

The California Model for Fighting Global Warming with Energy Efficiency: Accomplishments, Current Status, and Next Steps

Audrey B. Chang, Natural Resources Defense Council

ABSTRACT

In June 2005, Governor Schwarzenegger established aggressive greenhouse gas reduction targets for California through 2050. At the cornerstone of the state's strategies to combat global warming is energy efficiency, which is anticipated to meet more than 17 percent of the 2020 goals. Largely due to its historical energy efficiency accomplishments, California already outperforms the rest of nation as a whole in per capita carbon dioxide emissions and electricity consumption, and the state is well-poised to continually improve in both these areas.

This paper describes the model policy framework that has allowed for California's efficiency success that will also help the state meet its energy savings and greenhouse gas reduction goals. Building on California's energy efficiency legacy, the California Public Utilities Commission approved in September 2005 the investor-owned utilities' energy efficiency program plans for 2006 to 2008. Together, these plans represent one of the most aggressive efficiency programs in the history of the utility industry. Over three years, \$2 billion will be invested in energy efficiency, generating nearly \$3 billion in net benefits for the state, avoiding over three million tons of greenhouse gas emissions, and surpassing even the state's own remarkable historical efficiency savings. Although this is a landmark accomplishment, the 2006 to 2008 efficiency plans are just the first step in achieving the state's larger energy savings and climate policy goals. Looking ahead, additional steps will also be necessary for California to capture all cost-effective efficiency potential throughout the state.

Introduction

California has long been at the vanguard of innovative energy policy. Today, the Golden State continues to establish pioneering energy policies that address pressing environmental concerns while strengthening the sixth largest economy in the world (LAO 2004, 7).

Currently at the core of California's environmental and energy policy goals is the issue of addressing climate change.¹ While an increasing number of nations, states, and cities have explicitly acknowledged the need to act to combat global warming, California has again risen to the challenge with its innovation and leadership in tackling greenhouse gas emissions.

In June 2005, Governor Schwarzenegger signed Executive Order S-3-05, and established the following greenhouse gas (GHG) reduction targets for California:

- by 2010, reduce GHG emissions to 2000 levels;
- by 2020, reduce GHG emissions to 1990 levels; and,
- by 2050, reduce GHG emissions to 80 percent below 1990 levels.

¹ In this paper, the terms "global warming" and "climate change" are used interchangeably.

The Climate Action Team (CAT), a joint agency task force led by the California Environmental Protection Agency, is in the early stages of establishing and implementing the necessary steps California will need to take to meet these targets. In a report to the Governor and Legislature, the CAT calculated that the 2010 reduction goals will require a 59 million ton reduction in GHGs (11 percent below business-as-usual), and the 2020 reduction goals will require a 174 million ton reduction in GHGs (29 percent below business-as-usual) (CAT 2006, 64).

As it has in the past, energy efficiency lies at the foundation of California's sound energy and global warming policy. As the cheapest, fastest, and cleanest energy resource, energy efficiency is the first priority resource for the state to meet its GHG reduction goals. By design, this paper focuses on California's energy efficiency policies and targets and how they will help achieve the state's GHG goals, but it does not address the many issues that will need to be developed to effectively integrate energy efficiency into the overall developing framework for reducing GHG emissions (e.g., quantifying the emissions reductions due to energy efficiency improvements).

The Natural Resources Defense Council, a non-profit organization with a long-standing interest in minimizing the societal costs of the reliable energy services that Californians demand, has promoted sustainable energy policies in California since the 1970s. This paper provides an overview of California's energy efficiency policies and accomplishments and the linkages with the state's climate change policies and targets.

