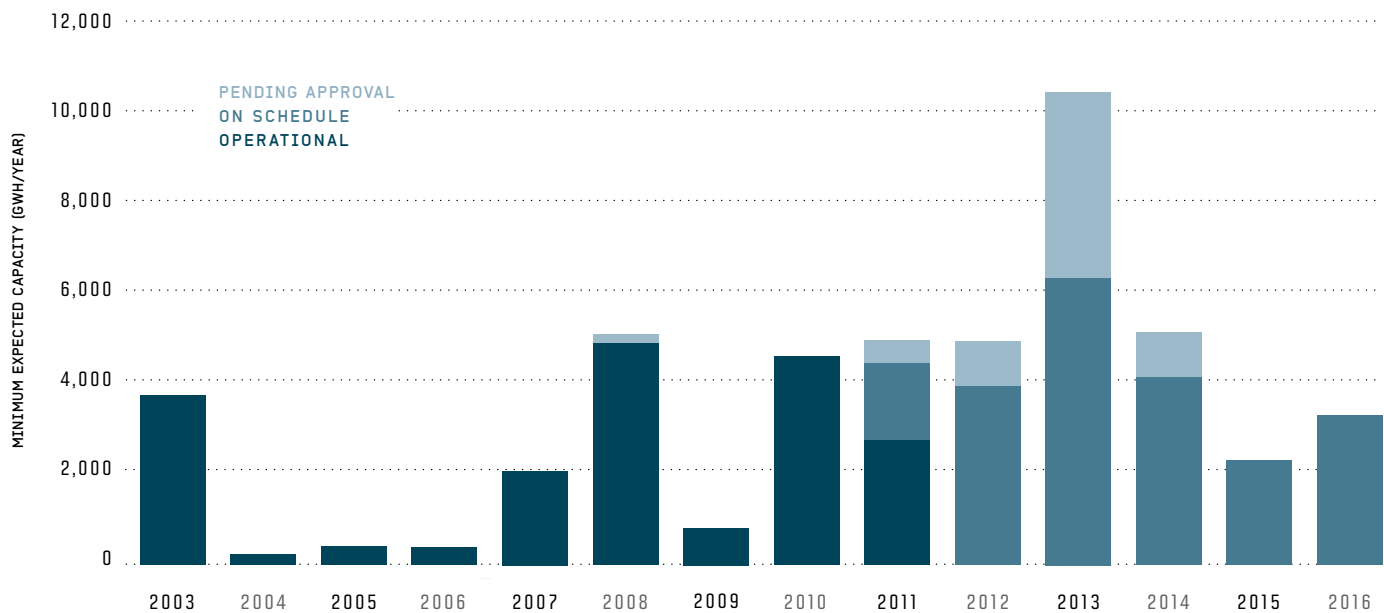


CUMULATIVE OPERATIONAL CAPACITY OF RENEWABLES PORTFOLIO STANDARD PROJECTS BY INVESTOR-OWNED UTILITIES CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Public Utilities Commission. Analysis: Collaborative Economics

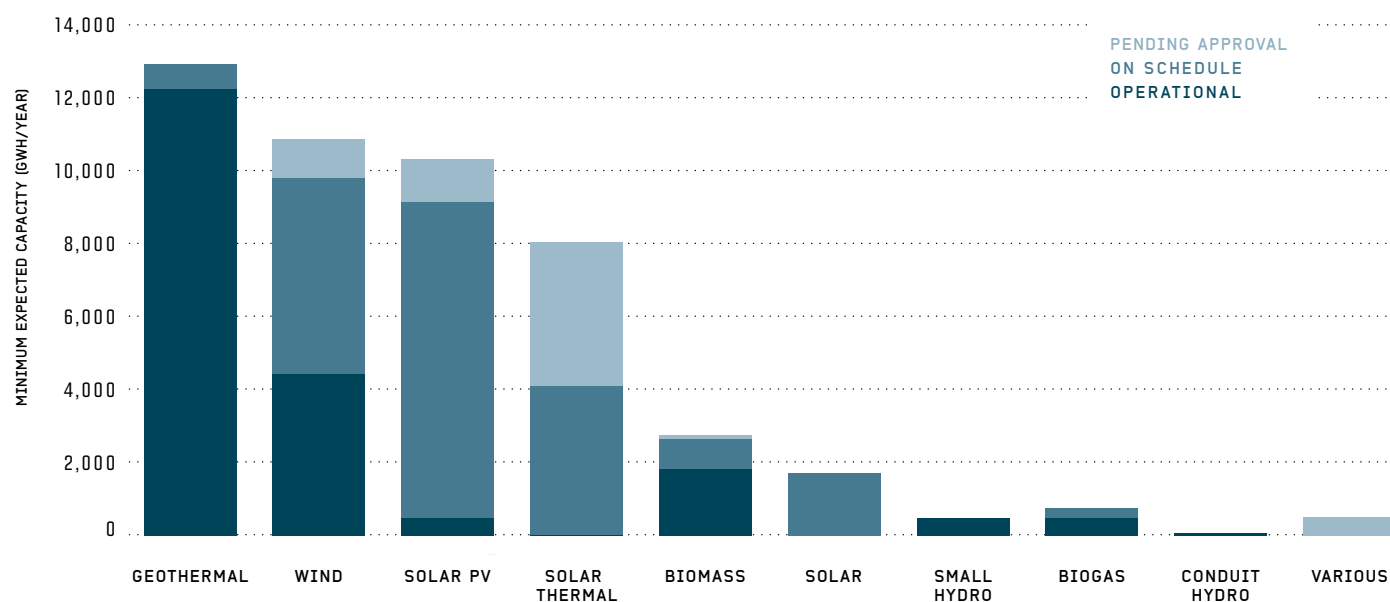
CONTRACTED DELIVERY DATE OF RENEWABLES PORTFOLIO STANDARD PROJECTS FOR INVESTOR-OWNED UTILITIES OPERATIONAL, ON SCHEDULE AND PENDING RPS APPROVAL / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Notes: Renewable generation includes wind, geothermal, solar PV, solar thermal, biomass, space-based solar, small hydro, biogas and conduit hydro.
Data Source: California Public Utility Commission. Analysis: Collaborative Economics



TOTAL CAPACITY OF INVESTOR-OWNED UTILITY RENEWABLES PORTFOLIO STANDARD PROJECTS FROM 2003 TO 2016 OPERATIONAL, ON SCHEDULE AND PENDING APPROVAL / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Public Utility Commission. Analysis: Collaborative Economics

TECHNOLOGY	ON SCHEDULE		PENDING APPROVAL	
	MINIMUM EXPECTED GWH/YEAR	NUMBER OF PROJECTS	MINIMUM EXPECTED GWH/YEAR	NUMBER OF PROJECTS
SOLAR PV	8607.80	35	1185.18	27
WIND	5346.20	18	1066.00	3
SOLAR THERMAL	4069.94	7	3940.00	2
SOLAR	1700.00	1	—	—
BIOMASS	816.60	4	100.00	1
GEOTHERMAL	661.00	2	—	—
BIOGAS	276.86	7	—	—
SMALL HYDRO	8.00	1	—	—
CONDUIT HYDRO	—	—	—	—
VARIOUS	—	—	508.00	2



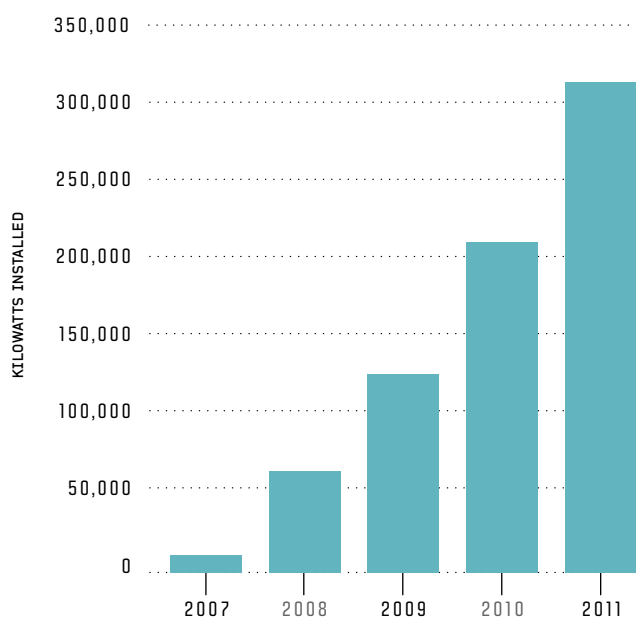
Investor-owned utilities have expanded renewable capacity every year since 2003 in order to meet RPS goals. As of December 2011, the cumulative renewable energy capacity in operation was 19,648 GWh per year, which is more than five times the renewable energy capacity in operation in 2003. From 2009 to 2010, renewable capacity was expanded by 4,540 GWh per year. In 2011, an additional 2,718 GWh per year of capacity went into operation.

Based on the contracted delivery date of RPS projects by investor-owned utilities (IOUs), 2013 will be the year with the largest volume of renewable power from new generators coming online. This estimate is based on the status for projects on schedule for completion (6,255 GWh/year) and projects pending approval (4,034 GWh/year) in 2013, totaling an added capacity of 10,289 GWh per year. The number of RPS projects by IOUs scheduled for completion is projected to increase in every year from ten projects in 2010 to 28 projected in 2013.

Wind, Geothermal, and Solar PV make up the largest share of energy capacity from RPS projects projected to be in operation by 2016. Solar PV and Solar Thermal generation from IOU RPS projects are primarily under construction (on schedule for completion) or pending RPS approval. Ninety-five percent of geothermal capacity is currently operational. Biomass, Small Hydro, and Biogas generation from RPS projects is also primarily already in operation.

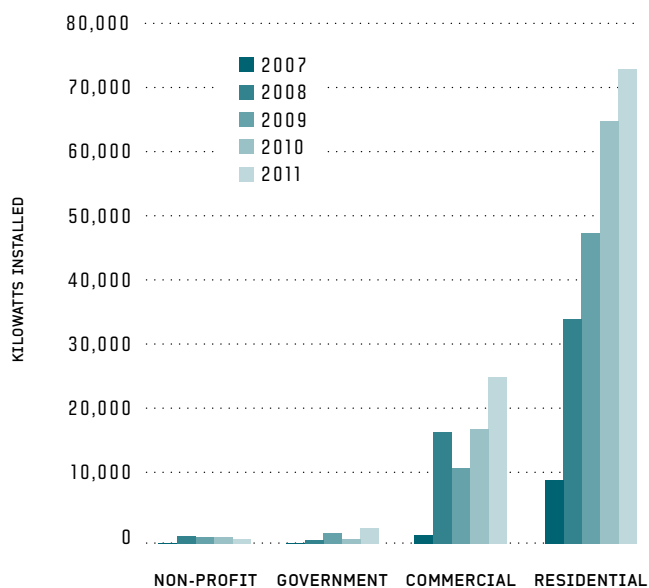
New solar capacity installed through the California Solar Initiative increased 21 percent from 2010 to 2011 and has expanded by a factor of seven since 2007. Nearly all sectors of the economy witnessed growth in added solar capacity. Residential property capacity added was up 12 percent, accounting for 72 percent of the state's total capacity added in 2011. The Government added capacity tripled in 2011. This jump, along with gains in Commercial solar capacity of 46 percent resulted in the addition of over 100,000 kilowatts installed in 2011.

NEW SOLAR INSTALLATIONS CAPACITY (KW) INSTALLED THROUGH THE CALIFORNIA SOLAR INITIATIVE / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Public Utilities Commission, California Solar Initiative. Analysis: Collaborative Economics

NEW SOLAR INSTALLATIONS BY SECTOR CAPACITY (KW) INSTALLED THROUGH THE CALIFORNIA SOLAR INITIATIVE NON-PROFIT, GOVERNMENT, RESIDENTIAL, COMMERCIAL / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Public Utilities Commission, California Solar Initiative. Analysis: Collaborative Economics



THE CALIFORNIA SOLAR INITIATIVE

The California Solar Initiative (CSI) is a rebate program for solar installations on residential and commercial buildings. CSI provides cash back rebates based on every watt of solar energy installed and offers different incentive levels based on the overall performance of the solar system. The program's goal is to install 1,940 MW of new solar capacity in the state by 2016.*

*Go Solar California. About the California Solar Initiative (CSI). Web.

PROPERTY ASSESSED CLEAN ENERGY PROGRAM

The Property Assessed Clean Energy (PACE) program provides financing of solar systems and energy efficiency retrofits through loans offered by municipalities that are paid back through the homeowner's property tax bills over 15 to 20 years. The program model is based on a similar program first implemented in Berkeley called the "Berkeley First Program." The PACE program is appealing due to low upfront costs, sustained home equity, and the program's ability to address a question many property owners ask themselves when they consider investing in energy efficiency improvements: "What happens when I sell my property?" With PACE, the solar system or energy efficiency retrofit, as well as the tax liability, is transferred to the new property owner. In addition, since payments are distributed over many years, the system becomes profitable for the homeowner within the first year, since the money saved on energy costs is usually more than their increased property tax, there is a net gain in each year. Lenders are able to offer low interest rates through senior property liens, which use the property, instead of the energy efficiency systems installed, as collateral.

There are both residential and commercial components of the PACE program. On July 6, 2010, residential PACE financing came to a standstill when the Federal Housing Finance Authority (FHFA) advised that Fannie Mae and Freddie Mac not work with loans with PACE financing because of the perceived added risk associated with the senior property liens. In response to this, the California Legislature voted to pass ABx14 in August 2011, expanding the authority of the state to spend the \$50 million appropriated for PACE to administer a new Clean Energy Upgrade Program to help finance energy and water efficiency improvements and the installation of renewable energy generation technologies.

Commercial PACE was unaffected by the advisory for Fannie Mae and Freddie Mac on home mortgages. The PACE market is picking up, with the potential for increased construction jobs, business for banks, and utility savings for property owners.



