

July 2008



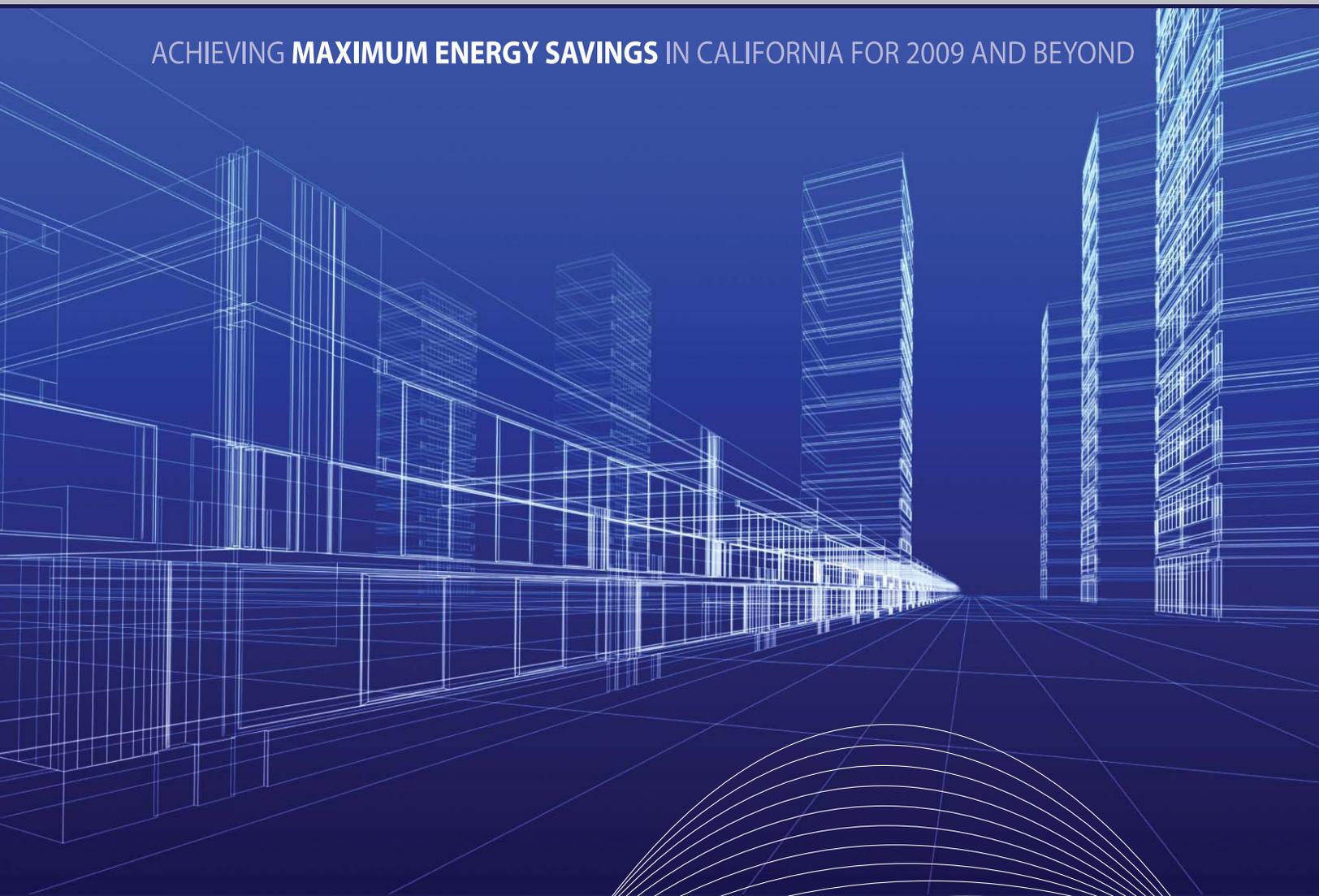
FILED

07-14-08
10:55 AM

California long term **ENERGY EFFICIENCY**

STRATEGIC PLAN

ACHIEVING **MAXIMUM ENERGY SAVINGS** IN CALIFORNIA FOR 2009 AND BEYOND



RESEARCH & TECHNOLOGY

WORKFORCE EDUCATION & TRAINING

CODES & STANDARDS

COMMERCIAL SECTOR

LOCAL GOVERNMENTS

RESIDENTIAL SECTOR INCLUDING LOW INCOME

MARKETING, EDUCATION & OUTREACH

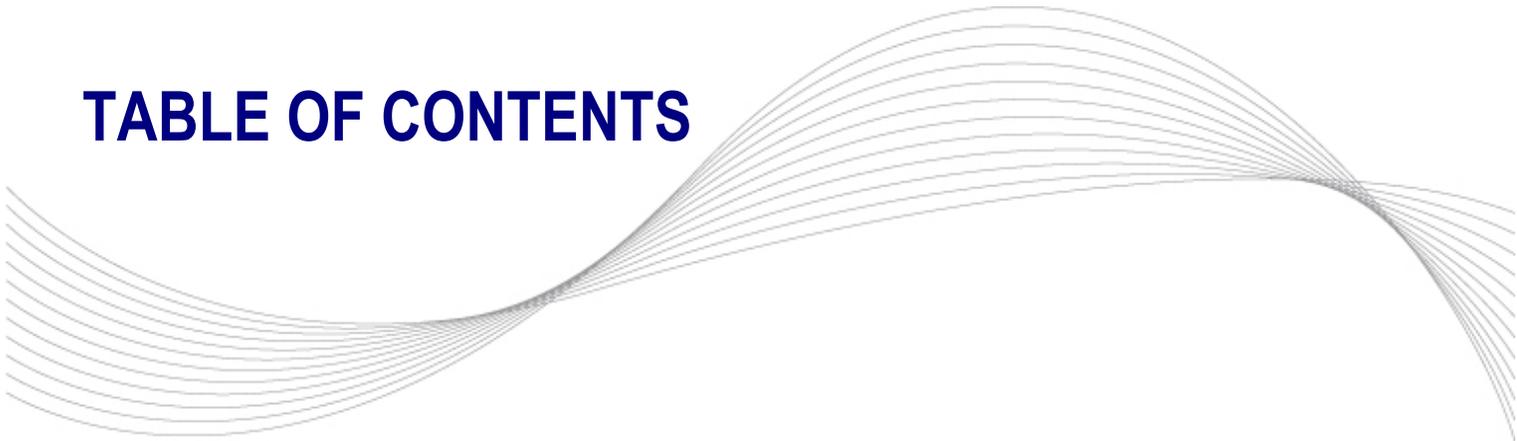
INDUSTRIAL SECTOR

California Public Utilities Commission



DSM COORDINATION AND INTEGRATION

TABLE OF CONTENTS



section	page
1. INTRODUCTION.....	2
2. RESIDENTIAL SECTOR INCLUDING LOW INCOME.....	8
3. COMMERCIAL SECTOR.....	26
4. INDUSTRIAL SECTOR.....	36
5. AGRICULTURAL SECTOR.....	44
6. HEATING, VENTILATION AND AIR CONDITIONING.....	51
7. CODES AND STANDARDS.....	60
8. DSM COORDINATION AND INTEGRATION.....	65
9. WORKFORCE EDUCATION AND TRAINING.....	68
10. MARKETING, EDUCATION AND OUTREACH.....	73
11. RESEARCH AND TECHNOLOGY.....	77
12. LOCAL GOVERNMENTS.....	82

INTRODUCTION

In October 2007, the California Public Utilities Commission (CPUC) created a framework to make energy efficiency a way of life in California by refocusing ratepayer funded energy efficiency programs on achieving long-term savings through structural changes in the way Californians use energy. The Commission recognized that these very ambitious goals require long-term strategic planning to achieve market transformation through continual incorporation of efficiency gains into codes and standards and increasing privatization of cost-effective energy efficiency services in competitive markets activities.¹ – to prepare a long-term strategic plan for energy efficiency through 2020.

This *Energy Efficiency Strategic Plan (Plan)* was developed through a collaborative process involving the CPUC’s regulated utilities – Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas and Electricity Company (SDG&E) and Southern

California Gas Company (SoCal) (collectively, “IOUs” or “utilities”) and over 500 individuals and organizations working together over a nine-month period. This *Plan* sets forth a roadmap for energy efficiency in California through 2020 and beyond, that articulates a long-term vision and goals for each economic sector and identifies specific near-term, mid-term and long-term actions to achieve the goals. Every participant in this process recognizes the enormous task that lies ahead. However, every participant also recognizes that the threat of global climate change and ever increasing energy prices require that California set the hurdle high and move forward quickly and purposefully to achieve deep reductions in energy demand.

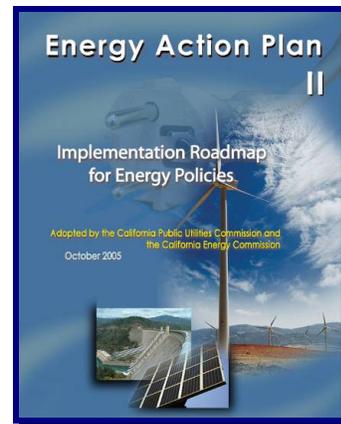
1.1 PAST ACCOMPLISHMENTS AND FUTURE CHALLENGES

The 2005 CPUC and California Energy Commission’s (Energy Commission) Energy Action Plan II,² declared:

“[The] goal is for California’s energy to be adequate, affordable, technologically advanced, and environmentally-sound...[C]ost effective energy efficiency is the resource of first choice for meeting California’s energy needs. Energy efficiency is the least cost, most reliable, and most environmentally-sensitive resource, and minimizes our contribution to climate change.”

Public Utilities Code Section 454.5(b)(9)(C) also requires utilities to first meet their “unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible.”

“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.”



With three decades of leadership and innovation in the public and private sectors, California leads the nation and perhaps the world in developing and implementing successful energy efficiency efforts. As the Energy Commission notes in its 2007 Integrated Energy Policy Report (IEPR)³:

The IOUs' 2006-2008 energy efficiency portfolio marks the single-largest energy efficiency campaign in U.S. history and one that will produce an estimated \$2.7 billion in net resource benefits, representing a 2-to-1 return on the efficiency investment. In addition, individual and corporate energy consumers; state and local agencies; and publicly owned utilities continue to make significant investments to increase the efficient use of energy.

However, with a growing population, increasing demand for energy, and the greenhouse gas (GHG) reduction goals in the California Global Warming Solutions Act of 2006 (AB 32)⁴, there has never been a more important time for energy efficiency. California is the second-largest greenhouse gas-emitting state in the U.S. and ranks behind only about a dozen countries in emission levels. Electricity generation, from both in-state and out-of-state resources, accounts for

about 23 percent of California's emissions.⁵ In addition to high levels of energy-related greenhouse gas emissions, the state faces rising energy consumption and escalating energy prices. Statewide electricity consumption is expected to grow at an annual average of 1.25 percent from 2008-2018, with natural gas consumption projected to grow at somewhat less than 1 percent per year, mostly for electricity generation.⁶

The combination of high emissions, growing energy consumption, and rising energy prices poses significant economic and social risks to California. It also provides both an opportunity and a challenge—to make energy efficiency an integral part of “business as usual.” This challenge is based in part on the political will to continue making investments during times of economic stress, and in part on the levels of energy efficiency available within the state.

1.2 POLICY CONTEXT

The California Air Resources Board's (CARB) Draft Scoping Plan for AB 32 (Draft Scoping Plan) states, “California has a long history of success in implementing regulations and programs to encourage energy efficiency and will need to greatly expand those efforts to meet our greenhouse gas emission reduction goals”.⁷ The Draft Scoping Plan also notes that “[e]nergy efficiency measures for both electricity and natural gas can reduce greenhouse gas emissions on a scale second only to the Pavley regulations”, and establishes a state-wide target of at least 32,000 gigawatt hours and 800 million therms by 2020.⁸

This and other pivotal legislation and policy in California—such as the Energy Action Plan II, AB 2021 (which involves setting statewide energy efficiency goals), the Low-Income Energy Efficiency statutes, the Governor's Green Building Executive Order and the 2007 IEPR — are an environment where energy efficiency can continue to thrive. For this reason, there is even greater need for this *Plan* to provide a roadmap for integrating all energy efficiency and related policies.

The *Plan* fully embraces the goals set by the Energy Commission and CARB to meet the State's energy needs while reducing greenhouse gases. The *Plan* also incorporates consideration of recent legislation, such as the 2007 Assembly Bill (AB) 1109 (Huffman Bill), which requires reductions in energy usage for lighting and encouraging the use of more efficient lighting technologies.⁹

This *Plan* hopes to achieve a new energy efficiency planning and coordination landscape in California. This *Plan* aims to bring together other participants beyond the CPUC and the IOUs, such as publicly owned utilities; the financial and building industries; partnerships with cities and counties; other state agencies; and businesses and consumers; to work together toward common energy efficiency goals. Therefore, the strategies and goals are not restricted by geographical, jurisdictional, regulatory, or political boundaries. To achieve these goals, the various actors must work collaboratively over the long-term to leverage all of the available resources to change the way Californians use energy at home and at work.

1.3 STRATEGIC PLANNING PROCESS

The CPUC's 2007 Decision (07-10-032) outlined the key goals, content, and development process for this first California Energy Efficiency Strategic Plan (*Plan*). During November and December 2007 and January 2008, working groups for four "vertical" market sectors—residential, including low-income, commercial, industrial, and agricultural—and seven cross-cutting areas—Heating, Ventilation and Air Conditioning (HVAC) systems; Demand Side Management (DSM) Coordination and Integration; Workforce Education and Training (WET); Marketing Education and Outreach (ME&O); Research and Technology; Codes and Standards; and Local Governments—held 36 public stakeholder workshops. The objective of these meetings was to develop an action plan

for each market sector and each cross-cutting sector. In January, these plans ("convener reports") were provided to the IOUs to inform their efforts.

As required by the CPUC, the IOUs filed a draft *Plan* on February 8, 2008. On March 6, 2008, the IOUs filed a revised draft *Plan*, supplementing the February draft pursuant to Commission direction. Three stakeholder workshops were then held (in San Diego, Los Angeles, and San Francisco).¹⁰

All public comments, workshop transcripts, IOU and CPUC staff materials, and convener reports are available on the strategic planning website: www.californiaenergyefficiency.com.

1.4 STRATEGIC VISION AND GOALS

With a foundation of innovation, integration and collaboration, this *Plan* establishes a three-part vision:

1. All cost-effective, reliable, and feasible energy efficiency measures and actions are implemented in an integrated systems or whole-building approach.
2. Strategies, programs, measures and institutional structures must provide long-term energy savings.
3. Energy efficiency will generate significant reductions in greenhouse gas emissions.



This vision embraces four specific goals, known as the "Big Bold Energy Efficiency Strategies," or Programmatic Initiatives, established by the CPUC in D.07-10-032 and D.07-12-051:

1. All new residential construction in California will be zero net energy by 2020⁷;
2. All new commercial construction in California will be zero net energy by 2030;
3. Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate; and
4. All eligible low-income customers will have a meaningful opportunity to participate in the LIEE program and will be provided all cost effective energy efficiency measures in their residences by 2020.

The Energy Commission has also embraced the first three of these goals.

1.5 EMBRACING MARKET TRANSFORMATION

This *Plan* seeks to move beyond a focus on short term activities to a broader long-term strategic focus—one that permanently transforms markets so that using energy efficiently represents not a special action, but “business as usual.”

Market transformation is both a strategy and a desired “end-point.” It is defined as elimination of barriers to the adoption of energy efficiency measures such that publicly funded intervention is no longer appropriate in that specific market.⁸ Transformation of the energy efficiency market requires changes in energy user behaviors and in infrastructure, services and products that affect energy usage.

Several mechanisms can be used to advance market transformation, including but certainly not limited to utility programs. These are employed to encourage suppliers and manufacturers to sell efficiency products or services to “push” the market or encourage consumers to buy these products or services to “pull” the market. When “push-pull” strategies and other market forces, succeed in moving a particular product or service into standard practice (perhaps by being incorporated into a mandated code or standard), the market for that product or service is considered “transformed.”

Market transformation activities do not produce the same short-term, or relatively easily measured or apparent, results as resource

acquisition programs. However, they can result in a much larger, medium- to long-term result that can yield a much larger energy efficiency payoff. Transformation is an evolutionary process, and markets are not necessarily transformed only once, but continuously. Market transformation is also not merely a tactic or program description, but a fundamental change in the markets for energy and energy efficiency. This *Plan* embraces the goals and strategies of market transformation by seeking to achieve transformative progress in all sectors by 2020.

Clearly defined rules must be established to determine when market transformation has occurred to define the end point for strategies and set the course for new programs and goals. The CPUC stated in D.07-10-032 that the utility portfolios should identify “an ‘end game’ for each technology or practice that transforms building, purchasing, and use decisions to become either ‘standard practice’ . . . or incorporated into minimum codes and standards.”

The CPUC will examine appropriate rules and guidelines for evaluating market transformation for energy efficiency strategies and determining when publicly funded intervention is no longer appropriate. In addition, the CPUC will examine changes to the policy rules on counting savings from IOU programs to appropriately attribute gains from market transformation and long-term strategies to the IOUs.

The strategies covered in the *Plan* are built upon one or more of the following strategic themes that both push and pull the market:

- **Incentives** include rebates; innovative or discounted financing; and/or non-financial support to consumers who implement energy efficiency practices and measures that go beyond current practice or mandates. Incentives are the “carrots” that help *pull* consumers into choosing the efficient option.
- **Codes and Standards** mandate maximum energy consumption levels for buildings, appliances and/or equipment, thereby removing the less efficient choices from the marketplace (some standards are not legally mandated). These are the “sticks” that *push* builders and manufacturers.
- **Education and Information** inform consumers and others about energy use and opportunities associated with energy efficiency. They are provided by a wide variety of marketing, education and outreach techniques and often include labeling; benchmarking; internet-based comparisons; professional and trade materials; school curricula; peer-to-peer exchanges; and other resources.
- **Market Transformation** is both a cross-cutting strategy and a desired “end-point,” as described above.

-
- **Price and Rate Design** can provide incentives for or inhibit energy efficiency and demand-side management actions. If it does so by making price signals more precise, it is often called “getting prices right.”
 - **Emerging Technologies** rely on research, development, demonstration and/or deployment to move energy-efficient products and developments from the laboratory into the commercial marketplace.

LIMITATIONS AND POLICY ISSUES

Two limitations to this 2008 *Plan* should be noted:

1. Because it is the initial energy efficiency strategic plan—and due to time and other constraints—this *Plan* has not undergone rigorous cost-benefit analysis. Similarly, the strategies and actions have not been fully evaluated for prioritization or for budget and resource-allocation decisions. Accordingly, the strategies and actions described in this *Plan* will be updated and improved as conditions change and new experience and information is obtained.
2. This *Plan* does not specifically address three important elements of energy efficiency. These are the evaluation and measurement and verification of energy savings; transportation; and the water-energy “nexus.” The reasons for these exclusions are two-fold: first, there was no specific input provided by the working groups on these topics; and, second, various state agencies are covering these issues in separate processes. Future strategic planning cycles are likely to address these issues.

Many of the strategies in the *Plan* do not require changes in state or federal law or the regulations of various agencies. Specifically, most of the activities to be implemented in the near term (approximately 2009-2011) are expected to be feasible under current law and the rules of the CPUC and other agencies. However, there are longer term elements of the *Plan* for which changes in law and/or agency rules and policies would be useful—or even essential—to achieve the desired cost-effective energy efficiency over the 2009-2020 period.

LONG TERM PLANNING

This *Plan* is a dynamic document that will be continually updated to reflect past successes, failures, and lessons learned and to adjust the visions, goals and strategies accordingly. Given the urgency of the need to achieve the AB 32 goals, it is necessary to quickly and efficiently complete foundations activities such as studies, data collection and pilot programs and to move just as quickly to implementation of actual programs and delivery of real results in the near term.

The process that started during the Fall of 2007 was a tremendous and highly productive effort by the utilities, CPUC, and the Energy Commission working with a large number of stakeholders from all sectors of the California economy. This process must continue in order to continue the momentum and build the sustained velocity needed to achieve the goals expressed in this *Plan*.

The next planning cycle will include:

- Completing data development and collection efforts including application of market assessment and market potential data more directly in the planning process. This planning should align with the needs for procurement plans at utilities and the Energy Commission as well as other related statewide long term resource plans, for example those associated with water, waste management and climate mitigation.
- Evaluating performance to-date with respect to goals established in the current *Plan*.
- Enrolling more key stakeholders prior to initiating the planning cycle and cooperatively developing roles and a process that

increases the information resources and breadth of stakeholders. Central to this expanded process will be additional state agencies, which may wish to co-sponsor various task forces—for example, in Workforce Education and Training or in technology development—establishing promotional initiatives for leaders in each area.

- Conducting public workshops open to all stakeholders to provide planning input and to vet planning documents. Discussing commitments with key participants identified as having responsibility for funding or implementing strategies.

2. RESIDENTIAL SECTOR INCLUDING LOW INCOME

2.1 CORE RESIDENTIAL

2.1.1 VISION

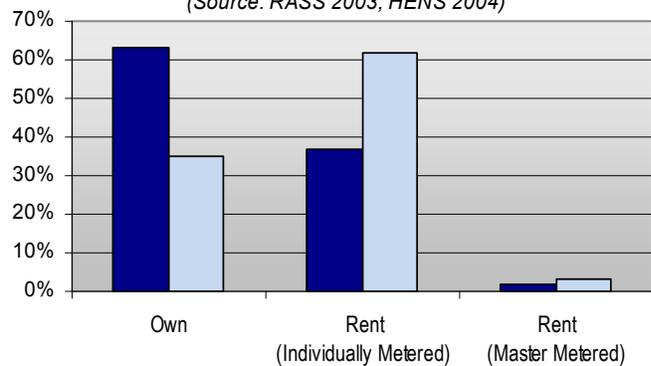
Residential energy use will be transformed to ultra-high levels of energy efficiency resulting in Zero Net Energy new construction standards by 2020. All cost-effective potential for energy efficiency, demand response and clean energy production will be routinely realized for all dwellings on a fully integrated, site-specific basis.

2.1.2 PROFILE

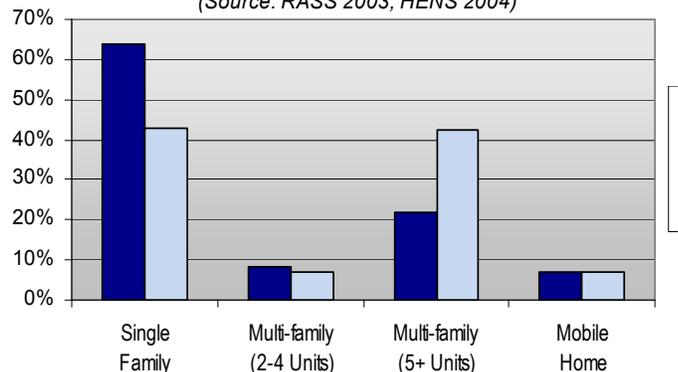
In 2008, energy demand for California's 12.6 million households was over 25,000 MW. The residential sector represents approximately 32% of total state electricity consumption and 36% of its total natural gas consumption.¹ Electricity demand is expected to grow to almost 31,000 MW by 2018.¹¹

Approximately one-third of all households live in multi-family structures and two-thirds in single family homes. The balance of renters to homeowners is about 42% to 58%, respectively.¹ Most or all of these households qualify for utility energy efficiency programs targeting residential customers.¹² About one-third (approximately 4 million) of these households qualify for additional low income energy efficiency (LIEE) programs extended to households with annual incomes less than or equal to 200% of Federal Poverty Guidelines.¹³

Distribution of California Household by Home Ownership
(Source: RASS 2003, HENS 2004)



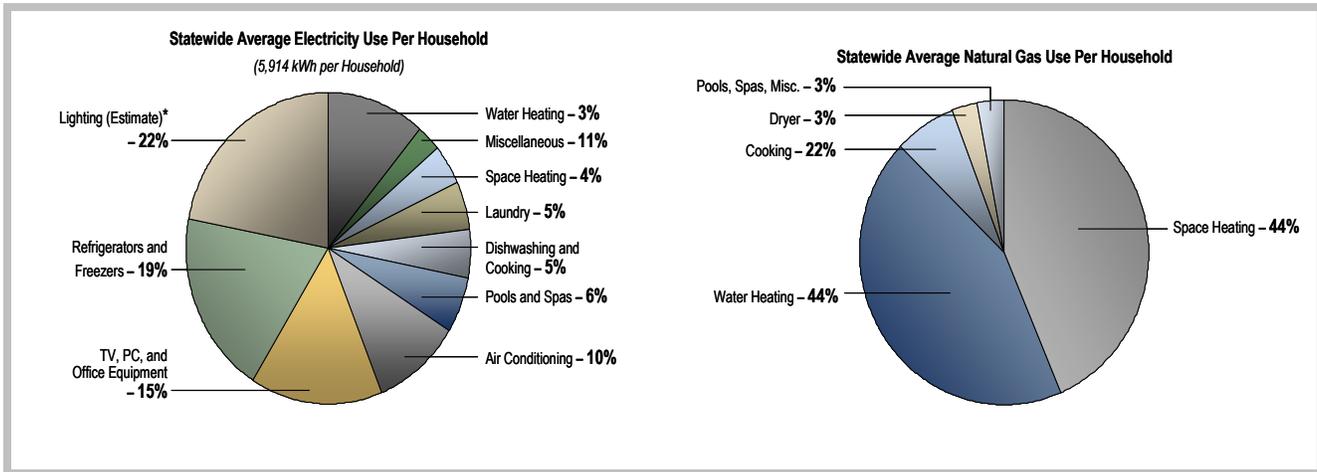
Distribution of California Household by Dwelling Type
(Source: RASS 2003, HENS 2004)



■ % of All CA Households
□ % of Low Income Households

The utilities have responded to the diverse needs of California's residential sector by offering a wide range of energy efficiency programs that impact every level of the residential market, including work to enhance the Energy Commission's building and appliance codes and standards, offering training and education to architects, engineers, building managers and building inspectors, and rebates

for efficient products, such as lighting, air conditioners, and refrigerators. The utilities also have a number of innovative whole-house or community-wide programs such as the SCE Sustainable Communities program which targets new residential developments and the Design for Comfort Program that provides efficiency assistance to affordable housing developments that are undergoing renovation.



