# EXECUTIVE SUMMARY

California's vibrant economy is dependent on reliable and affordable supplies of energy. Yet, fossil-based energy produces greenhouse gases that are the primary contributors to climate change. California's challenge, like that of the rest of the developed world, is how to maintain its growth and vitality while decreasing its contributions to global greenhouse gas emissions.

> *"We can't solve problems by using the same kind of thinking we used when we created them."*
>
> Albert Einstein

Responding to this challenge, Governor Arnold Schwarzenegger and the California Legislature placed reducing greenhouse gas emissions at the center of their agendas. Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of 2006 (AB 32), mandates that California reduce its greenhouse gas emissions to 1990 levels by 2020.

In 2004, the state produced almost 500 million metric tons of carbon dioxide ($CO_2$). Reducing California's *greenhouse gas footprint* to meet AB 32 goals will require approximately a 29 percent[1] cut in emissions below the levels the state is currently projected to produce in 2020.

As the second largest emitter of greenhouse gases in the United States and about twelfth largest in the world, California's efforts to reduce its emissions will lead the way for other governments, as well easing the severity of environmental and economic impacts experienced this century.

AB 32 marks a significant change in California's energy policies. Before its passage, energy policy makers focused on stabilizing and/or minimizing energy costs, ensuring supply, limiting dependence on imports and fossil fuels, protecting the environment, and benefiting the state's economy.

AB 32 upped the ante: California is obligated to meet its previous energy goals, but it must do so while reducing the volume of $CO_2$ emissions. Slowing global warming requires meeting energy needs with zero-or low-carbon energy sources.

California has led the nation in effective action to improve air quality and has held the line on per capita consumption of electricity. But, with a growing population and economy, California must ensure that energy supplies keep pace with the growth while simultaneously reducing its greenhouse gas footprint.

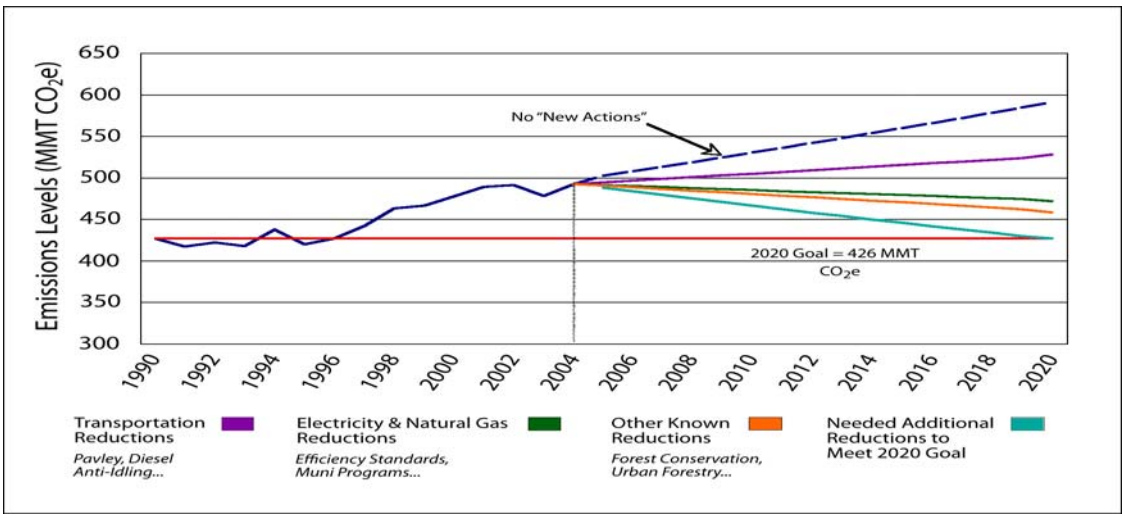
[1] The 29 percent reduction of greenhouse gas emissions from a *business-as-usual* 2020 level is based on 174 million metric tons $CO_2$ equivalent as assessed by the Climate Action Team report, March 2006.

Today one in eight Americans, over 37 million people, lives in California. The state's population has doubled since 1965, a growth rate faster than that of any other developed region in the world. In fact, if California were a nation, its population would make it the 33rd largest in the world. The state Department of Finance expects California will add another 7 million people in the next dozen years, to more than 44 million by 2020, moving toward 60 million residents by 2050.[2]

Affordable and reliable energy is essential to California's successful economy. Energy represents nearly $100 billion in annual expenditures. Fossil fuels dominate the state's energy system — petroleum to serve the transportation sector and natural gas to heat homes and generate electricity. Most of California's greenhouse gas emissions, 81 percent, are $CO_2$ produced from fossil fuel combustion, 2.8 percent are from other sources of $CO_2$, 5.7 percent are from methane, and 6.8 percent are from nitrous oxide. Of those emissions, 28 percent results from electricity generation and 39 percent from transportation.

The top dashed line on Figure ES-1 shows the anticipated growth in emissions levels with no new strategies undertaken to reduce this growth. The figure also depicts the potential effects of AB 32 compliant actions. The effects of these strategies can be significant compared to the projected unmitigated growth in emissions.