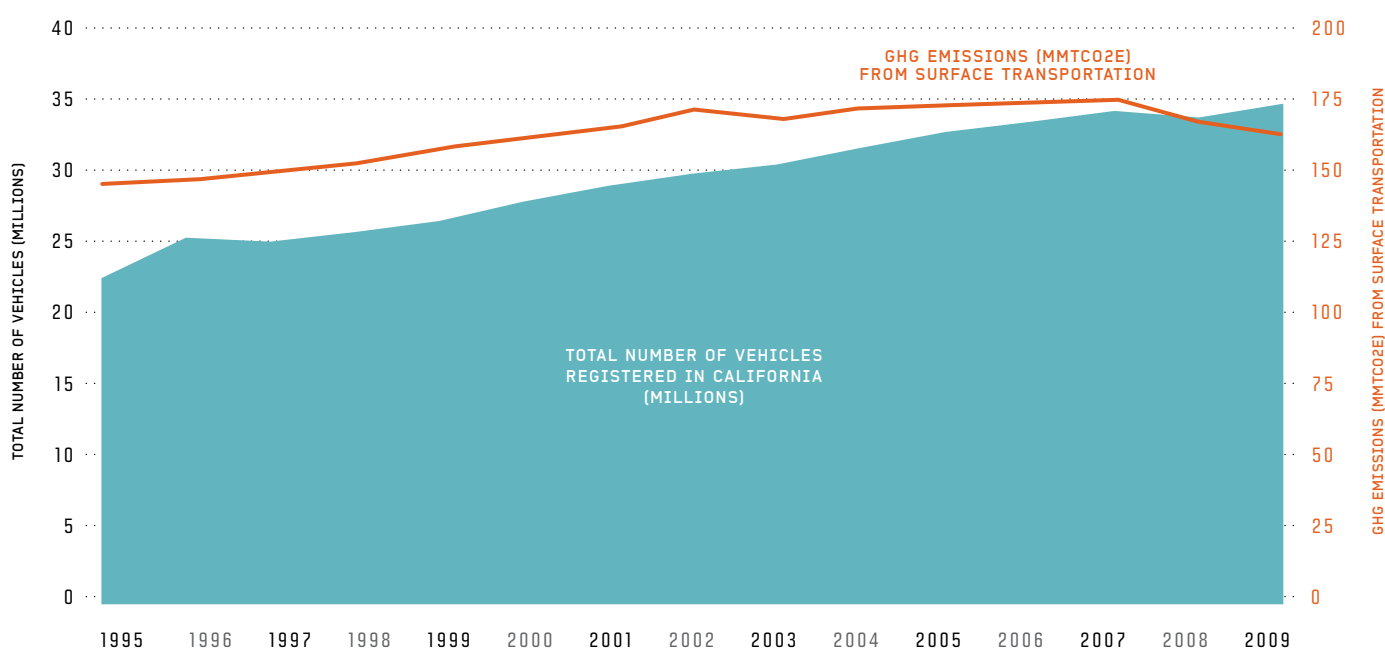
TRANSPORTATION

California is the national leader in targeting reductions in carbon emissions from transportation sources. Despite delays as a result of legal action, California was the first state to set standards on vehicle tailpipe emissions. The California Air Resources Board adopted the second round of Clean Car Rules in January 2012, which establishes the next round of GHG tailpipe emission standards and Zero Emission Vehicle (ZEV) requirements. GHG tailpipe emissions standards are set to reduce 34 percent of greenhouse gas emissions by 2025. Under the latest ZEV requirements, one-in-seven of new cars purchased in 2025 will be an electric or other zero-emission vehicle. The Advanced Clean Cars Rules also join the management of smog-causing pollutants and greenhouse gas emissions into a single integrated package of requirements for model years 2017 through 2025. Further, the state enacted the Sustainable Communities and Climate

Protection Act (SB 375) in 2008 which links GHG reduction goals with integrated land use and transportation planning by requiring sustainable communities strategies (SCS). The SCS plans for each metropolitan planning organization (MPO) are currently being developed in accordance with GHG reduction targets set by CARB in 2010. In October 2011, the San Diego Association of Governments became the first region in California to adopt a SCS, and 2012 will see SCS development in the Los Angeles and Sacramento regions. All eligible regions will have SCSs adopted by 2014.

In addition to public policy leadership, the state benefits from a population of early adopters of new technology. This is illustrated in the relatively high adoption rates of hybrid and electric vehicles. These actions help drive progress in reducing pollution and improving transportation efficiencies.

TOTAL VEHICLES AND GHG EMISSIONS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Total number of vehicles are for all vehicles registered in California including cars, trucks, busses, and motorcycles. Data Source: California Air Resources Board, California Greenhouse Gas Inventory- By Sector and Activity; Federal Highway Administration, U.S. Department of Transportation. Analysis: Collaborative Economics



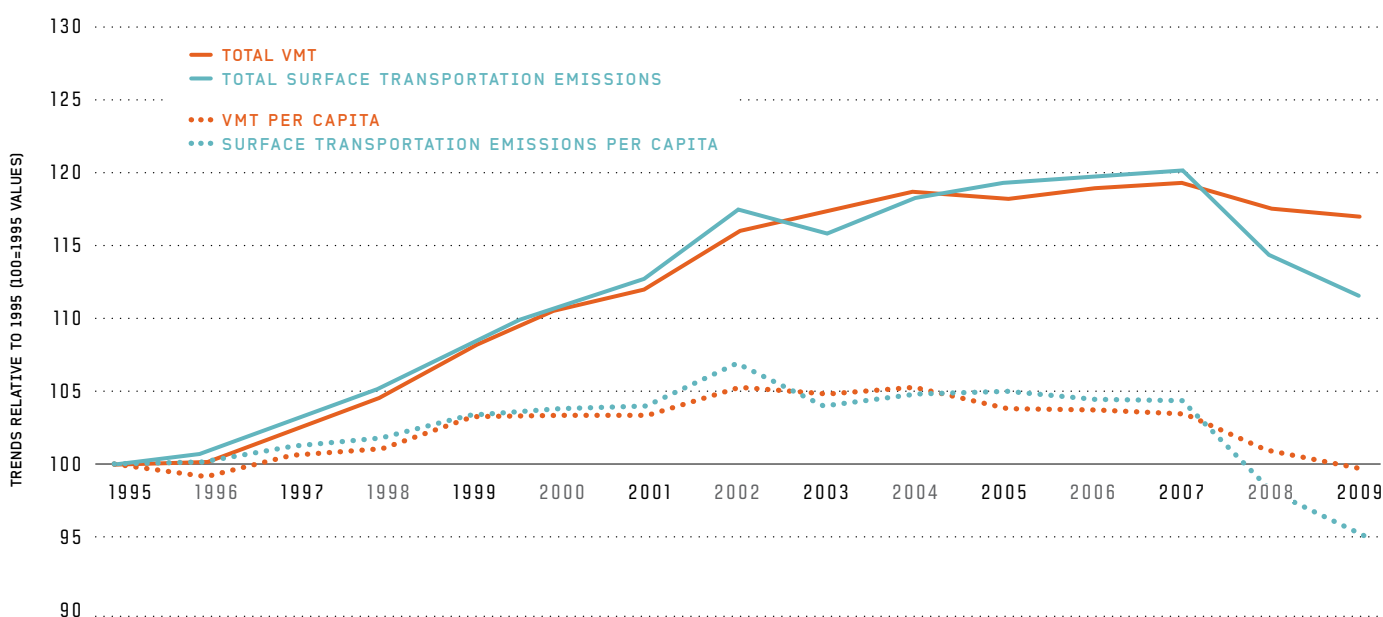
The impact of the recent economic downturn can be observed in the notable drop in miles traveled by California drivers since 2007 and in the drop in GHG emissions from surface transportation. GHG Emissions from surface transportation dropped for a second year in a row totaling a drop of seven percent between 2007 and 2009.

After peaking in 2007, total vehicle miles traveled dropped 0.45 percent in 2009 and miles traveled per capita fell three percent, an overall drop of over five percent since its peak in 2002. The year 2009 was the first time per capita VMT returned to 1995 levels. Relative to 1995, total VMT remained 17 percent above 1995 levels. Total surface transportation emissions dropped from 20 to 11 percent above levels in 1995. Per capita, emissions dropped to five percent below 1995 levels.

Growing numbers of Californians are choosing vehicles that run on nonconventional fuels. Since 2002, registrations in California have increased eight fold with nearly 54,000 new alternative fuel vehicles registered in the state in 2009. This reflects a 14 percent increase from 2008 figures. Hybrid vehicles continue to dominate, accounting for 88 percent of alternative fuel vehicles registered in California in 2009. In 2009, alternative fuel vehicles represented a high of 1.59 percent of total registered vehicles in California. While alternative fuel vehicle registration continues to rise, the total number of registered vehicles in the state has dropped two percent since 2007.

TRENDS IN VEHICLE MILES OF TRAVEL AND GHG EMISSIONS FROM SURFACE TRANSPORTATION

TOTAL AND PER CAPITA TRENDS RELATIVE TO 1995 / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Air Resources Board, California Greenhouse Gas Inventory- by Sector and Activity; California Department of Transportation; California Department of Finance. Analysis: Collaborative Economics



The use of alternative fuels is rising at a faster rate in California than nationally, and the use of conventional gas is declining in the state at a faster rate than in the nation. Alternative fuel consumption in California jumped 81 percent between 2003 and 2009 while conventional gas consumption in the state fell two percent over the same period. Nationwide, alternative fuel consumption grew seven percent and conventional gas consumption increased one percent over the same time period.

In California, alternative fuel consumption has been on an upward trajectory since 2003 and reached a new peak of 0.85 percent of total transportation fuel consumption in 2009. Nationwide, alternative fuel consumption has remained stagnant accounting for 0.16 of total transportation fuel consumption.

ALTERNATIVE FUEL VEHICLES AS A PERCENTAGE OF TOTAL VEHICLES REGISTERED

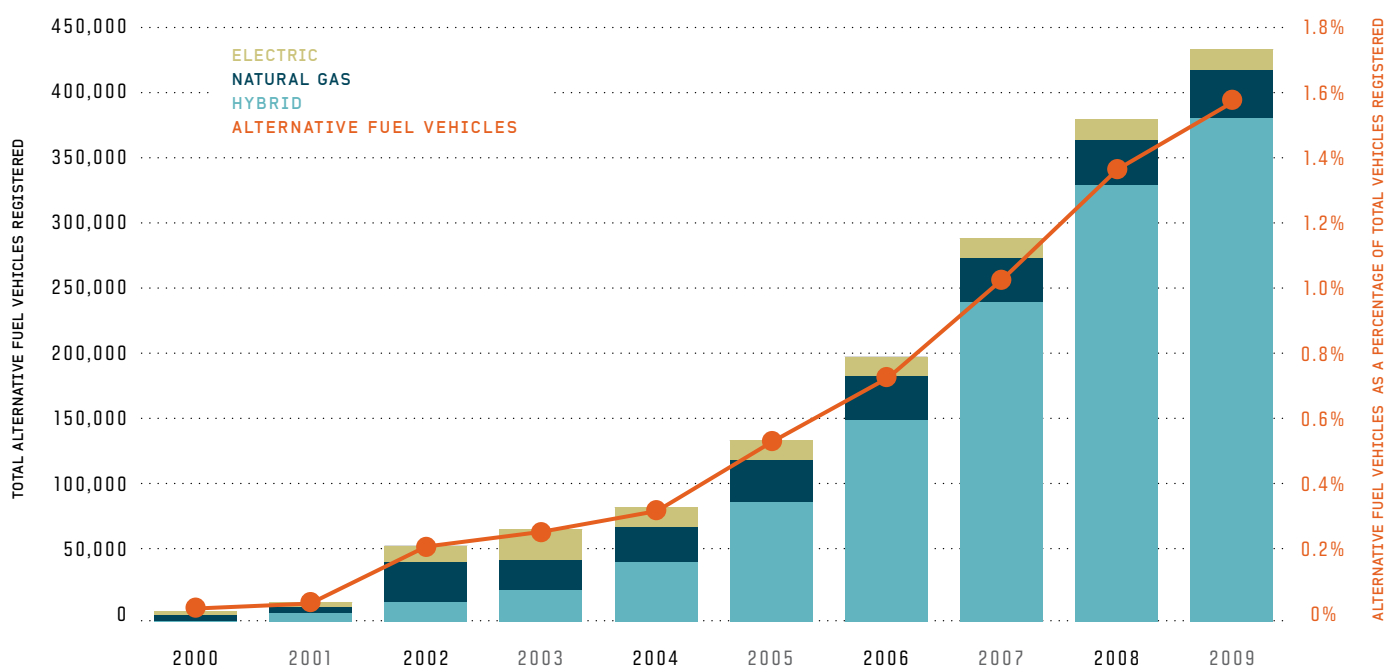
2000	0.03%
2009	1.59%

TOTAL GAS CONSUMPTION & AVERAGE PRICE PER GALLON

	BILLIONS OF GALLONS	AVG. PRICE PER GALLON
2003	15.63	\$2.30
2004	15.88	\$2.58
2005	15.91	\$2.90
2006	15.80	\$3.19
2007	15.65	\$3.39
2008	15.01	\$3.72
2009	14.79	\$2.86
2010	14.85	\$3.24
2011	14.58	\$3.86

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Total Gas Consumption Data - California Board of Equalization, Monthly Motor Vehicle Fuel Distributions Reports. Average Price per Gallon Data - Energy Information Association, California Gasoline and Diesel Retail Prices. Analysis: Collaborative Economics

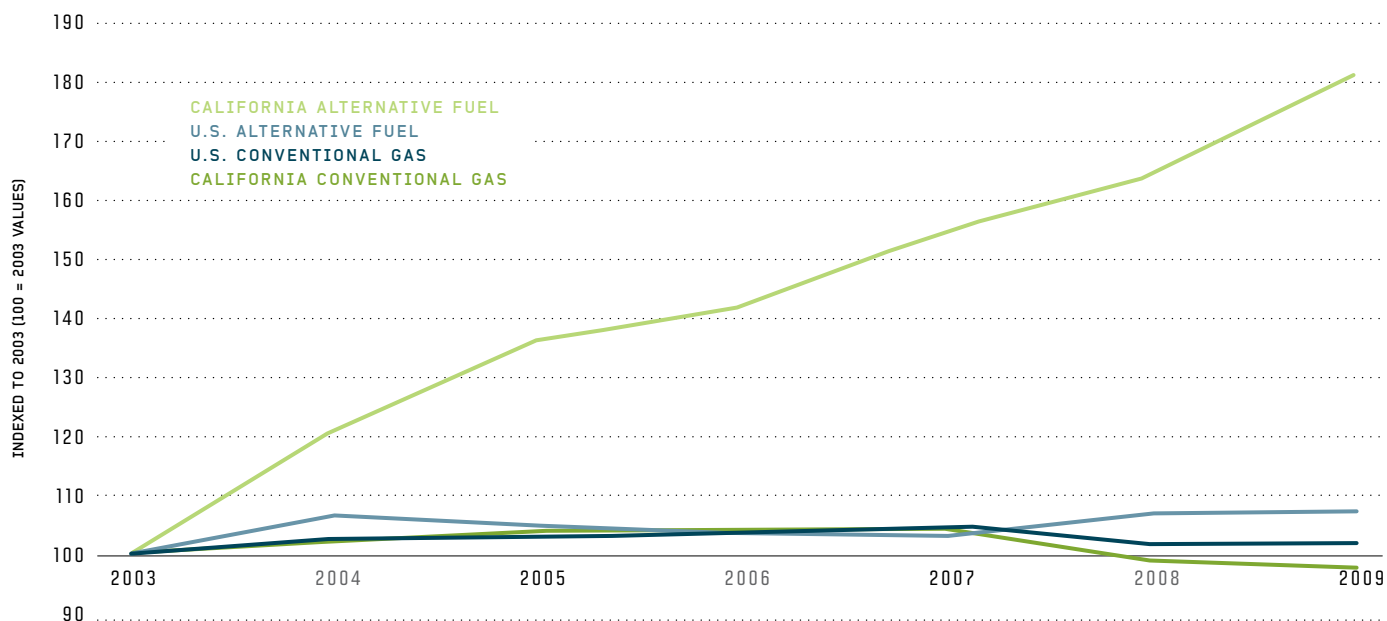
TRENDS IN TOTAL ALTERNATIVE FUEL VEHICLE REGISTRATIONS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: California Energy Commission. Analysis: Collaborative Economics



ALTERNATIVE FUEL AND CONVENTIONAL GAS CONSUMPTION RELATIVE TO 2003 / CALIFORNIA AND THE U.S.