Over the past two utility program cycles (2004/2005 and 2006/2008), the utilities have focused heavily on residential lighting, which accounts for the largest electricity end use in the residential sector. As a result, the bulk of residential efficiency savings has come from lighting programs such as measures that encourage the use of CFL bulbs. In the past few years, the CFL market has undergone a major transformation, as evinced by the ubiquity of CFL products in the retail market and recent energy measurement and verification studies.

Commission anticipates issuing the first phase of the standards by January 1, 2010.¹⁵

These changes in the lighting market provide a road map to success in achieving market transformation for other end use technologies and creating new opportunities to move the utilities' residential energy efficiency resources from mass market light bulb promotions and give-aways to new lighting technologies and other innovative programs that focus on whole-building efficiency measures.

The transformation of the lighting market will be completed through the passage and implementation of AB1109, the 2007 California Lighting Efficiency and Toxics Reduction Act.¹⁴ AB 1109 requires a 50% increase in efficiency for residential general service lighting by 2018 through phased increases in the Energy Commission's Title 20 regulations. The Energy

The strategies set forth in this *Plan* will create longer term savings from the built environment with a goal of incorporating the advances into codes and standards. The 2009-2011 Energy Efficiency utility program cycle will lay the foundation for aggressive, long-term strategies to change the way buildings are constructed, used and maintained.

2.1.3 GOALS

Goal	Goal Results
1. New construction will reach “zero net energy” (ZNE) performance (including clean, onsite distributed generation) for all new single and multi-family homes by 2020.	<ul style="list-style-type: none"> ➤ By 2011, 50% of new homes will surpass 2005 Title 24 energy efficiency standards (Title 24) by 35%; 10% will surpass 2005 Title 24 standards by 55%. ➤ By 2015, 90% will surpass 2005 Title 24 standards by 35%. ➤ By 2020, all new homes are ZNE.
2. Home buyers, owners and renovators will implement a whole-house approach to energy consumption that will guide their purchase and use of existing and new homes, home equipment (e.g., HVAC systems), household appliances, and “plug load” amenities.	<p>Energy consumption in existing homes will be reduced by 20% by 2015 and 40% by 2020 through universal demand for highly efficient homes and products.</p>
3. Plug loads will be managed by developing consumer electronics and appliances that use less energy and provide tools to enable customers to understand and manage their energy demand.	<p>Plug loads will grow at a slower rate and then decline through technological innovation spurred by market transformation and customer demand for energy efficient products.</p>

Transformation of markets for new multi family homes can be achieved through strategies targeting the Commercial or Residential sectors or a combination of both since rental buildings are commercial enterprises as well as dwelling units. In this first *Plan*, with the exception of the approximately 50 percent of LIEE-eligible households living in multi-family housing, there is no specific focus on strategies to upgrade efficiency in existing multi-family dwellings. This market must be addressed in greater detail in the next iteration of this *Plan*.

The leadership and active participation of many organizations is also necessary to achieve the

vision for the Residential Sector. The Energy Commission must lead the efforts to continually enhance and expand the Building and Appliance Codes with active technical support and expertise from the IOUs, national laboratories, and the building industry. For technological advances in buildings, appliances and plug loads, the IOU’s Emerging Technologies program and the Energy Commission’s Public Interest Energy Research (PIER) program must work cooperatively with the national laboratories and private industry to achieve the advances envisioned in this *Plan*.

2.1.4 STRATEGIES

The market transformation envisioned by the residential sector *Vision and Goals* involves changing both the supply chain of products and services and the behaviors that residential energy consumers rely on to use energy efficiently. The three interrelated Goals are designed to achieve this transformation through the following themes:

- **Building Innovation:** Drive continual advances in technologies in the building envelope, including building materials and systems, construction methods, distributed generation, and building design, and incorporate technology advances into codes and standards.
- **Comprehensive Solutions:** Develop, offer and promote comprehensive solutions for single and multi-family buildings, including energy efficiency measures, demand management tools and real-time information, and clean distributed generation options in order to maximize economic decision-making and energy savings.

- **Customer Demand:** Create high levels of customer demand for progressively more efficient homes through a coordinated state-wide public education campaign and targeted incentive programs.
- **State-wide Solutions:** Coordinate and collaborate with state agencies and private organizations to advance research and

development and to align state efforts on buildings.

- **Financing:** Work with the financial community to develop innovative and affordable financing options for energy efficient buildings and retrofits.

While the overall mission for the residential sector is quite difficult, these goals and strategies are interrelated and many of the efforts to reach one goal will contribute to the achievement of a different goal; for example, success in Goal 3 (Plug Load) will contribute to the success of Goal 1 (ZNE Homes) and Goal 2 (Whole House Performance). Improvements in building standards resulting from improvements in technologies (Goal 1) will promote efficiencies from existing home renovations and improvements. In addition, certain strategies in the residential market (e.g., marketing,

education and outreach) are part of larger, cross-cutting strategies.

As a consequence, the strategies described below contain a certain amount of repetition and cross-referencing; however, each strategy will require refinements to accomplish the specific Goal. This is consistent with our overall goal of encouraging integrated energy efficiency programs that recognize and leverage the benefits of related projects, while at the same time aligning specific strategies with the requirement of each Goal.

2.1.5 IMPLEMENTATION PLAN

Goal 1: Deliver Zero Net Energy New Homes By 2020.

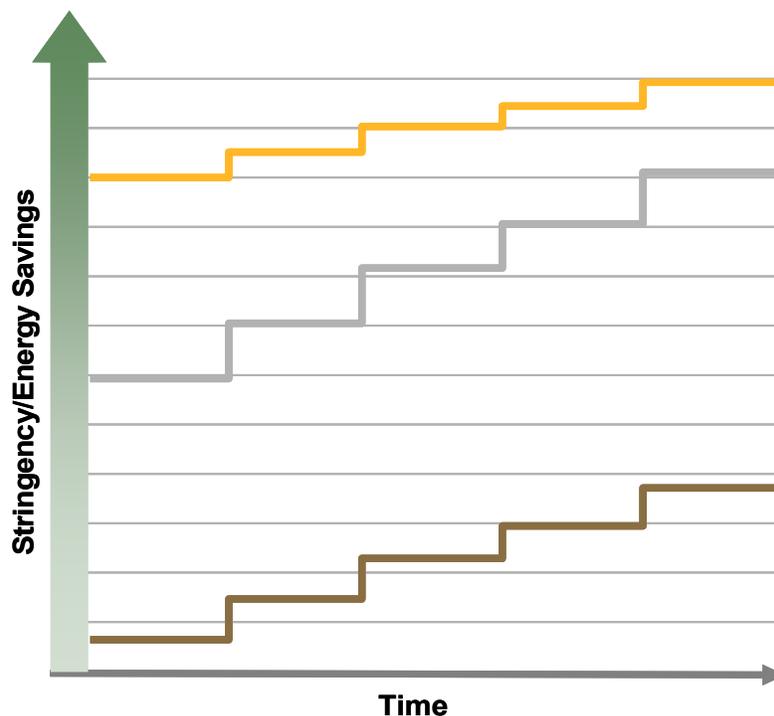
Goal 1 envisions a continual and dramatic increase in the demand for and supply of lower energy homes based on new technologies, new building approaches, and policy solutions to achieve a state-wide standard of zero net energy for all new homes by 2020. Interim milestones for Goal 1 are: by 2011, 50% of new homes will be 35% more efficient than 2005 Title 24 standards and 10% will be 55% more efficient. By 2015, 90% of homes will surpass 2005 Title 24 standards by 35%.

A ZNE home will employ a combination of energy efficiency design features, efficient

appliances, managed plug loads and clean on-site distributed generation to result in no net purchases of energy from the grid.¹⁶ The “Big Bold” goal of achieving zero net energy impacts for 100% of new residential construction and the interim goal of achieving the Energy Commission’s New Solar Homes Program Tier II standards for 50% of new homes by 2011 are extremely aggressive. They are intended to capture the imagination and spark the enthusiasm of all who participate in transforming residential new construction to ultra-high levels of energy efficiency.

The Title 24 energy code should continue to be progressively updated and tightened on a triennial basis along a planned trajectory leading to achievement of goals for the year 2020. Mandatory standards of Title 24 should be linked to one or two tiers of voluntary, beyond-code standards such that the single mandatory and one or two voluntary levels comprise a bronze-silver-gold approach to residential efficiency performance. Each Title 24 Code update will

achieve a stepped pattern of tightening standards to what had been the higher voluntary level, dropping the previous minimum mandatory (i.e., 2011's gold becomes 2014's silver and 2017's minimum mandatory). These voluntary silver-gold tiers could be used as reference points for "reach" building policies and programs, local ordinances, and utility incentives.



GOLD

Silver plus:

- Zero Net Energy Buildings
- Clean Energy Generation
- New Technologies
- Integrated Design
- Transaction Mandates

SILVER

Bronze plus:

- Higher Voluntary Energy Efficiency
- Local Government Push
- Labeling
- Incentives & Financing
- Broader Energy End-use Focus

BRONZE

- Minimum T-24 Standards
- Strong Enforcement
- Building Energy Efficiency Benchmarks

The emergence of sustainable building policies and ordinances are an indication that many local governments desire building practices that go beyond state minimum building codes. As more local governments enact codes that are more stringent than state codes, a patchwork of different and potentially conflicting building requirements is arising. As requirements become more varied across geography, developers and particularly production home builders will have difficulty designing and building major developments consistent with state and local codes. Progress toward zero net energy and interim energy efficiency goals may suffer as a result.

Accordingly, Strategy 4 requires coordination of local government building codes and development policies to facilitate the adoption and rapid evolution of highly energy efficient technologies and techniques in new construction statewide. Coordination also will advance testing of sustainable building technologies and techniques in different operating environments to provide a stronger basis for progressive increases in the stringency and coverage of energy efficiency standards within state building codes.

The Energy Commission is the logical candidate to lead the codes and standards effort along with the State Buildings Standards Commission and the Department of Housing and Community Development. Near-term, the Energy Commission could collaborate with these agencies to publish a provisional, performance-based “reach code” reference standard for “beyond code” residential construction in California. This would be advisory and create a reference from which to gauge further improvements. The process could coordinate with the Energy Commission’s Public Interest Energy Research (PIER) and other research organizations (Lawrence Berkeley National Laboratory (LBNL), National Renewable Energy Laboratory (NREL), Building Industry Research Alliance (BIRA) to assess and provide the foundation for recommendations, including monitoring and measurement approaches.

This Goal also requires a major transformation in the construction, design and usage of residential real estate through a combination of mandates and voluntary actions. The technical feasibility of ZNE homes is in early stages of demonstration through the pioneering efforts of SMUD, NREL, and home designers and builders. Significant additional progress is required to scale successful demonstrations for full-scale production and sale at affordable

prices. However, several ZNE residential projects, such as Sacramento Municipal Utility District’s (SMUD) project in Roseville, CA, are already underway, and others are in the planning or conceptual phase. In the near term, the utilities will aggressively promote additional proof of concept pilots, including significant affordable housing elements in these pilots.

California will need new, cost-effective technologies for home building materials and fabrication techniques, and “smarter” home operating systems, such as visual displays of real-time (or near real-time) energy use. In addition, the energy efficiencies of household equipment and appliances must increase. (In this regard, see Strategies 2 and 3 below and the Heating, Ventilation & Air Conditioning chapter.) These innovations must be accompanied by a strong education, outreach and marketing effort to increase customer demand for efficient homes (See the Marketing, Education and Outreach Chapter).

Affordability is a key consideration in California, where the cost of housing is a serious, long-term issue.¹⁷ A key element of this Goal is to develop ZNE energy projects across the spectrum of housing options, including multi-family affordable housing in urban infill areas with access to public transportation.

Goal 1: Zero Net Energy Homes

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid-Term 2012 – 2015	Long Term 2016 – 2020
<p>1-1: Drive continual advances in technologies in the building envelope, including building materials and systems, construction methods, distributed generation, and building design.</p>	<p>Energy Commission (PIER) Utilities LBNL NREL Production home builders and building industry organizations</p>	<ul style="list-style-type: none"> 50% of new homes exceed 2005 Title 24 standards by 35% 10% of new homes exceed 2005 Title 24 standards by 55% 	<ul style="list-style-type: none"> 90% of new homes exceed Title 24 by 35% 40% of new homes exceed Title 24 by 55% 	<ul style="list-style-type: none"> 100% of new homes exceed Title 24 by 35% 90% of new homes exceed Title 24 by 55%
		<ul style="list-style-type: none"> Develop and participate in pilot projects in specific climates to prove technologies for next generation of lower and zero energy homes, including affordable housing projects. Continually monitor performance of pilot projects to provide feedback for next level of design and development of technologies. 	<ul style="list-style-type: none"> Develop and implement next generation of pilot projects; continually monitor performance of pilots to provide feedback for next level of design and development of technologies. 	<ul style="list-style-type: none"> Develop and implement next generation of pilot projects; continually monitor performance of pilots to provide feedback for next level of design and development of technologies.
		<ul style="list-style-type: none"> Advance technological innovation through collaboration of Energy Commission PIER and Emerging Technologies Programs, LBNL, NREL, Utilities, CBIA, and other appropriate organizations. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
		<ul style="list-style-type: none"> Assess existing technologies and identify areas for strategic involvement in research and development. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing

Implementation Plan and Timeline

Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid-Term 2012 – 2015	Long Term 2016 – 2020
<p>1-2: Continual coordination and cooperation with the Energy Commission to progressively increase Title 24 building standards and Title 20 appliance standards consistent with the interim and long-term goals set forth in this Plan.</p>	<p>Energy Commission Utilities Local governments</p>	<ul style="list-style-type: none"> • Map a trajectory for Title 24 mandatory and voluntary standard(s) through 2020. • Progressively make energy efficiency advances permanent by raising Title 24 mandatory standards in 2011 consistent with the trajectory. • Progressively advance Title 24 voluntary, “beyond code” standard(s) and ratings systems in step with changes to the mandatory standards. 	<ul style="list-style-type: none"> • Fine-tune and revise the trajectory based on the changing energy efficiency state-of-the-art. • Progressively make energy efficiency advances permanent by raising Title 24 mandatory standards in 2014 consistent with the trajectory. • Progressively advance Title 24 voluntary, “beyond code” standard(s) in step with mandatory standards in 2011 and 2014. 	<ul style="list-style-type: none"> • Fine-tune and revise the trajectory based on the changing energy efficiency state-of-the-art. • Progressively make energy efficiency advances permanent by raising Title 24 mandatory standards in 2017 and to ZNE by 2020 consistent with the trajectory. • Progressively advance Title 24 voluntary, “beyond code” standard(s) in step with mandatory standards in 2017 and 2020.
<p>1-3: Coordinate and Support “Reach” Building Standards</p>	<p>Energy Commission Utilities Local governments</p>	<ul style="list-style-type: none"> • Identify and resolve conflicts or inconsistencies between Title 24 and local “green” building ordinances or other standards. • Establish policies and procedures for statewide coordination of local building standards that are acceptable to local governments. • Provide technical support for the development and implementation of reach standards through partnerships with local governments 	<ul style="list-style-type: none"> • Monitor success of coordination and resolve new issues as they arise. 	<ul style="list-style-type: none"> • Monitor success of coordination and resolve new issues as they arise.
<p>1-4: Develop innovative financing programs for the construction of energy efficient homes.</p>	<p>Finance Task Force Financial institutions Utilities</p>	<ul style="list-style-type: none"> • Convene a working group of financial experts to develop attractive financial products for energy efficiency homes. • Implement Options 	<ul style="list-style-type: none"> • Ongoing expansion of these options. 	<ul style="list-style-type: none"> • Ongoing expansion of these options.

Goal 2: Transform home improvement markets to apply whole-house energy solutions to existing homes.

The overall objective of Goal 2 is to reach all existing homes and maximize their energy efficiency potential through delivery of a comprehensive package of cost-effective, whole-house energy efficiency retrofit measures—including building shell upgrades, high-efficiency HVAC units, and emerging deep energy reduction initiatives— with comprehensive audits, installation services and attractive financing. This can be achieved through parallel and coordinated initiatives among utility programs, market mechanisms, and state and local government policies.

The IOUs currently offer a wide range of energy efficiency programs for existing homes, including audits, efficient appliance rebates, lighting programs, and consumer education. This Plan envisions a refocusing of these programs to move from a “widget” based approach to a “whole house” approach to program delivery to offer comprehensive packages of audits, demand side management options and tools, rebates and financing options, and installation services.

A similar approach must be developed for multi-family housing, both condominiums and rentals. The key to this effort will be defining workable financing mechanisms that allow energy bill savings from improvements occurring in the individual units to offset the up-front capital costs typically paid by building owners and homeowners associations. These mechanisms also must allow repayment of energy improvements from successor occupants so that turnover does not dissuade taking action. With such financing mechanisms, it should be possible for multi-family housing to take fuller advantage of both private energy services and utility programs and incentives. Since many lower-income households live in multi-family housing, they can be served via the strategies targeting low income households discussed later in this Chapter.

A key driver for the success of this Goal is to create market demand for efficient homes by

increasing awareness of, and information on, energy efficiency. In the near term, the Energy Commission will adopt its Home Energy Rating System (HERS) standards by the end of 2008. In cooperation with the Energy Commission, the IOUs will begin voluntary pilot programs to implement the HERS system and to encourage local governments to adopt residential energy conservation ordinances for energy ratings at the time of sale. In the longer-term, additional mechanisms might include community initiatives to reduce the “carbon footprint” of homes or neighborhoods, or promoting inclusion of home energy ratings in real estate sales listing information.

To achieve both widespread and deep levels of energy efficiency throughout the existing housing stock eventually may call upon state or local government leadership. Individual local governments can adopt residential energy conservation ordinances (RECO) for energy ratings and possible improvements at the time of sale. Utility programs can partner with these governments to provide supporting information on ratings systems, cost-effective measures and related implementation issues.

Strengthening building codes without improving compliance leads to illusory progress. Concerns have arisen regarding whether compliance issues already undermine the effectiveness of Title 24 standards, and increasing the stringency and coverage of state standards is likely to add to these issues. The reasons behind compliance issues vary with jurisdiction and may include conflicts between state and local priorities and budget limitations.

The CPUC and utilities should coordinate with the Energy Commission and local governments to identify barriers to aggressive enforcement of state building standards and to develop effective plans for overcoming these barriers. An objective of these plans should be to leverage state and local resources to improve compliance.

Goal 2: Existing Homes

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
2-1: Deploy full-scale Whole-House programs.	Utilities Home improvement industry	<ul style="list-style-type: none"> Implement pilot home retrofit programs with effective integration and delivery of comprehensive demand-side options including energy efficiency, demand response and renewable energy measures in specific locations to prove technologies for next generation of lower energy homes in various climate zones. 	<ul style="list-style-type: none"> Monitor performance of selected lower energy homes. Design implement, monitor and continuously improve full-scale programs for whole-house energy efficiency and renewable energy retrofits. 	<ul style="list-style-type: none"> By 2020: 25% of existing homes have a 70% decrease in purchased energy from 2008 levels 75% of existing homes have a 30% decrease in purchased energy from 2008 levels 100% of existing multi-family homes have a 40% decrease in purchased energy from 2008 levels
2-2: Promote effective decision-making to create wide spread demand for energy efficiency measures.	Utilities Home improvement industry Building industry assns Local governments	<ul style="list-style-type: none"> Complete initial market research to determine homeowner "decision triggers" to improving home energy efficiency, including an assessment of the impact of GHG labeling. Develop, launch, monitor and continuously improve campaigns to raise demand for lower energy homes, including home labeling programs. Actively support local governments considering RECOs to improve the energy performance of existing homes at time of sale or during major renovations. Develop and implement home rating system pilot projects based on the Energy Commission HERS program. 	<ul style="list-style-type: none"> Follow-up market research. Continuously improve campaigns to raise demand for lower energy homes, including home labeling programs. 	<ul style="list-style-type: none"> Follow-up market research. Continuously improve campaigns to raise demand for lower energy homes, including home labeling programs.
2-3: Manage research into new/advanced cost-	Utilities Energy	<ul style="list-style-type: none"> Gather and disseminate information on advanced retrofits. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing

Implementation Plan and Timeline

Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
effective innovations to reduce energy use in existing homes	Commission National labs	<ul style="list-style-type: none"> • Advance technological innovation through collaboration of Energy Commission PIER and Emerging Technologies Programs, Utilities and other appropriate organizations. • Promote commercialization of home energy management tools including AMI-based monitoring and display tools. 	<ul style="list-style-type: none"> • Ongoing 	<ul style="list-style-type: none"> • Ongoing
2-4 Develop financial products and programs such as on-bill financing to encourage demand for energy efficiency building products, homes systems, and appliances.	Utilities Financial institutions Contractors	<ul style="list-style-type: none"> • Develop partnerships for innovative financing programs, such as performance contracts and City of Berkeley's solar and EE property loans. • Investigate the feasibility of on-bill financing and other lending products. • Convene Task force on Financing with attention to issues of multi-family housing and paying for actions with longer-term paybacks. 	<ul style="list-style-type: none"> • Design implement, monitor and continuously improve financial products and programs for whole-house energy efficiency and renewable energy retrofits 	<ul style="list-style-type: none"> • Design implement, monitor and continuously improve financial products and programs for whole-house energy efficiency and renewable energy retrofits
2-5: Increase Title 24 compliance through specific measures leading to aggressive statewide enforcement.	Energy Commission State Contractor Licensing Board Utilities Local Governments	<ul style="list-style-type: none"> • Identify the barriers to compliance and develop a compliance plan to implement remedial measures, including legislation if necessary. • Leverage the compliance plan measures to support enforcement of local energy efficiency codes and standards. Identify opportunities for leveraging Title 24 and local codes enforcement. • Develop program models that require proof of code compliance as a condition of receiving rebates or financing. 	<ul style="list-style-type: none"> • 80% of transactions that trigger Title 24 requirements will comply with all applicable requirements. • Monitor success or failure of leveraging and pursue additional actions to achieve success as necessary. 	<ul style="list-style-type: none"> • Monitor success or failure of leveraging and pursue additional actions to achieve success as necessary.

Goal 3: Develop comprehensive, innovative initiatives to reverse the growth of plug load energy consumption through technological and behavioral solutions.

Plug loads are a complex, rapidly growing driver of electricity consumption. They range from the ubiquitous energy thief transformers on almost every appliance, to home offices and the 1+ kW

home entertainment centers growing in popularity. Potential savings from this plug load strategy could be 200 MW by 2011 with larger potential savings in the future.