**Figure ES-1: California's $CO_2$ Emission Reduction Strategies**




Source: California Energy Commission, Climate Action Team data

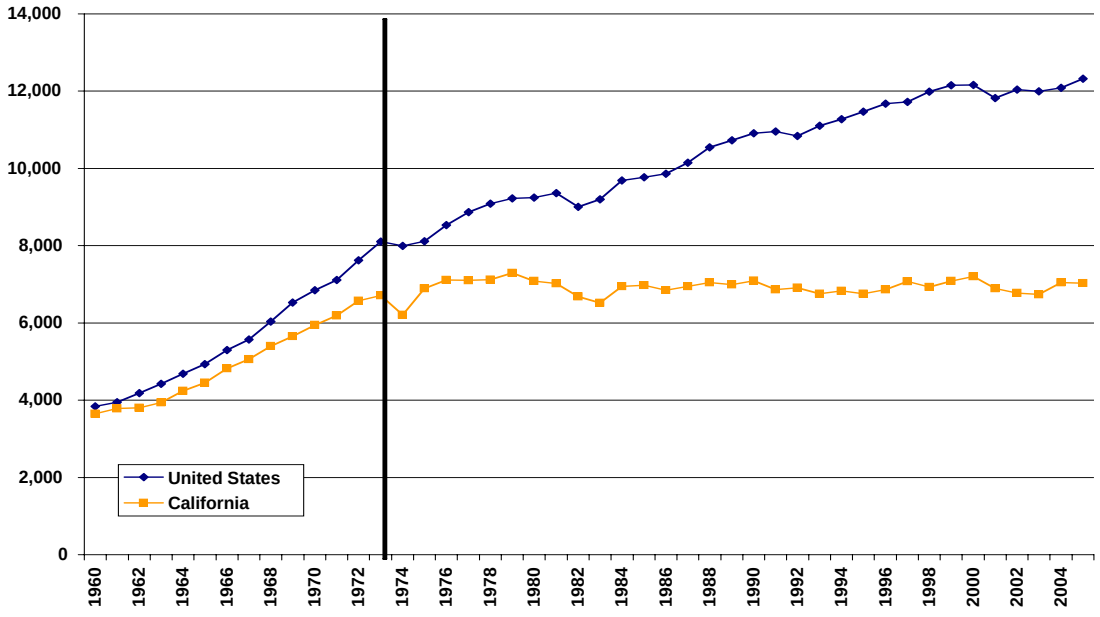
[2] California Department of Finance, Demographic Research Unit, July 2007.

# The Electricity Sector

Electricity accounts for 28 percent of the state's $CO_2$ emissions and demand for electricity is forecast to grow at a steady pace, fed by a projected increase in population. Even with a decrease in the rate of population growth, from 1.8 percent to 1.2 percent annually, the cumulative growth will significantly affect statewide annual electricity consumption. In addition, tendencies toward larger houses and more and bigger appliances will increase expected growth in electricity demand. Projected effects of building and appliance standards and energy efficiency programs will mitigate some of this electricity growth, but overall electricity demand is still expected to increase an average of 1.25 percent annually.

California uses less electricity per person than any other state in the nation. While per capita electricity consumption in the United States increased by nearly 50 percent over the past 30 years, California's per capita electricity use remained almost flat, due in large part to cost-effective building and appliance efficiency standards and other energy efficiency programs. (Figure ES-2).

**Figure ES-2: California Holds the Line on Electricity Consumption**
(Per Capita Electricity Sales in kilowatt hours per person)




Source: California Energy Commission

How California generates the electricity required to power its economy and support its growth has changed over the years. In the late 1970s, petroleum was the fuel source for over half of the state's electricity. Today, cleaner-burning natural gas produces over 41 percent of the state's electricity, and renewable resources account for about 11 percent.

Since 2003, California's energy policy has defined a **loading order**[3] of resource additions to meet the state's growing electricity needs: first, energy efficiency and demand response; second, renewable energy and distributed generation; and, third, clean fossil-fueled sources and infrastructure improvements. This strategy has had the benefit of reducing $CO_2$ emissions and diversifying our sources of energy.

Energy efficiency, which helped to flatten the state's per capita electricity use, will continue to be the keystone of California's energy strategy. California's building and appliance standards have saved consumers more than $56 billion in electricity and natural gas costs since 1978 and averted building 15 large power plants. It is estimated the current standards will save an additional $23 billion by 2013.

Overall electricity use in California is projected to grow at 1.25 percent annually; however, **peak**[4] demand is growing at a rate of 1.35 percent (850 megawatts) per year. This increase in peak demand is the result of a population that is moving inland to the hotter areas of the state, prompting higher demand for electricity for air conditioning.

While nearly 70 percent of the state's population currently lives along coastal California, it is the state's inland areas – the San Joaquin Valley, Southern California's Inland Empire, and the Sacramento area – where the population is growing most rapidly (Figure ES-3). By 2040, nearly 40 percent of the state's population, or more than 20 million people, will reside inland. This inland population growth not only drives overall demand for electricity, it changes the pattern of energy use. The climate inland is more extreme than along the coast. In the summer, inland areas require more air conditioning than coastal areas, increasing peak demand more dramatically than overall electricity demand.