California's History of Energy Efficiency

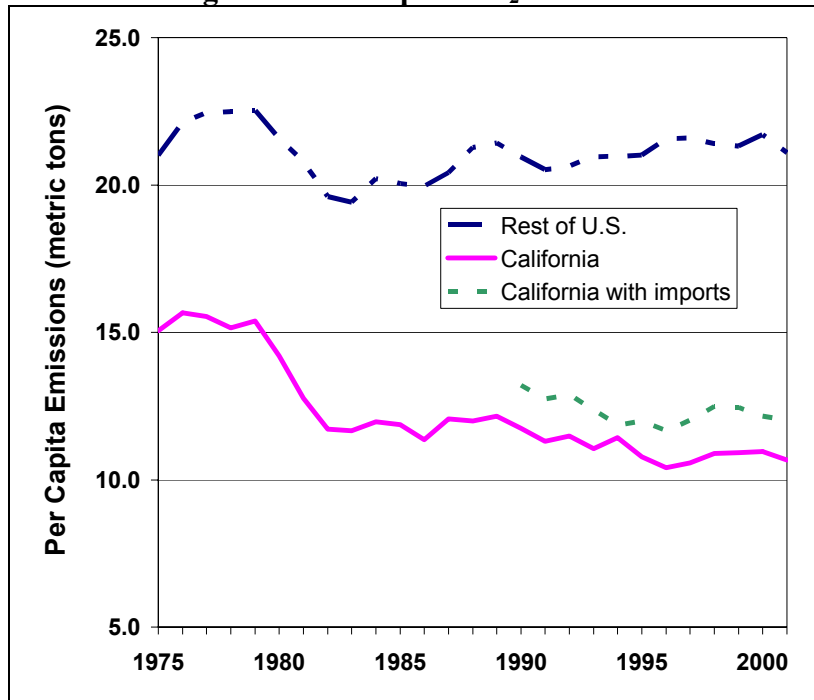
Since California's efficiency efforts first began in earnest in the mid-1970s, California has reduced its per-capita contributions to global warming by nearly 30 percent – even accounting for the emissions associated with California's imported electricity. Meanwhile, per capita carbon dioxide (CO₂) emissions in the U.S. have not improved (Figure 1).

California's strong focus on energy efficiency is at least partly responsible for these impressive reductions in per-capita CO₂ emissions in the state. While the rest of the nation saw its per-capita electricity consumption rise by nearly 50 percent in the past three decades, California's per-capita electricity consumption has remained essentially constant (Figure 2).

Demonstrating that economic growth need not be accompanied by proportional increases in energy consumption, California's inflation-adjusted economic output per unit of electricity consumed increased by over 40 percent during the same 30-year period (economic output per unit of electricity consumption in the rest of the nation increased by only 8 percent) (Bachrach, Ardeman & Leupp 2003, 2).

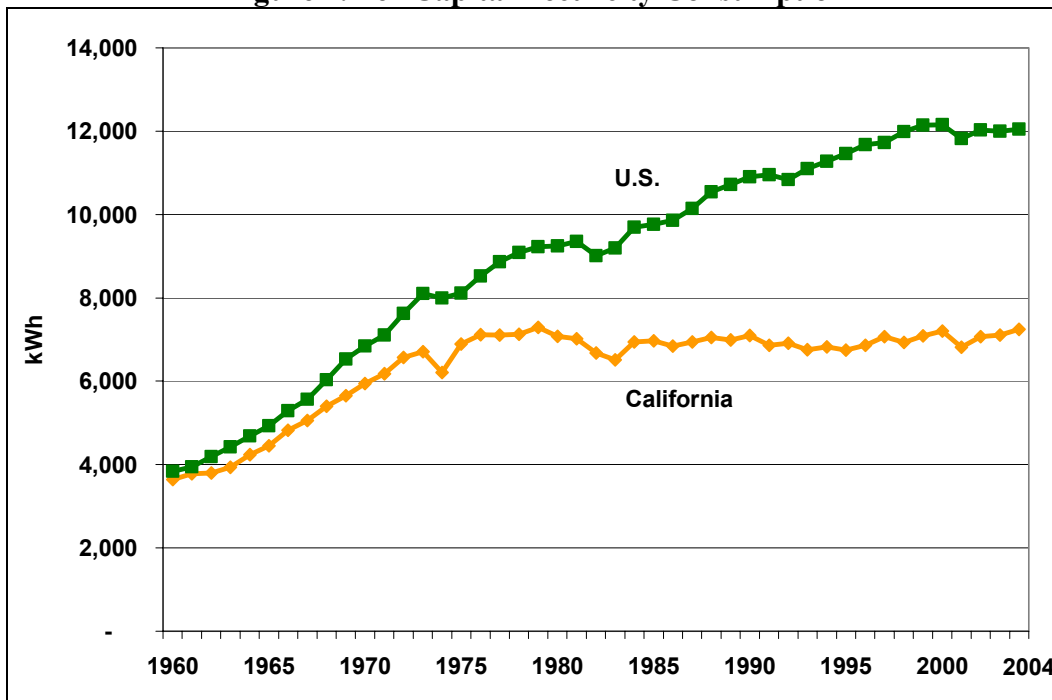
Behind this California success story is the state's aggressive energy efficiency legacy. Over the past three decades, California's investments in energy efficiency programs and improvements in building and appliance efficiency standards have saved more than 12,000 MW of peak demand (equivalent to avoiding about 24 large 500 MW power plants), and about 40,000 GWh of energy consumption each year. Annual electricity savings due to efficiency amounted to 15 percent of California's energy use in 2003 (CEC 2005b, E-4).