Goal 3: Reduce Plug Loads

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
3-1 Drive continual advances in residential energy usage, including plug loads, home energy management systems, and appliances.	Energy Commission (PIER) Utilities LBNL Appliance manufacturers Retailers	<ul style="list-style-type: none"> • Work with research organizations to develop smarter products with lower energy requirements. • Work with manufacturers to raise product energy efficiency, both when in use and when in standby mode. 	<ul style="list-style-type: none"> • 10% reduction in plug loads 	<ul style="list-style-type: none"> • 25% reduction in plug loads
3-2 In coordination with Strategy 2-2 above, develop public awareness of and demand for highly efficient products.	Utilities National labs Universities Manufacturers retailers	<ul style="list-style-type: none"> • Complete initial market research including identification of customer decision triggers for choosing highly energy efficient devices. • Implement public awareness and information campaign to promote purchase of more efficient products and create behavioral changes in the way products are perceived, used, and managed. 	<ul style="list-style-type: none"> • Follow-up market research 	<ul style="list-style-type: none"> • Follow-up market research.

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
3-3: Create demand for such products through information and market transformation activities	Utilities Industry partners	<ul style="list-style-type: none"> Deploy package of rebates, incentives and voluntary industry agreements to bring significant numbers of the best current technologies for managing plug loads (e.g., smart power strips and informative visual displays) to market. Promote unbiased labels and Web sites (<i>Consumer Reports</i> approach). 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
3-4: Continuously strengthen standards.	Energy Commission Utilities	<ul style="list-style-type: none"> Continuously incorporate gains in efficiency in the appliance standards. 	<ul style="list-style-type: none"> Continuously incorporate gains in efficiency in the appliance standards. 	<ul style="list-style-type: none"> Continuously incorporate gains in efficiency in the appliance standards.

2.2 LOW INCOME RESIDENTIAL SEGMENT

2.2.1 VISION

By 2020, 100 percent of eligible and willing customers will have received all cost-effective Low Income Energy Efficiency measures.

2.2.2 PROFILE

The Low Income Energy Efficiency (LIEE) programs provide no-cost energy efficiency and appliance testing and repair measures to qualified low income customers in rental and customer-owned residences. The complementary objectives of the LIEE programs are to produce energy savings and lower customer bills. Customers qualifying for LIEE programs represent up to 30% of the IOUs' residential customers—or about 3.8 million households. In the past ten years, LIEE programs have provided about 1.6 million low-income households a range of energy-related services including home weatherization, refrigerator replacement, repair and replacement

of heating and air conditioning equipment, and CFL distribution.

Although a large number of homes have received measures under the LIEE programs over the past 10 years, more than 50 percent of low income residences remain untreated. The Commission has called upon the IOUs for a fresh look at LIEE programs to provide an expanded role for LIEE programs as a California energy resource, working in concert with other efforts to address climate change and meeting the needs of more low-income customers. In particular, the Commission has adopted a

Big/Bold Strategy to provide all eligible and willing low income customers the opportunity to participate in the LIEE programs and to offer cost-effective energy efficiency measures in their residences by 2020.

During the initial years of this *Plan*, the IOUs will focus their efforts on developing a more effective outreach program using segmentation

techniques to identify target groups within the low income populations. In order to serve these additional households, the IOUs will design programs to be more administratively and operationally efficient. In the near term, the IOUs will develop partnerships with community organizations and local governments to leverage existing services and tools.

2.2.3 GOALS

This Plan contains two goals to achieve the LIEE vision:

Goal	Goal Results
1. By 2020, all eligible customers will be given the opportunity to participate in the LIEE program.	 Outreach programs will be highly successful. LIEE customers will be educated on the benefits of energy efficiency and conservation behaviors. A trained LIEE workforce will accommodate future job demand and educate their communities.
2. The LIEE programs will be an energy resource by delivering increasingly cost-effective and longer-term savings.	 Other state, federal and local programs will be leveraged to streamline and improve customer identification and program delivery. LIEE programs will be integrated with core energy efficiency programs to achieve economies of scale. Participants will receive comprehensive energy efficiency services that produce long-term energy savings for the state.

2.2.4 STRATEGIES

The market transformation envisioned for the LIEE sector involves changing both the delivery of products and services and the behaviors that low income energy consumers rely on to use energy efficiently.

The LIEE Goals require leadership from the Low Income Oversight Board and the IOUs working

in partnership with community based organizations, contractors educational and training institutions, and state and federal agencies that also serve the low income community.

2.2.5 IMPLEMENTATION PLAN

Goal 1: By 2020, all eligible customers will be given the opportunity to participate in the LIEE program.

The IOUS will approach this Goal through two broad efforts: Marketing, Outreach, and Education (ME&O) and Workforce, Education, and Training (WE&T). These broader efforts will encompass current activities as a foundation, but will expand to newer, more creative efforts. ME&O efforts will be improved through the collaborative and integrated approach as discussed in the ME&O chapter. As part of the overall ME&O program, additional efforts specifically designed for the low income community will be implemented. For this group, the IOUs will also target its outreach efforts based on customer segmentation and four factors: geography, demographic description (e.g., language preference), social networks; and level of energy use. Though this list of factors may expand over time, it represents an extension of current approaches and areas scheduled to be further developed in the 2009-2011 program.

Second, the IOUs will focus on improving delivery methods so that all customers can be reached by 2020. The segmentation approach discussed earlier will improve the efficiency of delivery by identifying geographic and social concentrations of customers to achieve

economies in delivery, material purchasing and resources. It also promotes effective use of low-income customer service providers, including community-based organizations and other qualified agencies. The segmentation or tiered approach will enable the IOUs to offer more households measures more efficiently.

Increasing the current LIEE program training to meet the demand for resources is necessary to implement the expanded LIEE programs. Training efforts for the LIEE program will be addressed by the strategies described in the Workforce Education and Training (WE&T) Chapter of the *Plan*, including incorporating the needs of the LIEE programs into the needs assessment. The needs assessment will include the development of LIEE job definitions, inform a LIEE Training Roadmap, and ensure trained resources are available to deliver LIEE services. To promote substantial growth in a trained LIEE workforce, the IOUs will integrate LIEE program installation training into other energy efficiency training. This integration will enable a wider network of providers to provide for LIEE services and provide those trained in LIEE access to other energy service opportunities.

Goal 1: Improve Customer Outreach

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
1.1: Strengthen LIEE outreach using segmentation analysis and social marketing tools.	IOUs Low income customers LIOB Contractors Community Based Organizations (CBOs) ME&O Taskforce	<ul style="list-style-type: none"> Identify, implement and evaluate effective marketing, education and outreach methods for targeting low-income customer segments. Use social marketing to effectively engage low income customers 	<ul style="list-style-type: none"> Implement energy education designed to help customers understand and change behaviors in ways that support LIEE savings. 	<ul style="list-style-type: none"> Continue to assess and evaluate customer-behavior and energy savings; improve upon energy education.
1.2: Develop a recognizable and trustworthy Brand/Tagline for the LIEE programs.	IOUs Low income customers LIOB Contractors (CBOs)	<ul style="list-style-type: none"> Develop a statewide program name and description for LIEE which is coordinated with the ME&O efforts for energy efficiency, demand response and any other demand-side options. Implement branding. 	<ul style="list-style-type: none"> Launch integrated EE/LIEE/DSM brand. 	<ul style="list-style-type: none"> Evaluate progress/refine strategy.
1.3: Improve program delivery	IOUs LIOB Low Income Customers CBOs Contractors	<ul style="list-style-type: none"> Use information from segmentation analysis to achieve efficiencies in program delivery. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
1.4: Promote the growth of a trained LIEE workforce.	WE&T Task Force IOUs Low income customers LIOB Contractors CBOs	<ul style="list-style-type: none"> Incorporate LIEE training needs into the Workforce Training needs assessment. Develop Training Roadmap which includes funding requirements and sources other than IOUs. Implement LIEE workforce education and training. 	<ul style="list-style-type: none"> Implement LIEE workforce education and training. Coordinate resources for training related to LIEE program needs to ensure delivery of LIEE-trained resources to the program. 	<ul style="list-style-type: none"> Implement LIEE workforce education and training. Coordinate LIEE workforce and service providers with broader market.

Goal 2. The LIEE programs will be an energy resource by delivering increasingly cost-effective and longer-term savings.

Significant opportunities exist to better achieve the Commission's objectives and more deeply reduce energy use among LIEE qualifying customers through ongoing collaboration among the IOUs and the state and federal agencies providing services to the low-income community. In particular, data sharing with other state and federal agencies, and collaborating with community partners to leverage federal, state and local funds are critical in achieving this Goal.

The IOUs currently have successful partnerships with low-income population assistance agencies, community based organizations, county agencies, and water districts. Over the longer-term, utility efforts will increase the number of partnerships with additional resources and organizations.

In addition to working with other local, state and federal agencies, the IOUs will focus on providing LIEE program measures and services that are cost-effective and emphasize long-term and enduring energy savings—for example, refrigerators, attic insulation, and other major appliance replacements.

The LIEE programs will also incorporate the most recent strategies and programs in the core residential sector energy efficiency and DSM programs, including the energy efficiency mandates of the California Solar Initiative (CSI). The IOUs will ensure that LIEE participants are

made aware of core energy efficiency and demand response programs at the time of enrollment. LIEE messaging and outreach will be integrated into energy efficiency marketing to provide information on energy efficiency and demand response programs to low-income customers.

The LIEE programs will also receive the benefits of the core residential strategies on new and existing homes. As new technologies are commercialized for reduced plug loads, energy management tools, and building materials, they will be incorporated into the programs offered to low income customers. As advanced meters are deployed, the LIEE programs will ensure that low income customers receive the benefits of energy management tools. As discussed above, the ZNE new residential homes goal will include affordable housing components.

The IOUs will focus on improving delivery methods so that all of these homes can be reached by 2020. The segmentation approach discussed earlier will improve the efficiency of delivery by identifying geographic and social concentrations of customers to achieve economies in delivery, material purchasing and resources. It also promotes effective use of low-income customer service providers, including community-based organizations and other qualified agencies. The segmentation or tiered approach will enable the IOUs to offer more households measures more efficiently.

Goal 2: LIEE is an Energy Resource

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
2.1: Increase collaboration and leveraging of other low-income programs and services	IOUs LIOB CBOs Department of Community Services Local Government	<ul style="list-style-type: none"> Identify key areas where data sharing would be possible and advantageous. Seek legislative changes to ease data sharing between agencies. Develop partnerships with community organizations and other agencies to leverage resources available from local governments, federal, state, and private project funding sources. 	<ul style="list-style-type: none"> Continue to expand partnerships with stakeholders and seek new opportunities for data sharing. 	<ul style="list-style-type: none"> Continue to expand partnerships with stakeholders and seek new opportunities for data sharing.
2.2: Coordinate and communicate between LIEE, energy efficiency and DSM programs to achieve service offerings that are seamless for the customer.	IOUs LIOB	<ul style="list-style-type: none"> Ensure LIEE participants are aware of energy efficiency and DSM/EE programs. Coordinate with CSI programs to provide LIEE program services in qualified low income housing for both single family and multi-family CSI programs. Coordinate AMI delivery and LIEE Programs 	<ul style="list-style-type: none"> Continually reevaluate and update programs to take advantage of new technologies. Explore in-home displays; home area networks and/or “pay-as-you-go” technology to assist low income customers manage their use. 	<ul style="list-style-type: none"> Continually reevaluate and update programs to take advantage of new technologies.
2.3: Provide low income customers with measures that result in the most savings in the LIEE program	IOUs LIOB	<ul style="list-style-type: none"> Measure cost-effectiveness and assess design for LIEE program. Continue to include measures that provide long term energy savings, such as refrigerators. 	<ul style="list-style-type: none"> Assess opportunities to incorporate new energy efficiency measures into the LIEE program, e.g., plug-load reduction, new HVAC technology. 	<ul style="list-style-type: none"> Continue to evaluate
2.4: Increase delivery of efficiency programs by identifying segmented concentrations of customers.	IOUs CBOs	<ul style="list-style-type: none"> Identify and develop segmented approach to deliver services to households Improve use of CBOs in delivering services 	<ul style="list-style-type: none"> Evaluate approach determine whether additional segments are needed. 	<ul style="list-style-type: none"> Continue to evaluate

3. COMMERCIAL SECTOR

3.1 VISION

Commercial buildings will be put on a path to zero net energy by 2030 for all new buildings and for a substantial proportion of existing ones. Innovative technologies and enhanced building design and operation practices will dramatically grow in use in the coming years through a combination of comprehensive whole building programs, technology development, market pull, professional education, targeted financing and incentives, and codes and standards.



3.2 PROFILE

Commercial buildings consume more electricity than any other end-use sector in California. The sector's 5 billion-plus square feet of space is very diverse—not only office buildings but stores, restaurants, warehouses, schools, hospitals, public buildings and facilities¹⁸, and others—in aggregate accounting for 38 percent of the state's power use and over 25 percent of natural gas consumption. Four electric end uses (lighting, cooling, refrigeration, and ventilation) account for 75 percent of all commercial electric use, while just three (space heating, water

heating, and cooking) account for over 90 percent of gas use. These end uses command attention for energy efficiency savings strategies.

In terms of the electricity use by the various commercial building types, office buildings are the largest accounting for nearly 25 percent. Restaurants have a comparable share among gas consumers. Offices, restaurants, and schools and colleges are in the top five facility types for both fuel types.

The following chart provides a snapshot of dominant energy end uses for buildings in California by building type and energy end use category for 2006.

Table 1 - Profile of Consumption by End Use and Major Facility Type *

	Electric %	Cumulative Electric %		Gas %	Cumulative Gas %
End Use			End Use		
Lighting-inter & exter	34.5	34.5	Space Heating	36.4	36.4
Cooling	14.9	49.4	Water heating	31.8	68.2
Refrigeration	13.4	62.8	Cooking	22.6	90.8
Ventilation	11.9	74.7	Process	5.9	96.7
Office Equipment	7.1	81.8	Misc.	1.8	98.5
Facility Type			Facility Type		
Office	24.5	24.5	Restaurant	24.5	24.5
Retail	14.7	39.2	Health	13.7	38.2
Restaurant	8.9	48.1	Office	13.3	51.5
Food Store	8.8	56.9	School & College	11.1	62.6
School & College	8.8	65.7	Lodging	9.0	71.6
Health	6.8	72.5	Food Store	3.1	74.7
Lodging	4.9	77.4	Retail	2.5	77.2
Unrefrig warehouse	3.7	81.1	Unrefrig warehouse	1.3	78.5

* Source: California End Use Survey, 2006

Commensurate with the energy demand from the commercial sector, the 2006-2008 IOU energy efficiency programs for commercial building retrofits is approximately one third of the total budget, exceeding \$1 billion dollars over the three year period. The IOUs also offer a “Savings by Design” program for new construction, which offers incentives to owners and design teams to incorporate efficient systems into building design or to develop projects that go beyond Title 24 standards using a whole building approach. For the next

program cycle, this *Plan* envisions an increased emphasis on programs to exceed Title 24 standards with the ultimate goal of building codes and standards that require zero net energy (ZNE) new construction and retrofits by 2030.

Achieving the vision and goals established for the commercial sector involves transforming the market, i.e., changing both energy user behaviors and the supply chain of services and products that commercial end-users rely on to efficiently use energy.

3.3 GOALS

The following goals will spur actions to transform the energy patterns of California’s largest energy-consuming sector—its commercial buildings.

Goal	Goal Results
1. New construction will increasingly embrace zero net energy performance (including clean, on-site distributed generation), reaching 100 percent penetration of new starts in 2030. ¹⁹	➔ An increasing percentage of the 50-120 million sq.ft. per year of new commercial construction will be progressively more efficient and all new construction will be zero net energy by 2030.
2. 50 percent of existing buildings will be equivalent to zero net energy buildings by 2030 through achievement of deep levels of energy efficiency and with the addition of clean distributed generation.	➔ 250 million square feet (1/20 th of existing space) per year through 2030 reach deep levels of energy efficiency improvements through whole building approaches.

3.4 STRATEGIES

Three interrelated and comprehensive strategies will be employed to reach the goals for energy efficiency in new and existing commercial buildings:

1. **Codes and Standards:** Adopt aggressive and progressive minimum energy codes and standards for buildings and plug loads, effective code compliance and enforcement, and parallel, tiered voluntary energy efficiency standards.
2. **Access to Information:** Align commercial building benchmarking, labels and operations and maintenance practices to address energy efficiency.
3. **Financing:** Target financing and incentives to support meeting commercial sector goals. Meeting the challenge of reaching ZNE levels, for a substantial fraction of the new and existing commercial building stock, will likely require increased availability and use of innovative and expanded financing and financial incentives.

These primary strategies will be supported by three enabling strategies:

1. Promote integrated design knowledge as the basis for commercial building design, construction, renovations and occupancy.
2. Support targeted research and development and emerging technologies.
3. Offer integrated program delivery of DSM retrofit solutions.

This Plan envisions that the building industry (including developers, construction firms, building owners, tenants, building managers, contractors and others), the CPUC, Energy Commission, architectural and engineering (A&E) firms, and utilities embrace the vision statement and goals as the basis for long-term strategic planning and actions, assuring other market participants of their commitments through 2030. As a result building space markets will provide demand “pull” alongside both codes and standards and market supply “push” for ZNE and ultra-low energy buildings.

The most promising approach for commercial buildings is a progressive set of building codes and standards that steadily tightens over the coming years and is directly linked to one or two tiers of voluntary higher standards, in the “bronze-silver-gold” approach described in the Residential Sector Chapter. These voluntary higher standards (also known as “beyond” or “reach” codes) will be the leading edge that serves to prove and improve the efficacy and cost-effectiveness of advanced products and practices. This *Plan* anticipates that the IOUs, in cooperation with the building industry and local governments, will continue to play a critical role in providing technical support for developing these voluntary standards and the progressively higher mandatory standards.

Commercial building market actors tend to follow the industry leaders; corporate champions and state and local government leaders can set the direction and pace using the voluntary higher standards. The voluntary tiers should be the common reference points for utility incentives,

local government ordinances, recognition given to highly efficient buildings, and other policy and market-based drivers that go beyond the minimum code to pull up new construction and renovation.

While the Utilities will play an important role to jump-start a financing strategy, they cannot be a “default” source of EE funding. Rather, the utility programs must leverage and build upon financing options available from private markets and other government initiatives. To that end, the CPUC will establish a Zero/Low-Energy Finance Task Force for the commercial and residential sectors made up of members of the building and financial/investment industries, developers and trade groups to identify existing or needed tools, instruments, and information necessary to attract greater participation of capital markets in funding efficiency transactions. The Task Force will identify actors to develop innovative and effective financing tools especially suited for ZNE and ultra low-energy buildings, such as loans that remain with the property through owner/occupant turnover.

The Task Force will be convened at a critical period in the development of California’s AB 32 implementation process. The Draft AB 32 Scoping Plan has identified energy efficiency in buildings as producing sizeable GHG reductions at comparatively lower-cost than other strategies. The Task Force should investigate methods to leverage the value of carbon reductions from energy efficiency to finance implementation of energy efficiency in buildings.

3.5 IMPLEMENTATION PLAN

Goal 1: New construction will increasingly embrace zero net energy performance (including clean, on-site distributed generation), reaching 100 percent penetration of new starts in 2030.

The CPUC and the Energy Commission have adopted the goal of requiring all new commercial buildings to be ZNE by 2030. This “Big/Bold” initiative is based on the American Institute of Architects’ 2030° Challenge, a global initiative to have all new buildings and major renovations reduce their carbon emissions by 50 percent by 2010, incrementally increasing the reduction for new buildings to be carbon neutral by 2030. A consortium of groups including the AIA, the American Society of Heating, Refrigeration, and Air Conditioning Engineers, the US Green Buildings Council, and the Alliance to Save Energy have initiated the Commercial Building Initiative which is working to develop a framework and strategy for the 2030 Challenge goal.

- As with the Residential ZNE goal, new construction design, products, materials, and operations innovations must be developed and implemented. Title 24 should be broadened to address as many energy end uses as possible, especially plug loads; metering and data management; automated diagnostic systems; and sub-metering for tenant-occupied space. These innovations can quickly transfer to the existing building market, especially for those undergoing occupancy turn-over renovations or improvements. This effort should be lead by the Energy Commission with significant support from the Utilities, Building Standards Commission, the construction and building design industry, and manufacturers.
- The ZNE goal will promote an integrated design strategy. Integrated design brings together all relevant players at the start of a building project to comprehensively analyze and optimize energy strategies to deliver energy-efficient, high performance buildings and renovations, at little or no additional cost to the building owner. Integrated design can go beyond individual buildings and consider community-level energy and carbon impacts. Lead by the utilities’ energy efficiency programs, the Energy Commission, and the Building Standards Commission (BSC) in partnership with the AIA, ASHRAE, USGBC,



the California Architects Board, and construction and development organizations - should promote the use of building commissioning, retro-commissioning, and ongoing building measurement and verification to validate the building performance goals of integrated design teams.

- California will establish a “Path to Zero” campaign sponsored by the building industry, government agencies, utilities and others. This campaign will feature real-world experience and data on emerging technologies, practices, and designs that deliver zero net and ultra-low energy buildings and mechanisms to demonstrate their effectiveness and create demand in the marketplace for high-performance buildings coordinated with marketing tactics and financial incentives.

Goal 1: ZNE Commercial Buildings

Implementation Plan and Timeline					
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020	2021 – 2030
1-1: Establish a long-term progressive path of higher minimum codes and standards ending with ZNE codes and standards for all new buildings by 2030.	Energy Commission Utilities BSC A&E firms Building industry	<ul style="list-style-type: none"> Establish one- or two-tiered voluntary EE standards. Align Title 24 targets with goals of AB 32 and carbon reduction. 	<ul style="list-style-type: none"> Develop/adopt process to adjust the code on a triennial schedule on a “fixed” trajectory. 	<ul style="list-style-type: none"> RD&D Title 24 updates 	<ul style="list-style-type: none"> RD&D Title 24 updates
1-2: Broaden Title 24 to address as many energy end uses as possible.	Energy Commission Utilities Building industry	<ul style="list-style-type: none"> Develop and adopt broader codes and standards for plug loads, such as copy machines, printers, battery chargers, televisions. Expand Title 24 to include whole building approaches including metering and data management; automated diagnostic systems; and sub-metering for tenant-occupied space. 	<ul style="list-style-type: none"> Develop and adopt broader codes and standards for plug loads and sub-metering and automated self diagnostic controls. Expand Title 20 and Title 24 to cover additional uses such as server farms, process loads and water use. Develop building standards to better integrate on-site DSM 	<ul style="list-style-type: none"> Develop and adopt broader codes and standards for other end uses and devices. 	<ul style="list-style-type: none"> Develop and adopt broader codes and standards for other end uses and devices.
1-3 Establish a “Path to Zero” Campaign to create demand for high-efficiency buildings.	Utilities Building industries Building owners A&E firms Local governments	<ul style="list-style-type: none"> Convene leading building industry associations to plan and conduct campaign. Organize forums to develop and exchange experience and data on emerging technologies, practices and designs that deliver ultra-low and ZNE buildings. 	<ul style="list-style-type: none"> Develop companion strategies to create demand in the marketplace for high-scoring buildings. Conduct campaign 	<ul style="list-style-type: none"> Conduct Campaign 	<ul style="list-style-type: none"> Conduct Campaign
1-4: Develop innovative financing tools for ZNE and ultra-low energy <i>new</i> buildings.	Finance Task Force Financial and Investment community, Commercial developers and Trade groups Utilities	<ul style="list-style-type: none"> Develop and pilot innovative financing tools. Identify building performance metrics or documentation needed to inform performance and risks of financing. Develop performance data. 	<ul style="list-style-type: none"> Disseminate performance information on new financing instruments to increase awareness and utilization within financial markets and owners/investors. Implement most effective funding mechanisms. 	<ul style="list-style-type: none"> Expand Implementation of innovative funding mechanisms. 	<ul style="list-style-type: none"> On-going expansion of these options

Implementation Plan and Timeline

Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020	2021 – 2030
1-5: Create additional investment incentives and leverage other funding.	Finance Task Force Utilities Financial and Investment community Building trade groups	<ul style="list-style-type: none"> Investigate other funding support that might be offered such as local government “feebates” for EE/green construction, federal funding, federal or state tax incentives, GHG reduction benefits, e.g. via carbon offsets. 	<ul style="list-style-type: none"> Secure governmental support for most promising supplemental funds or investment. 	<ul style="list-style-type: none"> Ongoing expansion of these options. 	<ul style="list-style-type: none"> Ongoing expansion of these options.
1-6: Develop a multi-pronged approach to advance the practice of integrated design.	Integrated Design Working Group Utilities AIA CAB Architectural schools Building and Building products Industry ASHRAE USGBC	<ul style="list-style-type: none"> Promote ID development via Title 24 codes/ standards and market activities. Identify/develop tools and protocols from building commissioning, retro-commissioning and building M&V to enable ID to be deployed. Form partnerships with industry and architectural/engineering schools to promote the practice of and education in ID. Provide incentive credits for professionals who maintain their accreditation with ID training. 	<ul style="list-style-type: none"> Promote widespread adoption of tools and resources that enable ID. Create market demand for ID as a key strategy to comply with a vastly enhanced Title 24. Leverage competition between A/E firms to ramp up their ID expertise. (similar to how LEED-AP has become de rigeur) Implement an integrated design curricula. 	<ul style="list-style-type: none"> Ongoing curriculum enhancements to promote ID. Professional boards establish minimum guidelines for A/E and construction firms to require ID skills as a core competency among personnel Demonstrate how ID, Cx, RCx, and Bldg M&V can produce GHG benefits. 	<ul style="list-style-type: none"> Ongoing expansion of these options

Goal 2: 50 percent of existing buildings will be retrofit to zero net energy by 2030 through achievement of deep levels of energy efficiency and with the addition of clean distributed generation.