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Alternative Fuel includes Electric, Ethanol, 85 Percent (E85), Liquefied Natural Gas (LNG), Liquefied Petroleum Gas (LPG), and Compressed Natural Gas (CNG). Data Source: Alternative Fuels Data – EIA Coal, Nuclear, Electric, and Alternate Fuels Division "Estimated Consumption of Alternative Fuels by State and Fuel Type," Table C4. Motor Gasoline Data – State Energy Data System, Series MGACP "Motor gasoline consumed by the transportation sector." Analysis: Collaborative Economics

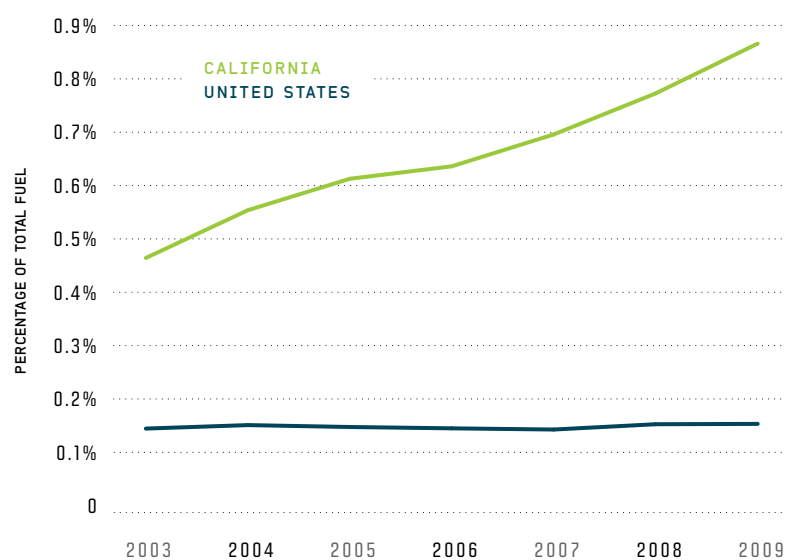
ALTERNATIVE FUEL CONSUMPTION AS A PERCENTAGE OF TOTAL TRANSPORTATION

	2003	2009
CALIFORNIA	0.46%	0.85%
UNITED STATES	0.15%	0.16%

PERCENTAGE OF VEHICLES CHANGED

	% CHANGE 2007-2009	% CHANGE 2008-2009
ELECTRIC	+9%	+3%
NATURAL GAS	+7%	+5%
HYBRID	+58%	+15%
TOTAL ALTERNATIVE FUEL VEHICLES	+49%	+14%
TOTAL VEHICLES	-1.6%	-1.3%

ALTERNATIVE FUEL CONSUMPTION AS A PERCENTAGE OF TOTAL TRANSPORTATION FUEL CONSUMPTION



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Alternative Fuel includes Electric, Ethanol, 85 Percent (E85), Liquefied Natural Gas (LNG), Liquefied Petroleum Gas (LPG), and Compressed Natural Gas (CNG). Data Source: Alternative Fuels Data – EIA Coal, Nuclear, Electric, and Alternate Fuels Division "Estimated Consumption of Alternative Fuels by State and Fuel Type," Table C4. Motor Gasoline Data – State Energy Data System, Series MGACP "Motor gasoline consumed by the transportation sector." Analysis: Collaborative Economics

WITH THE HIGH PROFILE COLLAPSE OF SOLYNDRA, QUESTIONS ABOUT BOTH THE SOLAR INDUSTRY'S ECONOMIC VIABILITY AND THE ROLE OF GOVERNMENT IN THIS FLEDGLING INDUSTRY HAVE DOMINATED THE NEWS AND POLITICAL DEBATE. THIS FEATURE INTENDS TO PROVIDE THE HARD DATA NECESSARY FOR AN INFORMED DISCUSSION. IT EXAMINES THE TREND LINES OF COST, VENTURE CAPITAL INVESTMENT, PATENT REGISTRATIONS AND MARKET PENETRATION.

SHEDDING LIGHT ON CALIFORNIA'S GROWING SOLAR INDUSTRY

AS IN ANY EMERGING INDUSTRY, INDIVIDUAL BUSINESSES RISE AND FALL BASED ON THE STRENGTH OF THEIR BUSINESS PLANS, MODELS AND EXECUTION. DESPITE THE SOLYNDRA BANKRUPTCY, CALIFORNIA'S SOLAR INDUSTRY IS A HOTBED WITHIN THE STATE'S RENEWABLE ENERGY SECTOR. IN NOVEMBER 2011, CALIFORNIA SURPASSED 1,000 MW OF SOLAR ENERGY CAPACITY, MARKING AN IMPORTANT MILESTONE IN ENERGY POTENTIAL AND PUTTING THE STATE IN THE TOP RANKS OF COUNTRIES WORLDWIDE IN SOLAR ADOPTION.

FALLING SOLAR PRICES

The installed cost of solar photovoltaic (PV) power systems in the U.S. fell substantially in 2010 and into the first half of 2011, according to Lawrence Berkeley National Lab (LBNL).¹⁰ The average installed cost of residential and commercial PV systems completed in 2010 fell by roughly 17 percent when compared to 2009, and dropped by an additional 11 percent within the first six months of 2011, due to the dramatic reductions in the price of PV modules. PV module prices have plummeted due in part to a global oversupply, led by several European countries with well-funded PV incentive programs and aggressive PV targets. The global PV market supply chain has expanded and PV technology has improved, driving down the costs of PV. Global market demand was estimated to be 16.6 gigawatts (GW) in 2010 and industry analysts estimate that there is currently significant manufacturing overcapacity in several key value chain components.¹¹ In the U.S. the national weighted-average system price dropped from \$6.45 per Watt (/W) to \$5.45 per Watt (/W) from the first quarter of 2010 to the first quarter of 2011, a decrease of over 15 percent. In addition cost improvements stemming from streamlining project development and installation procedures, such as integrated or modular racking systems, installation workforce training programs and streamlined permitting, also contributed

to lower costs. General Electric recently announced solar will likely be cheaper than electricity from fossil fuels in three to five years.¹²

Historical findings show the two largest factors for driving down PV costs are module efficiency and plant size. Overall, from 1980 to 2001 plant size growth accounted for 43 percent of the decrease in PV cost, and increased module efficiency accounted for 30 percent of the decrease. The two main drivers of scaling up were growth in expected future demand and the ability to manage investment risk.¹³ These factors in addition to incentives, such as the SunShot Initiative, have resulted in decreasing the cost of solar PV. If California hopes to meet its goal of 33 percent renewable energy by 2020 and current cost trends for solar PV continues, solar power will become a significant factor in future low-carbon plans.

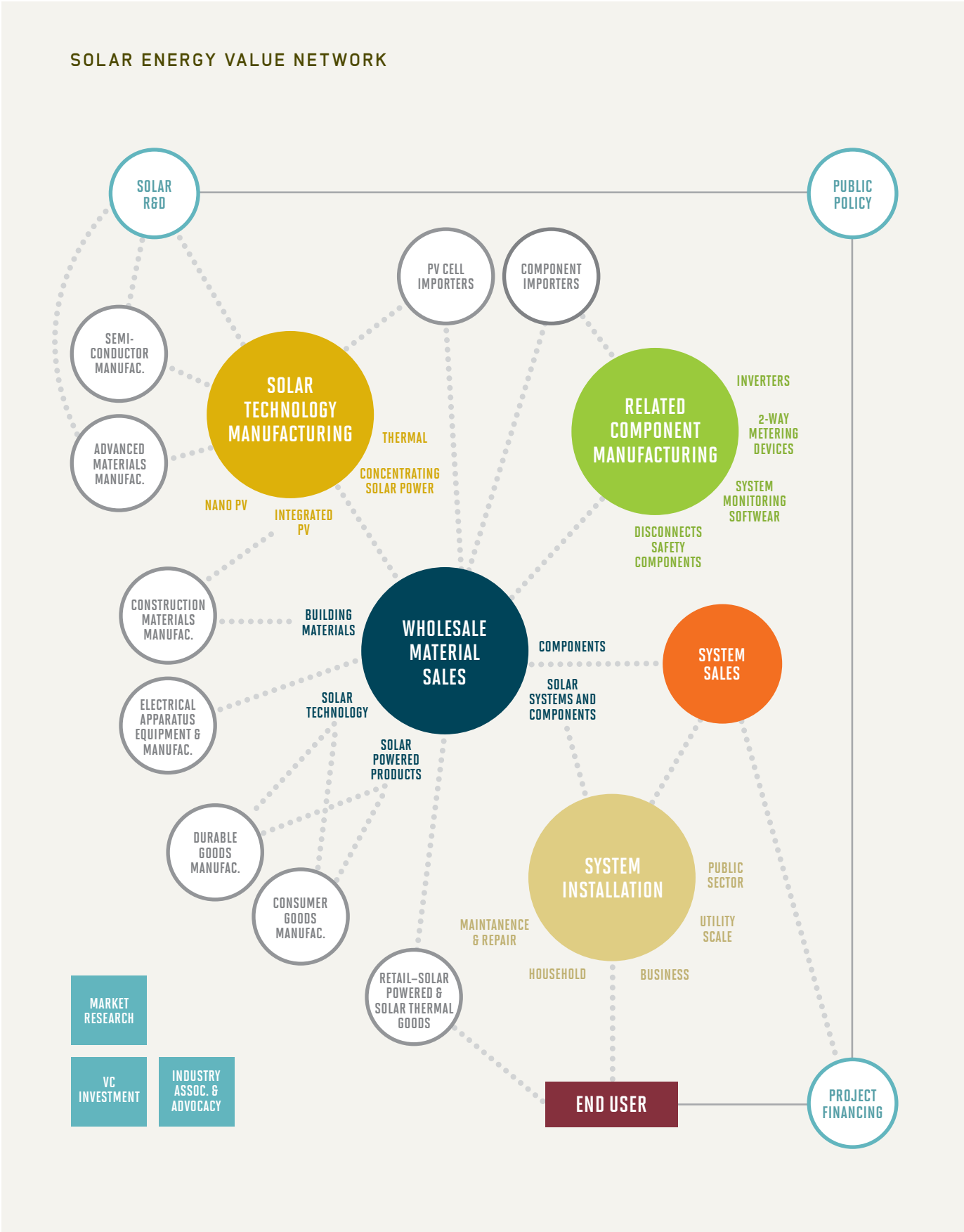
Resource cost scenarios suggest that traditional coal power plants will be replaced by solar, wind, gas, and/or nuclear generation, with renewable sources providing anywhere from 17 to 29 percent of total power by 2030 in the Western United States. The cost of PV technology is assumed to continue to decline substantially between now and 2030, at a rate of 3.7 percent per year, resulting in large-scale deployment of solar between years 2026 and 2029.¹⁴ If the Department of Energy

APPROACHING GRID PARITY IN SAN DIEGO

Solar grid parity, the point at which electricity generated from solar power is less costly than electricity generated from the existing grid, removes the cost barrier to the adoption of solar power systems. At the point of solar parity, it makes more economic sense to invest in solar installations than continuing to purchase electricity from the grid.

San Diego is predicted to be the first metropolitan city to reach solar grid parity in 2013. This prediction is based on calculations by John Farrell, senior researcher at the Institute for Local Self-Reliance. Four other California cities including San Francisco, San Jose, Los Angeles and Riverside are estimated to reach solar grid parity in the year 2017. By 2027, over 156 million Americans are expected to experience solar energy prices cheaper than the traditional grid.*

*California City News. Here Comes the Sun: Research Maps Solar Grid Parity in Cities; San Diego to be 1st City?. 04 Jan 2012. Web.



SunShot Initiative goal of reaching \$1/W solar PV system cost by 2020 is met, solar technology would be deployed quickly and on a large scale because electricity generated from solar power would cost less than electricity generated from traditional methods.

Turning to utility sector PV, costs varied over a wide range of systems installed in 2010, with the cost of systems greater than 5,000 kilowatts (kW) ranging from \$2.90 per watt to \$6.20 per watt, reflecting differences in project size, system configuration as well as the unique characteristics of certain individual projects.¹⁵

GROWTH OF THE INDUSTRY

California's solar industry has been growing at a solid clip since 1995. The total number of business locations has increased by 171 percent and total employment by 166 percent. For comparison, the state's economy as a whole has increased 70 percent in number of businesses and 12 percent in total employment over the same period.

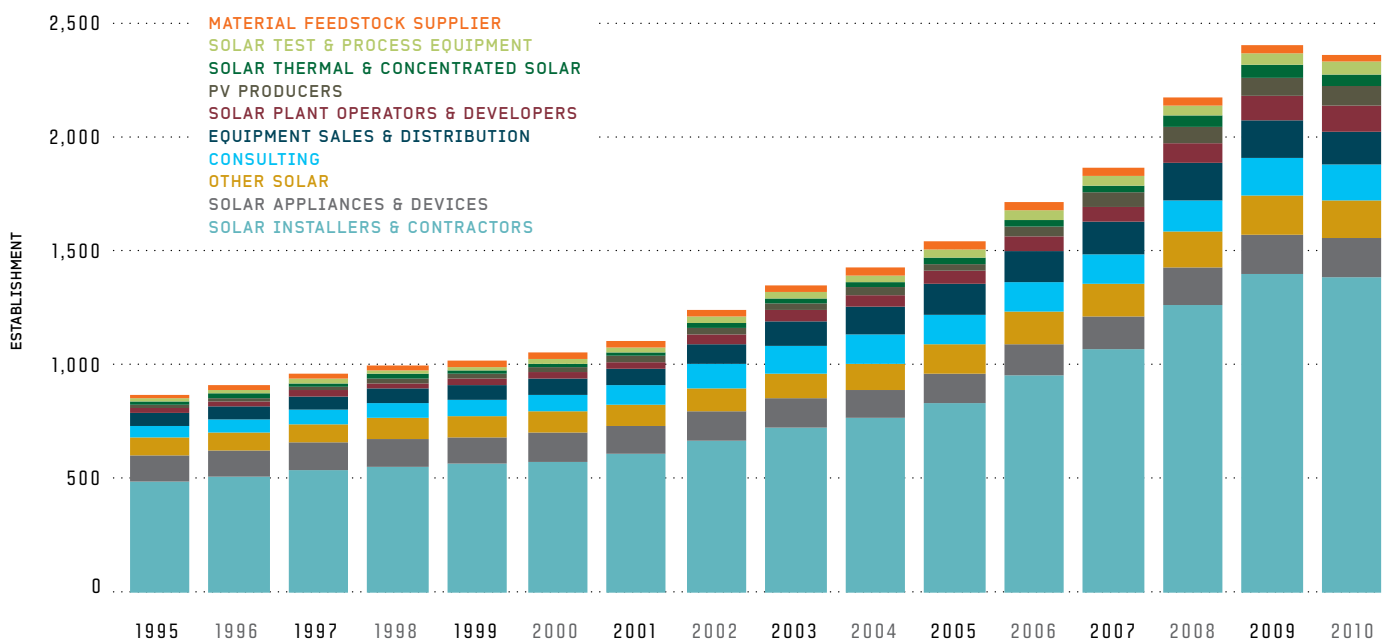
The state's solar industry is diverse. The full scope of the solar industry is actually much more far reaching when all of the activities spanning from research to installation are considered.

A technological innovation can have a wide-spread impact across the economy. For example, the economic impact of the application of solar energy technology goes well beyond the manufacture of photovoltaic cells. As the technology develops, new developmental branches emerge as solar research is influenced by other technological advances such as in nanotechnology.

Each new advance in solar technology presents opportunity for new applications and new products. And, each product has its own value chain requiring a different set of components. A complete energy generating system requires core components for the management and transmission of energy. These may or may not be exclusively "green" in character, but are growing in demand because of the growing solar market.

Manufacturers require component and materials suppliers as well as distributors of their own products. As solar technology manufacturing grows, distribution flows of supplies and products increase, and the realm of wholesale material/product sales related to solar expands. Not only are these wholesalers supplying retail sellers and installers of solar systems, they are also supplying solar technology to manufacturing industries such as construction materials, appliances, and other consumer goods.