Figure 1. Per Capita CO₂ Emissions



Source: Data compiled from Blasing, Broniak & Marland 2004 and CEC 2005a

Figure 2. Per Capita Electricity Consumption

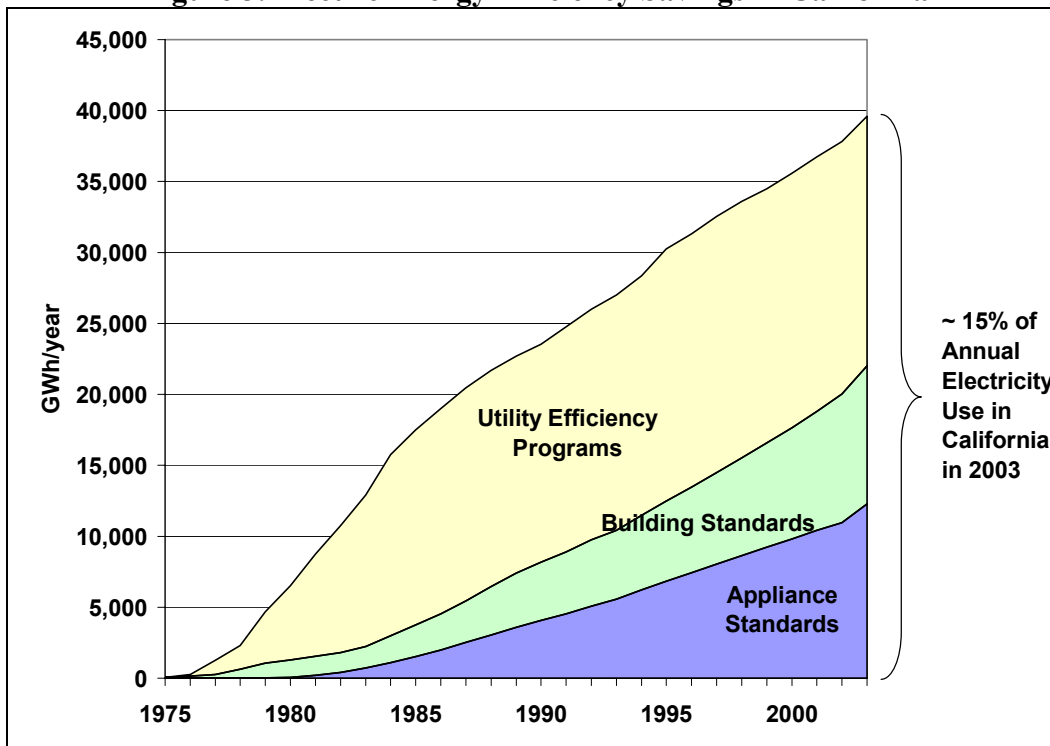


Source: McAuliffe 2006

Over the years, California has used a three-pronged approach to energy efficiency: research, development, and deployment (RD&D) activities have helped to develop the next

generation of energy-saving technologies and strategies that continue to push the envelope of possible efficiency gains;² utility rebate and education programs have helped these technologies gain widespread acceptance; and finally building and appliance codes and standards that are regularly strengthened over time cement these savings into place once the technologies are fully integrated into the market and help drive the market for increasingly efficient products.³ The cycle repeats itself, and the efficiency of energy use is continually improved over time. During the past 30 years, standards and utility programs have contributed roughly equal amounts of electricity savings for California (Figure 3).