As discussed above, the commercial building industry tends to respond to industry leaders to set the path for action. Therefore, it is critical to lead by example by making public, state-owned and leased buildings benchmarked, sub-metered, and retro-commissioned by 2012, and energy efficient by 2015 (consistent with the Governor’s Green Building Initiative), and to implement a campaign to secure similar commitments from the private sector and local governments.

Goal 2 uses a combination of regulatory and market forces to enable owners and tenants to value the economic and environmental

advantages of high-performing (existing) buildings, thereby creating a “market pull” for buildings that are energy efficient. Goal 2 will leverage the progress made in mandatory and voluntary codes and standards developed for Goal 1, by lowering the renovation threshold at which minimum codes and standards are applied to an entire existing structure. This effort must be accompanied by actions to improve and enforce compliance with existing codes for renovations and by including training of building managers and operators to ensure maximum efficiency from building systems. As discussed in detail in Chapter 6, special attention must be placed on proper design and installation/repair of air conditioning systems.

In 2005, the Energy Commission issued a report titled, *Options for Energy Efficiency in Existing Buildings*,²⁰ which adopted two strategies for commercial buildings –



benchmarking tools with implementation and retro-commissioning guidelines and implementation. Elements of the benchmarking strategy have been implemented through AB 1103 (Saldana, 2007) which requires benchmarking of the energy consumption of commercial buildings and disclosure to a prospective buyer, lessee, or lender.

The Energy Commission's benchmarking and retro-commissioning strategies must be further implemented by actions to align commercial building benchmarking, labels and operations and maintenance practices to address energy efficiency. The IOUs will link their incentives to benchmarks to spur market demand for steadily improving benchmarks. During the 2009-2011 periods, the goal is to attain a benchmark score for specified buildings; starting in 2012-2015, the goal is to attain a minimum Energy Star benchmark score. The U.S. EPA Portfolio Manager's Energy Star benchmark rating system is a commonly-used and well-known benchmarking system well-suited to major commercial building types such as offices and schools. California or USEPA will need to develop other or expanded tools to rate remaining building types. Also in the longer term, local governments would adopt ordinances to issue and renew building certificates of occupancy only for buildings meeting minimum energy benchmarks.

The benchmarking and labeling mandates should include carbon footprint information. Although the Leadership in Energy and Environmental Design (LEED) rating system has become a de facto "green" label, it does not provide specific information on a building's energy or carbon performance. Annual energy and carbon labels are needed for populated buildings to send signals to market players that actual (not just designed) building energy performance is of value in commercial building markets. Protocols for low-carbon and high-efficiency commercial building attributes will be needed to encourage owners and tenants to

demand—and, in turn, markets to deliver—highly efficient buildings.

The Existing Buildings Report identified development of retro-commissioning guidelines by the Energy Commission as a key step in the strategy for existing buildings. The IOUs should expand upon their existing retro-commissioning efforts by using benchmarking information to identify candidates and offer whole-building measures and incentives. Collaboration must occur among the Energy Commission, CPUC, the building industry, and national laboratories to develop tools and strategies to further reduce energy consumption via information, behavioral strategies, commissioning and retro-commissioning, and operating practices. An effective communications strategy to make the business and environmental case for owners and tenants to demand high voluntary performance levels must also be delivered.

Achieving the energy savings identified from codes and standards and benchmarking requires further action on three fronts. First is to motivate owners and operators to undertake improvements, This will mean presenting compelling business cases to top decision-makers, while strengthening the skills and knowledge of building operators.

Second is to ensure access to financing mechanisms that effectively surmount capital limitations and cash flow requirements. This means attracting the interest of banking and capital industries to the magnitude of investment and borrowing needs, and identifying finance mechanisms that properly balance recovery of owner costs through rents, operating cost pass-throughs, or sales price premiums as occupants experience reduced utility bills, higher worker productivity, and other benefits.

Third is to facilitate the existence of knowledgeable energy management service providers that can conveniently arrange comprehensive improvements in buildings. This may require experimentation with incentives or new business model incubation to attract and reward those businesses willing to offer and arrange one-stop comprehensive energy management solutions that achieve deeper levels of savings than more typically obtained from the more specialized businesses primarily operating in energy service markets today.

Goal 2: Existing Buildings

Implementation Plan and Timeline					
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020	2020-2030
<p>2-1: Lead by Example: State/local governments and major corporations commit to achieve energy efficiency, EE, (or green) targets in existing buildings.</p>	<p>State of California Local governments Building industry Building owners Business Community</p>	<ul style="list-style-type: none"> • Ensure all state-owned and leased buildings are benchmarked and retro-commissioned by 2012. • Conduct campaign to have 100 local governments commit to the same target. • Conduct campaign to have 500 million sq. ft of commercial space where owners/tenants pledge to reach the same target by 2015. 	<ul style="list-style-type: none"> • Require all public buildings receiving significant financial support from the state are benchmarked and retro-commissioned by 2015. • All state-owned and leased buildings (on average) reach Energy Star equivalent rating by 2015. • 100 local governments reach the Energy Star target by 2015. • 500 million sq. ft of commercial space where owners/tenants reach the Energy Star target by 2015. 	<ul style="list-style-type: none"> • 250 local governments reach the Energy Star target by 2020. • 2 billion sq. ft. of commercial space reach the Energy Star target by 2020. 	<ul style="list-style-type: none"> • 400 local governments reach the Energy Star target by 2030. • 4 billion sq. ft. of commercial space reach the Energy Star target by 2030.
<p>2-2: Lower the threshold for applying codes to existing buildings.</p>	<p>Energy Commission Legislature A&E firms Local governments Building industry Utilities</p>	<ul style="list-style-type: none"> • Adopt regulations to lower threshold applied to existing building renovations. 	<ul style="list-style-type: none"> • Implement lower threshold for renovations. 	<ul style="list-style-type: none"> • If necessary, adopt regulations to further lower threshold applied to existing building renovations. 	
<p>2-3: Ensure compliance with minimum Title 24 codes and standards for building renovations and expansion.</p>	<p>Energy Commission BSC Contractors State Licensing Board Professional licensing/Registration agencies Local governments</p>	<ul style="list-style-type: none"> • Analyze and adopt best options to ensure compliance with minimum standards. • Establish accepted certification methods for voluntary levels of high-performance buildings. • Fifteen percent of HVAC sales by 2015 are for advanced air conditioning technologies optimized for climate variations. 	<ul style="list-style-type: none"> • Fifty percent of HVAC installations comply with codes via permits by 2015. (See implementation details in Chapter 6, Goal 1.) 	<ul style="list-style-type: none"> • By 2020, 90 percent of HVAC systems are installed to code and optimally maintained for systems' useful life. 	

Implementation Plan and Timeline

Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020	2020-2030
2-4: Establish mandatory energy and carbon labeling and benchmarks.	Legislature Energy Commission Utilities Research institutions Building owners and operators Industry stakeholders State agencies	<ul style="list-style-type: none"> Mandate benchmarking for all commercial buildings, triggered by changes in building ownership, financing or tenancy. Develop or approve protocols for benchmarking and compliance options. Incorporate carbon footprint into labeling. Link IOU and other incentives to benchmarks. 	<ul style="list-style-type: none"> Implement mandatory energy and carbon labeling and benchmarks. Promote national labeling and benchmarking standards and protocols. Develop minimum levels of benchmarks to maintain future certificates of occupancy. 	<ul style="list-style-type: none"> Require minimum levels of benchmarks to maintain future certificates of occupancy. Establish change of ownership as a trigger for updated benchmarking requirements. 	<ul style="list-style-type: none"> Establish change in tenancy/lease as a trigger for updated benchmarking requirements.
2-5: Develop tools and strategies to use information and behavioral strategies, commissioning, and training to reduce energy consumption in commercial buildings.	Building Industry Energy Commission Utilities Research Institutions	<ul style="list-style-type: none"> Identify new or improved tools and strategies that apply information and behavioral strategies, including presentation of economic, comfort and productivity cases to owners, occupants, and appraisers. Strengthen tools and practices for building commissioning. Strengthen Building Operator Certification (BOC) training for commissioning. 	<ul style="list-style-type: none"> Quantify and document business case for EE commissioning and operation and maintenance (O&M) activities. 	<ul style="list-style-type: none"> Use business case to expand BOC programs to an increased portion of commercial buildings. 	
2-6: Develop effective financing tools for EE improvements to <i>existing</i> buildings.	Finance Task Force Utilities Financial and Investment community Building owners and operators Real estate trade organizations	<ul style="list-style-type: none"> Quantify magnitude of building investment needed in California to meet long-term EE goals, and identify business-types expected to benefit from EE investments. Build and quantify strong business case for DSM/GHG reduction. Identify tools, instruments, and information necessary to attract capital to EE. Explore changes to standard lease terms to address perceived tenant/owner “split incentives” issue. Explore expanding on-bill financing offerings to other DSM programs. 	<ul style="list-style-type: none"> Roll out new instruments. Evaluate instruments and cash flow of transactions. Promote success stories. Refine or develop most effective EE financing instruments and business capital investment paths. 	<ul style="list-style-type: none"> Evaluate instruments and cash flow of transactions. Promote success stories. 	<ul style="list-style-type: none"> Refine or develop most effective EE financing instruments and business capital investment paths.

Implementation Plan and Timeline

Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020	2020-2030
<p>2-7 Develop business models and supplier infrastructure to deliver integrated and comprehensive “one-stop” energy management solutions</p>	<p>Utilities Energy Service Companies (ESCOs) DSM and solar service providers Venture capital firms</p>	<ul style="list-style-type: none"> • Initiate utility incentive pilots that test the viability of integrated DSM service delivery models (ESCOs, aggregators, etc.) • Explore other mechanisms to more highly reward comprehensive energy management retrofits, e.g. premium incentives for measured performance, local government permits incentives, insurance discounts, etc. 	<ul style="list-style-type: none"> • Investigate business model barriers and opportunities for scalable integrated business models 	<ul style="list-style-type: none"> • Apply branding, certification, marketing, or incentive strategies that best delivery one-stop comprehensive DSM services. 	<ul style="list-style-type: none"> • Refine most effective integrated one-stop delivery models.

4. INDUSTRIAL SECTOR

4.1 VISION

California industry will be vibrant, profitable and exceed national benchmarks for energy and resource efficiency.



4.2 PROFILE

California's industrial sector is both a major driver of California's economy and a major consumer of energy:

Contribution of the Industrial Sector	(% of total in CA)
Electricity use	16
Natural gas use ²¹	33
Energy use ²²	22
End use CO2 emissions ²³	>20

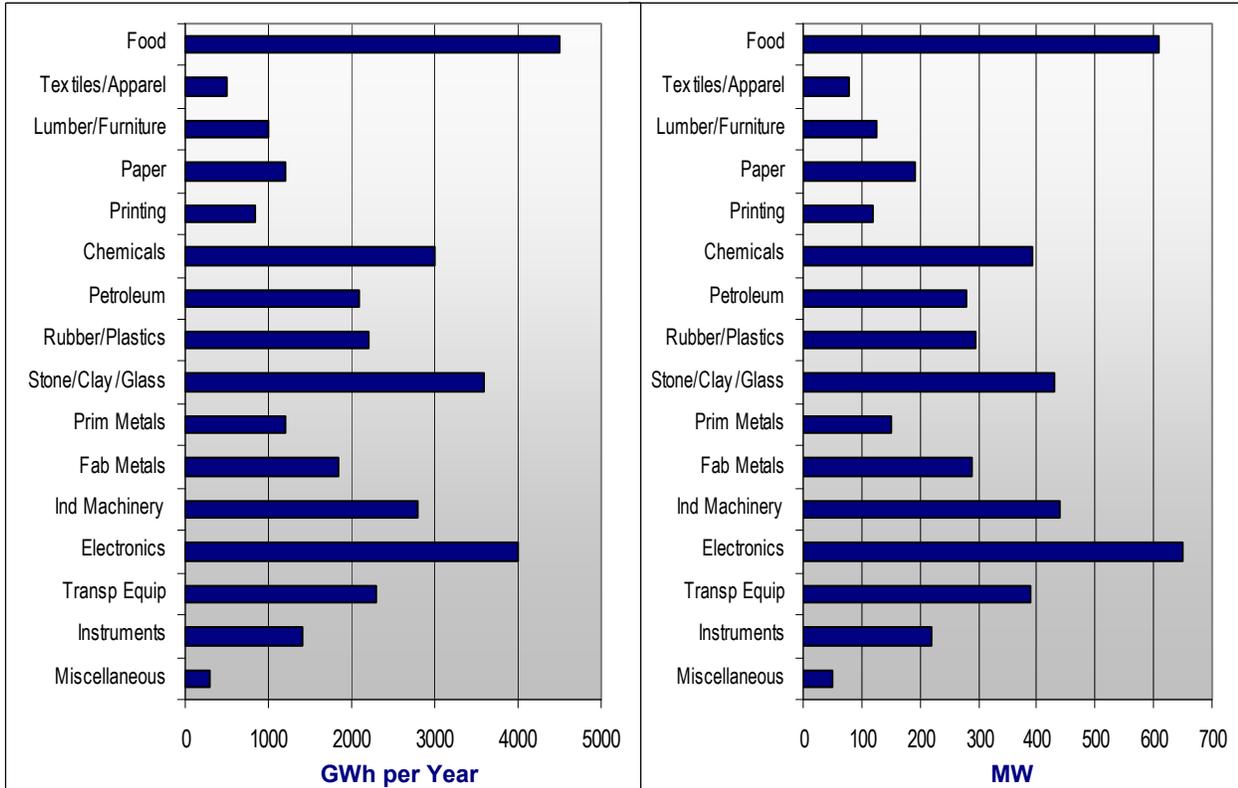
The treatment, distribution, and use of water in California's industrial sector contribute an additional 3 percent of California's electricity use and 14 percent of its non-power plant natural gas.²⁴

As shown below, the largest industrial users of electricity in California are food processing and electronics, although a number of other sectors have also reached significant use levels.

Industrial Electricity Usage by Industry Type, 2003–Overall

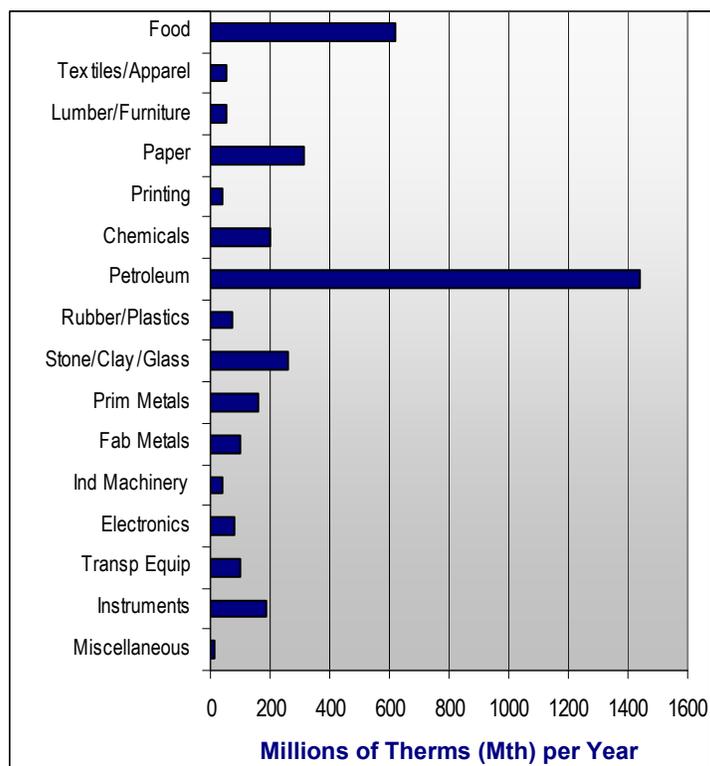
Energy

Peak Demand



The largest user of natural gas is petroleum sector, with about half going to feedstocks, followed by food processing.

Industrial Natural Gas Usage by Industry Type, 2003–Overall



Source: KEMA 2006, California Industrial Existing Construction Energy Efficiency Potential Study

Several factors unique to the industrial sector require an approach to California’s energy efficiency and greenhouse gas (GHG) reduction goals different from that used in the commercial and residential sectors:

- Industry uses a large quantity of energy and other resources via complex processes to create and bring products to market. Products, to varying degrees, have embedded energy that traditionally cannot be “zeroed out”, although technology is changing (e.g., the developing technologies for “zero energy” cement, dry walls, etc.)
- Industrial facilities in California are increasingly managed by corporations that reside outside of the state or outside of the country and who view these facilities as mobile assets in their efforts to compete in the global marketplace.
- California industry is highly diverse in type, size, and operation; uniform programs often will not match needs.
- Industries are subject to multiple policies and rules in resource areas (e.g. air quality, water quality, energy efficiency, GHG reductions, solid waste management), where compliance can raise competing objectives and outcomes.

4.3 GOALS

Goal	Goals Results
1. Support California industry's adoption of energy efficiency by integrating energy efficiency savings with achievement of GHG goals and other resource areas.	<p>➔ By 2012, the goals, program designs and funding of industrial resource programs are fully coordinated.</p>
2. Build market value of and demand for energy efficiency through branding and certification.	<p>➔ Energy efficiency certification and benchmarking will become a standard industrial practice for businesses that are responsible for 80 percent of the sectoral energy usage by 2020.</p> <p>➔ By 2020, Energy intensity (per gross dollars of production value) will be reduced at least 25 percent.</p> <p>There will be a trained workforce in energy management and systems energy efficiency.</p>
3. Provide centralized technical and regulatory assistance for resource efficiency and workforce training.	<p>➔ Industrial consumers will use this knowledge base to inform energy efficiency actions and manage their energy and resource use by adopting best practices.</p>

4.4 STRATEGIES

There are a multitude of significant barriers to achieving the full technical potential for energy efficiency in the industrial sector. These barriers include:

- Regulatory uncertainty and/or conflicting regulatory goals;
- Primary focus on industrial production, not energy efficiency;
- Resource limitations of both time and capital for assessment and implementation of energy efficiency projects;
- Lack of awareness of energy efficiency opportunities;
- Internal hurdle rates that often limit energy efficiency projects to paybacks of two years or less;
- Utility program parameters that are at odds with industry practice (e.g., limitations due to “free-rider shop” rules, lack of recognition of savings from process or operational changes, limits on funding for large projects).
- Difficulty in accessing industry-relevant technical assistance;
- Inadequate availability of qualified personnel in specialized industries.

This *Plan* will use the following strategies to address these barriers:

1. **Integrated Solutions:** Provide integrated energy solutions and products through a “one-stop shop” approach.
2. **Education and Outreach:** Provide energy efficiency education and outreach to create awareness of and demand for continuous energy efficiency improvements.
3. **Workforce Training:** Leverage existing training initiatives and technical exchange forums so that California industries have access to highly skilled professionals who are fully knowledgeable in the areas of system energy efficiency and energy management.

4.5 IMPLEMENTATION PLAN

Goal 1: Support California industry's adoption of energy efficiency by integrating energy efficiency savings with achievement of GHG goals and other resource goals.

Ideally, this effort will be integrated with the CARB's AB 32 requirements so that industrial facilities use energy efficiency to meet or exceed regulatory requirements for GHG emission reductions (as well as water conservation, waste disposal, and air quality). Properly structured, a coordinated regulatory framework could be coupled with incentives to actively promote and reward measured performance improvements across energy, water, GHG emissions, waste disposal, and air quality.

A major strategy will be to directly engage industry in coordinated interagency planning for the energy efficiency portions of AB 32. This effort will include examining the potential benefits of negotiated, legally binding agreements with the chief operating officers (COOs) of industrial corporations as a policy mechanism to promote energy efficiency in industry and corresponding reductions in GHG emissions. The United Kingdom, the Netherlands, Sweden, and a number of other countries have negotiated agreements programs in place, and such a strategy may work in California. US DOE has begun development of a national voluntary agreement program as well. Financial and other incentives and supporting programs would be needed for implementation of the agreements, so as to accelerate adoption of changes in operations and processes.

While the CPUC and IOU utilities could potentially develop such a program focused only on energy efficiency savings, a program approach covering all energy resource utilization, including energy efficiency, demand response, energy storage, combined heat and power, distributed generation, renewables and emerging technologies will provide the greatest benefit.

The food processing industry, with the leadership of the California League of Food Processors in partnerships with the Manufacturers Council of the Central Valley, has proposed a pilot demonstration project that could be undertaken in 2009.

This effort will also enhance broader utility program incentives from the current focus on energy efficient projects to include energy efficient processes (defined as documented, measurable evidence of energy management resulting in improved energy efficiency via projects, process, and operational improvements). The focus will move to delivered energy savings, either from hardware installations or documented permanent changes in operational processes. Utility program rules will become more flexible and reflect the reality of industrial decision-making, particularly regarding early replacement of equipment.

Goal 1: Integration with Other Resource Strategies

Implementation Plan and Timeline				
Strategy	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
1-1: Develop coordinated energy and resource management program for CA's industrial sector, to enhance use of energy efficiency	ARB Utilities Industry Reps.	<ul style="list-style-type: none"> Establish ARB AB 32 Industry Team Study feasibility of implementing negotiated agreements Undertake pilot program with food processing sector 	<ul style="list-style-type: none"> Analyze results of pilot program. If favorable, negotiate agreements with other key sectors 	<ul style="list-style-type: none"> Implement statewide

Goal 2: Continuous improvement in industrial energy efficient facility and process operations through branding and certification programs.

Goal 1 above focused on strategies that will support development of minimum regulatory energy efficiency requirements for either individual company or industrial sub-sectors as a whole, preferably integrated with the State's AB 32 program. Goal 2 is focused on companies that seek to exceed either minimum regulatory requirements or any negotiated bilateral agreement targets for industries as a whole, by actively managing their energy use over time.

A national industrial continuous performance program, known as the "Superior Energy Performance Partnership" (SEPP), is being developed by the USDOE, USEPA, the Manufacturing Extension Partnership, and a number of industrial firms. The SEPP is scheduled to be launched in 2010. Texas will conduct a pilot program in mid-2008 through mid-2009.

California could join the initiative while it is still under development. This could ensure that the certification program, including the M&V methodology, is compatible with other California industrial energy efficiency and GHG emission reduction program initiatives and regulations, is crafted with input from California industry, and builds upon the experience of the Texas pilot program. By participating in a recognized national effort to certify industrial facilities for energy efficiency, California will be assisting its industries to:

- More easily reach their GHG emission reductions targets via a supported, structured program based on proven best practices;
- Develop market recognition for their efforts through third-party certification, thus increasing global competitiveness; and
- Provide a tangible way to encourage greater energy efficiency through their supply chain.

Programs, such as those offered by U.S. Department of Energy Industrial Technologies Program (DOE/ITP) and USEPA could provide substantial cost-share opportunities and in-kind assistance, especially if linked to certification.