SOLAR ESTABLISHMENTS BY SEGMENT CALIFORNIA



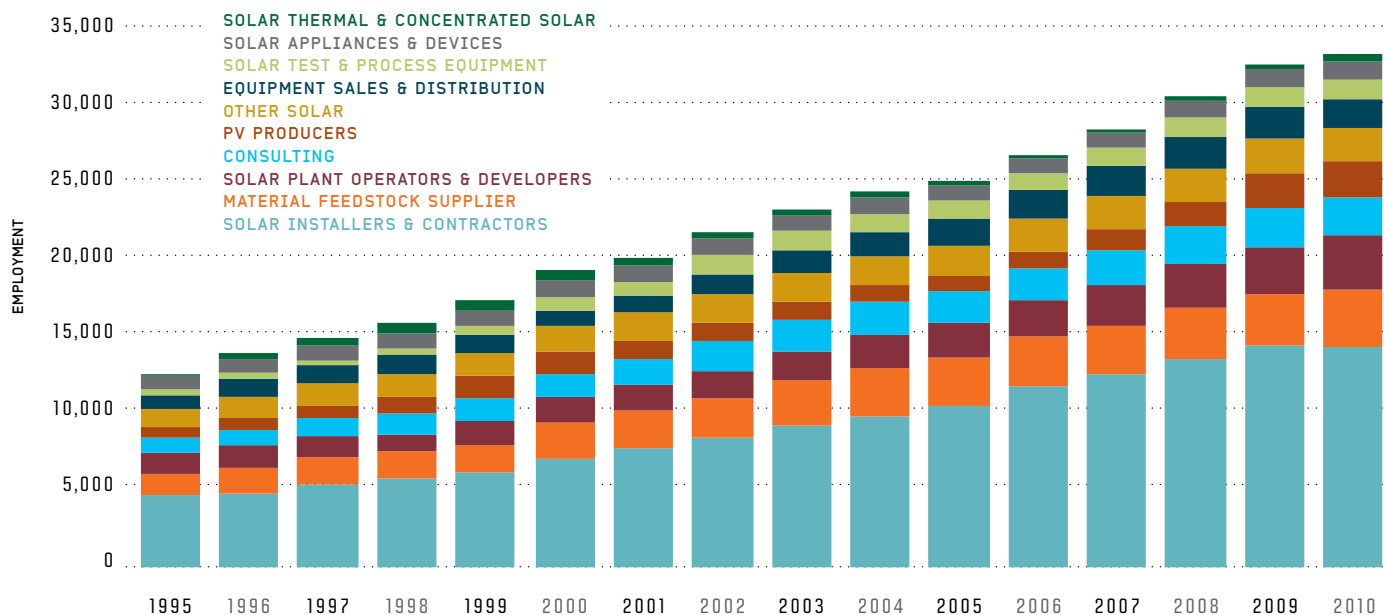
NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Green Establishment Database. Analysis: Collaborative Economics

SHEDDING LIGHT ON CALIFORNIA'S GROWING SOLAR INDUSTRY

SOLAR UNITS EXPLAINED

SOLAR INDUSTRY SECTORS	DESCRIPTION
MATERIAL FEEDSTOCK SUPPLIERS	PRODUCERS AND SUPPLIERS OF RAW MATERIALS FOR THE PRODUCTION OF SOLAR PANELS.
PV PRODUCERS	PRODUCERS OF DIFFERENT PHOTOVOLTAIC (PV) MATERIALS AND TECHNOLOGIES INCLUDING THIN FILM AND BUILDING INTEGRATED PHOTOVOLTAICS (BIPV). PV TECHNOLOGIES CONVERT SUNLIGHT INTO DIRECT CURRENT ELECTRICITY THROUGH THE USE OF SEMICONDUCTORS.
SOLAR THERMAL AND CONCENTRATED SOLAR SYSTEMS	DESIGNERS, PRODUCERS AND INSTALLERS OF SOLAR SYSTEMS THAT USE THE WARMTH OF THE SUN TO HEAT LIQUIDS WHICH PRODUCE STEAM IN ORDER TO GENERATE ELECTRICITY. DOES NOT INCLUDE PV TECHNOLOGIES.
INSTALLERS & CONTRACTORS	INSTALLERS OF SOLAR SYSTEMS OF VARYING SCOPE. INCLUDES MOSTLY CONTRACTORS AND CONSTRUCTION FIRMS SPECIALIZED IN SOLAR PROJECTS.
PLANT OPERATORS & DEVELOPERS	INCLUDES MANAGERS AND DEVELOPERS OF LARGE SCALE SOLAR PLANTS INVOLVING ARRAY PLACEMENT, CONNECTIVITY, OVERVIEW AND MANAGEMENT OF SOLAR SYSTEMS.
EQUIPMENT SALES & DISTRIBUTION	SELLERS OF SOLAR SYSTEMS AND RELATED EQUIPMENT INCLUDING INVERTERS, INSTALLATION BRACKETS AND ALL CONNECTING EQUIPMENT.
SOLAR APPLIANCES & DEVICES	SOLAR-POWERED APPLIANCES INCLUDING WATER HEATERS, ATTIC COOLERS, REFRIGERATORS AND STOVES. THIS SOLAR SECTOR ALSO INCLUDES SOLAR TUBE LIGHTING AS WELL AS SOLAR-POWERED OUTDOOR LIGHTING.
TESTING & PROCESS EQUIPMENT	PRODUCERS AND PROVIDERS OF EQUIPMENT FOR THE TESTING OF SOLAR TECHNOLOGY AND SYSTEMS.
CONSULTING	FIRMS AND CONTRACTORS WHO SPECIALIZE IN SOLAR PLACEMENT, COST ESTIMATION AND GENERAL CONSULTING WHO DO NOT INSTALL SOLAR SYSTEMS.
OTHER SOLAR	PROVIDERS OF SOLAR SYSTEMS IN ADDITION TO OTHER RENEWABLE ENERGY SYSTEMS. MOST BUSINESSES IN THIS SECTOR PROVIDE SOLAR AND WIND SYSTEMS.

SOLAR EMPLOYMENT BY SEGMENT CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Green Establishment Database. Analysis: Collaborative Economics

The end users of solar technology are varied, and as the technology continues to develop in new ways, new applications will emerge. In addition to energy generating systems on roofs of homes and schools, new business models are appearing such as the case with the solar car wash and other innovative business concepts.

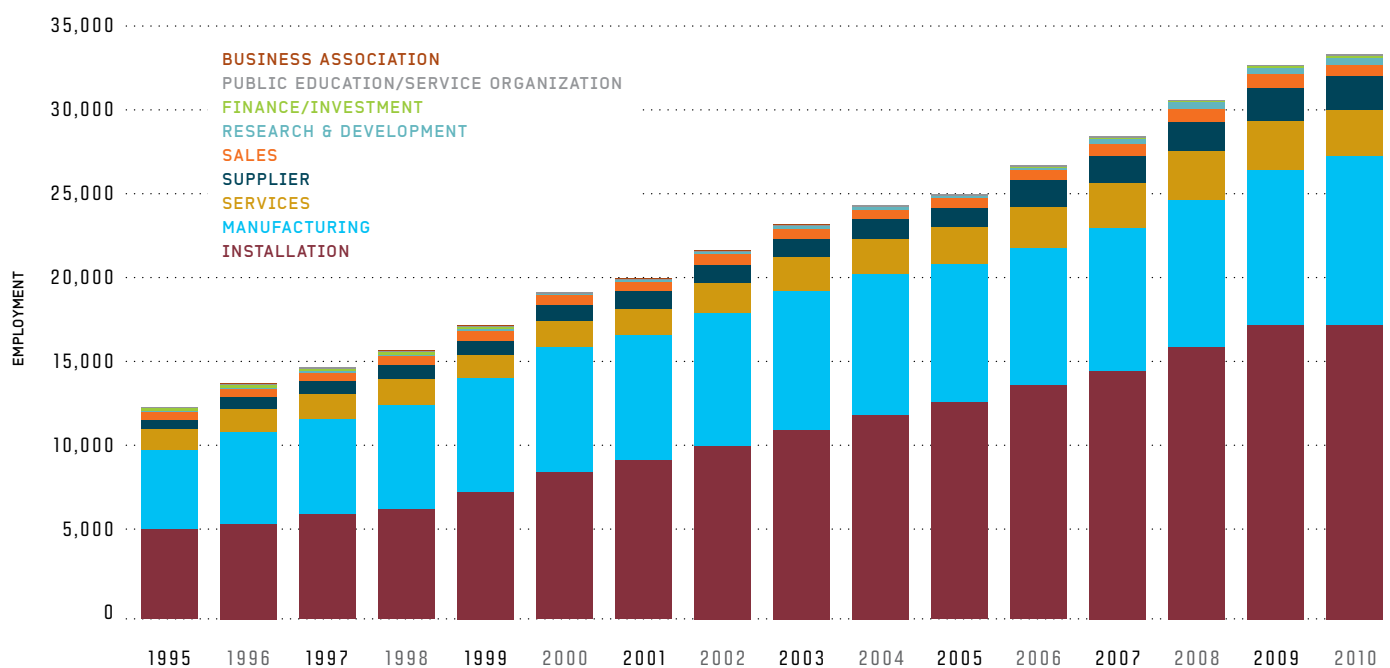
Completing the framework of research & development (R&D), Policy and Project Financing, of the Solar Energy Value Network are three other pieces that serve to speed the flows of activity described above. Venture capital investment encourages R&D and speeds the process of getting new technology to market. Market research feeds vital information back to the R&D and commercialization processes. Industry associations provide a networking space for businesses and individuals as well as a voice for influencing public policy in areas such as streamlining public permitting processes, defining government regulated standards and designing public incentives for technology adoption. In each area, specialized business activities are developing with a focus on the solar energy market. In addition to multiple solar industry associations, marketing firms as well as venture capital firms are appearing with a single focus on the solar energy market.

BUSINESS AND JOB GROWTH

Solar employment growth varies across the solar segments but has been dominated by Solar Installers & Contractors. This surging segment increased threefold since 1995 and constituted 43 percent of total solar employment or nearly 14,200 jobs in 2010. Despite the recent recessionary period, total solar employment has continued to climb, ticking up two percent since 2009. In the recent period, Material Feedstock Supplier (the second largest segment) grew 13 percent, followed by a 15 percent growth in Solar Plant Operations & Developers.

Solar establishments are predominately categorized as Solar Installers & Contractors, representing 59 percent of total establishments in 2010. The year 2010 marked the first time in the observable period that total solar establishments declined, falling two percent to just under 2,400 establishments. While the largest five segments witnessed drops from 2009 levels, growth was seen in Solar Plant Operators & Developers, Solar Test & Process Equipment and PV Producers.

SOLAR EMPLOYMENT ALONG THE VALUE CHAIN CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Green Establishment Database. Analysis: Collaborative Economics

SHEDDING LIGHT ON CALIFORNIA'S GROWING SOLAR INDUSTRY

Solar industry businesses can be viewed by their primary functions along the production value chain. Since 1995, employment along the value chain has increased steadily, expanding 166 percent. In 2010, Installation and Manufacturing accounted for the vast majority of employment along the solar value chain. Installation remained stable over the previous year, while Manufacturing shot up nine percent.

While manufacturing jobs continue to climb in the state, the supply of inexpensive, quality panels produced in China and other nations continue to feed the installation market, the solid base of California's solar industry. The state can utilize global competition, driving down the price of solar panels, to grow other segments of the value chain and to provide residents with cost effective systems. Research shows that nationally the vast majority of solar jobs are across the finance, services and installation segment and not in manufacturing, presenting California with the opportunity to redefine its niche within the global solar market.¹⁶

INVESTMENT & INNOVATION

California is a global hotspot in the development of solar technology. In addition to driving technological advance in its

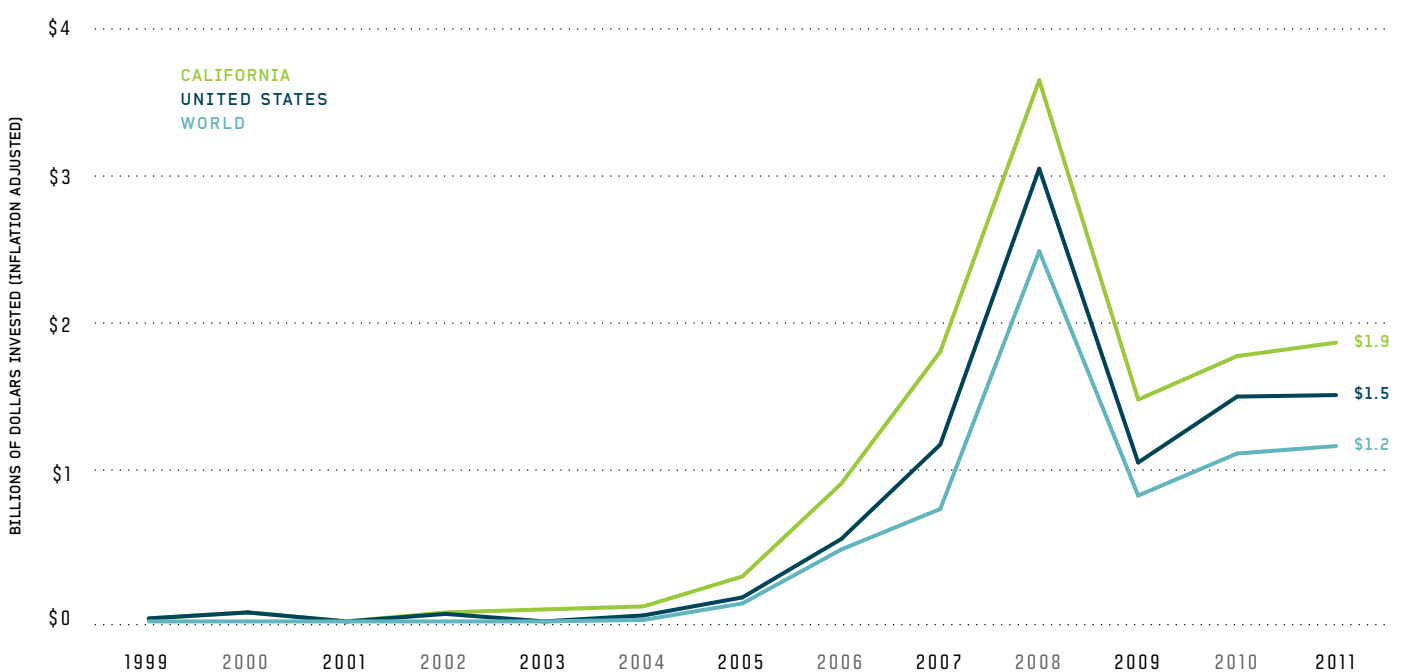
world-class research centers, the state must also be a leader in the adoption of new solar technology in order to continue driving the innovation process and benefit from the economic gains locally.

Venture Capital

In 2011, California made up 62 percent of total global venture capital (VC) investment in solar and 77 percent of total U.S. investment. The U.S. as a whole accounts for over 81 percent of global VC investment in solar. VC investment in solar technology increased by four percent in the state from 2010 to 2011, reaching \$1.2 billion. Global solar investment attained \$1.9 billion in 2011 and increased five percent over the prior year. As global markets continue to grow, investment in research and business growth will increase where markets are expanding.