With the pressure of increasing population growth in drier, hotter inland areas, energy efficiency and demand response programs become even more important. The Energy Commission and the California Public Utilities Commission (CPUC) are collaborating to step up the state's efficiency efforts. Assembly Bill 2021 (Levine, Chapter 734, Statutes of 2006) requires the Energy Commission, in consultation with the CPUC and the publicly owned utilities, to produce a statewide estimate for investor-owned and publicly owned

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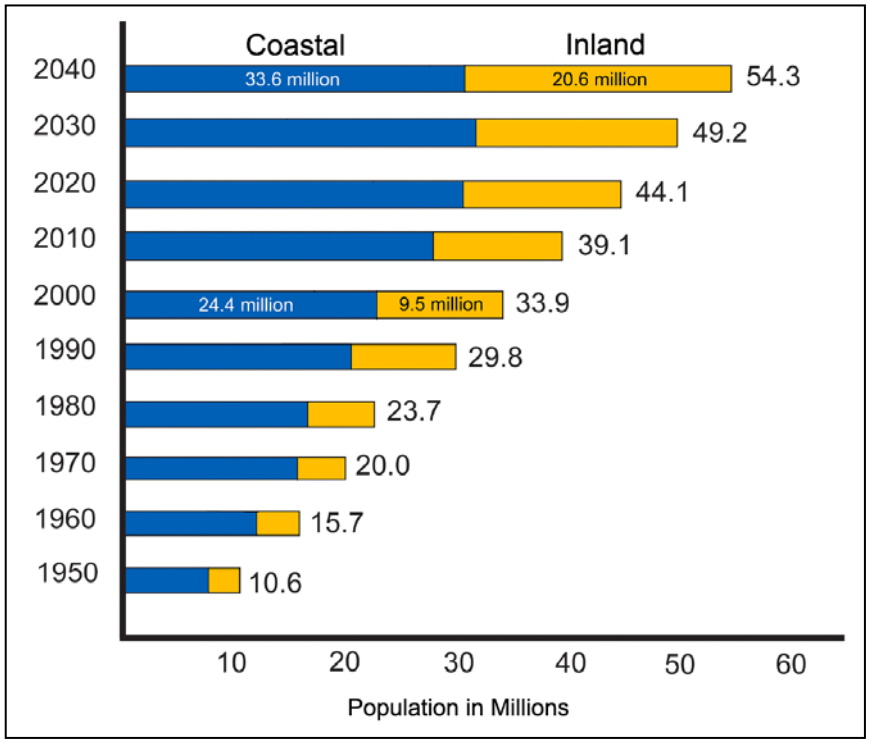
[3] The **loading order**, adopted as the state's energy policy, is the accepted protocol that describes the priority sequence for actions to address increasing energy needs.

[4] **Peak** refers to the highest hourly demand for electricity. Summer demand peaks are mostly driven by increased air conditioning during the hottest hours of day on the hottest days of the year.

utilities of "all potentially achievable cost-effective electricity and natural gas efficiency savings and establish statewide annual targets for energy efficiency savings and demand reduction over 10 years." The Energy Commission concluded that the statewide targets should be set to achieve all of the state's cost-effective energy efficiency. The CPUC supports this goal and has described a course of action focused on programs under its and the Energy Commission's authority to pursue it.[5]

Scenario analysis indicates that these aggressive cost-effective efficiency programs, when coupled with renewables development, could allow the electricity industry to achieve at least a proportional reduction,[6] and perhaps more, of the state's $CO_2$ emissions to meet AB 32's 2020 goals.

**Figure ES-3: California's Inland Population Increases**




Source: California Department of Finance, Demographic Research Unit projections and Public Policy Institute of California

**The Energy Commission strongly supports capturing all cost-effective efficiency saving potential and recommends that this agency:**

- Adopt statewide energy efficiency targets for 2016 equal to 100 percent of economic potential, to be achieved by a combination of state and local standards, utility programs, and other strategies.
- Enlist publicly owned utilities in a collaborative relationship to further their efforts in aggressively ramping up energy efficiency programs. Publicly owned utilities can use their knowledge of local conditions and customers to craft new program ideas.

[5] CPUC decision D.07-10-032 adopted October 18, 2007

[6] Proportional to the estimated amount of emissions that the electricity sector emitted in 1990.

- Pursue legislation that would require energy audits and a cost-effective level of efficiency improvements at the time of sale of a building.
- Initiate a rulemaking, involving the CPUC and California ISO, to pursue the adoption of load management standards under the Energy Commission's existing authority.
- Enact appliance standards to improve the efficiency of appliances sold in California, including standards to increase the efficacy of general service lighting.
- Increase the efficiency standards for buildings such that, when combined with on-site generation, newly constructed buildings can be net zero energy by 2020 for residences and 2030 for commercial buildings.
- Investigate market-based approaches to energy efficiency, such as "white tags" or "white certificates" (also known as energy efficiency certificates or credits), the companion to renewable energy credits.

Renewable resources are essential for reducing greenhouse gas emissions and reaching AB 32 goals. Over the last three decades, the state has built one of the largest and most diverse renewable generation portfolios in the world. Currently, about 11 percent of the state's electricity is from renewable energy sources such as solar, wind, and biomass.

Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002), introduced a Renewables Portfolio Standard (RPS) with the goal of increasing the portion of electricity derived from renewable resources and sold to retail customers to 20 percent by 2017. Initially designed to address California's growing dependence on natural gas for electricity generation and encourage long-term power purchase contracts, the RPS is also an important means for meeting the state's AB 32 greenhouse gas emission reduction goals. Senate Bill 107 (Simitian, Chapter 464, Statutes of 2006) accelerated the 20 percent goal to 2010. The Governor, the Energy Commission, and the CPUC have endorsed an enhanced target of 33 percent renewables by 2020.