To meet the near-term needs for a branding and certification program, California industries must have ready access to high skilled professionals who are trained in energy management and systems efficiency. Key areas include training industry professionals (consultants, plant engineers, and equipment suppliers) to provide energy management assistance, in-depth system assessment services, and in later phases, multi-resource utilization assistance, including waste reduction, water efficiency and air quality. California can leverage the workforce training element of the SEPP program to achieve this goal.

Goal 2: Certification Program for Continuous Improvement

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
2-1: Participate in national SEPP planning process.	SEPP Program Utilities Industry	<ul style="list-style-type: none"> Participate in planning process. 		
2-2: Implement certification	SEPP Program Utilities Industry	<ul style="list-style-type: none"> Plan pilot and recruit host sites (8-10 facilities). Implement and analyze pilots. 	<ul style="list-style-type: none"> If successful, launch statewide program. 	<ul style="list-style-type: none"> Refine and obtain widespread program enrollment and certifications.
2-3: Develop and implement workforce training program (integrated with national training effort).	SEPP Program WE&T Task Force Utilities Industry	<ul style="list-style-type: none"> Adopt the national curriculum for certification. Consider curriculum enhancements for awareness-level training on integrating energy efficiency into the workplace and developing a higher education curriculum that provides a fast track for future energy management professionals Begin pilot courses. 	<ul style="list-style-type: none"> Expand statewide 	<ul style="list-style-type: none"> Maintain and update curriculum.
2-4: Create tracking and scoring systems to measure resource efficiency improvements. (integrate w/ nat'l effort)	Utilities Industry	<ul style="list-style-type: none"> Develop systems. Implement on test basis 	<ul style="list-style-type: none"> Launch statewide Coordinate with ME&O program. 	<ul style="list-style-type: none"> Maintenance and improvement
2-5: Implement ME&O program to educate industry and consumers	ME&O Task Force Utilities	<ul style="list-style-type: none"> Develop plan. 	<ul style="list-style-type: none"> Launch w/ statewide program 	<ul style="list-style-type: none"> Maintenance and improvement

Goal 3: Provide centralized technical and regulatory assistance for California industrial energy and resource efficiency.

The essence of this strategy is to facilitate adoption of energy efficiency through centralized and easily accessed information and resources.

Industrial facilities are not just large buildings that can be effectively served by programs designed for the commercial sector. The principal use of energy in industrial facilities is to create products or transform materials. Most industrial facilities have management systems in

place for materials and labor but many are still lagging on optimizing energy or resource utilization. The goal is to provide a single clearinghouse of technical and regulatory assistance that industry can use for more effective utilization of energy and environmental resources. Ideally, there is a single source of access that builds on and fills in the gaps in existing partnerships and relationships in the industrial sector. The goal is to provide access

for individuals to technical information that can be applied in a practical way to industry needs.

The clearinghouse will also include information on emerging technologies, and industry-specific

research. The clearinghouse will leverage knowledge developed through other organizations, including USDOE and USEPA.

Goal 3: Single Clearinghouse

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Short Term 2012 – 2015	Medium Term 2016 – 2020
3-1: Compile technical and regulatory EE materials into centralized assistance repository	Utilities Industry Associations	<ul style="list-style-type: none"> • Inventory existing sources for technical and regulatory assistance for industrial energy efficiency • Collect data • Develop clearinghouse 	<ul style="list-style-type: none"> • Update as needed;. • Extend to GHG and water. 	<ul style="list-style-type: none"> • Extend info to include waste disposal and air quality.
3-2: Conduct statewide marketing and education effort to create demand for Alliance and Industrial Information clearinghouse.	Utilities Industry Associations	<ul style="list-style-type: none"> • Develop ME&O Plan. • Implement plan. 	<ul style="list-style-type: none"> • Publicize results of pilots. • Extend statewide. 	<ul style="list-style-type: none"> • Update and maintain.

5. AGRICULTURAL SECTOR

5.1 VISION

Energy efficiency will support the long-term economic and environmental success of California agriculture.



5.2 PROFILE

The agricultural sector accounts for about 7 percent of California's overall energy,²⁵ a similar percentage of its private sector jobs, and around 1.5 percent of the gross state product. In terms of energy efficiency (and renewable energy), this sector has seven key end-use subsectors:

- Irrigated Agriculture
- Dairies
- Refrigerated Warehouses
- Vineyards & Wineries
- Greenhouses & Nurseries
- Post-Harvest Processing (on and near-frame)
- Confined Animal Feeding Operations (feedlots)

Energy consumption in the agricultural sector is concentrated in three end uses: irrigation, process heat applications, and refrigeration. Of these end uses, irrigation pumping accounts for 80 percent of electric energy use in the agricultural sector and has average pumping efficiencies of only about 53 percent.

Opportunities, barriers, and uncertainties that affect the success of energy efficiency in this sector include:

- Continuing consolidation of farming into agribusiness enterprises, concentrating decisions affecting energy consumption in the hands of fewer decision makers.
- Agricultural operators relying on commodity-specific and often local networks for information on technologies, practices and programs.
- Lack of up-to-date, statewide, segment-specific data on energy consumption and the potential for energy efficiency (and renewable generation) across the sector.
- Reluctance to accept higher first costs required to realize longer-term financial benefits, and to bear production risks associated with emerging or unproven technologies and practices.
- Continuing rapid evolution of regulations, including new requirements of the Water Resources Control Board and Regional Water Quality Controls Boards, and the Air Resources Board and Regional Air Quality Control Boards that have no compliance coordination and can slow the impetus to adopt energy efficiency technologies and practices, as well as the unknown structure of the AB 32 regulatory scheme.
- Expected reductions in surface water supplies due to climate change will increase demand for energy-intensive groundwater pumping, making energy efficiency both critical and cost-compelling.

Beyond energy efficiency, agriculture offers a unique opportunity to integrate on-site renewable energy in the form of biomass from agricultural field crop residues and biogas from animal wastes from dairy, cattle, and poultry farms. While this overall resource management opportunity is highly important, this first *Plan* has not been able to focus specific attention here.

5.3 GOALS

Goals	Goal Results
1. Establish and maintain a knowledge base sufficient to support development of all available, cost-effective, reliable, and feasible energy efficiency, demand reduction (and renewable) energy resources.	By 2015 California agriculture will develop and implement action plans, best practices and educational infrastructure to support ongoing improvements in irrigation, refrigeration and process heating efficiency, demand response, and renewable energy production.
2. California regulations, financing mechanisms, and incentives programs affecting the management of energy, air and water resources, solid waste, and climate change will be coordinated to mutual advantage.	By 2010, key stakeholders will develop a roadmap for regulatory and incentives coordination. By 2012, the goals, program designs and funding of such programs for agricultural energy, air and water improvements will be fully coordinated.
3. Achieve significant increases in the efficiency of electricity and natural gas use and on-site renewable energy utilization.	California agriculture will reduce production energy intensity by 15% from 2008 levels by 2020.

5.4 STRATEGIES

A central challenge to achieving broader energy efficiency in the agricultural sector is elevating energy as an agricultural priority. Demonstrating how energy efficiency contributes to increased competitiveness or profitability and to compliance with environmental requirements (e.g., impending AB 32 regulations) will be essential.

The overall strategic approach will be to focus on the largest energy end users first, while also capitalizing on farming consolidation companies and entities that concentrate on energy decision making within the sector. The major initial emphasis will be on the most energy intensive end uses—irrigation, process heating and refrigeration—since these are where the largest potential energy and dollar savings are most likely. However, this emphasis will be supported by an integrated “whole farm” approach that evaluates and addresses energy resource management comprehensively.

Strategies will expand to target progressively smaller energy consumers, especially early movers and opinion influencers. Success stories from both large- and smaller-scale agricultural enterprises will be widely disseminated throughout the sector to build both awareness of and enthusiasm for whole farm approaches targeting energy efficiency.

Success in carrying out these strategies for one of California’s key economic sectors will require the collaboration and active engagement of numerous stakeholders. Among state agencies, key players will be the Department of Food and Agriculture (DFA), Department of Water Resources (DWR), the Energy Commission, and others. At the federal level, the Department of Agriculture and Bureau of Reclamation are critical. The agriculture industry associations obviously will be leaders in this effort, supported by educational institutions, the Cooperative Extension service, and the investor-owned and publicly-owned utilities serving agricultural energy users. Local government agricultural commissioners’ offices likely will drive some of the marketing education and outreach efforts in tandem with the statewide ME&O Task Force.

Agricultural sector stakeholders have identified the single highest priority is to conduct baseline studies to understand the energy usage patterns in California’s agricultural sector, forecast likely changes in the future, determine the energy efficiency potential in the seven key areas of the sector, and evaluate the cost-effectiveness of measures and programs, best practices, etc. Without this basic information, it is impossible to implement a cohesive strategy to pursue all cost-effective energy efficiency in California.

Two additional items are central to the success of all three goals:

- **Marketing, Education and Outreach:** There must be a defined, comprehensive, long-term marketing, education, and outreach program to inform the agricultural sector and consumers regarding the goal and key strategies.
- **Workforce Training:** There must be a statewide focus on the workforce needs to achieve the goal, with adequate funding and support for development of the needed workforce.

5.5 IMPLEMENTATION PLAN

Goal 1: Establish and maintain a knowledge base sufficient to support development of all available, cost-effective, reliable, and feasible energy efficiency, demand reduction (and renewable) energy resources.

Absent a better understanding of the current and forecasted energy use in California's agricultural sector, energy efficiency potential, successes and failures to date, it will be impossible to implement significant energy efficiency in this sector, much less provide the cost-saving opportunities that energy efficiency offers. Therefore, the single most important strategic step – needed to be done immediately – is to conduct studies that will provide the necessary information and to then make that information available on a statewide data base.

Once developed, it is essential to place this knowledge in the hands of agricultural professionals and operators through appropriate education, training, and field-based extension activities. This must start with a needs assessment, followed by development of curricula, training modules, and supportive tools that can access and leverage the content of the newly created knowledge base. Trained and experienced advisors and farm operators can

then be developed and recognized for their knowledge in how to apply efficiency and resource solutions to individual agri-business operations.

The search for solutions will not stop with existing technologies and practices. There will be a focused effort to develop new technologies and applications that can help achieve multiple resource management goals. For example, opportunities exist to leverage knowledge from the industrial sector to apply to key processes driving energy consumption in the agricultural sector – such as for pumping, boiler operations and refrigeration. Another strategy will be better coordination of knowledge being developed by the now unconnected federal and state agricultural and energy research programs, agricultural equipment manufacturers, utility promotion of emerging technologies, and agricultural extension programs to individual farms and production facilities.

Goal 1: Energy Efficiency Knowledge Data Base

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
1-1: Develop knowledge base of efficiency solutions	Utilities CDFA DWR Agriculture Industry	<ul style="list-style-type: none"> Conduct an energy use characterization and efficiency potential study for the statewide agricultural market. Include potential for waste streams to offset energy consumption. Study plan (6/2009) and study completed (12/2010). Collect data on key programs and measures, best practices for energy efficiency in the agricultural sector. Study complete (6/10) 	<ul style="list-style-type: none"> Develop framework for common agricultural data base. Establish central clearinghouse for technical, program, regulatory, and incentive information. 	<ul style="list-style-type: none"> Ongoing refinement and maintenance.
1-2: Ensure workforce has information and training necessary to apply efficiency solutions	Utilities WE&T Task Force Educational Institutions Agricultural industry	<ul style="list-style-type: none"> Conduct workforce training needs assessment and next steps (12/2010) Develop training curricula and modules identified by needs assessment. (12/2011) 	<ul style="list-style-type: none"> Develop training and education tools for use of data base and benchmarking methods Begin pilot training & education programs. 	<ul style="list-style-type: none"> Training & education activities are fully rolled-out. Certification programs are in place.
1-3: Conduct research & development of new technologies and practices for agricultural efficiency	Energy Commission Utilities National Labs Agriculture Industry	<ul style="list-style-type: none"> Conduct an Energy Technologies/ RD&D gap analysis. Identify and prioritize needed RD&D/ET projects. (12/2010) Coordinate research activities across government, utilities, agricultural extension and university programs, and equipment manufacturer proprietary efforts. 	<ul style="list-style-type: none"> Ongoing identification, prioritization and execution of ET/RD&D projects. 	<ul style="list-style-type: none"> Ongoing identification, prioritization and execution of ET/RD&D projects.

Goal 2: California regulations, financing mechanisms, and incentives programs affecting the management of energy, air and water resources, solid waste, and climate change will be coordinated to mutual advantage.

Increasingly, the agricultural sector is subject to water use, water quality, air quality, solid waste, and soon global warming requirements. Energy efficiency, particularly when linked to water conservation, can be a key strategy to achieve goals in these other areas. Yet currently, there is no coordination at the state, local or federal level to optimize the use of energy efficiency in meeting multiple resource objectives.

A multitude of programs – currently uncoordinated – operate in the agricultural sector that address the sector’s use of energy, air and water. Better coordination of these programs would lead to enhanced use of energy

efficiency as a successful strategy to implement the goals across all programs. Specific programs warranting coordination are: water conservation and quality improvement funding, Energy Commission Emerging Technology funds, local air quality improvement funds, federal tax credits, Rural Energy for America Program (REAP) under the Federal Food, Conservation and Energy Act of 2008 (Farm Bill) and utility energy efficiency incentives.

One of the most important goals for agriculture is to develop a forum or process involving multiple stakeholders to coordinate technical energy efficiency solutions and program designs

(e.g., knowledge bases, technical assistance, financing, and financial incentives) across the

range of environmental management policies and goals.

Strategies will include:

- **Integrated Resource Management:** Setting up a common framework for resource management that can better leverage and “piggyback” multiple resource management programs to support increased adoption of energy efficiency, demand response and onsite generation opportunities integrated with efforts to attain air, water, and solid waste objectives.
- **Financing:** Developing common technical and financial assistance energy efficiency strategies most appropriate in the agricultural sector for achieving specific program objectives (e.g. deciding among grants vs. loans vs. rebates; structuring appropriate financial programs sensitive to preferences among traditional financing vs. performance contracting; and utilizing technical assistance advisors and expertise to deliver integrated solutions across multiple objectives).

The goal is to provide one-stop-shopping assistance to both program sponsors and the agricultural operators targeted by energy, air and water programs. This will assist program sponsors in tailoring their programs to the unique needs and preferences of agricultural operators, and prospective program participants in understanding program opportunities and requirements and in efficiently accessing and participating in programs.

the mechanism for implementing the strategy. The task force will provide both a forum for alignment and leveraging of program goals, designs and funding, and a clearinghouse for program information and coordination. The California Department of Food and Agriculture (CDFA) is developing a California Agricultural Vision through 2030, which may provide a useful opportunity to launch this forum.²⁶

A task force including representatives of all major sources of agricultural expertise, financing, and incentives targeting energy, air, water and solid waste concerns is envisioned as

The immediate focus of the task force will be on identifying and mitigating existing conflicts in programs operating across energy, air, water and solid waste concerns within the agricultural sector.

Goal 2: Coordination of Programs and Funding

Implementation Plan and Timeline				
Strategies	Non-CPUC Parties	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
2-1: Set reasonable and achievable objectives and framework for agriculture to attain multi-resource management goals	Utilities CDFA DWR Industry participants	<ul style="list-style-type: none"> • Establish a task force to coordinate resource management policies, action goals, and program designs targeting California’s agricultural sector. • Identify where goal conflicts arise and resolve these conflicts. • Assess potential for integrated approaches. 	<ul style="list-style-type: none"> • Establish a central database to track and coordinate available programs. • Undertake pilot integrated approaches. • Refine program designs and support based on experience. 	<ul style="list-style-type: none"> • Continue to modify and refine approaches for integrated solutions.

Implementation Plan and Timeline

Strategies	Non-CPUC Parties	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
2-2 Coordinate technical assistance, funding, and incentive mechanisms	Financing Task Force Utilities Financial Institutions Agriculture Industry	<ul style="list-style-type: none"> Identify the programs and major funding sources affecting the management of energy, air and water resources, and climate change. Create a collaborative forum to facilitate sharing of information and coordination of programs. 	Identify approaches to cross-market and leverage resource management goals across programs, funding, and technical assistance	Continue to modify and refine approaches for integrated solutions.

Goal 3: Achieve significant increases in the efficiency of electricity and natural gas use and on-site renewable energy utilization, including setting a specific target for irrigation efficiency.

Because irrigation accounts for 80 percent of the electricity used in the agricultural sector and current pumping efficiencies are so low, a specific goal targeting improvement in this area is warranted. Two other areas that warrant specific focus are higher efficiency with refrigeration and process heating from natural gas.

Strategies needed to achieve this goal include identification and adoption of management best practices and highly efficiency equipment. Specific areas of focus will include targeting energy efficiency opportunities from:

- Onsite source-water reduction
- Pressure reduction in irrigation
- Retro-commissioning
- Waste heat recovery and other gas-savings measures
- Precision agriculture
- Improved industrial refrigeration practices and technologies.
- Advanced irrigation systems

One of the emerging energy efficiency practices to guide end users in their efficiency actions is the use of “benchmarking”. This is premised upon developing a best practice standard and supporting systems that enables individual end users to analyze their energy usage compared to the benchmark. The US EPA has developed a benchmark tool for existing commercial buildings and pursuant to state law²⁷ utilities are working with commercial customers to expand use of benchmarking and help customers identify actions to save energy. Development of similar benchmarking tools for each agricultural sub-sector – starting first with the irrigated agriculture subsector and then expanding to other subsectors – would be an important

strategy in identifying profitable opportunities for efficiency improvements.

Achieving real savings in agriculture will be founded upon a compelling financial case to decision-makers in agricultural sub-sectors and individual companies. The strategy will identify the most effective communication channels, partners, and messages to deliver to these decision-makers.

Recognizing that irrigation accounts for the predominant share of electricity, both on-farm and in the statewide delivery of water, pilot programs and evaluation will be used to identify the embodied energy savings associated with water efficiency gains. This will be a critical step in linking energy and water efficiency strategies.

Goal 3: Capturing Energy Efficiency

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Medium Term 2016 – 2020
3-1 Make information on efficiency solutions readily available	Utilities Agricultural Industry	<ul style="list-style-type: none"> • Develop benchmarking resources, tools and methods for the agricultural sub-sectors. • Implement focused program for irrigation efficiency, refrigeration, and process heating 	<ul style="list-style-type: none"> • Apply feedback and refine benchmarking tools. • Expand programs. 	<ul style="list-style-type: none"> • Ongoing refinement and maintenance
3-2 Conduct marketing & outreach	ME&O Task Force Utilities Agriculture Industry	<ul style="list-style-type: none"> • Develop ME&O strategy, addressing communication channels, partners, and effective messaging. • Begin pilot implementation 	<ul style="list-style-type: none"> • Launch statewide program 	<ul style="list-style-type: none"> • Ongoing refinement and maintenance
3-3 Resolve metrics for embedded energy in water savings	State water agencies Agriculture Industry Energy and Water utilities	<ul style="list-style-type: none"> • Update evaluation measurement & verification protocols to define energy impacts of water efficiency actions. 	<ul style="list-style-type: none"> • Measure and evaluation all embedded energy savings associated with irrigation and process efficiency. 	<ul style="list-style-type: none"> • Ongoing

6. HEATING, VENTILATION AND AIR CONDITIONING²⁸

6.1 VISION

Residential and small commercial HVAC will be transformed to ensure that technology, equipment, installation, and maintenance are of the highest quality to promote energy efficiency and peak load reduction in California's climate.



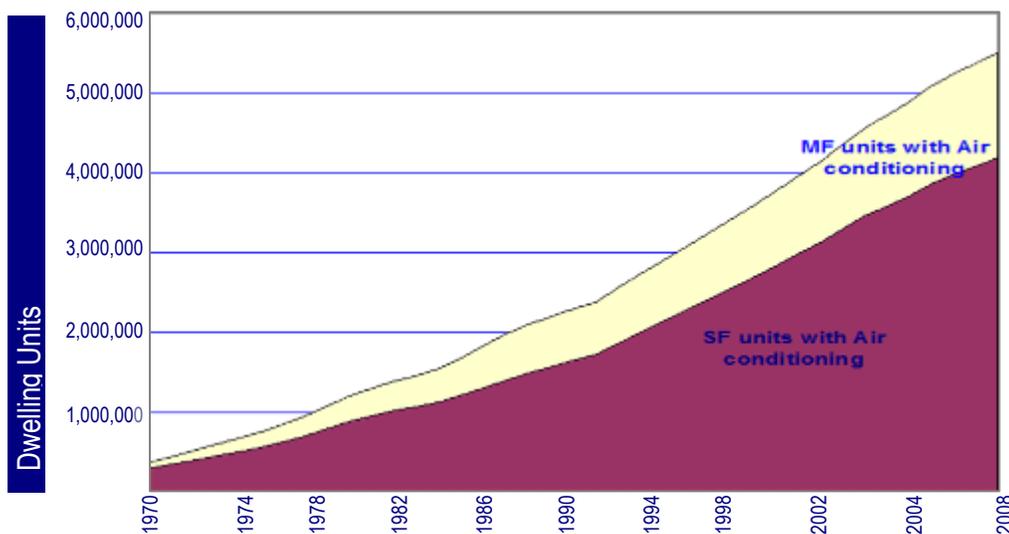
6.2 PROFILE

The rapid growth in air conditioning in California's commercial buildings and homes has made it one of the state's largest energy-consuming end uses and the single largest contributor to peak demand—and a leading opportunity to improve energy efficiency and reduce peak power demand. Accordingly, one of the three initial Programmatic Initiatives adopted by the Commission in October 2007 is to “reshape residential and small commercial HVAC to ensure optimal equipment performance.”²⁹

In 1976, 25 percent of new California homes had central air conditioning. Today, it is 95 percent,

and new home size has increased by more than half. These increases have resulted in a greater than seven-fold increase in the electricity capacity to meet this load. By 2006, peak demand for residential air conditioning units was 14,316 MW. When small commercial air conditioning is added to the residential share, this represents over 30 percent of California's total peak power demand in summer—with an enormous and costly impact on the need for generation, transmission, and distribution resources and a concurrent reduction of utility load factors.

Growth in Residential Dwellings with Central Air Conditioning - Single Family and Multi Family Units from 1970 to 2007



Unfortunately, as air conditioning was becoming nearly ubiquitous in new California buildings, installation and maintenance practices suffered substantially. The HVAC industry has struggled to provide qualified technicians, and market conditions rarely value quality installation and maintenance (QI/QM). Less than 10 percent of HVAC systems obtain legally required pre-installation local building permits and 30-50 percent of new central air conditioning systems are not being properly installed. Californians have paid a large price for the lack of quality installation and maintenance, with commensurate poor performance. The factors

that have led to a 20-30 percent increase in the peak energy needed to provide consumers with the cooling and comfort they demand on hot summer afternoons³⁰ has been accompanied by an estimated 30 percent increase in carbon emissions.

The Energy Commission recently estimated potential cumulative savings from higher quality installation in the residential and small commercial markets at 1,216 GWh and 1,096 MW by 2020. The estimated cumulative savings from accelerated introduction of more efficient cooling technologies is 1,272 MW and peak shifting technologies is 2,299 MW by 2020.

HVAC is regulated in California by the Energy Commission’s Title 20 and Title 24 appliance and building codes and by federal appliance standards. These codes and standards have become increasingly stringent in recent years, along with related activities such as the promotion of Energy Star-compliant units. But numerous barriers reduce the effectiveness of the codes and standards including:

- The federal standards use a single, national air conditioning metric that does not robustly measure—never mind promote—the performance of air conditioners in hot, dry conditions such as California.
- Federal law pre-empts California’s ability to set its own air conditioning efficiency standards.³¹
- A consumer market focused on lowest first cost, and ignoring operating costs.
- Inadequate installation and maintenance practices.
- Building design practices that do not take an integrated systems approach to lessen the need for HVAC.

6.3 GOALS

Goal	Goal Results
1. Consistent and effective compliance, enforcement, and verification of HVAC-related building and appliance standards.	➔ HVAC-related permits are obtained for 50 percent of installations by 2015 and 90+ percent by 2020.
2. Quality installation and maintenance becomes the industry and market norm.	➔ By 2020 100 percent of systems are installed to quality standards and optimally maintained throughout their useful life.
3. Whole building design and construction practices fully integrate building performance to reduce cooling and heating loads.	➔ Integrated design and construction practices are standard practice by 2020.
4. Develop new hot/dry climate HVAC technologies (equipment and controls, including system diagnostics) and greatly accelerate their marketplace penetration.	➔ For at least 15 percent of equipment shipments by 2015 and 70 percent by 2020.