Figure 3. Electric Energy Efficiency Savings in California



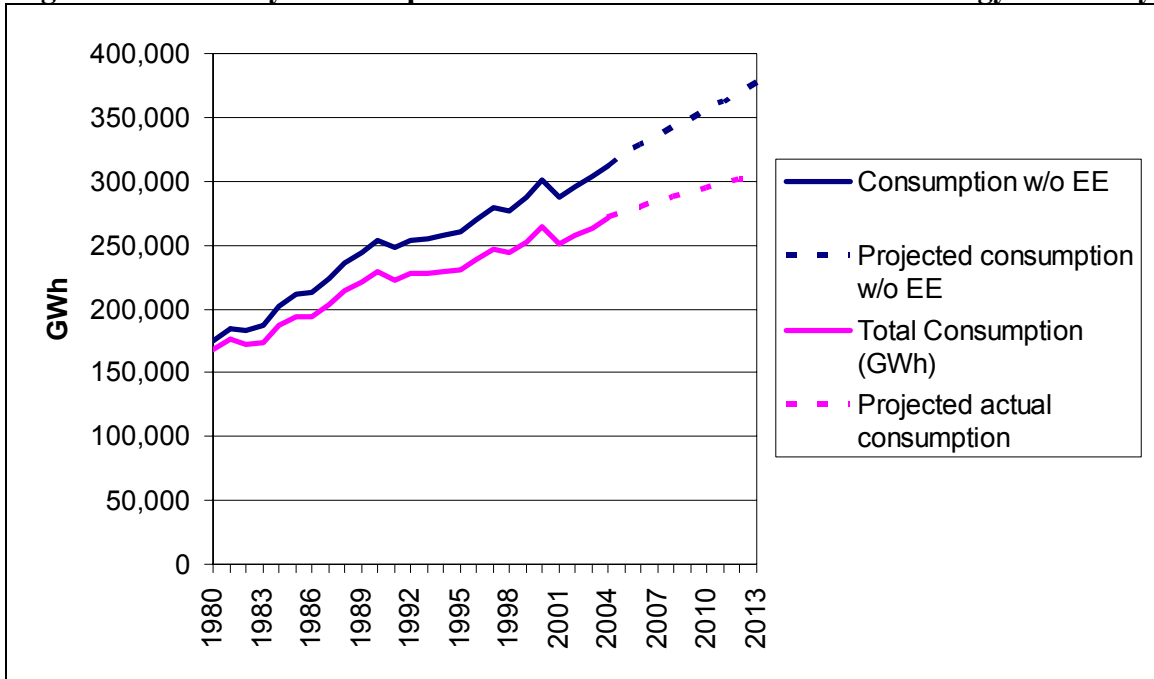
Source: CEC 2005b

In the future, energy efficiency can be expected to continue to reduce California's electricity consumption, and it will play an even larger role in the coming years. Even with the state's impressive accomplishments in energy efficiency, ample cost-effective opportunities still remain, as suggested by several potential studies (e.g., Rufo and Coito 2002). Without the historical and future planned contributions of energy efficiency, California's energy demand would be about 25 percent higher in 2013 (Figure 4). As California's economy and population continue to grow, the need for aggressive energy efficiency will be as important as ever.

² The California Energy Commission runs a Public Interest Energy Research (PIER) program to support non-commercial research, and the IOUs have programs to examine emerging technologies.

³ The California Energy Commission is responsible for regularly updating California's cost-effective building and appliance standards.

Figure 4. Electricity Consumption in California with and without Energy Efficiency



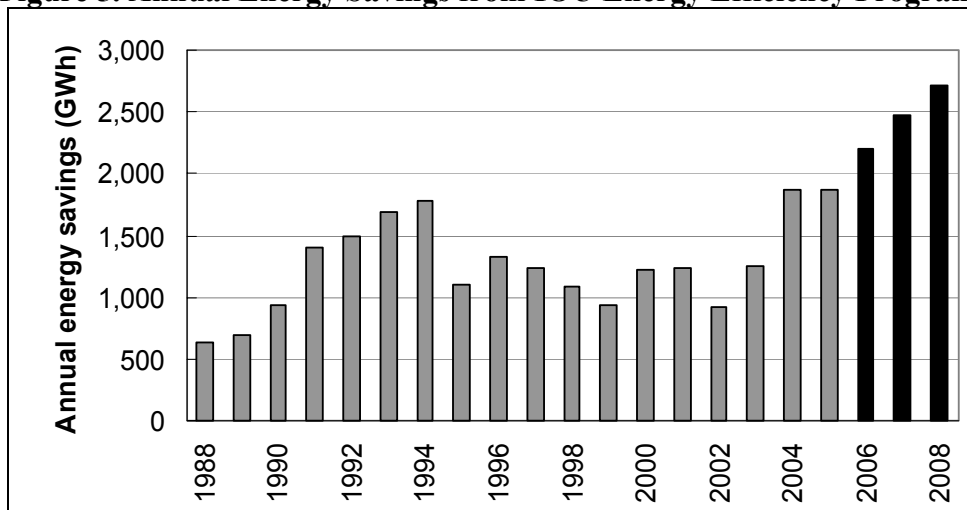
Sources: CEC 1995; CEC 2005b; CEC 2005c; CPUC 2004; and CPUC 2005b

In September 2005, the California Public Utilities Commission (CPUC) approved the investor-owned utilities’ (IOUs) energy efficiency program plans for 2006 to 2008. In accordance with these plans, the California IOUs have launched one of the most aggressive efficiency programs in the history of the utility industry, encompassing \$2 billion in investments over three years and producing first-year electricity savings that will exceed one percent of annual electricity consumption. While California’s IOUs have long been nationwide leaders on energy efficiency, this three-year initiative is expected to provide greater savings than the IOUs have ever achieved before (Figure 5), surpassing 2,000 GWh in annual savings and more than doubling the savings achieved through the historical “public goods charge” (PGC) funded programs (CPUC 2005b).⁴

The cost of these savings is less than half the cost of the avoided supply, providing an estimated \$3 billion in net direct economic benefits to California’s consumers. Moreover, the efficiency programs will reduce carbon dioxide emissions by more than 3 million tons per year by 2008, which is equivalent to taking 650,000 cars off the road (CPUC 2005b, 3).