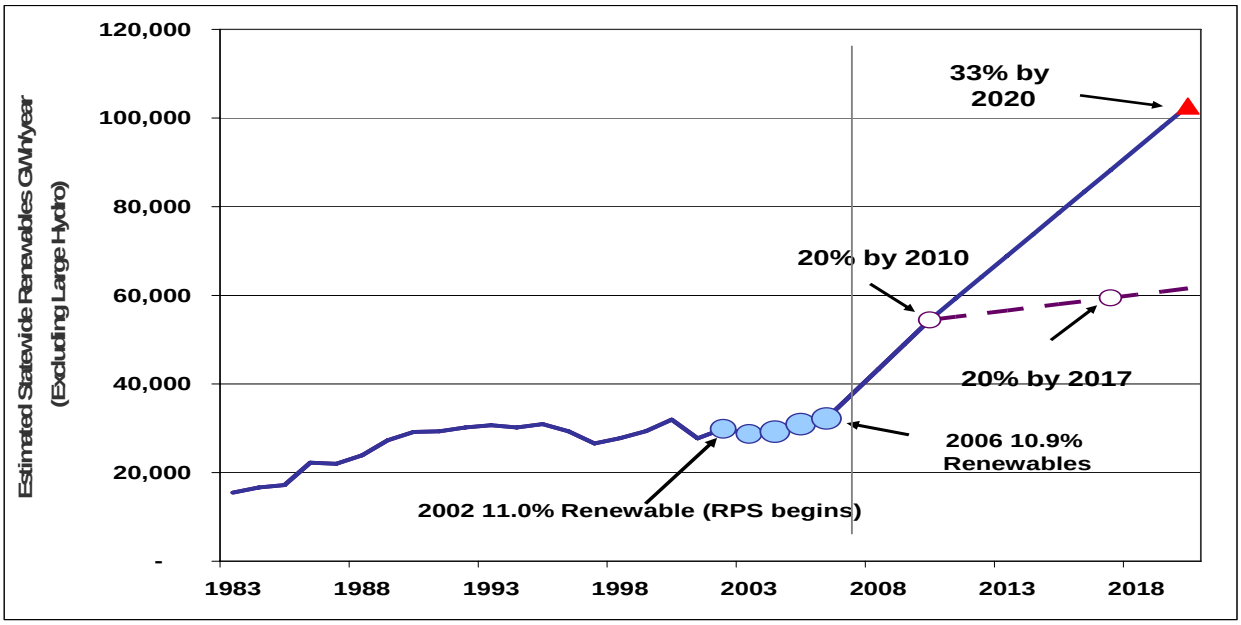
So far, however, the RPS results have not kept pace with its mandate due principally to insufficient transmission infrastructure and complex administration (Figure ES-4). The utilities are not expected to be able to serve 20 percent of their retail load with renewables by 2010 although they may have contracted for the necessary amount by that date. The 33 percent goal by 2020 *is* feasible but only if the state commits to significant investments in transmission infrastructure and makes some key changes in policy.

**The Energy Commission strongly supports renewable energy development to achieve the RPS targets and recommends that this agency:**

- Leverage its power plant licensing and transmission corridor designation authority, its environmental expertise, and its transmission planning and policy experience to guide further renewable resource development in California.

- Establish a more cohesive statewide approach for renewable development that identifies preferred renewable generation and transmission projects in a "road map" for renewables.

**Figure ES-4: Progress Toward California's Renewable Energy Goals**




Source: California Energy Commission

- Implement a feed-in tariff, set initially at the market price referent, for all RPS-eligible renewables up to 20 MW in size.
- Collaborate with the CPUC to evaluate feed-in tariffs for larger projects. Such tariffs should incorporate the value of a diverse mix of renewables as well as features of the most successful European feed-in tariffs.
- Collaborate with the CPUC to establish an appropriate feed-in tariff for excess generation from customer-owned solar installations.

**The Energy Commission also recommends that:**

- The wind industry expand and repower existing wind sites to increase the efficient use of existing infrastructure.
- The CPUC revise the market price referent calculation to more fully reflect price volatility, market costs of long-term fixed-price power, and appropriate greenhouse gas adders.
- The greenhouse gas reductions attributable to the RPS be removed from any cap-and-trade allowance system.

Even as California increases its use of preferred strategies of efficiency and renewable resources, conventional resources—natural gas, nuclear, coal and large hydroelectric — will continue to be the mainstay of the state's resource mix for the immediate future.

Non-renewable generation resources and large hydroelectric currently account for 89 percent of the state's electricity supply. Even when California's 33 percent renewable target is met, two-thirds of the state's electricity will still come from conventional sources—the vast majority of those will be natural gas-fired.

Of the nearly 24,000 megawatts of new capacity licensed since 1998, 36 plants — 12,910 megawatts — have been built and are in operation. An additional 2,278 megawatts are currently under construction, and 18 additional plants, totaling 8,361 megawatts, have been approved, but construction has not moved forward. Of these megawatts, 99 percent are fueled by natural gas and 1 percent by geothermal.

While nuclear and "clean" coal-fired generation offer the potential to generate electricity with lower $CO_2$ emissions, the Energy Commission does not expect them to contribute significantly to the state's near-term AB 32 goals given the economic, environmental, and regulatory barriers these technologies face.