VC investment related to solar is directed toward the commercialization of specific technologies as well as to a variety of business activities across the solar value network. Since 2005, investment has been concentrated in photovoltaics (PV) and solar thermal technologies. In 2008, there was a significant jump in investment in different types

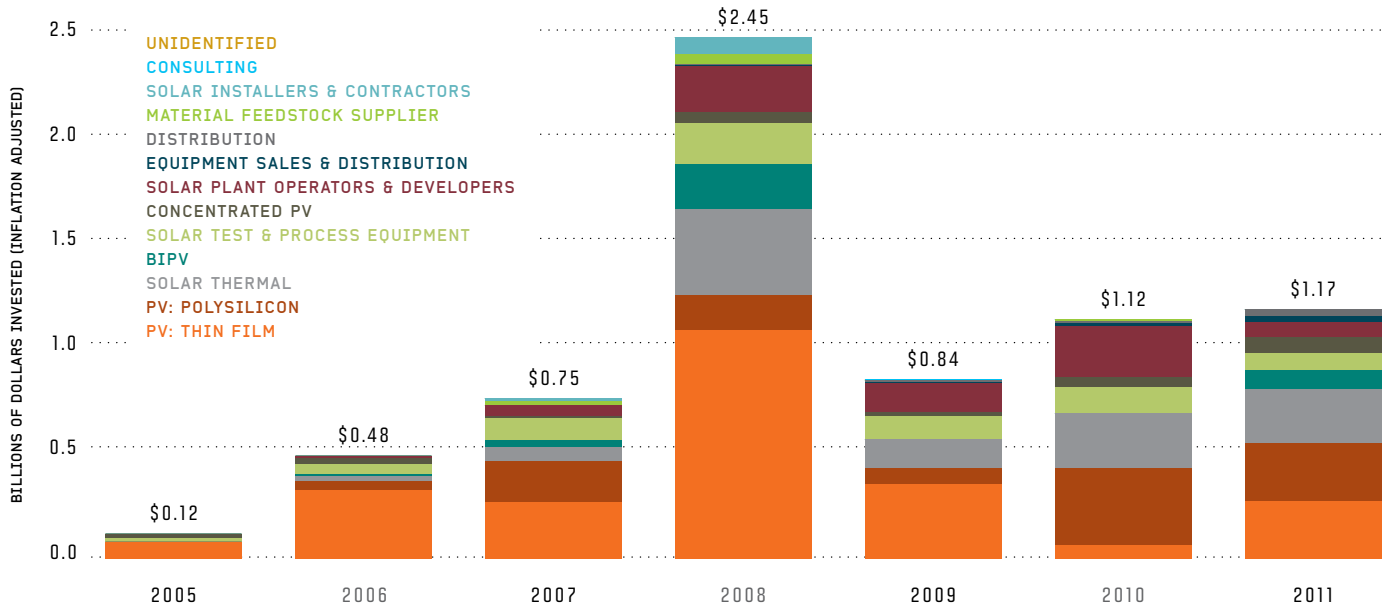
VENTURE CAPITAL INVESTMENT IN SOLAR TECHNOLOGY CALIFORNIA, UNITED STATES, AND WORLD



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Cleantech Group™ LLC. Analysis: Collaborative Economics

VENTURE CAPITAL INVESTMENT IN SOLAR TECHNOLOGY BY SEGMENT

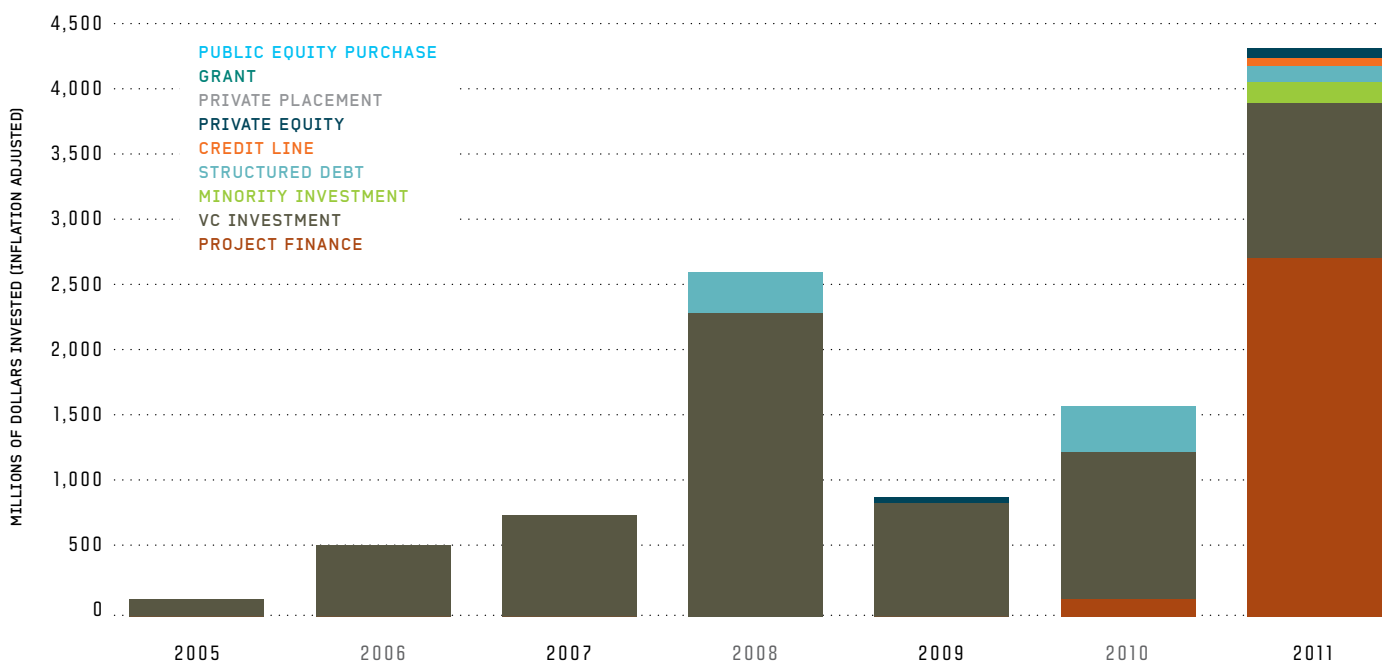
BILLIONS OF DOLLARS INVESTED / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Cleantech Group, LLC. Analysis: Collaborative Economics

INVESTMENT IN SOLAR TECHNOLOGY BY INVESTMENT TYPE

MILLIONS OF DOLLARS INVESTED / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Cleantech Group, LLC. Analysis: Collaborative Economics

of thin film PV technologies as well as in solar thermal. Combined, the three largest areas of investment, Thin Film PV, Polysilicon PV and Solar Thermal, represented 68 percent of total solar VC investment in 2011.

In addition to VC investment, other forms of investment and project funding are growing and representing a broad range of developmental phases between research and installation. In particular, project financing activity soared in 2011. Recently, Rabobank and SolarCity, based in San Mateo, announced they have teamed up to finance more than 30 commercial solar projects in California worth \$42.5 million. The new fund is part of an ongoing collaboration that already has developed a solar-powered electric vehicle charging

corridor between Los Angeles and San Francisco and solar installations at several California banks.

Patents

The registration of patents related to solar technology is strong and growing in California. Tracking trends in patent registrations in the state provides an indication for the growth of research activity with potential commercial application. A total of 105 patents were registered in California in 2010 in solar technologies and related processes. This represents a doubling of registrations over the prior year and also the highest number over the observable period since 1975.

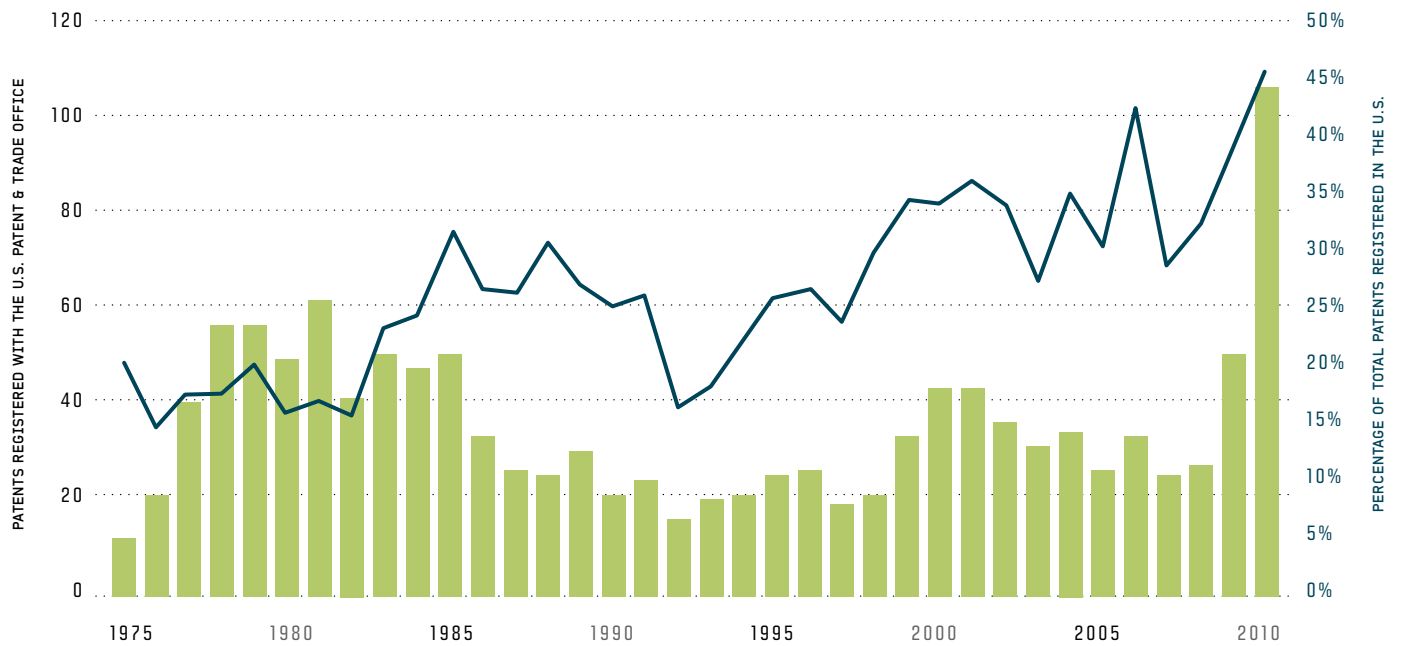
WARREN BUFFETT'S INVESTMENT IN FIRST SOLAR

Topaz Solar Farm, located in San Luis Obispo County, was purchased by billionaire investor Warren Buffett in December 2011. Once completed, this 550-megawatt (MW) solar farm will be one of the largest solar photovoltaic projects in the world, generating enough energy to power 160,000 homes. Pacific Gas & Electric's (PG&E) 25-year purchasing power agreement, signed before the drop in energy prices solidifying relatively high power rates, increased the value and attractiveness of this investment opportunity. Buffett's MidAmerican Energy Holding Company bought the farm from First Solar, which had been searching for an investor since September when the company was unable to secure a \$1.9 billion federal loan guarantee. This is due to the Department of Energy's inability to process the detailed loan guarantee and First Solar's failure to meet all requirements by the statutory September 30 deadline. First Solar will continue to manage the operations and construction of the project, which will produce 400 engineering and construction jobs.

This solar investment expands upon Buffett's portfolio of renewable energy assets, which includes 1,400 MW of wind power. Buffett's venture has boosted the solar industry and helped restore confidence in investors who questioned the stability of the industry following bankruptcies of large solar suppliers including Solyndra. After receiving \$535 million in federal loan guarantees and raising \$1 billion from investors, the Fremont, California solar panel manufacturer filed for bankruptcy in September 2011 unable to stay competitive as solar panel prices plummeted. Speaking about First Solar, Greg Abel, President and CEO of MidAmerican Energy Holdings Company, said it clearly, "this project demonstrates that solar energy is a commercially viable technology without the support of governmental loan guarantees."*

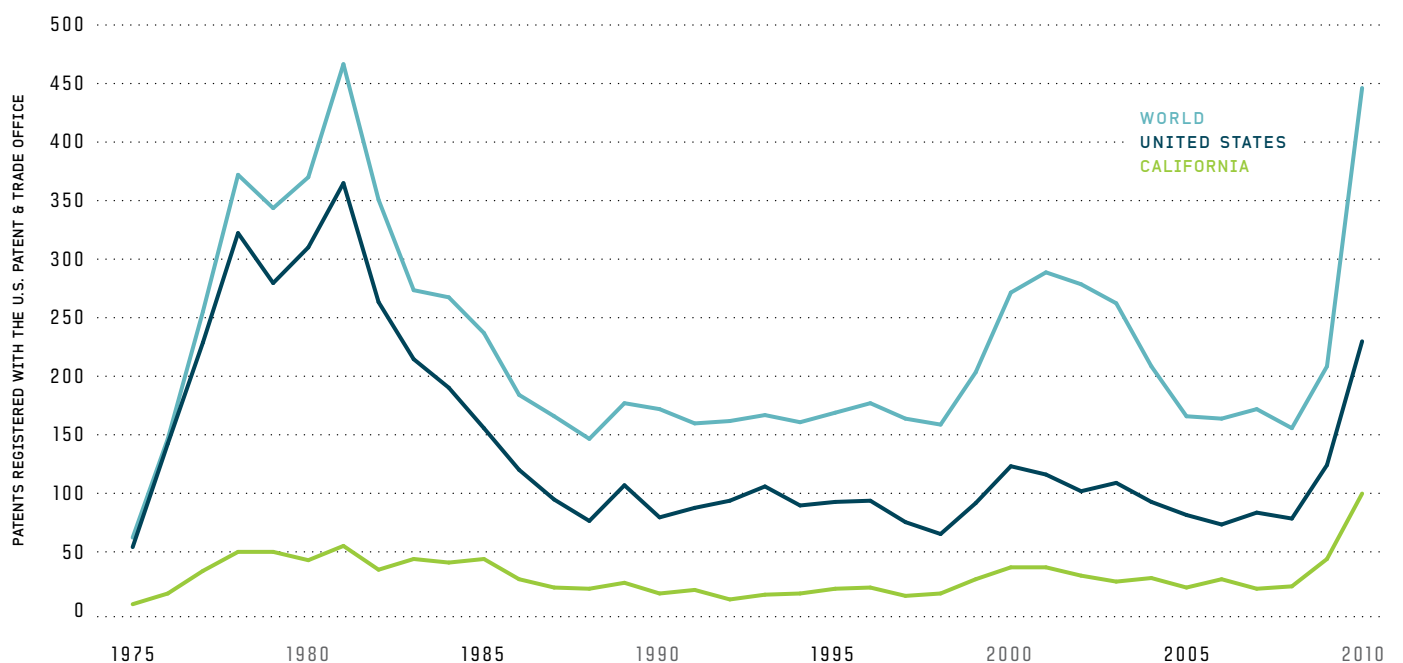
*San Luis Obispo Tribune. Warren Buffett buys Carrizo solar farm. 8 Dec. 2011. Web.