6.4 STRATEGIES

To achieve the Commission's adopted Programmatic Initiative of transforming the HVAC market and the four specific goals identified above, broad-based and aggressive strategies are needed that involve many stakeholders beyond the Commission and IOUs. An HVAC Advisory Group should be chartered to involve high-level HVAC industry

stakeholders—such as manufacturers, distributors, and contractors—to coordinate industry sponsorship of and participation in HVAC strategies. Membership should also include other key players, such as the CPUC, Energy Commission utilities, building owners/managers, and consumers.

6.5 IMPLEMENTATION PLAN

Goal 1: Consistent and effective compliance, enforcement, and verification of applicable building and appliance standards.

California law requires contractors to obtain a permit for the installation of new HVAC equipment (including replacements of existing equipments) and to perform quality control checks. Yet less than 10 percent of contractors obtain such permits and a similar percent of installers fail to perform quality control checks or have their work verified by third-party raters. Failure to ensure quality at the time of cooling system installations results in a 20 to 30 percent increase in the peak energy needed by systems.

This problem is exacerbated by Title 24 provisions that allow optional compliance with HVAC quality control requirements; a contractor may install higher efficiency measures in a new building in lieu of the quality installation and control requirements. The Air Conditioning Contractors of America (ACCA) recently developed a quality installation (QI) specification for air conditioning equipment that has become an American National Standards Institute (ANSI) standard. It is comprehensive, addressing all

aspects of HVAC quality installation, including equipment, installation and ducts. The Energy Commission's June 2008 HVAC report has recommended that the Energy Commission consider making the ACCA or similar requirements mandatory for all HVAC installations, in lieu of Title 24's current optional requirement.

Changing the status quo will require significant effort, since contractors who comply with HVAC code provisions incur higher costs that are difficult to pass onto customers in a highly competitive market. Such contractors may also experience delays due to local government permit timelines. Local building officials may not have the resources or knowledge to establish streamlined permitting systems that support quality HVAC installations and penalize contractors who do not comply. Likewise, Energy Commission action to change its optional standards to mandatory quality control provisions is critical.

Strategies to achieve significantly improved compliance include:

- Streamlining local government permitting and licensing processes, beginning with pilot programs.
- Changing the building code by replacing the current optional quality control requirements with mandatory requirements.
- Improving the current processes for inspecting and verifying system installations including tracking the installation of all new and replacement equipment, to ensure they are installed in compliance with all applicable state energy codes.
- Actively enforcing penalties for contractors who do not pull required permits or who operate without the appropriate licenses.
- Development of an internet-based system that tracks the status of compliant equipment—from the initial sale to contractors to the final quality check performed by third parties in the field.

Goal 1: Improve Code Compliance

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
1-1: Develop streamlined local government HVAC permitting systems, including on-line HVAC replacement permitting.	Local Governments CALBO Utilities Distributors Contractors	<ul style="list-style-type: none"> Convene an industry/local gov'n't stakeholder group; develop proposed new system; pilot test with local governments 	<ul style="list-style-type: none"> Revise pilots and expand to other cities; develop framework for statewide program. 	<ul style="list-style-type: none"> Expand statewide.
1-2: Streamline process for obtaining contractor business licenses for multiple jurisdictions.	Local Governments CALBO Calif. Contractor State License Board	<ul style="list-style-type: none"> Pilot test process with local building departments. 	<ul style="list-style-type: none"> Revise pilot and expand pilot testing to other cities; develop framework for statewide program. 	<ul style="list-style-type: none"> Expand statewide.
1-3: Replace Title 24's current optional quality control requirements with mandatory requirements akin to the ACCA/ANSI QI/QM specification.	Energy Commission ACCA/ANSI Utilities Contractors	<ul style="list-style-type: none"> Adopt ANSI standards into Title 24; integrate into existing utility program designs. 	<ul style="list-style-type: none"> Explore steadily higher QI/QM standards as baseline becomes commonplace. 	<ul style="list-style-type: none"> Ongoing
1-4: Consider developing an internet-based system that tracks the status of equipment, from the initial sale to final quality check in the field.	Utilities Local Governments CALBO Distributors Contractors	<ul style="list-style-type: none"> Convene stakeholder group; develop details of proposed system and determine whether to proceed. 	<ul style="list-style-type: none"> If recommended for development; pilot test. 	<ul style="list-style-type: none"> Expand statewide if pilot testing is successful.
1-5: Enforce penalties for contractors who do not pull permits for the replacement and installation of space cooling systems or those who operate without the appropriate license.	Local Governments CA Contractor State License Board Contractors Utilities	<ul style="list-style-type: none"> Pilot test local government fines in lieu of contractor license suspension; expand SMUD program to IOUs (proof of quality installation req'd for rebate); identify local gov'n't resources needed for enforcement; establish action plan to phase-in mandatory enforcement. 	<ul style="list-style-type: none"> Expand pilot programs; Continue phase-in of mandatory enforcement activities. 	<ul style="list-style-type: none"> Fully implement mandatory enforcement.

Goal 2: Quality HVAC installation and maintenance becomes the norm. The marketplace understands and values the performance benefits of quality installation and maintenance.

Quality HVAC installation and maintenance (QI/QM) is currently the exception, not the norm. Achieving this goal will require a major transformation in both markets and behavior. Consumers need education on the value of properly installed and maintained systems, need to demand it, and the service industry needs proper education, training, and certification to then meet consumer demand.

Strategy 1-3 under Goal 1 above is to replace the Energy Commission’s current Title 24 optional quality control approach with a mandatory requirement, such as the ACCA/ANSI standard. If this is done, then a logical next step is to develop a label that would be attached to residential or small commercial HVAC installations by a third-party rater. Even before a change in the Title 24 requirements, a statewide brand program could be developed to benchmark, recognize, and/or certify, quality installation and maintenance and high levels of HVAC technician competence. This effort could be done by California alone, with other southwestern states, or on a national basis. The brand would be used in at least two ways - affixed to equipment to certify the equipment has been installed pursuant to QI/QM requirements and available to contractors who voluntarily ensure a high proportion (perhaps 90 percent) of their workers have received high-quality certification from North American Technician

Excellence or other industry groups that wish to offer the same high quality brand. This branding effort could be tied to utility programs, such that only customers or contractors who use the brand receive incentives.

A consumer marketing and education campaign about the value of quality installation and maintenance can introduce and stimulate the demand for the new brand—communicating that quality work results in increased comfort, improved air quality and higher energy and cost savings. Development and launch of the quality brand should be supported with the appropriate level of behavioral studies to assess the market transformation impacts of the brand and ensure that any utility incentives are linked to use of a statewide brand is effective in changing consumer and contractor behavior.

A concurrently key strategy needed to achieve this goal is the development of adequate workforce education and training for HVAC contractor/owners, service and installation technicians, sales representatives and building officials. The first step is to conduct a comprehensive needs assessment that will identify industry skill gaps and form the basis of an effective action plan to address these gaps. After that, support should be provided to certify new trainers and courses and provide incentives directly to technicians who complete training.

Goal 2: Quality HVAC Installation and Maintenance

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012-2015	Long Term 2016 – 2020
2-1: Create and launch a statewide Quality Installation and Maintenance (QI/QM) brand that will be attached to systems/installations/contractors that meet quality standards.	ME&O Task Force Utilities HVAC industry Retailers	<ul style="list-style-type: none"> • Create and launch statewide quality brand and/or align with national brand and launch supporting marketing activities. • Develop operating and lifecycle data on economic and comfort benefits. 	<ul style="list-style-type: none"> • Ongoing 	<ul style="list-style-type: none"> • Ongoing

Implementation Plan and Timeline				
Strategies	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012-2015	Long Term 2016 – 2020
2-2: Launch a consumer marketing and education campaign to support the brand	Utilities HVAC industry	<ul style="list-style-type: none"> Develop and launch campaign. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
2-3: Develop and provide expanded QI/QM training for contractors, technicians and sales agents.	WE&T Task Force Utilities HVAC Industry Educational institutions Labor Unions CSLB NATE	<ul style="list-style-type: none"> Conduct comprehensive training needs assessment to identify industry skill gaps; begin expanded training programs. 	<ul style="list-style-type: none"> Assess impact of training activities and update needs assessment as required. Expand training programs statewide, particularly at the vocational/technical and community college levels. 	<ul style="list-style-type: none"> Ongoing
2-4: Develop and implement comprehensive technician certification program	HVAC Industry Energy Commission Labor Unions CSLB WE&T Task Force Educational institutions NATE	<ul style="list-style-type: none"> Develop certification program requirements; begin implementation 	<ul style="list-style-type: none"> Expand program 	<ul style="list-style-type: none"> Statewide certification program
2-5: Conduct ongoing behavioral studies to ensure strategies are effective	Utilities HVAC Industry	<ul style="list-style-type: none"> Identify and undertake studies. 	<ul style="list-style-type: none"> Integrate study findings into revised/updated strategies and programs. 	<ul style="list-style-type: none"> Ongoing

Goal 3: Building industry design and construction practices that fully integrate building performance to reduce cooling and heating loads.

Both the residential and commercial sector chapters address the need for “whole building” design and implementation in California, in order to achieve truly aggressive energy efficiency savings. One key goal of this overall effort must

be building performance that improves space conditioning, by dramatically reducing cooling and heating loads. Fundamental changes will be needed in current design and building practices.

Specific design and building changes addressing HVAC performance include:

- Placing more emphasis on the whole building as a complete interactive system and improving the thermal integrity of structures to reduce heating and cooling loads.
- Moving ducts and equipment off the roof and out of hot attics.
- Incorporating ductless systems, radiant heating and cooling, ground source heat pumps and thermal energy storage technologies with overall higher efficiencies.

Equally important, strategies are needed to change behavior. The Residential and Commercial Sector Chapters address behavioral change strategies to promote whole building

design and implementation. Those strategies need to include focus on the HVAC industry as a key player.

Goal 3: Whole-Building Design

Implementation Plan and Timeline				
Strategy	Non-CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
3-1: Aggressively promote whole building design concepts that improve the overall thermal integrity of new and existing structures.	Utilities HVAC industry Architects Builders and Contractors	<ul style="list-style-type: none"> Pilot targeted programs. Incorporate radiant cooling, ductless systems, ground source heat pumps, etc. into 5 percent of new and existing construction by 2011 	<ul style="list-style-type: none"> Include standard program offerings that emphasize HVAC-related elements to whole building approaches. Incorporate radiant cooling, ductless systems, ground source heat pumps, etc. into 25 percent or more of new and existing construction by 2015. 	<ul style="list-style-type: none"> Incorporate radiant cooling, ductless systems, ground source heat pumps, etc. into 50 percent or more of new and existing construction by 2020.
3-2: Accelerate activities related to HVAC aspects of whole building industry design standards.	ASHRAE Energy Commission Utilities Manufacturers AHRI	<ul style="list-style-type: none"> Establish an industry-wide task force to evaluate and update existing standards to include increased emphasis on HVAC aspects of whole building approaches. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
3-3: Accelerate HVAC related aspects of whole building design in the educational and professional communities.	Colleges/ Universities Utilities Department of Education	<ul style="list-style-type: none"> Develop continuing education programs. Begin curriculum use 	<ul style="list-style-type: none"> Expand statewide. Develop university degree level programs. 	<ul style="list-style-type: none"> Ongoing
3-4: Accelerate code-based solutions to improving the thermal structural integrity and incorporating alternative cooling methods into building designs.	Energy Commission Local Governments Utilities	<ul style="list-style-type: none"> Implement optional code improvements necessary to facilitate moves to whole building design approaches 	<ul style="list-style-type: none"> Establish mandatory whole building code-based solutions. 	<ul style="list-style-type: none"> Ongoing
3-5: Sponsor design competitions to encourage builders to design and build homes with net zero peak demands	Utilities Foundations Industry Builders and Contractors	<ul style="list-style-type: none"> Conduct first competition in 2010 and annually thereafter. 	<ul style="list-style-type: none"> Annually. 	<ul style="list-style-type: none"> Annually.

Goal 4: Develop new hot/dry climate HVAC technologies (equipment and controls, including system diagnostics) and greatly accelerate their marketplace penetration.

This goal requires coordinated development and use of new and improved HVAC technologies (equipment *and* controls, including two-way demand response and onboard diagnostics) that perform better in California's climate.

The strategies to achieve this goal include:

- **Develop a regional (southwest) strategy:** Because advanced technology development and market penetration has a regional impact, it would be advantageous to draw participants from other states experiencing similar increasing air conditioning loads (e.g., Nevada, Arizona, New Mexico and perhaps Texas). The focus would be on working with USDOE to develop new cooling systems with technology and designs that reflect California and similar hot/dry climate conditions.
- **Expand HVAC-related R&D:** Past improvements in HVAC energy efficiency have been the result of R&D by the HVAC manufacturers, utilities, government, and academia.
- **Support incremental improvements to HVAC equipment.** Because highly advanced cooling technologies will only penetrate small portions of the total market at a time, incremental improvements in standard HVAC equipment are also required, including continued upgrading of codes and standards. Any economic analysis must include on-peak energy resource values and resulting peak-specific standards.
- **Commercialize on-board diagnostic systems:** Such systems automatically collect data and alert consumers and/or contractors when a fault or negative performance trend is detected. These diagnostics will result in energy benefits by helping ensure that HVAC systems are maintained and operate within design specifications. While many manufacturers currently offer either "on board" systems or hand-held ones that work with all systems, none are widely used by consumers or contractors. Actions to accelerate the commercialization of such diagnostics include:
 - Prioritizing in-field diagnostic and maintenance approaches based on the anticipated size of savings, cost of repairs, and the frequency of faults occurring
 - Benchmarking of existing diagnostic, repair and maintenance protocols
 - Developing nationwide standards and/or guidelines for onboard diagnostic functionality and specifications for designated sensor mount locations.
 - Aggressive promotion of diagnostic systems as a standard offering on all HVAC equipment.

In addition to technology development, a key strategy to achieve this goal is education of contractors and consumers about the advanced technologies' availability and value, as well as education and training of service technicians, particularly on the use of diagnostic systems.

Goal 4: New HVAC Technologies and System Diagnostics

Implementation Plan and Timeline				
Strategies	Non -CPUC Partners	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
4-1: Pursue regional climate optimized equipment standards through DOE rulemaking process.	DOE Utilities Nat'l Labs NBI HVAC industry	<ul style="list-style-type: none"> Convene industry-wide task force. 	<ul style="list-style-type: none"> Regional climate optimized standards adopted by DOE. 	<ul style="list-style-type: none"> Ongoing
4-2: Update "Total Avoided Cost Model" and Title 24 "Time Dependent Valuation" calculations, including use of peak energy values.	Energy Commission Utilities	<ul style="list-style-type: none"> Evaluate, revise and update as needed. 	<ul style="list-style-type: none"> Maintenance 	<ul style="list-style-type: none"> Maintenance
4-3: Accelerate market penetration of advanced technologies by updating/expanding current programs to include the new technologies as appropriate	Utilities Energy Commission	<ul style="list-style-type: none"> Conduct a comprehensive cost-benefit analysis of leading and prospective advanced technologies, and use to prioritize incentive offerings and deployment strategies Establish an incubator program. 	<ul style="list-style-type: none"> Provide necessary program incentives to ensure that advanced technologies represent 30 percent of the systems sold by 2015. 	<ul style="list-style-type: none"> Continue to provide necessary program incentives to ensure that advanced technologies represent 50 percent of systems sold by 2020.
4-4: Adopt a progressive set of building codes that support the deployment of peak efficient equipment.	Energy Commission Utilities AHRI ASHRAE	<ul style="list-style-type: none"> Enhance and accelerate the deployment of Title 20/24 codes. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
4-5: Develop nationwide standards and/or guidelines for onboard diagnostic functionality and specifications for designated sensor mount locations.	Manufacturers Utilities Trade Associations AHRI ASHRAE	<ul style="list-style-type: none"> Establish an industry-wide task force to develop national standard diagnostic protocols. Begin implementation. 	<ul style="list-style-type: none"> Incorporate diagnostic standards into equipment codes. 	<ul style="list-style-type: none"> Ongoing
4-6: Prioritize in-field diagnostic and maintenance approaches based on the anticipated size of savings, cost of repairs, and the frequency of faults occurring.	Manufacturers Utilities Trade Associations AHRI ASHRAE	<ul style="list-style-type: none"> Benchmark existing diagnostic, repair and maintenance protocols and develop appropriate products 	<ul style="list-style-type: none"> Commercialize on-board diagnostic systems. 	<ul style="list-style-type: none"> Incorporate mandatory onboard diagnostic systems in California building codes.

7. CODES AND STANDARDS

7.1 VISION

A broad range of aggressive and continually improving energy codes and standards will be adopted to greatly accelerate the widespread deployment of zero-net energy and highly efficient buildings and equipment. The effectiveness of codes and standards will be enhanced by improved code compliance as well as coordinated voluntary efficiency activities.



The ambitious goals of this *Strategic Plan* as well as greenhouse gas imperatives place an unprecedented reliance on mandatory codes and standards—both on energy codes for new and renovated buildings and on efficiency standards for appliances and equipment—and pressure for them to perform.

PROFILE

There is no policy tool more essential for the widespread and persistent transformation of energy performance in California than energy codes and standards. California has aggressively and successfully used its two principal frameworks for regulating minimum energy performance—Title 24 building energy codes and Title 20 appliance standards³²—to cost-effectively reduce the energy consumption of commercial buildings, homes and appliances.

The effectiveness of energy codes and standards is beyond debate—the Energy Commission’s 2007 Integrated Energy Policy Report³³ notes that: “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.”

The appeal of codes and standards for promoting energy efficiency is simple: they make better energy performance mandatory, and not just for early adopters or self-selected consumers but for all users of regulated products and structures. Codes and standards’ impact, while enormous, can be enhanced and made even more successful and cost-effective if they are:

- Capturing a wide range of economically viable technologies and building practices, including integrated DSM approaches.
- Integrated with non-regulatory market transformation efforts, such as utility incentives and rebates, Energy Star and other benchmarking programs, builder and consumer education, etc.
- Optimized with other regulations, especially federal efficiency standards, non-California state efficiency standards, AB 32, ambient air quality rules and local government development policies.
- Applied more comprehensively to end uses, including plug loads and building operations.
- Supported by better enforcement and compliance.
- Rely on more sophisticated analytics regarding whole buildings and measures.
- Encouraging building industry players to design or manufacture new energy solutions.

7.3 GOALS

Goal	Goal Results
1. Continually strengthen and expand building and appliance codes and standards.	➔ California’s codes and standards will support the Residential and Commercial sector goals.
2. Dramatically improve code compliance and enforcement.	➔ Energy savings from codes and standards will be fully realized.

7.4 STRATEGIES

The Energy Commission re-visits and tightens Title 24 building codes on a triennial basis. However, the scale of the goals and challenges at hand—including that of putting all new commercial buildings on a path to zero net energy by 2030, and AB 32—prompts a strategy of new efforts to make the code more stringent and cover more end uses and measures.

The strategies described below pursue both sides of the codes and standards coin: they develop enhanced regulations “on paper;” and they improve their real world effectiveness, cost-effectiveness and compliance. Although the strategies place greater emphasis on building codes than on appliance/equipment standards—as the former are principally regulated at the state level and the latter principally at the federal level—there is nonetheless a tremendous

opportunity for appliance regulation to increase energy savings.

The Energy Commission is a key leader in this effort, along with the California Building Standards Commission. Utilities, research organizations (Energy Commission-PIER, LBNL, NREL), trade and professional licensing/registration agencies, the building/developer/contractor/ manufacturers industry and realtors must work cooperatively to develop common goals and provide the technical support for this effort.

These strategies are presented at a high level in this Chapter. The Residential, Commercial and HVAC Chapter provide greater detail on codes and standards measures applicable to those sectors.

7.5 IMPLEMENTATION PLAN

There is a de facto symbiotic relationship between more stringent codes and standards and improvements in technology, products and practices (the former prods the latter, while the latter helps allow the former) that will need to strengthen and accelerate in the coming years.

More than most other efficiency policy areas, codes and standards demands coordination with other efforts and parties—from regulators to the regulated—to be optimal. The IOUs have played a major role in assisting this coordination, and must be committed to playing a larger role in the future to support and/or facilitate future efforts. Such coordination has two major components: one, coordinating with other relevant governmental regulations; and two, coordinating with relevant programs, incentives, market

dynamics, research and other non-regulatory initiatives.

Many other governmental entities can impact the effectiveness of California’s codes and standards. For example, the federal government (DOE) has primary responsibility for appliance/equipment standards. Local governments play an important role, including enforcement of Title 24 and adoption of reach codes. Coordination with other programs and laws is also critical. Codes and standards by their nature are more focused on eliminating inefficient products and practices than on developing or popularizing new highly efficient ones. Accordingly, codes and standards should be coordinated with efficiency programs that develop and commercialize new products.

Goal 1: Code Enhancement and Expansion

Implementation Plan and Timeline				
Strategies	Near-Term (2009-2011)	Mid-Term (2012-2015)	Long-Term (2016-2020)	2021 – Beyond
1.1: Develop more stringent codes and standards.	<ul style="list-style-type: none"> • Adopt a progressive set of building codes; including one or two voluntary “reach code” tiers for residential and commercial sectors. • Lower the renovation threshold at which the code applies to an entire existing structure 	<ul style="list-style-type: none"> • Develop road map for codes and standards to enhance Title 20 and Title 24 codes in a “top-down” approach • Increase building commissioning requirements for new buildings and retrofits. 	<ul style="list-style-type: none"> • Development of reach codes for buildings as “net producers” energy. • Codes and Standards require net zero residential buildings by 2020 	<ul style="list-style-type: none"> • Codes and Standards require net zero commercial buildings by 2030
1.2: Expand Titles 24 and 20 to address all significant energy end uses	<ul style="list-style-type: none"> • Expand Title 20 to cover additional plug loads such as copy machines, printers, battery chargers, televisions. • Enhance Title 24 to include whole building approaches including metering and data management; automated diagnostic systems; and sub-metering for tenant-occupied space. • Pursue greater alignment of green building codes. • Integrate AB 32 standards with energy efficiency goals. 	<ul style="list-style-type: none"> • Expand Title 20 and Title 24 to cover additional uses such as server farms, process loads and water use. • Develop building standards to better integrate on-site DSM. • Investigate establishing energy and green building codes on a community and/or city level that may include infrastructure issues such as transportation, wastewater treatment, solid waste disposal. 	<ul style="list-style-type: none"> • Investigate expansion of Titles 24 and 20 to address all significant energy end uses (manufacturing, agricultural, healthcare, etc.). • Evaluate including land development in energy standards and regulations. 	<ul style="list-style-type: none"> • Ongoing
1-3: Improve code research and analysis.	<ul style="list-style-type: none"> • Conduct analysis that will help the code move toward a zero-based approach. • Analyze approaches for whole buildings, non-covered end uses and measures that are not currently credited by Title 24. • Conduct tests and evaluations of potential code change measures. • Increase research and analysis regarding how behavior affects use of buildings and code compliance. • Evaluate and develop 	<ul style="list-style-type: none"> • Continue research to improve program impact and processes. • Conduct analysis of embedded energy savings with transportation, wastewater, and solid waste options for green building standards. • Investigate the balance between mandatory, prescriptive, and beyond-code requirements to achieve more stringent codes, 	<ul style="list-style-type: none"> • Continue research. • Conduct research on revising and updating the cost-effectiveness. 	<ul style="list-style-type: none"> • Continue research. • Investigate the potential for using life cycle analysis as a component of cost effectiveness.