**The Energy Commission supports the improved use of California's electricity infrastructure and recommends that this agency:**

- Conduct a public process including the CPUC, utilities and other stakeholders to determine an effective method to better delineate the energy efficiency savings assumptions in the Energy Commission's staff forecasts.
- Develop a common portfolio analytic methodology to clearly influence the long-term procurement plans filed by the investor-owned utilities.
- Refine in the *2009 IEPR* the input data used for developing technologies in the Cost of Generation Model and establish a process to regularly update changing technology costs over time.
- Include in the *2009 IEPR* a robust assessment of the effect of high levels of preferred resources on reducing natural gas prices.
- Ensure that California's interests in the nuclear process are protected by taking an active role in the Yucca Mountain licensing proceeding; challenging the U.S. Department of Energy's inadequate response to potential impacts identified by California; and continuing to participate in DOE and regional planning activities for nuclear waste shipments.
- Incorporate Institute of Nuclear Power Operations (INPO) reviews and ratings of reactor operations into a meaningful public process while maintaining the value of the INPO reviews as candid assessments.
- Assess the reliability implications of federal and state once-through cooling regulations for California's operating nuclear plants.

**The Energy Commission also recommends the CPUC**:

- Require investor-owned utilities to procure enough capacity from long-term contracts to allow for the orderly retirement or repowering of aging plants by 2012.
- Require Southern California Edison to develop, as part of their long-term procurement plans, a contingency plan to replace generation from Palo Verde should it be shut down for an extended period.

Electric distribution systems throughout California still mainly use designs, technologies and strategies that were designed to meet the needs of mid-20th century customers. These large and complex systems have historically provided reliable electric power to millions of customers throughout the state; however, aging infrastructure coupled with modern demands is starting to erode this capability. About 90 percent of all customer interruptions and outages are caused by distribution problems.

California's commitment to distributed renewable energy, combined heat and power and demand response requires a change in the design of these distribution systems to accommodate the integration of these new resources. Ideally, an automated 21st century distribution grid would allow operators to manage the grid in real time, provide for rapid two-way information exchange between utilities and customers, and provide a seamless integration of the full spectrum of 21st century technologies.

**The Energy Commission supports the development of a modern electric distribution system to incorporate new resources and recommends that the state:**

- Integrate distribution planning with other resource procurement processes to support the use of new low-carbon resources and applications — renewables, demand response, efficient combined heat and power, distributed generation, energy storage, advanced metering infrastructure, and plug-in hybrid electric vehicles.
- Fund research to develop and demonstrate technologies that will accelerate the transformation of the distribution grid into an intelligent and sustainable network.
- Develop new rate designs that will encourage consumers and utilities to invest in promising technologies.
- Provide financial incentives for utilities to meet goals related to performance, achievement of designated goals, service reliability, and customer assistance to achieve greater efficiency of electricity use.
- Allow utilities to recover the remaining book-value costs of equipment rendered obsolete by the deployment of a qualified smart grid system.

Distributed generation (DG) and combined heat and power, regardless of size or interconnection voltage, are valuable resource options for California. Combined heat and power, in particular, offers low levels of greenhouse gas emission for electricity generation, taking advantage of fuel that is already being used for other purposes. DG can also play an important role in helping to meet local capacity requirements. The California ISO has encouraged the CPUC to include local capacity requirements in its procurement process to replace power plants that must operate, even if uneconomically, to preserve system reliability.

The Energy Commission has encouraged development of DG resources, including combined heat and power projects, since the late 1990s and continues today through collaborative efforts with the CPUC to address barriers to DG development. Yet, significant issues facing DG developers persist. In the *2005 Integrated Energy Policy Report (2005 IEPR)*, the Energy Commission reported that, despite many years of policy preferences, DG and combined heat and power in California continue to struggle with major barriers to market entry in the context of traditional utility cost-of-service grid management. The *2005 IEPR* reiterated that California must improve access to wholesale energy markets and streamline utility long-term contracting processes so that combined heat and power facility owners can efficiently sell excess electricity to their local utility. Accessibility to the wholesale market continues to be a major consideration in encouraging DG.

**The Energy Commission continues to support distributed generation and recommends that this agency:**

- Work with the CPUC to eliminate non-bypassable charges for combined heat and power and DG and punitive standby reservation charges for DG.
- Develop a methodology for estimating DG costs and benefits.

**The Energy Commission also recommends:**

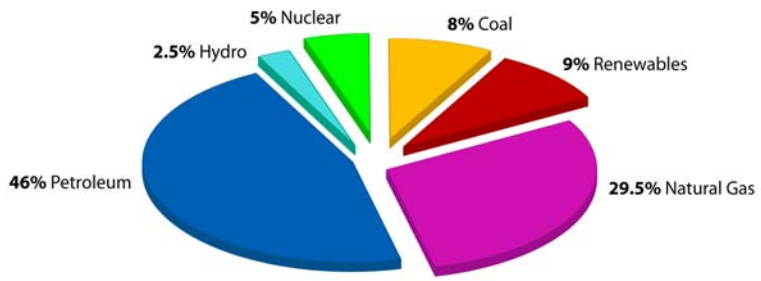
- The CPUC continue the work of the "Rule 21" industry/utility collaborative working group to refine interconnection standards, provide third party resolution of interconnection issues, and streamline permitting.
- The state adopt greenhouse gas reduction measures and regulations that fully reflect the benefits of combined heat and power.
- The CPUC adopt a tariff structure to make DG projects "cost and revenue neutral," while granting owners credit for system benefits, such as reduced congestion.
- The CPUC base self-generation program incentives on overall efficiency and performance of systems, regardless of fuel type.
- The CPUC adopt revenue-neutral programs that would allow high efficiency combined heat and power on an equal footing with bulk power from utilities.