SOLAR PATENTS IN CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

SOLAR PATENTS REGISTERED CALIFORNIA, UNITED STATES, AND WORLD



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

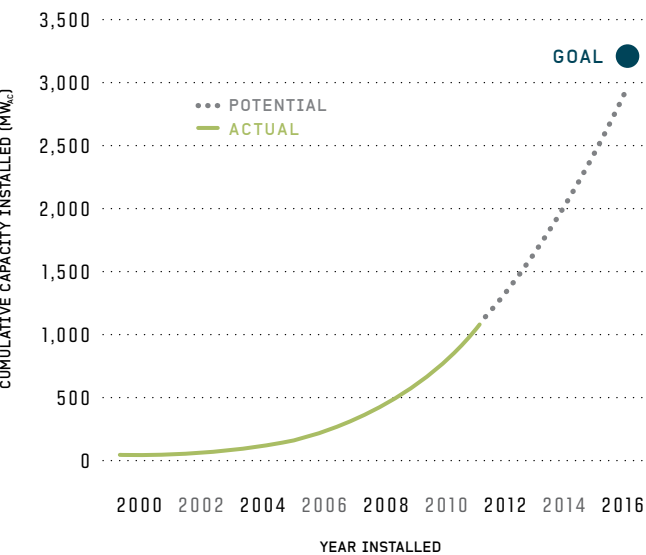
California accounts for a growing percentage of patents registered in the U.S. and abroad. The percentage of solar patents registered from California increased from 20 percent in 1975 to 45 percent in 2010. Globally, California represented 24 percent of the world's solar patents (registered with the U.S.P.T.O), up from 18 percent in 1975.

The registration of patents in solar technology has increased rapidly around the world. The increase in California is outpacing that of the U.S. and global trends. Since 2005, California's number of patents registered per year has tripled. Nationally and globally, registrations have increased by roughly 150 percent.

GROWING SOLAR CAPACITY

California's solar generation capacity has increased exponentially since 2000 and is on the path to meeting the Million Solar Roofs Initiative goal of 3,000 megawatts (MW) of distributed solar energy installations by the conclusion of 2016.¹⁷ In 2011, California surpassed 1,000 MW of installed solar capacity, and as of February 2012 the state had installed over 1,200 MW of solar energy power.¹⁸

ACTUAL (THROUGH 2011) AND POTENTIAL (THROUGH 2016) SOLAR INSTALLATIONS CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Chart taken from Environment California's "California's Solar Cities 2012" report, page 16. For methodology please refer to Environment California's "Building a Brighter Future California's Progress Toward a Million Solar Roofs," report, page 23. Data Source and Analysis: Environment California, California's Solar Cities 2012

San Diego leads the state in both solar capacity and number of solar installations. In August 2011, San Diego's solar generation capacity equaled 37 megawatts followed closely by Los Angeles (36 MW) and San Jose (31 MW).

The city of Roseville, located near Sacramento, ranks eighth in number of installations but 84th in solar capacity. This is due in part to the large number of residential solar installations, which possess less generation capacity than do commercial installations.¹⁹

The U.S. installed 1,046 MW (1.05 gigawatts, GW) of new solar capacity in the first three quarters of 2011, representing the first year of PV installations surpassing one GW of capacity in the U.S. In addition, the third quarter of 2011 witnessed the largest addition of solar capacity in any single quarter in the history of the U.S. PV market. A total of 449.2 MW were installed, a 140 percent increase over the third quarter in 2010. Of these installations 44 percent (196.7 MW) were in California, followed by 14 percent (64.6 MW) in New Jersey.

California possesses the largest solar energy capacity of any state, representing 29 percent of the nation's total in 2011.

CALIFORNIA'S TOP SOLAR CITIES BY GENERATION CAPACITY AND BY NUMBER OF INSTALLATIONS				
CITY	SOLAR CAPACITY (MW)	RANK BY CAPACITY	NUMBER OF INSTALLATIONS	RANK BY INSTALLATIONS
SAN DIEGO	37	1	4,507	1
LOS ANGELES	36	2	4,018	2
SAN JOSE	31	3	2,733	3
FRESNO	22	4	2,146	5
SAN FRANCISCO	17	5	2,405	4
BAKERSFIELD	16	6	1,643	6
SACRAMENTO	16	7	1,119	10
SANTA ROSA	14	8	1,467	7
OAKLAND	10	9	1,010	11
CHICO	9	10	615	19
CLOVIS	8	11	1,133	9
ROSEVILLE	3	84	1,170	8

NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Note: Data through August 2011. Data Source and Analysis: Environment California, California's Solar Cities 2012

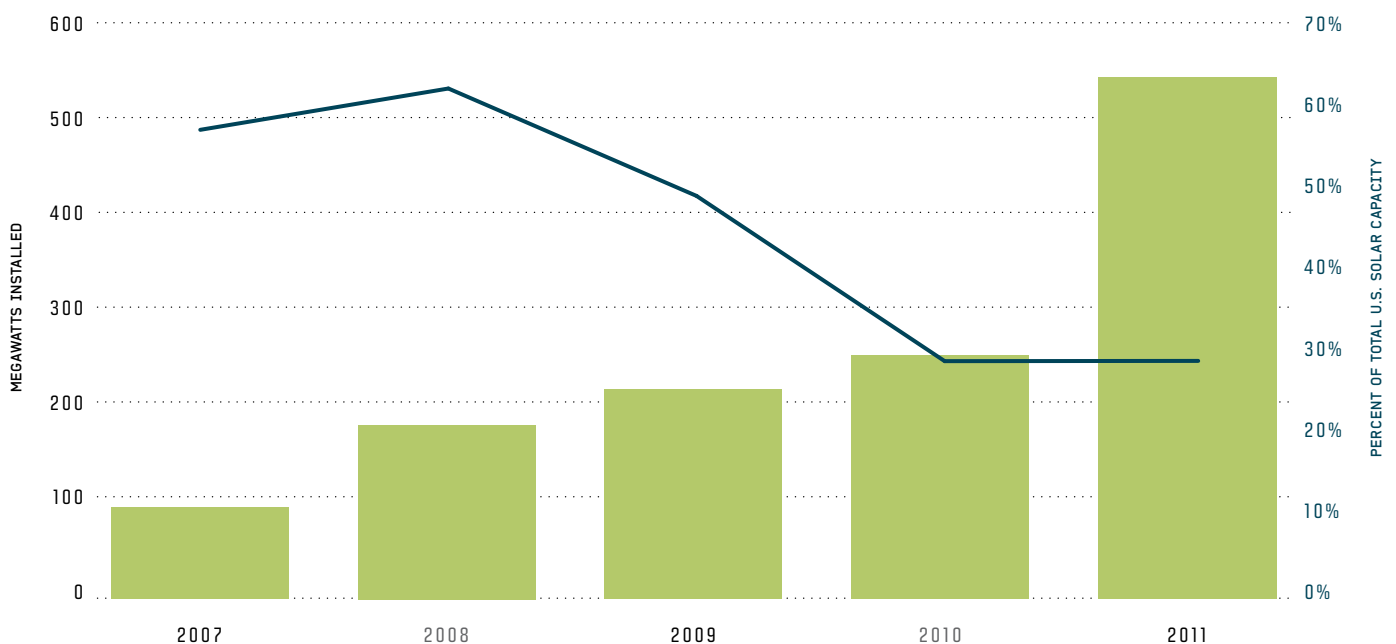
New Jersey ranks second, accounting for 17 percent of total capacity installed over the same time period. California's percentage of total U.S. solar capacity has been declining since 2008 and leveling off in 2011, as solar installations have gained momentum in other states. The nine percent uptick in 2011 was due to a jump in utility installations in the state.

The U.S. Solar Market is diversifying. While the top five PV installation states in 2007 comprised 89 percent of the nation's total solar market, in 2011 the top five states totaled 72 percent. New Jersey's solar market is expanding; in 2010 New Jersey became the second state to install over 100 MW of solar capacity in a single year, increasing 137 percent in 2011 to install 313 MW. California continues to build upon its solar energy capacity, while representing a shrinking percent of the U.S. total. In 2007, California comprised 57 percent of the U.S. PV market, but leveled off to under 30 percent by 2011. Since the U.S. PV market is split among various states, it benefits from a variety of incentives and market structures, making it less likely to experience a national boom or bust cycle like those observed in countries with feed-in tariff

markets. As the solar market diversifies to other states, the overall national market becomes more stable.

Looking at the growth in solar capacity globally, the U.S. trails Germany, Spain, Japan and Italy. In 2010, Germany ranked number one in solar energy generation with over 17,300 megawatts capacity, increasing nearly 75 percent over the previous year. Germany's solar potential was four times higher than that of Spain, the country with the second highest cumulative installed solar capacity, and more than 21 times that of California. Japan and Italy trailed closely behind Spain with 3,600 MW and 3,500 MW of cumulative solar energy capacity respectively in 2010. China is quickly closing in on the top countries and installed 2,900 MW in 2011 alone.²⁰ California ranked tenth in cumulative installed solar power behind China and Belgium in 2010, nearing 1,000 MW of total capacity at that time.

TOTAL SOLAR CAPACITY IN CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Solar Energy Industries Association, GTM. Analysis: Collaborative Economics

THE ROLE OF GOVERNMENT

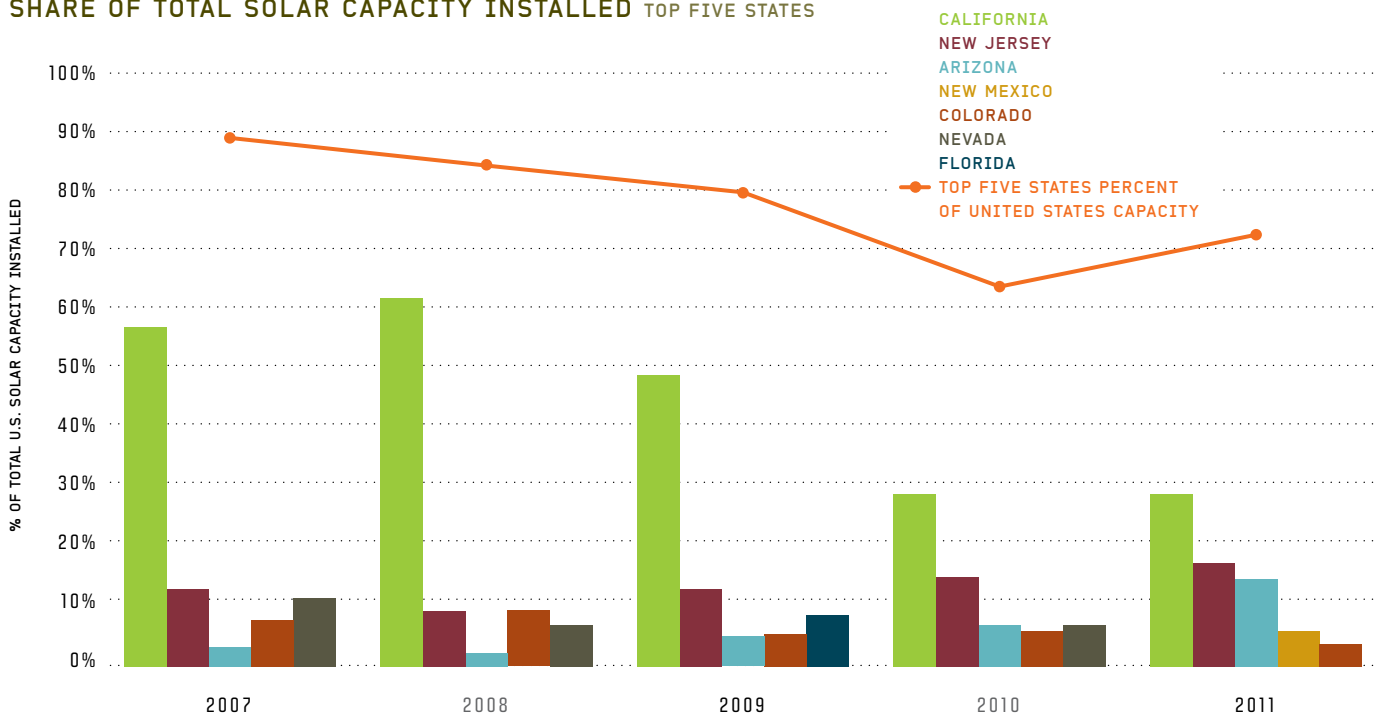
As discussed in the virtuous cycle of green innovation on page 6, public policy can play a significant role in the advancement of technology by driving investment in R&D efforts and by incentivizing early adoption of new technology. Project financing is critical to the growth of adoption of solar technology. Investors need the market certainty that public policy can provide before offering the levels of capital needed for project financing. A wide variety of policies can help to create a level playing field and market certainty for solar and other renewables without picking specific technology “winners” and “losers.” Renewable Energy or Portfolio Standards, pricing the externalities of fossil fuels (e.g. carbon price), and other state and federal policies can provide market certainty.

Despite falling prices, installation of a solar system involves upfront capital investment that is too expensive for many households and businesses. State rebates and federal tax credits aim to lessen this barrier to adoption. Federal and state programs including the Investment Tax Credit,

30 percent federal tax credit for residential PV systems and standard offer performance-based incentives for systems larger than 30kW. Continued federal and state incentives will play a critical role in the magnitude and predictability of future PV prices. In addition, the SunShot goal articulated by the U.S. Department of Energy, if achieved, would substantially reduce PV cost and change the benefit-cost equation. The longer term for a PV incentive, the lower the \$/kWh payment needs to be, creating the opportunity for PV to reach parity faster.²¹ Businesses have sprung up to help small and large-scale consumers alike to best leverage these public incentives and find ways of financing projects.

Much of the rapid growth of solar capacity globally is attributed to generous feed-in tariffs, awarding standard offer performance-based incentives that provide PV projects with a payment for each KWh generated for a set number of years to solar power generators. Following the rapid growth and the recent economic downturn, these lucrative feed-in tariffs are being scaled back beginning in 2012.

SHARE OF TOTAL SOLAR CAPACITY INSTALLED TOP FIVE STATES



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: Solar Energy Industries Association. GTM Research. Analysis: Collaborative Economics

CONCLUSION

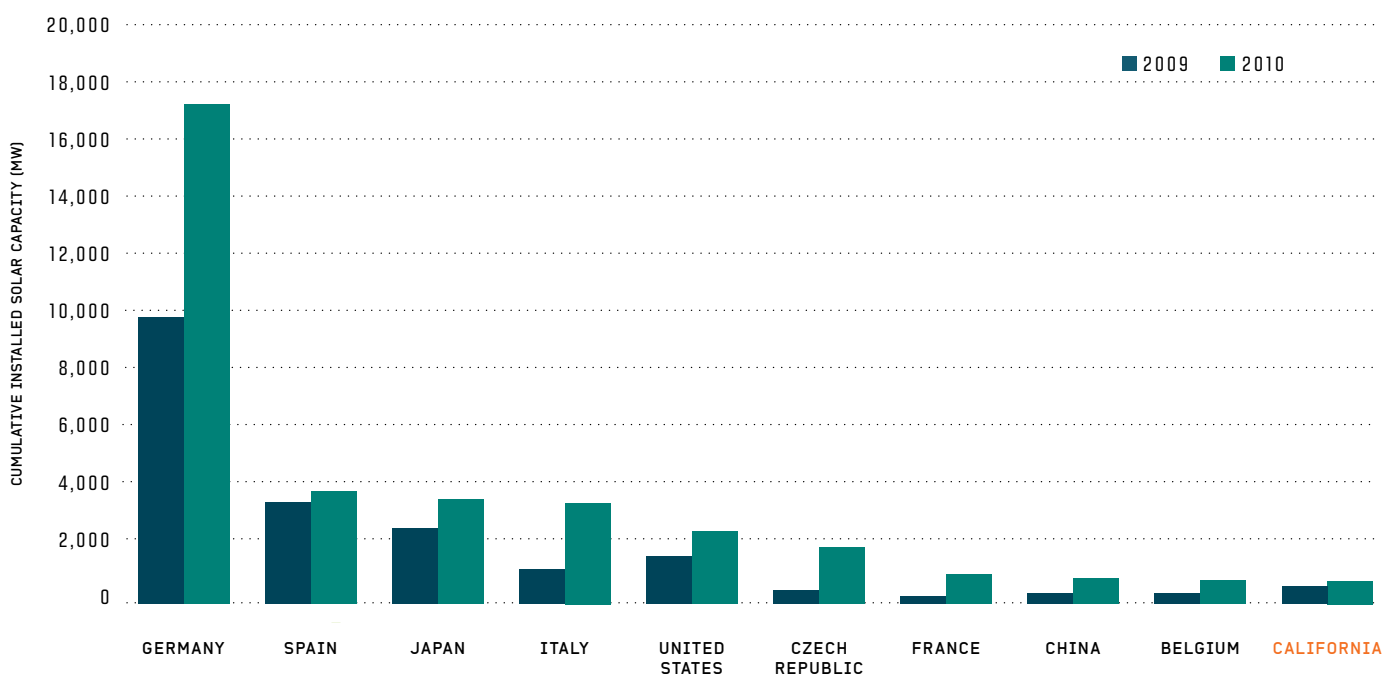
In sum, California continues to be the national leader in solar technology in R&D, commercialization and adoption. Not only does the state benefit from the application of solar, lessening the state's dependency on carbon-based energy, the state's economy also benefits from the related business and employment growth.