Implementation Plan and Timeline				
Strategies	Near-Term (2009-2011)	Mid-Term (2012-2015)	Long-Term (2016-2020)	2021 – Beyond
	<p>appropriate approaches to include DR standards in C&S.</p> <ul style="list-style-type: none"> Continue exploration and adoption of improved building energy simulation and compliance tools. 	<p>greater compliance rates, and more innovation in the marketplace.</p>		
<p>1-4: Improve coordination of state energy codes and standards with other state and federal regulations.</p>	<ul style="list-style-type: none"> Continue to develop appliance standards to influence the market prior to preemption by DOE. Coordinate Title 24 goals with 1992 EPart requirements for meeting/exceeding federal code. Coordinate development and adoption of California Green Building Standards with Title 20/24 and ASHRAE Standard 189, CHPS. 	<ul style="list-style-type: none"> Coordinate development of related codes and standards such as the California Green Building Standards, ASHRAE 90.1 and 189.1, ICC, CHPS, etc. Coordinate/support implementation of legislation impacting C&S program such as AB 32. Coordinate development of codes and standards with state and voluntary programs such as Energy Star, LEED, Flex Your Power, etc. 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
<p>1-5: Improve coordination of energy codes and standards with utility programs.</p>	<ul style="list-style-type: none"> Enhance coordination and integration of codes and standards with full spectrum of EE market transformation, including ET, deployment, incentives, consumer education, etc. 	<ul style="list-style-type: none"> Investigate ways to integrate C&S with other DSM by offering tiered incentives (financial and other) and technical assistance beginning with basic compliance. 	<ul style="list-style-type: none"> Investigate a greater convergence of the C&S and other DSM that may use non-code baselines. 	<ul style="list-style-type: none"> Investigate the integration of utility infrastructure planning with potential community-based codes.

Goal 2: Improve code compliance and enforcement.

Compliance with California’s efficiency codes and standards varies enormously, especially with respect to building codes. For example, less than 10 percent of HVAC systems installed have permits pulled and 30-50 percent of new central air conditioning systems are not being properly installed. This compliance failure comes at considerable cost to Californians—the HVAC compliance shortcomings alone has led to a 20-30 percent increase in the peak energy needed

to provide consumers with the cooling they demand on hot summer afternoons.³⁴ It has been estimated that a substantial fraction (estimated to be at least 30 percent) of the technical energy savings potential of energy codes is lost due to non-compliance—but in reality there is inadequate understanding of code compliance rates and a resulting degradation in performance.³⁵

This strategy will require a strong, coordinated effort by the utilities, local governments, CALBO, code compliance organizations, the Energy

Commission, trade and professional licensing/ registration agencies, and building/developer/ contractor/ manufacturers associations.

Goal 2: Compliance and Enforcement

Implementation Plan and Timeline				
Strategies	Near-Term (2009-2011)	Mid-Term (2012-2015)	Long Term (2016-2020)	2021 – Beyond
2-1: Improve code compliance and enforcement.	<ul style="list-style-type: none"> Conduct research to determine high-priority tactical solutions for code compliance and focus efforts accordingly. Increase training and support for local building code officials. Investigate regulatory tools such as licensing/ registration enforcement. Evaluate proposed changes to the code and compliance approaches to simplify and expedite compliance. Work with Local Governments to improve code compliance, adopt above code ordinances, and provide training/education. 	<ul style="list-style-type: none"> Continue to conduct further research relating to code compliance. Refocus efforts as needed. Pursue appropriate involvement of HERS raters. Pursue trade associations to improve “self-policing” of membership. Investigate tools, software programs, “incentives”, and policies to simplify and streamline permit process. 	<ul style="list-style-type: none"> Continue to conduct research. Investigate aggressive “stick” and “carrot” programs with monetary penalties and incentives. Investigate the feasibility of proving code compliance as a pre-requisite for partnership funding from the IOUs. Investigate greatest opportunities of compliance improvement of appliances (Title 20) in the upstream and midstream markets. Investigate developing programs to work directly with manufacturers and distributors to improve appliance and equipment compliance. 	<ul style="list-style-type: none"> Continue to conduct research. Investigate and pursue solutions to the perceived and real “penalties” associated with permitting. Investigate codes and standards that would regulate the operation of buildings that may include such things as maintenance requirements, regular updates to operating schedules, mandatory monitoring and controls points, system reporting requirements, etc.

8. DSM COORDINATION AND INTEGRATION

8.1 VISION

Energy Efficiency, demand response and distributed generation technologies are offered as elements of an integrated solution that supports energy reduction, and eventually water and carbon reduction, goals.

8.2 PROFILE

Historically, demand side management (DSM) options for energy consumers have been highly segregated activities within regulatory bodies, utilities, environmental organizations, and among private sector service providers. The programs are focused on mass delivery and promotion of individual products, for example efficient air conditioners, rather than on integrated packages of measures, for example, air conditioner rebates with duct sealing, weather-stripping, programmable thermostats, and advanced meters. This current narrow focus on a single product offering does not maximize energy savings and efficiencies in program delivery are minimized.

A narrow single product approach also maximizes customer confusion by requiring the customer to seek out information on a wide array of programs with multiple points of contact with providers in order to conduct a rational cost – benefit analysis of the DSM options available. Customers in all sectors do not have the time or expertise to seek this information and many opportunities to work with willing customers are lost.

The development of new technologies that enable active, real time energy management in homes and businesses has made it clear that DSM programs are not simply delivery of specific products and services, but also the delivery of information and the tools with which to use the information to maximize product and systems performance.

The goal of this *Plan* is to build on successes from current programs such as PG&E's Market Integrated DSM Initiative and the SCE and Sempra Sustainable Communities Initiative to offer integrated DSM solutions to maximize energy savings. A related goal is to design policies and programs in research and development, commercialization, deployment, and codes and standards that reinforce each other and use feedback loops to constantly improve energy efficiency programs.

Key participants in this effort include the utilities, the Energy Commission, energy service providers, contractors, research institutions, and the business community.

8.3 GOAL

Goal		Goal Results
Significantly expand programs to deliver integrated DSM options that include efficiency, demand response, energy management and self generation measures.		Customers will maximize energy savings through the implementation of a menu of DSM options.

The CPUC has described three levels of integration for DSM options:

- Program delivery coordination to enable systems integration: This includes offering integrated audits and recommendations across all relevant energy management opportunities, and combining EE, DR, DG, and other applicable incentives into the same project.
- Technology and systems integration: This includes equipment that enables achievement of multiple DSM options (EE, DR, etc.) and provides synergy across DSM program types (e.g., addressable electronic ballasts that both save energy and manage demand during utility peak hours).
- Comprehensive and Coordinated Marketing, Packaging and Delivery: This includes outreach and consumer education and discussing and presenting program options in a unified fashion so that the number of contacts and consumers utility engagement is coordinated, preferably through single points of contact.

Integrated packages of DSM solutions are a consistent theme throughout each of the chapters in this *Plan*. This Chapter describes augmented, not duplicate strategies described elsewhere.

8.4 STRATEGIES

This *Plan* contains three overarching strategies for DSM integration:

- **Pilot Programs:** The best short-term path to promote integration is to continue current efforts by the IOUs and pursue an expanded series of pilot projects as part of the 2009-2011 portfolio submissions to the CPUC. These pilots will be designed to inform future program and policy submissions regarding the value and best methods and targets of integration. The pilots will offer a bundled product that includes elements of energy efficiency and conservation, consumer generation, demand response, and the best available AMI technology. In addition, the pilots will offer different forms of delivery (including third-party and local government platforms) and information access.
- **Working Group:** For the longer term, the CPUC will launch a working group composed of key stakeholders to develop and implement a comprehensive, coordinated long-term approach to effective utilization of energy resources while also achieving GHG emissions reductions, water conservation, waste disposal, and air quality requirements.
- **New Technology:** Technology is a fundamental element to achieve the CPUC's Big Bold Energy Efficiency Initiatives and to maximize the contribution of energy efficiency to meeting the state's general energy and environmental goals. A major effort is needed to develop new technologies and systems that enable multiple DSM options and provide synergy

8.5 IMPLEMENTATION PLAN

Historically, resource efficiency messages, programs, and initiatives have been promoted

as separate and largely independent activities. Energy, water, waste and emissions regulations

are under the jurisdictions of separate agencies and commissions. Even with the CPUC, energy efficiency, distributed generation/solar, demand response, and AMI policies and programs are addressed through stand-alone proceedings. It is critical to develop a shared vision and process for regulatory coordination in California to support the energy savings benefits of DSM coordination/integration and to ensure consistent and mutually supportive energy, water, and GHG policy and regulations. Enhancing utility programs, technology advancement and general education and training objectives depends on

coordinated regulation across the spectrum of DSM activities. In addition, the implementation of AB 32 with its corresponding impact on both energy efficiency and conservation and GHG emissions is a key action driver.

Achieving this vision will require new forms of government agency collaboration, mechanisms to quantify and value multiple resource benefits, and fundamental changes to the standard business and service delivery practices of utilities, energy service companies and building contractors.

Goal: Integrated DSM Programs, Messages, and Technologies

Implementation Plan and Timeline			
Strategies	Near-Term (2009-2011)	Mid-Term (2012-2015)	Long Term (2016-2020)
1-1: Conduct Integrated DSM pilots in the Residential, Commercial, Industrial and Agricultural sectors.	<ul style="list-style-type: none"> Propose and launch pilots testing capabilities and effectiveness in the marketplace, including EE, DR, AMI and DG 	<ul style="list-style-type: none"> Implement learning from EE/DR pilots to develop new pilots that include “smart buildings” and building operator training and solar. 	<ul style="list-style-type: none"> Expand Statewide
1.2: Develop integrated DSM programs across resources, including energy, water, and transportation.	<ul style="list-style-type: none"> Establish on-going working group to develop and implement blueprint for integration. 	<ul style="list-style-type: none"> Implement pilot programs that integrate solutions across resources. 	<ul style="list-style-type: none"> Expand programs.
1.3: Promote development and support of new technologies that enable or facilitate DSM Coordination and Integration	<ul style="list-style-type: none"> Assess the current state of integration enabling technology and develop a guidance document detailing a technology development path related to integration. (2009) Prioritize integration enabling technologies in RD&D and ET programs based on the technology assessment. 	<ul style="list-style-type: none"> Update biennially. 	<ul style="list-style-type: none"> Update biennially.

9. WORKFORCE EDUCATION AND TRAINING

9.1 VISION

By 2020, California’s workforce is trained and engaged to provide the human capital necessary to achieve California’s economic energy efficiency and demand-side management potential.



9.2 PROFILE

Workforce Education and Training (WE&T) focuses on workforce issues—educating and training people to perform the jobs needed to reach California’s clean energy goals. The IOUs currently provide energy efficiency specific training courses to fulfill needs associated with implementing IOU programs; efficiency specific course materials; training for third-party program implementers; and energy efficiency and sustainability programs at K-12 schools.

In order to accommodate the dramatic increase in energy efficiency programs envisioned by this *Plan* and required by AB, the state must develop a trained workforce, including qualified people trained in the various aspects of energy-efficiency engineering, construction, maintenance, program design and implementation, and financial analysis. Meeting

the goals established in the *Plan* will require at least two categories of staffing development: completely new types of jobs that do not exist today (e.g., corporate emissions manager) and supplemental training for existing positions (e.g., training stationary engineers to enhance their awareness of energy efficient operations).

This cross-cutting sector is a truly state-wide coordination effort which must integrate energy efficiency training into a wide range of public and private programs. This effort will include the state Department of Education, and the Department of Employment Development, industry and labor associations, educational institutions at all levels, technical and vocational training organizations, community based non-profits, and the business community.

9.3 GOALS

Goals		Goal Results
1. Establish energy efficiency education and training at all levels of the State educational system.	➔	Students develop careers that advance DSM businesses, policy, research and development, and education.
2. Ensure that Minority, Low Income and Disadvantaged Communities fully participate in training and education programs at all levels of the DSM and the energy efficiency industry.	➔	Individuals from the targeted communities take advantage of programs that specialize in energy disciplines at all levels of the educational system and successfully advanced themselves into rewarding careers in these disciplines.

9.4 STRATEGIES

An effective, comprehensive WE&T program for a new energy efficient economy requires collaborative efforts by many entities. The IOUs are not in a position to effectuate the level of change needed to create a comprehensive WE&T program, nor can IOU ratepayers fully fund the effort. In addition to the educational institutions themselves, participants in defining and/or providing energy efficiency WE&T resources include:

- **Government.** California Department of Education and the Department of Employment Development, Federal government (e.g., Department of Labor), State government (e.g., licensing boards) and local governments (e.g., building departments) to recruit train and prepare workforce candidates for technical and professional careers.
- **Educational Institutions.** The University of California, California State Universities, Community Colleges, School Districts and private colleges and universities.
- **Community-based and non-profit organizations.** Organizations funded to provide education, career development and workforce training programs (i.e., Greenlining Institute, Apollo Alliance).
- **Industry and labor organizations.** Unions, the Sheet Metal and Air Conditioning Contractors' National Association, the California Building Performance Contractors Association, home rating organizations, and energy efficiency evaluation organizations.

Several strategies will be completed in the near term to more thoroughly define, initiate and drive long-term WE&T development and strategic planning. These actions will also support creation of funding streams other than rate-payer funding; identification of market sector specific needs, and inform the short-term through long-term strategies for each market sector and education sector.

- **WE&T Needs Assessment.** An in-depth formal statewide training and education resource inventory and needs assessment is necessary for long-range strategic planning and delivery. The needs assessment and resource inventory should be structured in such a way as to produce short-, near- and long-term strategies for implementation for each sector defined in the *Plan*. Information in the Convener Report provides an excellent start for the assessment. The assessment should be completed by a third-party with its process managed by the CPUC and IOUs.
- **WE&T Web Portal.** The web portal will include links to various demand-side management (DSM) related training programs and will allow for a single point of communication, serving as a repository for all demand-side management and energy efficiency training, educational conferences, and career opportunities. This portal will be created and funded in collaboration with other appropriate entities, and linked to the statewide efficiency web portal.
- **Energy Efficiency WE&T Task Force.** A task force would be formed of energy efficiency program administrators and the CPUC to fulfill administrative functions including: developing a needs assessment RFP; selecting the third party to conduct the needs assessment; and managing the needs assessment evaluation. The Task Force members would continue to help implement the goals and strategies set forth in this *Plan*.
- **Identify And Implement Specific Programs For Each Educational Sector.** Workforce Education and Training needs are best organized and approached by identifying the enabling or supporting educational sectors. Thus, five educational sectors have been defined for addressing WE&T needs and opportunities: Kindergarten through high school, adult education and community colleges, technical training, colleges and universities, and minority, low income and disadvantaged communities.

WE&T measures that are specific to particular industries or economic sectors are included in the appropriate chapters of this Plan. For example, the HVAC Chapter addresses training for technicians and

installers and building code officials. Similarly, the Commercial Chapter contains a strategy for expanded building operator certification training and integrated training for design of the zero net energy buildings. This Chapter focuses on cross-cutting measures.

9.5 IMPLEMENTATION PLAN

Goal 1. Establish energy efficiency education and training at all levels of the state educational system.

This *Plan* envisions that the IOUs will act as a catalyst to change by implementing several foundational activities that are necessary to accurately identify specific WE&T needs and recommendations for action. These activities will also enable the IOUs to review their existing programs and better align them within the context of a comprehensive WE&T strategy.

The most critical near term activity is a comprehensive needs assessment to evaluate energy efficiency workforce requirements through 2020 that are necessary to sustain a robust and effective industry to accomplish the goals set forth in this *Plan*. This needs assessment will solicit broad input from organizations identified above.

Goal 1: Energy Efficiency Education and Training

Implementation Plan and Timeline			
Key Actions	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
<p>9-1: Define, initiate and drive long-term WE&T development and strategic planning, including identification of funding streams and market sector specific needs.</p>	<ul style="list-style-type: none"> • Conduct an in-depth formal statewide training and education resource inventory and needs assessment. • Assess current and alternative funding mechanisms for WE&T activities. • Create a WE&T specific web portal and identify entities to co-fund and co-sponsor the web portal with utilities. • Initiate on-going dialogue with broad group of market participant and education stakeholders. • Establish task force to oversee utility specific WE&T activities. 	<ul style="list-style-type: none"> • Update assessment as needed. • Maintain and update web portal. • Maintain ongoing dialogue. • Continue to oversee utility specific WE&T activities. 	<ul style="list-style-type: none"> • Update assessment as needed. • Maintain and update web portal. • Maintain ongoing dialogue. • Continue to oversee utility specific WE&T activities.

Implementation Plan and Timeline

Key Actions	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
<p>9-2: Support the community college and adult education efforts to allow students to develop their education based on their career paths</p>	<ul style="list-style-type: none"> • Utilize community colleges to provide technical training such as HVAC maintenance and building operator certification. • Develop appropriate linkages with K-12 programs. • Coordinate with the community colleges and adult education sector to incorporate an energy component into their career laddering concept. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships.
<p>9-3: Incorporate energy efficiency and demand side energy management into traditional contractor roles such as plumbers and electricians and provide job training.</p>	<ul style="list-style-type: none"> • Implement additional building operator training curricula, training and professional career development programs. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships.
<p>9-4: Create or expand programs with energy focus and foster a green campus focus for college and university campuses.</p>	<ul style="list-style-type: none"> • Utilize existing UC/CSU extension programs to incorporate a continuing education curriculum component. • Work with Universities and colleges to expand professional energy related degree offerings and contribute to tailored curriculum. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships
<p>9-5: Develop K-12 curriculum to include energy efficiency fundamentals and career potential in energy-related fields.</p>	<ul style="list-style-type: none"> • Identify opportunities to leverage governor's career technical initiative. • Identify opportunities to work with the California Department of Education to develop a program specific to energy and GHG issues. • Support outreach into K-12 schools on energy, water and environmental issues. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships

Goal 2: Ensure that minority, low income and disadvantaged communities fully participate in training and education programs at all levels of the DSM and the energy efficiency industry.

Coordination of LIEE training with other energy efficiency training programs is essential. This includes coordination with The Green Jobs Act of 2007 as well as with state level agencies such as the Employment Development Department (EDD) and the Department of Social Services (DSS). The Green Jobs Act of 2007, approved as part of the recent Federal Energy Bill authorizes funding up to \$125 million annually for job training in the energy efficiency and renewable energy industries and facilitates economic development within minority, low-income, and economically disadvantaged communities. The IOUs will work to include the training to be offered under this Act into the LIEE training. Recruiting for trainees may well be accomplished within the targeted communities currently being served by the LIEE contractors.

The IOUs will also work with the EDD and the DSS to integrate the various training programs into the LIEE program so that those trained through these programs can be prepared to participate in the IOUs' LIEE programs. In addition, the IOUs shall also monitor the several pieces of pending legislation in California that offer opportunities to incorporate workforce education and LIEE-related skills training. If, and when they are enacted into law, these legislations can be used by the IOUs and other stakeholders for assistance.³⁶ The volume of pending legislation serves as a useful guide in ongoing efforts to leverage the Federal Green Jobs Act of 2007 and develop the resources to achieve California's AB 32 climate change goals.

Goal 2: Disadvantaged Communities

Implementation Timeline			
Strategies	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
<p>2-1: Collaboratively identify appropriate goals and strategies to build California's energy efficiency workforce through 2020, focusing on training that increase participation from within minority, low-income and disadvantaged communities in achieving California's economic energy efficiency potential.</p>	<ul style="list-style-type: none"> • Leverage Marketing Education & Outreach and task force to partner w/ community-based organizations and provide targeted outreach. • Develop Low Income WE&T Plan • Train qualified diverse business enterprises from minority, low-income and disadvantaged communities to be more efficient. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships. 	<ul style="list-style-type: none"> • Implement programs. • Evaluate progress and refine strategy. • Find opportunities to expand programs and partnerships

10. MARKETING, EDUCATION AND OUTREACH

10.1 VISION

Californians will be engaged as partners in the state's energy efficiency, demand-side management and clean energy efforts for 2009 and beyond fully informed of the importance of energy efficiency and their opportunities to act.



10.2 PROFILE

The purpose of Marketing, Education and Outreach (ME&O) is to increase consumer participation in demand side management activities (including the California Solar Initiative, Demand Response, and Advanced Metering Initiative efforts) and to encourage behavior changes that save energy, reduce greenhouse gas emissions and support clean energy solutions for 2009 and beyond. A highly successful ME&O program is a fundamental part of many of the strategies and programs presented in this *Plan* as well as the ultimate goal of market transformation for energy efficiency. ME&O must move consumers through a transitional process from awareness, to attitude change, to action.

Californians are currently engaged in a broad public discussion about energy use and its relationship to global warming and the environment. California's landmark legislation, the Global Warming Solutions Act of 2006 (AB32), set the stage for a statewide transition to a clean energy future by requiring the reduction of greenhouse gas emissions to 1990 levels by 2020. As a result, there is increased awareness of the value of energy efficiency and

interest among consumers to do their part. This discussion presents a strategic window of opportunity to use ratepayer-funded ME&O to leverage public and private messages on global warming to achieve greater impact on consumer awareness of, and demand for, energy efficiency.

Between 2006 and 2008, California IOU ratepayers will have funded approximately \$300 million for public education, marketing, and outreach to support customer demand-side programs. Of this amount, \$176 million funds public education and outreach for IOU energy efficiency programs.³⁷ The majority of these outreach efforts have focused primarily on promoting isolated consumer actions, such as buying solar panels or compact fluorescent lightbulbs, or reducing usage to prevent outages during peak periods. As a result, the associated ME&O messages efforts lack a comprehensive focus on motivating consumers to adopt energy efficiency as a way of life.

The CPUC's fall 2007 energy efficiency decision signaled the need to change this approach in order to better leverage ratepayer ME&O funding for more effective results.

10.3 GOALS

Goal	Goal Results
Create and launch an integrated, statewide Marketing, Education and Outreach effort for energy efficiency, including an energy efficiency brand.	 High levels of awareness statewide of the value of energy efficiency that leads to strong demand for energy efficient products, homes and services.

The ME&O effort will:

- Create instant brand recognition for energy efficiency in California, similar to the US EPA’s EnergyStar label.
- Create the demand pull that is a necessary component of the goals set forth elsewhere in this *Plan*.
- Motivate consumers to reduce energy consumption on a daily basis.

10.4 STRATEGIES

The ME&O goal will be achieved through four strategies:

1. **An Energy Efficiency Brand:** Creation of an instantly recognized brand for “California Energy Efficiency” with clear delineation of what the brand encompasses.
2. **Integrated Marketing:** Development of marketing messages that offer bundles of DSM programs targeted to specific customer groups and delivery of the messages using partnerships with a range of energy efficiency participants, including local governments, retailers and manufacturers.
3. **Social Marketing:** Use of social marketing techniques to create emotional and intellectual drivers for consumers to make a commitment to change and participate in energy efficiency.
4. **Internet Based Solutions:** Creation of a web portal that allows energy efficiency practitioners and consumers to exchange information and solutions on implementing energy efficiency programs and measures.

The key to the next generation of ME&O is to create a consumer experience that offers an integrated set of DSM information and program options that are clear, relevant to the consumer, and accessible to all Californians. By beginning with a systematic approach to branding energy efficiency that is rooted in effective message research, evaluation, social marketing, behavioral science, and targeted segmentation, California will be laying a framework for successful integration of ME&O across all clean energy programs.

A statewide brand will establish a clear, consistent message about the individual and social value of energy efficiency, and set a foundation for consumers to receive targeted

information on efficiency programs, products, and incentives. Segmentation research will be used to develop a wide range of messages designed to build on the brand and connect with specific groups of consumers, including low income and other hard to reach populations. Additional highly-targeted program marketing efforts that focus on specific consumer segments with the highest propensity to participate will also be executed to drive results. These efforts will be multi-channel and leverage strategic partners across the spectrum. All messages will be components of an integrated marketing strategy to provide consumers with an increased understanding of the full array of energy efficiency and DSM options.



California's businesses and educational institutions (public and private) are excellent channels to help leverage energy efficiency messaging and create the next generation of energy ambassadors. The statewide ME&O effort will work with both sectors to leverage their resources and utilize them fully in the statewide campaigns.

The Internet offers tremendous, cost-effective opportunities as a clearinghouse for energy efficiency programs and promoting behavior change. As directed in the CPUC's October, 2008 decision, the ME&O effort will include development of an interactive Energy Efficiency Web Portal that provides one integrated point of access to a multitude of energy efficiency information. The web portal will be a user-centered, interactive resource that allows users to easily navigate multiple points of data, applications, and information systems.³⁸ The portal will have two functions and development stages and functions. The first stage will be a website for energy efficiency professionals such as program designers, implementation practitioners, evaluators, marketers, and policy makers to share information and best practices on implementing energy efficiency measures, policies and programs.

The second stage will be development of an online resource for individual consumers (and businesses) that provides easy access to information on products, programs, services, practices and tools to manage their energy usage. This consumer web platform will be designed to facilitate peer-to-peer information exchange.