# The Natural Gas Sector

Almost 30 years ago, California's serious air quality problems made natural gas the fuel of choice for electricity generation. Natural gas was cleaner burning, relatively cheap and helped diversify our electricity generation system. Today, natural gas provides almost a third of the state's total energy requirements and will continue to be a major fuel in California's supply portfolio (Figure ES-5).

Imports of liquefied natural gas are expected to supplement conventional supply sources and help stabilize prices. With only a single liquefied natural gas facility under construction on the West Coast, however, the arrival of additional LNG supplies may be delayed.

**Figure ES-5: California Energy Sources 2006**




Source: California Energy Commission

**The Energy Commission recommends this agency take the following actions to maintain a reliable supply of natural gas:**

- Improve our ability to forecast natural gas production, demand, and price, including:

  - Conduct a rigorous verification of the models used to forecast natural gas supply and price.

  - Develop probabilities and quantifying outcomes for demand scenarios to gain better insight into natural gas demand.

- Increase natural gas research and development for ways to advance energy efficiency for both consumers and power plants.
- Support displacing natural gas with renewable sources to generate electricity and alternatives such as solar for water and space heating.
- Establish with the CPUC an appropriate feed-in tariff for pipeline-quality biogas.

**The Energy Commission also recommends:**

- The state secure alternative and diverse sources of natural gas, including liquefied natural gas, through licensing facilities that meet stringent environmental and public health and safety standards.
- California's utilities adopt all cost-effective energy efficiency measures for natural gas, including replacement of aging power plants with new efficient power plants.

## The Transportation Sector

Transportation is the single largest contributor to California's greenhouse gas emissions, producing 39 percent of the state's total emissions in 2004. California has long been regulating the criteria pollutants from automobiles. The state adopted stringent tailpipe emission standards as early as 1966, and in 1971 adopted automobile nitrogen oxides standards, both the first such standards in the nation. The California Smog Check Program, which assured the effectiveness of vehicle emission control systems, went into effect in 1984. In 1992, California began the first of many phases of reformulated clean-burning gasoline, and in 1993 the state enacted new standards for cleaner diesel fuel. However, reducing greenhouse gas emissions is a new, more difficult challenge for a state so heavily dependent on automobiles.

There is some good news. While national demand grew by 1.5 percent in the first half of 2007 according to the American Petroleum Institute, consumption in California actually dropped. Californians used over 63 million gallons of gasoline less from January through August 2007 then during the same period in 2006.[7] Despite these recent statistics, demand for gasoline and diesel is projected to increase in California by 1 to 2 percent each year as a growing population registers more vehicles and drives more miles.

As the third largest consumer of transportation fuels in the world (behind the United States as a whole and China) — almost 16 billion gallons of gasoline and over 4 billion gallons of diesel used each year — California would like to replicate its success with electricity efficiency in the area of transportation fuels. However, federal law prohibits states from setting the minimum number of miles per gallon those new cars and light trucks must achieve. In 2003, the Energy Commission and the ARB reviewed the technical and economic aspects of a major reduction in the petroleum dependence of California's transportation sector. [8] Based on this research, in 2005, Governor

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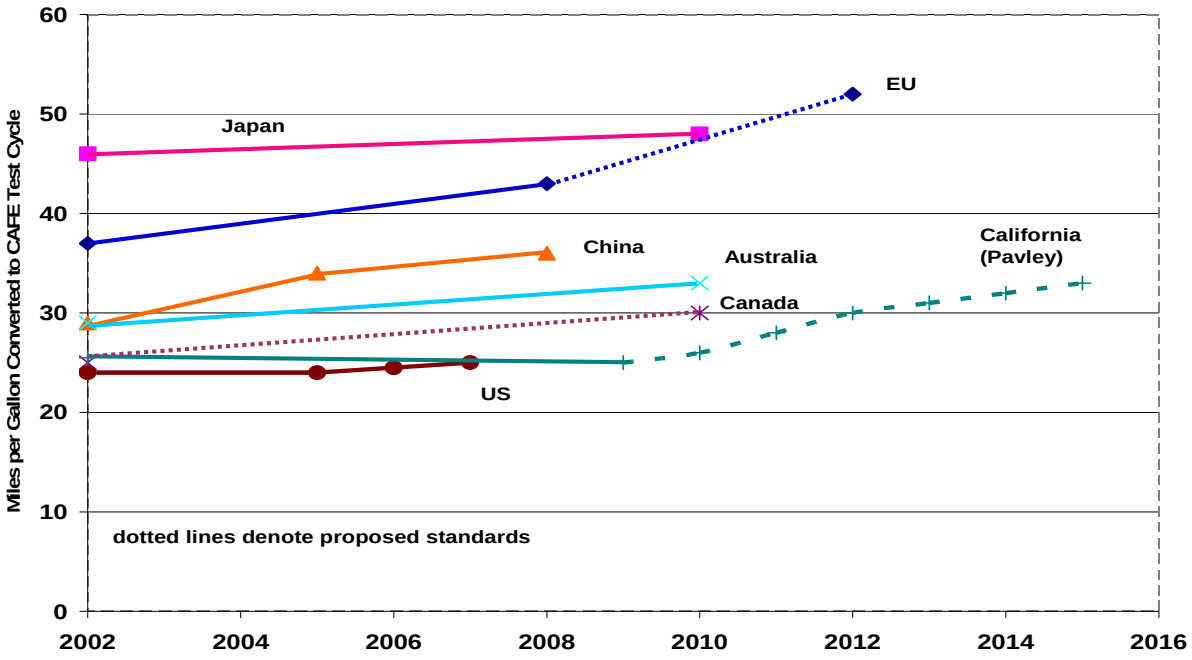
[7] California Board of Equalization, Net Taxable Gasoline Gallons, 2000-Present.