California surpassed 1,000 megawatts (MW) of solar capacity In November 2011, a milestone in solar generation potential. San Diego, Los Angeles and San Jose lead the state in solar installations, cumulatively representing eleven percent of the state's total capacity.

While the solar industry has recently been clouded by the bankruptcy of the solar panel manufacturer, Solyndra, California's solar industry is much larger and diverse than a single company. Solar in California continues to grow. Private and venture capital investment in solar technology is growing, supporting the commercialization of solar products and funding of projects within the state.

California ranks among the top countries in solar adoption. The continuation of the state's path-breaking public policy adoption including the California Solar Initiative, the New Solar Homes Partnership and the Renewables Portfolio Standard in conjunction with private funding and ample sun-soaked land will further propel the solar industry forward in the Golden State.

CUMULATIVE INSTALLED SOLAR PHOTOVOLTAIC CAPACITY (MW) TOP COUNTRIES AND CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: BP Statistical Review of World Energy June 2011, California Energy Commission. Analysis: Collaborative Economics

SOLARCITY – REIGNING SUPREME IN RESIDENTIAL SOLAR

SolarCity, based in San Mateo, produces, designs, installs, finances and maintains solar systems in eleven states and added 12,000 projects in 2011 alone. Leases constitute a large amount of the company's residential revenues. SolarCity typically offers a variety of lease structures, including zero down-payment options as well as monitoring, maintenance and repair for its solar systems. Instead of purchasing a PV system, a homeowner enters into a contract with SolarCity, who owns the PV system, and agrees to make monthly lease payments over a set period of time while consuming the electricity generated.

Google is investing over \$280 million in partnership with SolarCity to build more residential solar projects across the country, making it the largest fund of this type in the U.S. and Google's largest investment to date in renewable energy. In September 2011, Wal-Mart announced plans to partner with SolarCity to bring solar energy to 75 percent of Wal-Mart's California locations. Additionally, in 2011 SolarCity launched SolarStrong, a five-year, \$1 billion plan for outfitting up to 120,000 U.S. military housing units with rooftop solar.*

* SolarCity, <http://www.solarcity.com/>.

ENDNOTES

- ¹ U.S. Department of Energy. *Department of Energy Offers \$2.1 Billion Conditional Commitment Loan Guarantee to Support California Solar Thermal Power Plant*. SunShot Initiative, 18 Apr. 2011. Web.
- ² Nemet, Gregory and Kammen, Daniel. *U.S. Energy Research and Development: Declining investment, Increasing Need, and the Feasibility of Expansion*. pp. 750. Feb. 2006. Web.
- ³ A "backward citation" is the term used for a traditional citation: it is the document that was published earlier, and which appears on the newer document's front page. In turn, the newer document is called the "forward citation" or "citing document."
- ⁴ California Air Resources Board. *Trends in California Greenhouse Gas Emissions for 2000 to 2008 – by Category as Defined in the Scoping Plan*. 28 May 2010. Web. As for other factors behind the variability in the recent years, the peak in 2004 is due primarily to the low snowpack that year. Because of the limited capacity for hydroelectric generation, more power was generated by natural gas or coal plants. At the end of 2005, a coal plant located in Nevada and serving Southern California was shut down, and replacement power came from an in-state natural gas plant.
- ⁵ California Air Resources Board. *Staff Report: California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit*. 16 Nov. 2007. Web.
- ⁶ California Energy Commission. *California Energy Demand 2010-2020 Adopted Forecast*. pp. 14. Dec. 2009. Web.
- ⁷ California Energy Commission. *2010 Integrated Energy Policy Report Update*. pp. 11. Web.
- ⁸ California Public Utilities Commission. *Renewables Portfolio Standard Quarterly Report*, 3rd Quarter 2011. pp. 2. Web.
- ⁹ Mulkern, Anne. *California utilities surge past 20% mark for green energy*. ClimateWire. 8 Mar. 2012. Web.
- ¹⁰ Latest edition of an annual PV cost tracking report released by the Lawrence Berkeley National Laboratory in September 9, 2011.
- ¹¹ New York State Energy Research and Development Authority. *New York Solar Study: Executive Summary*. Jan 2012. Web.
- ¹² Bloomberg. *GE Sees Solar Cheaper than Fossil Fuels in Five Years*. 26 May 2011. Web.
- ¹³ Nemet, Gregory. *Beyond the learning curve: factors influencing cost reductions in photovoltaics*. 2005. Web.
- ¹⁴ Nelson et al. *High-resolution modeling of the western North American power system demonstrates low-cost and low-carbon futures*. 3 Feb. 2012. Web.
- ¹⁵ Latest edition of an annual PV cost tracking report released by the Lawrence Berkeley National Laboratory in September 9, 2011.
- ¹⁶ Kammen, Daniel. *Solar opportunity or new trade war?* San Francisco Chronicle. 28 Dec. 2011. Web.
- ¹⁷ Madsen, Kinman and Bernadette Del Chiaro. *Building a Brighter Future: California's Progress Toward a Million Solar Roofs*. Frontier Group and Environment California Research & Policy Center. Nov. 2011. Web.
- ¹⁸ California Energy Commission & California Public Utilities Commission. *California Solar Statistics: California Leads the Nation*. 24 Feb. 2012. Web.
- ¹⁹ Environment California. *California's Solar Cities 2012*. pp. 12. Jan 2012. Web.
- ²⁰ Getsolar.com. *Massive Growth in Chinese Solar Could Support Global Industry*. Feb. 2012. Web.
- ²¹ New York State Energy Research and Development Authority. *New York Solar Study: Executive Summary*. Jan 2012. Web.

APPENDIX

DASHBOARD INDICATORS

GREEN TECHNOLOGY INNOVATION

Cleantech Venture Capital Investment

Cleantech venture capital investment data is provided by Cleantech Group™, LLC (www.cleantech.com) and includes disclosed investment deals. Cleantech investment VC data is as of January 5th, 2012. Data is adjusted into 2011 dollars, using the U.S. city average Consumer Price Index (CPI) of all urban consumers, published by the Bureau of Labor Statistics. Data for total annual venture capital investment is provided by PricewaterhouseCoopers/National Venture Capital Association MoneyTree™ Report, Data: Thomson Reuters. The San Diego region is comprised of San Diego and Imperial Counties; the Los Angeles area includes Los Angeles and Ventura Counties; Orange County is only Orange County; the San Francisco region contains the ten county Bay Area region; and Silicon Valley is comprised of San Mateo County, Santa Clara County, Scotts Valley, Fremont, Newark and Union City.

Green Technology Patents and Patent Citations

1790 Analytics developed and performed the search of detailed U.S. Patent data from the U.S. Patent & Trade Office based on search criteria defined by Collaborative Economics for the nine technology areas: solar, wind, hydro and geothermal, energy generation, batteries, fuel cells, hybrid systems, water, and energy infrastructure. The citation index is derived by dividing the number of forward citations a patent has received by the average number of citations that a patent issued in the same year and same technology class has received.

THE CARBON ECONOMY

Total California GHG Emissions: Gross Annual Emissions

Greenhouse gas emissions data are from the California Air Resources Board's California Green House Gas Inventory – by Sector and Activity. The Greenhouse Gas (GHG) Inventory provides estimates of the amount of GHGs emitted to the atmosphere by human activities within California. The inventory includes estimates for carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), and

perfluorocarbons (PFCs), which are often referred to as the “six Kyoto gases,” and nitrogen trifluoride (NF₃).

The current (October 2011) GHG inventory covers years 2000 to 2009. The emissions estimates are statewide estimates that rely primarily on state, regional or national data sources rather than individual facility-specific emissions. As estimates are refined to include additional years and improved estimation methods, new editions of the inventory are released. GHG emissions for the years 1990 through 1999 are the archived 1990-2004 GHG inventory published in November 2007, which provided the basis for developing the 1990 statewide emissions level and 2020 emissions limit required by AB 32.

GHG Emissions and Gross Domestic Product: California's Relative Trends Since 1990

See the appendix entry for Total California Greenhouse Gas Emissions. GDP data come from the Bureau of Economic Analysis, U.S. Department of Commerce, GDP by state (millions of current dollars). GDP values are inflation-adjusted and reported in 2011 dollars, using the CPI for the U.S. City Average from the Bureau of Labor Statistics.

The Carbon Economy: GHG Emissions relative to GDP, California

See the appendix entry for Total California Greenhouse Gas Emissions. GDP data come from the Bureau of Economic Analysis, U.S. Department of Commerce, GDP by state (millions of current dollars). GDP values are inflation-adjusted and reported in 2011 dollars, using the CPI for the U.S. City Average from the Bureau of Labor Statistics.

The Carbon Economy in California and Other States: Carbon Emissions Relative to GDP

Emissions data come from U.S. Department of Energy, Energy Information Administration (EIA), State CO₂ Emissions. EIA emissions estimates at the state level for energy-related carbon dioxide emissions are based on data contained in the State Energy Data System (SEDS) for the years 1990 to 2008. The state-level emissions estimates include energy consumption data for the following fuel categories: coal, natural gas, and ten petroleum products, including asphalt and road oil, aviation gasoline, distillate fuel (including some kerosene jet fuel), jet fuel, kerosene, LPG, lubricants, motor gasoline, residual fuel, and other petroleum

products. GDP data come from the Bureau of Economic Analysis, U.S. Department of Commerce, GDP by state (millions of current dollars). GDP values are inflation-adjusted and reported in 2011 dollars, using the CPI for the U.S. City Average from the Bureau of Labor Statistics.

GHG Emissions by Source: California

See the appendix entry for Total California Greenhouse Gas Emissions.

Carbon Intensity and Efficiency: Global Fossil Fuel Combustion: CO₂E Emissions per Capita and per U.S. Dollar of GDP, California, U.S., Other Countries, FL and TX

For U.S. and other countries, data for carbon dioxide emissions from the consumption of energy, gross domestic product (GDP), and population are from U.S. Department of Energy, Energy Information Administration (EIA), International Energy Statistics. State level emissions data come from EIA, State CO₂ Emissions. State GDP data come from the Bureau of Economic Analysis, U.S. Department of Commerce, Real GDP by state (millions of chained 2005 dollars). Both state and country level GDP data are Real GDP values (millions of chained 2005 dollars) as the EIA, International Energy Statistics used Real GDP to calculate a country's carbon intensity. California population estimates come from The California Department of Finance's "E-4 Population Estimates for Cities, Counties and the State 2001-2010, with 2000 and 2010 Census Counts" and are preliminary. State population data come from the U.S. Census Bureau, Population Estimates Branch. International data for carbon dioxide emissions from the consumption of energy include emissions due to the consumption of petroleum, natural gas, and coal, and also from natural gas flaring. This data does not include emissions from geothermal power generation, cement production and other industrial process, or municipal solid waste combustion.

GHG Emissions by Detailed Source: California

See the appendix entry for Total California Greenhouse Gas Emissions

ENERGY EFFICIENCY

Energy Productivity: GDP relative to Total Energy Consumption, California and the Rest of the U.S.

Energy Productivity Energy consumption data are from the U.S. Department of Energy, Energy Information Administration's State Energy Data System, Consumption Physical Units, 1960-2009 and Table F20: Total Energy Consumption, Price, and Expenditure Estimates by Sector, 2009. Total energy consumption includes all of the following sources: petroleum, natural gas, electricity retail sales, nuclear, coal and coal coke, wood, waste, ethanol, hydroelectric, geothermal, solar, and wind energy. GDP data come from the Bureau of Economic Analysis, U.S. Department of Commerce, GDP by state (millions of current dollars). GDP values are inflation-adjusted and reported in 2011 dollars, using the CPI for the U.S. City Average from the Bureau of Labor Statistics.

Total Energy Consumption Relative to 1970: Total and per Capita, California and the Rest of the U.S.

Energy consumption data are from the U.S. Department of Energy, Energy Information Administration's State Energy Data System, Consumption, Physical Units, 1960 – 2009 and Table F20: Total Energy Consumption, Price, and Expenditure Estimates by Sector, 2009. Total energy consumption includes all of the following sources: petroleum, natural gas, electricity retail sales, nuclear, coal and coal coke, wood, waste, ethanol, hydroelectric, geothermal, solar, and wind energy. To compute per capita values, the California Department of Finance's "E-4 Population Estimates for Cities, Counties and the State 2001-2010, with 2000 and 2010 Census Counts" preliminary data for California and annual population estimates from the U.S. Census Bureau's Population Division were used for the Rest of the United States.

Electricity Consumption Relative to 1990: Total and per Capita, California

Electricity consumption data are from the U.S. Department of Energy, Energy Information Administration, *Current and Historical Monthly Retail Sales, Revenues and Average revenue per Kilowatthour by State and by Sector (Form EIA-826)*. Consumption does not include self-generation, but only the amount of electricity sold to end users. The California Department of Finance's "E-4 Population

Estimates for Cities, Counties and the State 2001-2010, with 2000 and 2010 Census Counts" preliminary data were used to calculate per capita figures.

Electricity Consumption by Sector

Data are from the California Energy Commission, "California Energy Demand 2010-2020 Adopted Forecast Commission Report," Form 1.1 - Statewide Electricity Consumption by Sector (GWh). 2010 data are preliminary. Consumption includes self-generation.

Statewide Electricity Bill as a Fraction of GDP

Data to calculate electricity bills are from 1990 - 2010 Retail Sales of Electricity by State by Sector Provider (EIA-861) and 1990 - 2010 Average Price by State by Provider (EIA-861), published by the U.S. Department of Energy, Energy Information Administration. Gross Domestic Product data are from the U.S. Department of Commerce, Bureau of Economic Analysis "Gross Domestic Product by State (millions of current dollars)."

Average Monthly Electricity Bills + Commercial, Residential & Industrial: California and Other States

Data used to calculate electricity bills are from *1990 - 2010 Number of Retail Customers by State by Sector (EIA-861)*, *1990 - 2010 Retail Sales of Electricity by State by Sector by Type of Provider (EIA-861)*, *1990 - 2010 Average Price by State by Type of Provider (EIA-861)*, published by the Energy Information Administration, U.S. Department of Energy. Electricity bills were adjusted into 2011 dollar, using the U.S. city average Consumer Price Index (CPI) of all urban consumers, published by the Bureau of Labor Statistics.