⁴ During the restructuring of California’s utility industry in 1996, the state, similar to other states across the U.S., also established a “public goods charge” (PGC) (AB 1890). The PGC is a non-bypassable surcharge imposed on all retail sales to fund cost-effective energy efficiency activities and public goods research and development. Since its creation, the PGC has continually been extended in California, and efficiency programs are still funded through these means.

Figure 5. Annual Energy Savings from IOU Energy Efficiency Programs



Sources: IOUs 2002, 2003, 2004; Global Energy Partners 2003; CPUC 2004; CEC 2005b; and CPUC 2005b

The Policy Framework for Energy Efficiency

This historic initiative represents the culmination of several years of work by the Governor, Legislature, CPUC, and California Energy Commission (CEC) to lay the policy foundation for an aggressive efficiency effort. California’s overarching goal for the electricity industry is to provide customers with affordable, reliable, and environmentally-sound energy services (CEC 2005d). In 2003, the state’s energy agencies adopted the Energy Action Plan, which established the blueprint for California’s energy policy (CPA, CEC & CPUC 2003).

Building upon the state’s strong history of RD&D and codes and standards development, California’s has now established an energy efficiency policy framework that includes the following components:

1. *Remove disincentives for investments in energy efficiency by decoupling revenues from sales volume*⁵

Under traditional regulation in much of the country, utilities face a disincentive to invest in energy efficiency, since their financial health is directly linked to the volume of energy sales. If sales are higher than forecasted, utilities over-collect for their fixed costs; if sales are lower than forecasted (a situation that would be created through energy efficiency), utilities face under-collection of their authorized recovery for fixed costs. California pioneered the solution to this problem. The utilities’ disincentive for energy efficiency can be corrected through modest regular true-ups in energy rates. Thus, if sales are higher than expected, over-collected revenues are returned to customers through rate adjustments, and vice versa. This decoupling mechanism has been successfully implemented for all the California investor-owned utilities, both gas and electric.⁶

⁵ For further discussion of decoupling, see Bachrach, D., S. Carter and S. Jaffe, “Do Portfolio Managers Have an *Inherent* Conflict of Interest with Energy Efficiency?” *The Electricity Journal*, Volume 17, Issue 8, October 2004, pp. 52-62.

⁶ California Public Utilities Code Section 739.10 states: “The commission shall ensure that errors in estimates of demand elasticity or sales do not result in material over or undercollections of the electrical corporations.”

2. *Establish energy efficiency as the top priority resource, and adopt an administrative structure that fully integrates energy efficiency into resource procurement*

Because energy efficiency is the cheapest, cleanest resource available, California has made it the state's top priority to meet customer energy needs.⁷ California's "loading order" policy places energy efficiency at the top of the state's resource priorities, followed by renewable energy and cleaner fossil-fueled generation (CPA, CEC & CPUC 2003).

Since energy efficiency investments provide substantial economic and environmental benefits to customers, California's utilities are required to invest in energy efficiency whenever it is cheaper than procuring power. Less than half the amount the California IOUs are investing in energy efficiency from 2006-2008 is expected to be from their public goods charges collected from their customer bills. In addition, the energy efficiency programs are being implemented by several parties besides the utilities, such as local governments and non-utility implementers (CPUC 2005a).

3. *Set aggressive energy saving targets*

California's energy savings targets set in 2004 for its IOUs will double historical electricity savings, triple historical natural gas savings, and meet about half of the utilities' incremental electricity needs by 2013 (CPUC 2004). The 2006 to 2008 programs are the first significant step toward meeting these goals. These energy savings goals were established first at a statewide level by the CEC, based on an analysis of the maximum achievable cost-effective potential for energy savings (CEC 2003). The CPUC then proceeded to establish energy saving goals for each IOU according to their proportional share of statewide load.

4. *Well-designed programs*

California's IOU efficiency programs are designed to achieve the maximum possible savings in a cost-effective manner. Utility investment decisions have potentially large impacts on society, and meaningful public participation in an open and transparent public process has helped ensure that the best programs are designed. In developing their 2006-2008 and future programs, the California IOUs solicited and incorporated input from advisory groups (CPUC 2005a).