[8] California Energy Commission and the California Air Resources Board, *AB 2076 Report*, adopted 2003.

Schwarzenegger appealed to the United States House of Representatives "to establish new fuel economy standards that double the fuel efficiency of new cars, light trucks and SUVs."[9] In June 2007, the United States Senate voted to raise the fuel efficiency standard for cars to 35 miles per gallon by 2020. As of October 2007, the House had taken no action. The proposed 35-miles-per-gallon standard pales in comparison with Japan's current standard of 45-miles-per-gallon and Europe's more than 50-miles-per-gallon standard by 2012 and may ultimately be too little, too late (Figure ES-6).

**Figure ES-6: Comparison of Passenger Car Fuel Economy**




Source: Pew Center on Global Climate Change, Comparison of Passenger Vehicle Fuel Economy and Greenhouse Gas Emission Standards Around the World, December 2004

The California legislature also took advantage of a federal Clean Air Act provision that allows states to set their own emission standards (with a waiver from the United States Environmental Protection Agency)[10] and passed California's Clean Car Law (Assembly Bill 1493, Pavley, Chapter 200, Statutes of 2002), the first such regulation in the United

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[9] May 13, 2005 letter from Governor Arnold Schwarzenegger to Senator Jeff Bingaman, chairman, Senate Energy and Natural Resources Committee of the U.S. Senate and Senator Pete Domenici, member, Senate Energy and Natural Resources Committee, U.S. Senate.

[10] <http://www.greencarcongress.com/2007/04/us_epa_opens_co.html> The EPA has historically granted all 53 such waivers previously sought by California.

States, to limit greenhouse gas emissions from passenger cars and light trucks. The Clean Car Law would cut greenhouse gas emissions by 30 percent by 2016 for all cars sold in California starting in 2009. As allowed under federal law, 15 other states have adopted or are considering these California standards pending receipt of the Environmental Protection Agency waiver. Unfortunately, the agency has failed to act on California's waiver request for nearly two years, declaring it lacks the authority to regulate greenhouse gases—a declaration rejected by the United States Supreme Court in its recent decision affirming that the Environmental Protection Agency does have the authority to regulate $CO_2$ emissions.

Decreasing California's reliance on petroleum fuels is critical. By 2020, at current trends, 44 million Californians will consume more than 24 billion gallons of gasoline and diesel fuel each year. Supplying this fuel for California's transportation sector poses two significant challenges: meeting demand while reducing $CO_2$ emissions and addressing infrastructure capacity and reliability. Transportation contributes nearly 40 percent of California's greenhouse gases; reducing our transportation-related $CO_2$ emissions requires alternative fuels, alternative vehicles, new standards and advances in technology. Although the anticipated population growth will not make it easy to reduce our carbon footprint, it is essential that we find the means to do so.

Assembly Bill 1007 (Pavley, Chapter 371, Statues of 2005) tasked the Energy Commission to develop a plan for reducing the state's petroleum use and greenhouse gas emissions and increasing the use of non-petroleum transportation fuels in California. As required by the statute, the Energy Commission adopted the State Alternative Fuels Plan in October 2007. Results of the Plan's full fuel cycle ("Well-to-Wheels") analysis demonstrate that certain alternative fuels can provide substantial greenhouse gas reduction benefits when used in mid-size passenger cars and urban buses. Fuels such as ethanol, natural gas, liquefied propane gas, electricity, and hydrogen can have important advantages over conventional gasoline and diesel fuels.

The Plan concludes that regulations alone cannot achieve the state's multiple policy goals; California requires a portfolio of alternative, low-carbon fuels to meet the goals of petroleum reduction, greenhouse gas emissions reduction, and increasing biofuels production. The plan recommends multiple strategies that combine private capital investment, financial incentives, and technology advancement. Substantial investment is also needed in fueling infrastructure, production facilities, vehicle components, and commercial development of "second generation"[11] alternative fuels and advanced technology vehicles.

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[11] *Second generation* alternative fuels refer to those biofuels that are under development and often called "advanced" or "emerging" such as biobutanol, which is an ethanol substitute produced from cellulose.

Over 60 percent of the crude oil used by California-based refineries to make the state's transportation fuels is imported into the state. California's refineries also import 10 percent of the refined and finished petroleum products to meet demand. No pipelines bring crude oil or petroleum products into California; all of these imported products arrive by ship through marine terminals. The marine terminals, specifically those in Los Angeles and Long Beach, are congested and near their maximum berth and storage capacity.