RENEWABLE ENERGY

California Renewable Energy Generation: Gigawatt Hours by Source

California data is from the California Energy Commission, "Net System Power Reports" 2002-2008, Table 2: 2008 Total System Power in Gigawatt Hours. Total system power is the sum of all in-state generation and net electricity imports by fuel type. Each year, the total-system-power mix changes, in part, because hydroelectric generation can significantly vary from year to year and other resources will make up the difference. In October 2009, Assembly Bill 162 was enacted. It specifies, among other changes, that retail suppliers must

now disclose total California system electricity instead of net system power in their customer disclosures. Accordingly, the 2009 Net System Power Report was not produced. Instead, in keeping with the new legislation, a table was created to mimic the previous NSP tables but with the addition of a new category called "Unspecified Sources of Power." This new category calls to attention imported power that does not have a clear source of origin in terms of primary fuel source. 2009 and 2010 data was taken from the 2009 and 2010 Total System Power table.

California's IOU Renewable Energy Generation, Percentage of Total Energy Generation

Data for California's Renewables Portfolio Standard, 2003 to 2010, are from the California Public Utilities Commission Table: Large IOU RPS Procurement Data 2003-2010, RPS GWh as percent of Bundled Sales. The 2011 data are from ClimateWire, California utilities surge past 20% mark for green energy, Anne Mulkern. 8 Mar. 2012. Web.

Renewable Energy Capacity under Development: GWh/year in Operation, On Schedule & Pending Approval

Data for RPS projects by investor-owned utilities in California are from the California Public Utilities Commission (CPUC). Projects are classified as: online, under development, and pending CPUC approval. Dates for the online date/contracted delivery date are also provided. Capacities are presented as the minimum expected GWh/year and the minimum MW. The types of renewable technologies include: wind, geothermal, solar PV, solar thermal, biomass, space-based solar, small hydro, biogas and conduit hydro.

Percent of Total Energy Generation from Renewable Sources: California and U.S.

California data is from the California Energy Commission, "Net System Power Reports" 2002-2008, Table 2: 2008 Total System Power in Gigawatt Hours. Total system power is the sum of all in-state generation and net electricity imports by fuel type. Each year, the total-system-power mix changes, in part, because hydroelectric generation can significantly vary from year to year and other resources will make up the difference. In October 2009, Assembly Bill 162 was enacted. It specifies, among other changes, that retail suppliers must now disclose total California system electricity instead of net system power in their customer disclosures. Accordingly, the 2009 Net System Power Report was not produced. Instead,

in keeping with the new legislation, a table was created to mimic the previous NSP tables but with the addition of a new category called “Unspecified Sources of Power.” This new category calls to attention imported power that does not have a clear source of origin in terms of primary fuel source. 2009 and 2010 data was taken from the 2009 and 2010 Total System Power table. U.S. Total energy generation data is from the Energy Information Administration, U.S. Department of Energy, “Table 1.1 Net Generation by Energy Source: Total (All Sectors), 1997 through November 2011.” U.S. Renewable energy generation data is from the Energy Information Administration, U.S. Department of Energy “Table 3 Electricity Net Generation From Renewable Energy by Energy Use Sector and Energy Source, 2006 - 2010” and “Table 1.11 Electricity Net and Energy Source, 2002 - 2007.” The State of California’s definition of renewable energy does not include large-scale hydroelectric power. Since the Energy Information Administration does not differentiate between small and large-scale hydro, data represented here for the U.S. does not include any hydro. In 2007, all hydro represented 6 percent of total U.S. energy generation. According to the Bureau of Reclamation, U.S. Department of the Interior (Hydroelectric Power plants Fiscal Year 2006 Generation) in 2006 small hydro accounted for 2 percent of total hydroelectric power generation.

Energy from Solar Installations in California: Grid-Connected Solar Photovoltaics

The California Solar Initiative (CSI) is part of the Go Solar California campaign, an unprecedented \$3.3 billion ratepayer-funded effort that aims to install 3,000 MW of new grid-connected solar over the next decade and to transform the market for solar energy. CSI is overseen by the California Public Utilities Commission and provides incentives for solar system installations to customers of the state’s three investor-owned utilities (IOUs): Pacific Gas & Electric, San Diego Gas & Electric (SDG&E) and Southern California Edison. The program tracks solar capacity added, and the data selected for this indicator includes all completed projects from January 2007 through December 31, 2011.

Risk Portfolio of Forecasted RPS Generation Based on Executed Contracts: California

Data is from the California Public Utilities Commission “Renewables Portfolio Standard Quarterly Report,” Third Quarter 2011. The methodology used to forecast future

RPS generation and categorize projects based on viability is based on utility forecasts. Project viability is sorted based on the most critical project development milestones.

TRANSPORTATION

Trends in Vehicle Miles of Travel and GHG Emissions from Surface Transportation: Total and Per Capita Trends Relative to 1995, California

Vehicle Miles Traveled (VMT) is defined as total distance traveled by all vehicles during a selected time period in geographic segment. VMT estimates for 1995-2007 are from the California Department of Transportation’s “2008 California Motor Vehicle Stock, Travel and Fuel Forecast.” VMT data for 2008 and 2009 is from the California Department of Transportation’s Highway Performance Monitoring System’s 2008 and 2009 “California Public Road Data.” Data includes annual statewide total VMT on State highways and non-state highways. In order to calculate VMT, Caltrans multiplies the road section length (length in miles along the centerline of the roadway) by Average Annual Daily Traffic (AADT). AADT are actual traffic counts that the city, county or state have taken and reported to the California Department of Transportation. To compute per-capita values, “Revised County Population Estimates, 1970-2011” from the California Department of Finance were used. GHG emissions data are from the California Air Resources Board’s California Greenhouse Gas Inventory – by Sector and Activity. Surface Transportation emissions sources include passenger vehicles, motorcycles and light and heavy duty trucks.

Alternative Fuel and Conventional Gas Consumption

Alternative Fuel Consumption data is provided by the Coal, Nuclear, Electric, and Alternate Fuels Division of the Energy Information Administration (EIA) in Table C4, “Estimated Consumption of Alternative Fuels by State and Fuel Type.” Motor Gasoline data is collected from the EIA State Energy Data Systems (SEDS); the SEDS series used in this indicator is identified as MGACP, “Motor gasoline consumed by the transportation sector.” As SEDS petroleum data is provided in ‘Thousand barrels’, this data was converted to gallons using 42 gallons per barrel.

Total Gas Consumption & Average Price Per Gallon

Fuel consumption data is provided by the California Board of Equalization (www.boe.ca.gov) in Motor Vehicle Fuel, Monthly

Motor Vehicle Fuel Distributions Reports. Average Gas Price Per Gallon data is provided by the Energy Information Association (www.eia.gov) in California Gasoline and Diesel Retail Prices. All price values are inflation-adjusted nominal figures and reported in 2011 dollars, using the CPI for the U.S. City Average from the Bureau of Labor Statistics.

Trends in Total Alternative Fuel Vehicle Registrations

Data are from the California Energy Commission (CEC), compiled using vehicle registration data from the California Department of Motor Vehicles. Alternative fuel-types include all hybrid, electric and natural gas vehicles.

Total Vehicles and GHG Emissions: California

GHG emissions data are from the California Air Resources Board's California Greenhouse Gas Inventory – by Sector and Activity Surface Transportation emissions sources include passenger vehicles, motorcycles and light and heavy duty trucks. Vehicle registration data are from the Federal Highway Administration, U.S. Department of Transportation, "Highway Statistics" 2008-2009, Table MV-1. Total number of vehicles are for all vehicles registered in California including, cars, trucks, busses and motorcycles.

Gross Domestic Product (GDP):

Note: All GDP values are inflation-adjusted nominal figures and reported in 2011 dollars, using the CPI for the U.S. City Average from the Bureau of Labor Statistics (unless otherwise noted). Nominally adjusted GDP values are used in this year's index as opposed to GDP chained dollars because the reference year is no longer consistent as reported by the Bureau of Economic Analysis (BEA). Real GDP by state (chained dollars) is an inflation-adjusted measure of each state's gross product. It is based on national prices for the goods and services produced within the state, using price indexes from the BEA's GDP by Industry accounts. Adjusting nominal figures using CPI expresses explicit GDP for that given year, adjusted for inflation.

FEATURE: SHEDDING LIGHT ON CALIFORNIA'S GROWING SOLAR INDUSTRY

Venture Capital Investment in Solar

Solar Technology investment data is provided by Cleantech Group,™ LLC (www.cleantech.com) and includes disclosed investment deals. Data is adjusted into 2011 dollars, using the U.S. city average Consumer Price Index (CPI) of all urban

consumers, published by the Bureau of Labor Statistics.

Solar Technology Patents

1790 Analytics developed and performed the search of detailed U.S. Patent data from the U.S. Patent & Trade Office based on search criteria defined by Collaborative Economics for the nine technology areas: solar, wind, hydro and geothermal, energy generation, batteries, fuel cells, hybrid systems, water, and energy infrastructure.

Business and Employment Trends related to Solar Technology

Solar and Related Industry Sectors

The solar and related industry sectors were created using establishment information from the Green Establishment Database and the 15 Green Segments as defined in Next 10's *Many Shades of Green Report*. Most of solar and related industry sector data originates from one of the 15 Green Segments, Energy Generation, but this analysis includes businesses providing other types of solar technology such as solar water heaters found in the segment Energy Efficiency. All establishments from the Green Establishment Database with products or services applicable to a sector of solar and related industries are included.

California's Core Green Economy:

Green Business Establishments Database

Collaborative Economics (CEI) has developed an approach for identifying and tracking the growth of businesses with primary activities in the Core Green Economy. This methodology was originally developed for work carried out on behalf of Next 10 and published in the *California Green Innovation Index* (2008, 2009, and 2010). Building on this work, CEI designed and conducted the nationwide analysis of green business activity on behalf of the Pew Charitable Trusts. The Pew Center on the States reformatted the results of the analysis and developed the report, *The Clean Energy Economy* (June 2009).

The accounting of green business establishments and jobs is based on multiple data sources (including New Energy Finance and the Cleantech Group,™ LLC) for the identification and classification of green businesses and also leveraged a sophisticated internet search process. Collaborative Economics designed the parameters of the internet search platform which was engineered by PlanetMagpie, a Bay Area-based IT service company. The National Establishments

Time- Series (NETS) database based on Dun & Bradstreet business-unit data was sourced to extract business information such as jobs. The operational definition of green is based primarily on the definition of cleantech defined by the Cleantech Network.

The jobs numbers reported in the database reflect all jobs at each business location. In the case of multi-establishment companies, only the green establishments are included. While this approach does not examine specifically green occupations that are appearing across the entire economy (such as Chief Sustainability Officer), it does account for the businesses behind the products and services that these new professionals need to use in their jobs (such as advanced metering devices, co-generation equipment, and various high-efficiency materials).

The multilayered process involves both automated and manual verification steps of business establishments and their activities. In cases where the results were uncertain and the activities of a business establishment could not be verified (e.g. on a company's website), the establishment was dropped from the database. Therefore, the database offers a conservative estimate for the numbers of establishments and jobs in the Core Green Economy.

National Establishment Time-Series (NETS) Database

The NETS database is constructed from 20 “snapshots” taken every January since 1990 of all active Dun and Bradstreet establishments (currently 41.7 million unique establishments with over 24 million still active). That data is then put through rigorous quality control, statistical analysis, and additional estimation procedures to create the resulting time-series in the NETS Database. These snapshots use the Duns Marketing Information (DMI) file to determine which establishments were active. Other archival files (e.g., the Credit Rating file) were utilized to provide annual raw establishment data that allowed us to create

time-series information. Each summer the NETS Database is updated with another year of establishment information. No establishments are ever deleted from the Database; but their “LastYear” is indicated, so one can explore the dynamics of “births” and “deaths” of establishments. Walls & Associates maintains the NETS Database and continues to update and improve estimates before the next annual update.

Solar Installation Capacity in California and by California City

Data for megawatts of solar installed in California and California cities is taken from California's Solar Cities 2012: Leaders in the Race Toward a Clean Energy Future report published by Environment California: Research & Policy Center. Figure 4 and Table ES-1 were sourced from this report. The underlying data for the analysis comes from California Energy Commission, the Californian Public Utilities Commission, the Californian Center for Sustainable Energy and the state's private and public utilities.

Total Solar Capacity in California, Share of Total Solar Capacity Installed

Solar capacity installed data is provided by Solar Energy Industries Association® and GTM Research (<http://www.seia.org/cs/research/>). Data is taken from the U.S. Solar Market Insight Reports, 2007 through 2011. The Top Five States are based upon the top five states of each year.

MW of Solar Installed by Top Countries

Country data as used in Figure 6 of California's Solar Cities 2012 report. Data are cumulative installed photovoltaic power at the end of a given year. California data are from the California Energy Commission Energy Almanac, California Solar Photovoltaic Statistics & Data and Publicly Owned Utilities' SB1 Solar Program Status Reports, Statewide Solar (PV) Total Distributed Generation, 2007-2010.

ACKNOWLEDGEMENTS

SPECIAL THANKS TO THE FOLLOWING PEOPLE AND ORGANIZATIONS THAT CONTRIBUTED DATA AND EXPERTISE:

Morrow Cater	Cater Communications
Tracey Grose	Institute for the Future
Roxanna Smith	Cater Communications

1790 Analytics

Bureau of Economic Analysis

California Air Resources Board

California Department of Finance

California Department of Transportation

California Energy Commission

California Integrated Waste Management Board

California Public Utilities Commission

California Solar Initiative

California State Controller's Office

Cleantech Group,™ LLC (www.cleantech.com)

Energy Information Administration

Federal Highway Administration

Independent Recovery Transparency and Accountability Board

PricewaterhouseCoopers/National Venture Capital Association

R.L. Polk & Co.

U.S. Census Bureau

U.S. Patent and Trademark Office

Walls & Associates

WWW.NEXT10.ORG



ADVISORS TO THE *CALIFORNIA GREEN INNOVATION INDEX*

NEXT 10 THANKS THE FOLLOWING EXPERT ADVISORS FOR
THEIR GENEROUS TIME AND GUIDANCE ON THIS PROJECT:

Ralph Cavanagh	Natural Resources Defense Council
Michael Hanemann	California Climate Change Center, Goldman School of Public Policy U.C. Berkeley
Hal Harvey	energyinnovation.org
Elliot Hoffman	True Market Solutions
Dan Kammen	Class of 1935 Distinguished Professor of Energy in the Energy and Resources Group and the Goldman School of Public Policy, Director, Renewable & Appropriate Energy Laboratory, U.C. Berkeley
Bruce Klafter	Applied Materials
Joel Makower	Chairman and Executive Editor, GreenBiz Group Inc.
Jason Mark	The Energy Foundation
Walter McGuire	McGuire & Co., Inc./ Flex Your Power
Joe Nation Ph.D.	Former State Assemblyman, District 6, Professor of the Practice of Public Policy, Stanford University
Manuel Pastor	Professor of American Studies & Ethnicity, Director of the USC Program for Environmental and Regional Equity, University of Southern California
Wendy Pulling	The Nature Conservancy
Carol Whiteside	California Strategies
Tim Woodward	Nth Power

2012 CALIFORNIA
GREEN INNOVATION INDEX

© COPYRIGHT 2012 NEXT 10

PRINTED ON 100% RECYCLED PAPER,
USING VEGETABLE-BASED INKS