5. *Independent evaluation of savings*

Independent evaluations and measurements are necessary to ensure that efficiency savings can be relied upon as a resource in place of acquiring new generation and to maintain the credibility of programs. All evaluations of IOU energy efficiency programs in California are now performed by independent parties (CPUC 2005a), and detailed evaluation protocols have been adopted for post-2005 programs (CPUC 2006c).

6. *Performance-based incentives*

Beyond eliminating disincentives, California intends to also provide its utilities with direct incentives based on their performance at delivering cost-effective savings for customers. A shared savings approach with both risk and reward provides an opportunity for utilities to earn a reward for good performance (how much energy is saved cost-effectively, rather than simply how much money is spent) and provides a penalty for poor performance. The CPUC is currently developing a risk/reward performance incentive mechanism in its new energy efficiency rulemaking (CPUC 2006b).

⁷ See California Public Utilities Code sections 454.5(b)(9)(C), 454.56(b), 9615(a).

Energy Efficiency: A Cornerstone of Meeting California's Greenhouse Gas Reduction Targets

In California, a natural synergy exists between the state's energy efficiency leadership and its desire to curb global warming. The successful policy framework for energy efficiency in California has allowed the state to aggressively pursue energy efficiency, which will help the state meet its greenhouse gas reduction targets. The establishment of the GHG reduction goals has in turn stimulated the state to think about ways in which even greater efficiency gains can be made. California's energy efficiency policy framework is a model for other entities that also plan to use energy efficiency to help reduce their greenhouse gas emissions.

In February 2006, the CPUC announced its intent to establish a load-based cap on GHG emissions for the state's regulated utilities and load-serving entities. Although other strategies will of course be necessary to meet the GHG goals, energy efficiency will play a critically important role in meeting the utility sector cap.

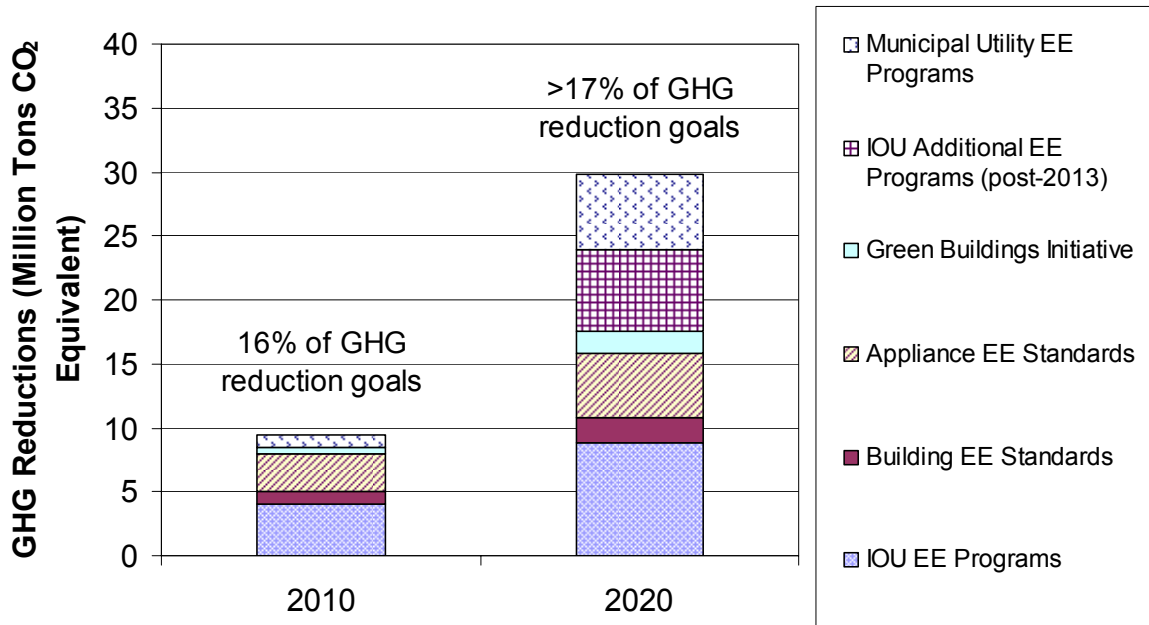
The Climate Action Team's report to the Governor and Legislature projects that current and additional energy efficiency strategies will account for 16 percent of the targeted statewide emission reductions by 2010, and at least 17 percent of the targeted reductions by 2020 (Figure 6). The share of GHG reductions that energy efficiency will contribute to help meet the 2020 target will be even higher once future updates to California's building and appliance standards are included. Within the electricity and natural gas utility sector, energy efficiency measures are expected to account for 39 percent by 2010 and 42 percent by 2020 of the sector's emission reductions, while providing net savings to ratepayers and other direct and indirect economic benefits to the state (CAT 2006).⁸

Quantifying the exact emissions reductions due to energy efficiency standards and programs will require additional measurement and verification methodologies beyond the rigorous evaluation protocols for energy efficiency that are already in place in California. Integrating evaluation and verification will be an important element of fully connecting the state's efficiency and climate change policies.