As the demand for transportation fuels continues to grow, California's 21 refineries have responded by gradually increasing their capacity. In 2005, California refineries processed 674 million barrels (1.8 million barrel per day) of crude oil. In addition to supplying California transportation fuels, the state's refineries also supply all of Nevada's needs, 60 percent of Arizona's, and as much as 35 percent of Oregon's. Based on increased future transportation fuel consumption in California and neighboring states, demand is growing faster than the ability of California's refineries to produce those fuels. Importing increasing quantities of finished petroleum products puts more pressure on already-congested marine terminals.

Over the next several decades California must pursue strategies to increase fuel efficiency, expand non-traditional fuel use, and ultimately realign consumer preferences to reduce demand for all transportation fuels. In the near term, California must expand its marine terminal capacity, marine storage, the pipelines connecting these facilities with the refineries, and other distribution pipelines.

**The Energy Commission recommends the following actions by this agency to meet California's growing transportation needs:**

- Propose legislation that allows state appeals in the petroleum marine infrastructure lease renewal process at the Ports of Los Angeles and Long Beach.
- Assess the impact on infrastructure development of the State Lands Commission Marine Oil Terminal Engineering and Maintenance Standards, especially on clean fuels marine terminals in the Ports of Los Angeles and Long Beach.
- Advocate for a federal funding mechanism to maintain an adequate depth for tanker traffic in the Pinole Shoal in San Francisco Bay.

**The Energy Commission also recommends:**

- The state increase alternative fuels use to 9 percent by 2012, 11 percent by 2017 and 26 percent by 2022 to meet the AB 1007 goals that reduce petroleum fuels use and greenhouse gas emissions.

# Land Use

Decisions affecting land use directly affect energy use and the consequent production of greenhouse gases, primarily because of the strong relationship between where we live and work and our transportation needs. Significant efforts are necessary to reduce vehicle miles traveled to meet the state's emission reduction goals. California must begin reversing the current 2 percent annual growth rate of vehicle miles traveled. Research shows that increasing a community's density and its accessibility to job centers are the two most significant factors for reducing vehicle miles traveled.

Housing, transportation planning, and local greenhouse gas reductions require local and regional approaches. California's metropolitan planning organizations are involved in long-range planning efforts to develop transportation plans that incorporate improved land use decisions. These plans are expected to reduce energy and climate impacts in metropolitan regions. The state-sponsored Blueprint Planning Program has engaged nearly all of the state's metropolitan planning organizations in a long-range planning effort that will result in plans to coordinate land use and transportation development. The plans accommodate housing needs, reduce the rate of growth of vehicle miles traveled, and identify priority-planning areas. They are in early stages of implementation and may require technical, financial, and regulatory assistance to achieve their goals.

While the state has limited land use authority, it does have some key leverage points (California Environmental Quality Act, housing elements, bond funding, and others) that it can use to assist local governments in reducing energy use and greenhouse gas emissions that result from land use planning choices. In addition, the state can provide local governments tools and technical assistance to help meet greenhouse gas emission goals.

The Governor's Strategic Growth Infrastructure Bond package represents an opportunity to influence the energy efficiency and environmental friendliness of communities through project funding criteria. Utilities are playing a small but growing role in collaborative planning efforts with local governments. The potential for mutual benefit from planning efforts between these groups is great, but may require regulatory support to achieve.

The body of research on the impact of land use on energy and climate is receiving significantly more attention with the growing interest in climate change. The Energy Commission is dedicating additional resources to studying opportunities and barriers to integrated energy and land use planning.

**The Energy Commission supports the adoption of efficient and effective land use planning and recommends that the state:**

- Adopt a unified statewide growth management plan, based on local and regional plans, aligning state planning, financing, infrastructure, and regulatory land use policies and programs.
- Require regional transportation planning and air quality agencies to adopt 25-year and 50-year regional growth plans that provide housing, transportation, and community services for projected population increases while reducing greenhouse gas emissions to state-determined climate change targets.
- Expand efforts to provide technical and financial assistance to regional agencies and local governments to facilitate climate-friendly and energy-efficient planning and development.
- Model climate-friendly and energy-efficient development patterns.
- Determine the extent to which state and local tax policies affect and guide land use practices and revise policies that encourage growth that is inconsistent with the state's growth management plan.
- Direct California's utilities to play an active role with regional and local governments to encourage climate friendly and energy efficient development in their service areas.
- Work with California's Congressional delegation to ensure that future federal highway and other transportation and land use related legislation and programs include energy reduction and climate stabilization considerations.

## Moving Forward in a Carbon-Constrained World

Energy and the environment are inextricably linked. Meeting the mandate of AB 32 will require aggressive and immediate action from all Californians—government, private entities and individual citizens. The *2007 IEPR* reviews the issues of California's energy system to assess how we can meet the state's growing energy needs while restraining greenhouse gas emissions.

The Energy Commission offers the *2007 IEPR* as a balanced and considered review of the major energy issues facing the state as it grapples with meeting the enormous challenge of reducing greenhouse gas emissions. A single state alone cannot stabilize the world's climate. But California has a reputation for innovation. Other states and countries follow our lead. If history is a predictor of a state's ability to make a difference on the world stage, California's actions on climate change will drive global progress.