Other strategies outlined by the CAT to meet the state's greenhouse gas reduction targets include a multi-sector, market-based emissions cap, as well as greater use of renewable energy, clean car technologies and standards, smart growth planning, and forest management.

⁸ These percentages are calculated based on the assumption that a sector's allocated emissions reductions targets are proportional to that sector's current share of California CO₂ emissions. This does not account for the relative cost of reducing emissions in each sector. The electricity and natural gas utility sector is assumed to contribute 41 percent of California's CO₂ emissions (CEC 2005a).

Figure 6. Current and Additional Energy Efficiency Strategies to Meet California's GHG Reduction Goals⁹



Source: Data compiled from CAT 2006

Next Steps

Besides establishing the policy framework for the IOUs' energy efficiency programs and launching a new era of energy efficiency in California, the state still must aggressively ramp up its energy efficiency activities in order to cost-effectively achieve the state's greenhouse gas reduction targets. The following strategies, also identified by the state's Climate Action Team, are essential for this purpose:

- Capture all cost-effective energy efficiency potential.
Current energy savings goals for the IOUs extend only through 2013, and further savings targets will need to be set for the following years. Significant additional energy saving potential remains. For instance, the natural gas savings goals were designed to capture only 40 percent of the maximum achievable potential identified in the most recent studies at that time; the electricity savings goals encompass 90 percent of the maximum achievable potential (CPUC 2004, 2-3). These post-2013 savings goals must be set to capture the remaining cost-effective energy efficiency, and California's regulators have plans to regularly update and further the IOUs' targets based on updated potential studies.
- Build publicly-owned utilities' (POUs) efficiency programs up to par with the IOUs.
The California IOUs are now generating large energy efficiency gains for the state, but the state's publicly-owned utilities (POUs) have not proportionally matched the IOUs' achievements. POUs provide about a quarter of California's electricity. Based on

⁹ Excludes future updates to building and appliance standards.

the best information available today, while some POU's have aggressive efficiency programs, it appears the POU's as a whole would need to accelerate their energy efficiency programs by two to three times in order to meet their share of the state's energy saving targets (Wang and Chang 2006). Going forward, more information will soon be available, as Senate Bill 1037, which was adopted by the Legislature and signed by the Governor in September 2005, now requires the POU's to report their savings annually to the CEC. Appropriately applying similar elements of the aforementioned policy framework that has been successful for the IOU's achievements in energy savings may also aid the POU's in accelerating their energy efficiency achievements.

- Develop a policy framework to recognize and encourage the energy savings contribution of water use efficiency.

Currently, the CPUC's policy framework for energy efficiency only recognizes the end-use energy savings from water efficiency measures (such as water heating). However, California's vast water distribution system uses prodigious amounts of energy to transport and treat water. This massive water infrastructure accounts for almost 20 percent of the state's electricity consumption (CEC 2005d, E-6). The potential energy savings from implementing "cold water" efficiency measures are likely to be tremendous. The CEC is currently investigating the extent of cold water energy savings potential in the state, and the CPUC is examining the related policy issues in its current energy efficiency rulemaking.¹⁰

Conclusion

California's energy efficiency achievements have established the state as a leader in sustainable energy policy, and the state's energy efficiency and global warming goals will continue to work in tandem. The adoption of the Governor's GHG reduction goals signifies that energy efficiency will play an ever larger role in the state's energy future. The challenge that lies ahead for the state is to improve upon its already unprecedented energy efficiency achievements, and California's established energy efficiency policy framework will be essential in this regard. Additional efforts to integrate the measurement and verification of energy efficiency with the corresponding GHG emissions reductions will also be necessary. The state will need to expend tremendous effort to capture every last unit of cost-effective energy efficiency potential, which will require long-term vision as well as the active participation of the state's publicly owned utilities. As California's top priority energy resource, energy efficiency will continue play a key role in helping California fight global warming while setting an example for the nation and the world.

References

Bachrach, D., M. Ardeman, and A. Leupp. 2003. *Energy Efficiency Leadership in California: Preventing the Next Crisis*. San Francisco, Calif.: Natural Resources Defense Council and Silicon Valley Manufacturing Group.

¹⁰ CPUC Rulemaking 06-04-010.

- Blasing, T. J., C. T. Broniak, and G. Marland. 2004. "Estimates of Annual Fossil-Fuel CO₂ Emitted for Each State in the U.S.A. and the District of Columbia for Each Year from 1960 through 2001." In *Trends: A Compendium of Data on Global Change, Carbon Dioxide Information Analysis Center*. Available online: cdiac.esd.ornl.gov/trends/emis_mon/stateemis/emis_state.htm. Oak Ridge, Tenn.: Oak Ridge National Laboratory.
- [CPA, CEC & CPUC] California Consumer Power and Conservation Financing Authority (CPA), California Energy Resources Conservation and Development Commission (CEC), and California Public Utilities Commission (CPUC). 2003. *Energy Action Plan*. Available online: www.energy.ca.gov/energy_action_plan/2003-05-08_ACTION_PLAN.PDF. Sacramento, Calif.: California Energy Commission.
- [CEC] California Energy Commission. 1995. *Savings and Costs of Statewide Efficiency Standards*. Sacramento, Calif.: California Energy Commission. December 20.
- California Energy Commission. 2003. *Proposed Energy Savings Goals for Energy Efficiency Programs in California*. Publication 100-03-021F. Sacramento, Calif.: California Energy Commission. October 27.
- California Energy Commission. 2005a. *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2002 Update*. Publication CEC-600-2005-025. Sacramento, Calif.: California Energy Commission. June.
- California Energy Commission. 2005b. *Implementing California's Loading Order for Electricity Resources*, Staff Report. Publication CEC-400-2005-043. Sacramento, Calif.: California Energy Commission. July.
- California Energy Commission. 2005c. *California Energy Demand 2006-2016: Staff Energy Demand Forecast*, Final Staff Report. Publication CEC-400-2005-034-SF-ED2. Sacramento, Calif.: California Energy Commission. September.
- California Energy Commission. 2005d. *2005 Integrated Energy Policy Report*. Publication CEC-100-2005-007. Sacramento, Calif.: California Energy Commission. November.
- [CPUC] California Public Utilities Commission. 2004. "Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond." Decision 04-09-060. San Francisco, Calif.: California Public Utilities Commission. September 23.
- California Public Utilities Commission. 2005a. "Interim Opinion on the Administrative Structure for Energy Efficiency: Threshold Issues." Decision 05-01-055. San Francisco, Calif.: California Public Utilities Commission. January 27.

- California Public Utilities Commission. 2005b. "Interim Opinion: Energy Efficiency Portfolio Plans and Program Funding Levels for 2006-2008 – Phase 1 Issues." Decision 05-09-043. San Francisco, Calif.: California Public Utilities Commission. September 22.
- California Public Utilities Commission. 2006a. "Opinion on Procurement Incentives Framework." Decision 06-02-032. San Francisco, Calif.: California Public Utilities Commission. February 16.
- California Public Utilities Commission. 2006b. "Order Instituting Rulemaking to Examine the Commission's Post-2005 Energy Efficiency Policies, Programs, Evaluation, Measurement and Verification, and Related Issues," Rulemaking 06-04-010. San Francisco, Calif.: California Public Utilities Commission. April 13.
- California Public Utilities Commission. 2006c. "Administrative Law Judge's Ruling Adopting Evaluators' Protocols for the Evaluation of Energy Efficiency Programs," Rulemaking 06-04-010. San Francisco, Calif.: California Public Utilities Commission. April 25.
- [CAT] Climate Action Team. 2006. *Climate Action Team Report to Governor Schwarzenegger and the Legislature*. Sacramento, Calif.: California Environmental Protection Agency. March.
- Global Energy Partners. 2003. *California Summary Study of 2001 Energy Efficiency Programs, for the California Measurement Advisory Council (CALMAC)*. Report ID# 02-1099. Lafayette, Calif.: Global Energy Partners. March.
- [LAO] Legislative Analyst's Office. 2004. *Cal Facts 2004: California's Economy and Budget in Perspective*. Sacramento, Calif.: Legislative Analyst's Office.
- McAuliffe, Pat (California Energy Commission). 2006. Personal communication. April 24.
- [IOUs] Pacific Gas and Electric, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company. 2002, 2003, 2004. *Energy Efficiency Program Annual Reports*. Submitted in California Public Utilities Commission Proceeding A. 00-05-002 et al.
- Rufo, M. and F. Coito. 2002. *California's Secret Energy Surplus: The Potential for Energy Efficiency*. Oakland, Calif.: Xenergy, Inc.
- Wang, D. and A. Chang. 2006. "Achieving Publicly-Owned Utilities' Contributions to California's Energy Saving Targets." San Francisco, Calif.: Natural Resources Defense Council.