Peer-to-peer and word-of-mouth contact are proven modes of information exchange that increase motivation for action. The ME&O effort will maximize these and other social marketing techniques to motivate consumers and achieve goals for change in behaviors, attitudes and perceptions. The practice of energy efficiency requires a sustained effort on the part of the consumer, both in information acquisition (i.e., what are the most effective methods and techniques), and in ongoing implementation.

Therefore, an approach based on increased access to information and behavior-based marketing techniques will both educate *and* inspire consumers to make a long-term change in how they think about and use energy.

For all of these strategies, clear objectives and metrics for the statewide campaign will be established prior to its launch, including an appropriate evaluation mechanism to measure results. The ME&O Task Force will continue to function in an advisory capacity, leveraging inputs and expertise from key stakeholders whose contributions collectively are vital to the successful implementation of the goals and strategies envisioned in this *Plan*. The CPUC will guide the process for developing and implementing the ME&O effort and integrating strategic adjustments and improvements over time to ensure the achievement of goals and benchmarks.

The result of these efforts will be a coordinated, comprehensive system of communicating with Californians and delivering an array of effective messages and valuable information resources. This system will prove essential for engaging the public to help achieve California's aggressive energy efficiency goals and global warming solutions.

Goal 1: Comprehensive ME&O Effort

Implementation Plan and Timeline			
Strategies	Near Term 2009 – 2011	Mid-Term 2012 – 2015	Long Term 2016 – 2020
1-1: Establish a recognizable and trustworthy brand for California’s Energy Efficiency and other DSM consumer products and services.	<ul style="list-style-type: none"> • Launch integrated energy efficiency/DSM Brand. • Evaluate progress and refine strategy. 	<ul style="list-style-type: none"> • Evaluate progress and refine strategy. 	<ul style="list-style-type: none"> • Evaluate progress and refine strategy.
1-2: Develop an integrated marketing plan for all Californians.	<ul style="list-style-type: none"> • Conduct statewide segmentation research, including LIEE and other hard to reach groups, on interests, awareness, and attitudes/perceptions related to energy efficiency and global warming messaging. • Develop targeted and highly relevant energy efficiency and DSM marketing messages to incite behavior change/action. • Create partnerships with private industry and businesses to help motivate consumer action. 	<ul style="list-style-type: none"> • Evaluate progress and refine segmentation research. 	<ul style="list-style-type: none"> • Evaluate progress and refine segmentation research.
1-3: Use social marketing techniques to build awareness and change consumer attitudes and perceptions.	<ul style="list-style-type: none"> • Develop a roadmap for a social marketing approach including exploration of behavioral science principles. 	<ul style="list-style-type: none"> • Implement social marketing approach. 	<ul style="list-style-type: none"> • Evaluate progress and refine strategy
1-4: Develop a California Energy Efficiency web portal with statewide information on GHG reductions, efficiency and DSM awareness and options.	<ul style="list-style-type: none"> • Develop initial website/portal for the energy efficiency/DSM industry. • Begin pilot programs in using web portal. 	<ul style="list-style-type: none"> • Add consumer end use function to website/portal. 	<ul style="list-style-type: none"> • Evaluate progress and refine strategy.

11. RESEARCH AND TECHNOLOGY

11.1 VISION

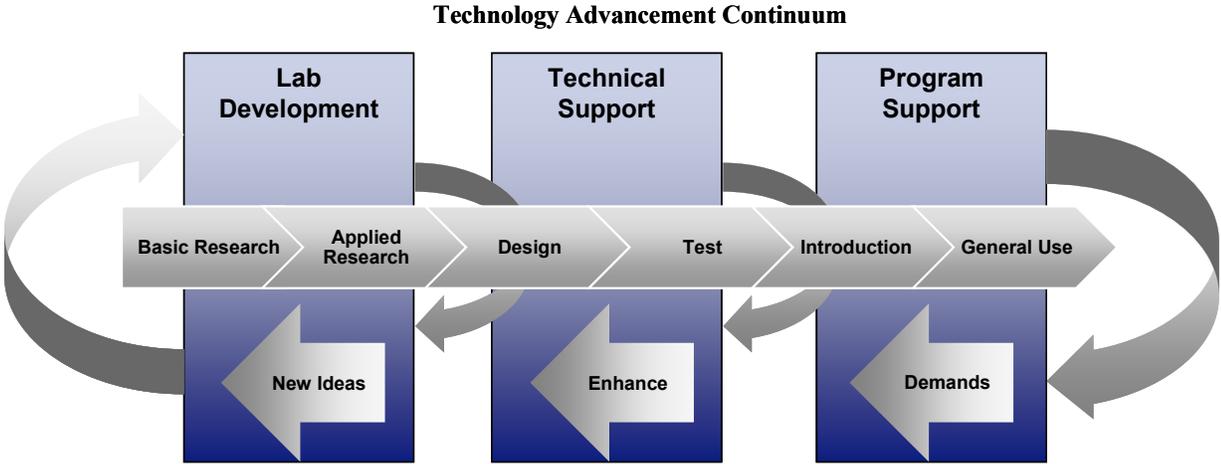
Technology advancement related to energy use and demand will match—or even eclipse—the consumer electronics industry in innovation, time to market and consumer acceptance.

11.2 PROFILE

The development, enhancement, deployment and operation of more and better energy efficiency related technology is fundamental to achieving California’s energy efficiency vision and goals. While technology breakthroughs do occur, the timing of California’s goals demands a targeted focus on moving more technologies into the marketplace. Since most demand-side technologies involve a human interface, increased knowledge of human behavior and social science is also necessary—as is the infusion of that knowledge into technology development, deployment, and integration.

Finally, establishing a robust and vibrant evaluation and user feedback loop is crucial to advancing technology development.

Technology advances along a continuum from basic research to general use. The advancement process comprises several stages and is not strictly linear. It also includes several feedback loops, restarts and early terminations.



Historically, the focus of the CPUC and utility technology programs has been on supporting energy efficiency technologies that are market ready but not commonly accepted. The Energy Commission’s Public Interest Energy Research (PIER) program focuses on technology just prior to market readiness. In 2000, the CPUC, utilities and the Energy Commission started the

Emerging Technologies Coordinating Council (ETCC) to coordinate statewide emerging technology efforts. To achieve the next level of energy efficiency, the *Plan* is looking beyond that historical focus.

At the national level, leading edge energy efficiency initiatives are now often led by entities

like the America Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE), the American Institute of Architects (AIA Architecture 2030), the New Buildings Institutes, other state organizations like the New York Energy Research and Development Authority (NYSERDA), and large municipalities

like New York City. On an international level, the leadership of the United Kingdom is critical. Within California, agencies like the Sacramento Municipal Utility District (SMUD) and progressive municipalities are also often on the leading edge. California will benefit greatly by better integration and leverage with these activities.

11.3 GOALS

New technologies that use minimum energy as well as new energy efficiency enabling technologies (e.g., nanotechnology, wireless sensors, DC Power Architecture) are fundamental to a transformed energy market. However, neither utility programs (including the ETCC) nor PIER create technology or drive technology advancement; rather they support the commercialization process and create an element of market pull.

Utility and Energy Commission energy efficiency technology programs must be refocused to catalyze research, development and commercialization of technologies that support the Big/Bold Strategies and integrated energy solutions initiatives. As noted above, research and technology strategies must include the entire technology advancement continuum as well as the operational and behavioral factors that influence technology usage.

Goal		Goal Results
1. Refocus utility and Energy Commission energy efficiency activities to create demand pull and set the research agenda for both incremental and game-changing energy efficiency technology innovations.	➔	Ratepayer funded R&D programs will explicitly support the whole-building and integrated energy solutions envisioned in this Plan and will be used to leverage other private and public funds for the deployment of new technologies.
2. Conduct targeted emerging technologies R&D to support the Big/Bold and integrated energy solutions goals.	➔	Profound improvement in equipment efficiency as well as new technologies aimed at achieving more efficiency from existing buildings than technically feasible today.

11.4 STRATEGIES

California's energy efficiency goals require substantial changes in all stages of the technology advancement cycle including technology, marketing, and operations. Strategies must harness private market forces – as well as regulatory-directed efforts - to foster the development and deployment of technologies and methods that promote and support a comprehensive adoption of energy efficiency practices. Key research and technology strategies are:

- Engage the full-range of participants – private entities, national labs, clean energy and environmental groups, green venture capital firms, federal, state and local governments, utilities and consumers.
- Identify new technologies and enhance existing technologies to make them better and improve their uptake and use.
- Employ a systems approach to establishing research priorities.

- Facilitate paths-to-market for technologies and enabling/supporting practices through targeted product distribution methods, directed research and technology investment, and market push/pull techniques.
- Apply social and behavioral science theory to encourage the adoption and best use of resources and energy efficient technology.

11.5 IMPLEMENTATION PLAN

Goal 1: Create demand pull and set the research agenda for both incremental and game-changing energy efficiency technology innovations.

To stimulate transformations in technology and related market dynamics, ratepayer funded emerging technologies monies must be used to create the demand pull for emerging technologies that support the goals of this *Plan*. Key to this effort is a focused effort to leverage public and private sector resources. Private industry's enormous investment in technology development and its ability to respond quickly to changing economic priorities and to capture opportunities is needed to realize the goals of the *Plan*. A second major source is federal R&D funding, including its support for national

laboratories. Academic research (both public and private) is a third major technology development and advancement force. A fourth area for California is the efforts of other state or regional entities that utilize energy efficiency as a means to achieve their goals (e.g., the ARB, South Coast Air Quality Management District). All of these activities need better coordination and focused strategies to pursue research agendas for both incremental and game-changing energy efficiency technologies, while at the same time creating demand pull for the technologies that emerge.

Goal 1: Create Demand Pull for New Technologies

Implementation Plan and Timeline			
Strategies	Near-Term	Mid-Term	Long Term
1-1: Enhance market intelligence and behavioral research activities related to energy efficient technologies.	<ul style="list-style-type: none"> • Develop road map to identify and prioritize consumer needs, behavioral drivers and decision processes. • Assess technology-specific market potential, business policies and cycles, market segments, product delivery channels, and market barriers. • Develop and launch research agenda • Integrate customer influences in emerging technologies project screening. • Assess technology specific market potential using secondary market research to obtain technical and economic potential on new and emerging technologies and market segments. 	<ul style="list-style-type: none"> • Integrate research and 2009-2011 M&V study for continuous improvement. • Ongoing research on customer choices, acceptance, experiences with new technologies. • Where secondary research is lacking, perform primary market research on specific applications and technologies. 	<ul style="list-style-type: none"> • Integrate research and 2012-2014 M&V study for continuous improvement. • Ongoing research on customer choices, acceptance, experiences with new technologies. • Where secondary research is lacking, perform primary market research on specific applications and technologies.

Implementation Plan and Timeline			
Strategies	Near-Term	Mid-Term	Long Term
1-2: Expand activities to create market pull for energy-efficient technologies	<ul style="list-style-type: none"> Plan, launch and enhance knowledge management systems. Explore customer/manufacture targeted strategies for creating pull. 	Continuous improvement of knowledge system, including lessons learned. Increase scope of reference material where needed.	Continuous improvement of knowledge system, including lessons learned. Increase scope of reference material where needed.
1-3: Leverage private industry and federally funded technology research and investment	<ul style="list-style-type: none"> Create an investor-ET network to share market information, technology assessment results, and expedited access to incentive programs. Refine ET and PIER process to encourage more rapid evaluation of emerging technologies. Pilot incubator program to fast-track ET deployment. Expand upstream relationships and channels to effectively target and generate support for energy-related technology. Expand federal government R&D support for California's efforts 	<ul style="list-style-type: none"> Improve and evolve enabling mechanisms. Continuous improvement, including lessons learned. Create mechanisms for enabling technology development and support to technology incubators, inventors at the development stage. Deploy statewide EE-based technology incubation process. 	<ul style="list-style-type: none"> Continuous improvement, including lessons learned. Create mechanisms for enabling technology development and support to technology incubators, inventors at the development stage. Ongoing

Goal 2: Conduct targeted emerging technologies R&D to support the Big/Bold Programmatic Initiatives and integrated energy solutions goals.

Goal 1 calls for reshaping the overall focus and direction of ratepayer-funded energy efficiency R&D programs. In the near term, it is critical that work continues on specific areas to support the Big/Bold Programmatic Initiatives and whole-building goals in this Plan. The first prong of this work is to collaborate with technology providers and the R&D community to promote cost-

effective performance enhancements of existing technologies for increased consumer demand and market penetration. This work will include targeting plug-loads (e.g. HDTV) as one of the major growth areas in demand.³⁹ The second prong is a strategic focus on leading-edge technologies, products, and practices including existing zero net energy buildings.

Goal 2: Targeted R&D

Implementation Plan and Timeline			
Strategies	Near-Term	Mid-Term	Long Term
<p>2-1: Develop general R&D community support for support Big Bold Initiatives</p>	<p>Provide input to ensure alignment of activities with big, bold focus areas. Collaborate with regional and national labs, manufacturers, universities to develop and enhance technologies that can help meet the statewide strategic EE/DR goals.</p>	<ul style="list-style-type: none"> Continue involvement and collaboration with R&D community, including input to ensure alignment. 	<ul style="list-style-type: none"> Continue involvement and collaboration with R&D community, including input to ensure alignment.
<p>2-2: Promote cost-effective performance enhancements of existing technologies</p>	<ul style="list-style-type: none"> Target plug-load initiatives such as HDTV and other big, bold focus areas. Collaborate with manufacturers to improve performance of existing technologies. Develop specifications to drive / guide improvement activities. Provide technology feedback through ET assessments. Explore longer term strategies to increase saturation of new big and bold measures and technologies. 	<ul style="list-style-type: none"> Extend to other plug loads. Target additional big, bold focus areas Continuous improvement, including lessons learned. Continue collaborations with manufacturers to bring more efficient technologies into the market. 	<ul style="list-style-type: none"> Continue previous efforts with higher levels of attention to net-zero residential goals. Continuous improvement, including lessons learned. Continue collaborations with manufacturers to bring more efficient technologies into the market.
<p>2-3: Develop initiatives aimed at ET to support Big Bold Initiatives.</p>	<ul style="list-style-type: none"> Initiate upstream technology program activities. Embark on plan to demonstrate big bold measures in customer sites and seed the market. Conduct “pilot” programs of new technology seeding and market uptake through subsidies and incentives. Collaborate with manufacturers in new ambitious pilot programs. 	<ul style="list-style-type: none"> Continue to drive efforts aimed at non-mainstream technologies. Improve and evolve upstream programs. Continue to collaborate with manufacturers in new ambitious pilot programs. 	<ul style="list-style-type: none"> Continue to drive efforts aimed at non-mainstream technologies.
<p>2-4: Develop initiatives aimed at PIER to support Big Bold goals.</p>	<ul style="list-style-type: none"> Provide input to ensure alignment of activities with Big, Bold Initiatives. Form Utility advisory group to formally provide input into PIER research strategies and programs. Collaborate with PIER to develop a formal process to roll PIER developed technologies into ET. 	<p>Continue collaboration with PIER, including input to ensure alignment.</p>	<p>Continue collaboration with PIER, including input to ensure alignment.</p>

12. LOCAL GOVERNMENTS

12.1 VISION

By 2020, California's local governments will be leaders in using energy efficiency to reduce energy use and global warming emissions both in their own facilities and throughout their communities.



12.2 PROFILE

California's 600-plus local governments are remarkably diverse—they range from the largest county in the U.S. to small towns; from busy agricultural centers to residential suburbs to world-renowned cities.⁴⁰ This diversity includes energy efficiency: California's local governments and their communities face different circumstances and have different constituencies,

and today are at different levels of commitment and capacity. Many of them, however, are paying significant attention to energy efficiency and climate change and are interested in doing what they can, as quickly as they can, and in collaboration with their residents, other local governments, state government, utilities and other key participants.

Local governments share a broad array of energy-related authorities and opportunities:

Regulatory Authority. Local governments have significant authorities that can improve the energy efficiency of new and existing buildings. These include:

- Ensuring compliance and enforcement of the Title 24 energy code for residential and commercial buildings.
- Adopting building codes beyond Title 24's energy requirements (and potentially other "green" requirements).
- Supporting highly efficient projects that voluntarily exceed minimum energy codes through favorable fee structures, fast-tracked permitting and other innovative and locally appropriate approaches.
- Enacting ordinances with point-of-sale or other approaches that spur efficiency actions in privately owned buildings.
- Applying efficiency-related "carrots" and "sticks" using local zoning and development authority.

Local Government Energy-Using Facilities.

Local governments can be significant energy end users in their own buildings and facilities, from public schools to wastewater treatment plants to City Hall. These facilities provide an opportunity to "lead by example" by improving energy efficiency, reducing CO₂ emissions, and cutting government energy bills. They can also use these facilities to showcase the products and practices that will become commonplace in a "zero net energy" world.

Energy Leadership in Local Communities.

Local governments often can play an important role in influencing the energy attitudes and actions of their citizens and businesses. This can take on many forms, from public education to adopting innovative policies and initiatives to integrating actions addressing energy efficiency, climate change and sustainability. Communities with municipally owned utilities have an additional opportunity in this regard.

The CPUC has recognized the unique role of local governments in fostering innovation. Almost ten years ago, the CPUC directed utilities to consider programs that take advantage of the unique expertise, relationships with customers, and ability to coordinate among related activities offered by individual or groups of local government.⁴¹

12.3 GOALS

Goals	Goal Results
1. Local governments are leaders in adopting and implementing “reach” codes stronger than Title 24, on both a mandatory basis and voluntary basis.	At least 5 percent of California’s local governments (representing at least 5 percent of CA total population) each year adopt reach codes. By 2020, the majority of local govts have adopted incentives or mandates to achieve above-code levels of EE (or DSM) in their communities.
2. Strong support from local governments for energy code compliance enforcement.	The current rate of non-compliance with codes and standards is halved by 2012, halved again by 2016, and there is full compliance by 2020.
3. Local government lead by example with their own facilities and energy usage practices.	The energy usage footprint of local government buildings is 20% below 2003 levels by 2015 and 20 percent below 1990 levels by 2020.
4. Local governments lead their communities with innovative programs for energy efficiency, sustainability and climate change.	By 2015, 50 percent of local governments have adopted EE/sustainability/climate change action plans for their communities and 100 percent by 2020, with implementation and tracking of achievements.
5. Local government energy efficiency expertise becomes widespread and typical.	By 2020, 100 percent of local governments have in-house capabilities devoted to achieving all cost-effective energy efficiency in their facilities and communities.

12.4 STRATEGIES

The three key strategies for local government action are:

1. **Tap Local Government Authority:** Use local government authority over planning and development policy to maximize energy efficiency in privately owned new construction and existing buildings.
2. **Leading by Example:** Showcase with local governments’ facilities achieving economic energy efficiency, reducing CO₂ emissions, and showcasing promising EE, DSM and renewables products and practices.
3. **Community Leadership:** Local governments should lead their communities to support clean energy goals.

12.5 IMPLEMENTATION PLAN

Goal 1: Local governments are leaders in adopting and implementing “reach” codes.

Local governments can adopt more stringent building standards than Title 20 and 24, subject to Energy Commission approval. However, only ten local governments have adopted local ordinances that exceed the 2005 Title 24 requirements.⁴² Much more can and should be done at the local level.

In addition, local governments can adopt point of sale requirements. For example, the City of Berkeley has had residential and commercial building ordinances that are triggered at the time of sale or significant renovations for over a decade. Several foundational activities will assist local governments in this effort:

- Development of model mandatory local government codes, ordinances and programs that local governments can modify as needed, adopt, and implement. These would include tiers of codes beyond Title 24 (see the Residential and Commercial Chapters.)
- Development of sample local ordinances for point-of-sale and other point-of-transaction energy efficiency requirements and building energy ratings that must be disclosed at these points. (This may require additional legal authorizations.)
- Development of sample local government programs to reward projects that voluntarily exceed state and local minimum energy codes by expedited permitting, entitlement approval processes, favorable fee structures, and other favorable actions for qualifying green buildings and developments.
- Focused and sustained outreach support for local governments to educate them about the model standards and ordinances and provide assistance in developing, adopting, and implementing reach standards.
- Network tools to allow local governments to share information and experiences on adopting and implementing reach standards and programs on a peer-to-peer basis
- Policies that support utility efforts to assist local government development and implementation of reach standards.
- Leadership recognition programs to support elected officials and local governments that adopt and implement reach standards and programs.
- Linkage of emission reductions from reach standards and programs to the ARB’s AB 32 implementation program.

Goal 1: “Reach” Codes

Implementation Plan and Timeline			
Strategies	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
1-1: Develop, adopt and implement model building energy codes (and/or other green codes) more stringent than Title 24’s requirements, on both a mandatory and voluntary basis; adopt one or two additional tiers of increasing stringency.	<ul style="list-style-type: none"> Develop model codes and tiers; launch statewide campaign for adoption 	<ul style="list-style-type: none"> Expand percent of cities adopting codes; monitor effectiveness and upgrade model codes. 	<ul style="list-style-type: none"> Expand to statewide program.
1-2: Establish expedited permitting and entitlement approval processes, fee structures and other incentives for green buildings and other above-code developments.	<ul style="list-style-type: none"> Develop sample programs; enact needed laws; Processes, fee structures, and other incentives in place statewide by 12/2011. 	<ul style="list-style-type: none"> Ongoing improvement and refinement. 	<ul style="list-style-type: none"> Ongoing improvement and refinement.
1-3: Develop, adopt and implement model point-of-sale and other point-of transactions relying on building ratings.	<ul style="list-style-type: none"> Develop model codes and programs in 2009; launch pilot programs in 2010 	<ul style="list-style-type: none"> Implement statewide building energy ratings system by 6/2012. 	<ul style="list-style-type: none"> Implement disclosure, ratings and/or energy upgrades at sale of properties by 1/2013.
1-4: Create assessment districts or other mechanisms so property owners can fund EE through city bonds and pay off on property taxes; develop other EE financing tools.	<ul style="list-style-type: none"> Develop funding sources. Establish loan funding mechanism. 	<ul style="list-style-type: none"> Ongoing implementation. 	<ul style="list-style-type: none"> Ongoing
1-5: Develop broad education program and peer-to-peer support to local gov’ts to adopt and implement model reach codes	<ul style="list-style-type: none"> Fund statewide liaison to local gov’t associations; develop public education campaign; establish leadership recognition programs 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
1-6: Link emission reductions from “reach” codes and programs to ARB’s AB 32 program	<ul style="list-style-type: none"> ARB adopts regulation providing local gov’t emission reduction credit for reach standards 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing

Goal 2: Strong support from local governments for energy code compliance enforcement.

Under state law, local governments, through their building permit and inspection processes, are responsible for enforcement of Titles 20 and 24, the state’s building codes promoting energy efficiency. While there is inadequate understanding of code compliance rates and the resulting degradation in performance, more than 30 percent of the technical energy savings from

California’s statewide energy codes may be lost due to non-compliance. A 2007 study estimated noncompliance rates with the Energy Commission statewide building measures ranging from 28 to 100% and with appliances standards from 0% to 63%. Resources (e.g., funds to send an inspector to training) are typically a barrier.⁴³ Inspections and

enforcement are paid for through local permit fees. Local governments are often reluctant to raise fees to levels above neighboring jurisdictions.

strongly supports local government compliance programs, is key to obtaining full savings from California’s aggressive building and appliance standards.

A comprehensive, adequately funded statewide program for state building code compliance that

Goal 2: Code Compliance

Implementation Plan and Timeline			
Strategies	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
2-1: Statewide assessment of local gov’t code enforcement and recommendations for change	<ul style="list-style-type: none"> Develop and conduct assessment; develop set of recommended improvements 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing
2-2: Dramatically improve compliance with and enforcement of Title 24 building code, and of HVAC permitting and inspection requirements (including focus on peak load reductions in inland areas).	<ul style="list-style-type: none"> Form working group to develop strategies; test pilot programs in 2010; Initial improvements in place statewide by 12/2010. 	<ul style="list-style-type: none"> Expand statewide 	<ul style="list-style-type: none"> Ongoing
2-3: Local inspectors and contractors hired by local governments shall meet the requirements of the energy component of their professional licensing (as such energy components are adopted).	<ul style="list-style-type: none"> Update and/or incorporate energy components in licensing requirements. Adopt requirements 	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Ongoing

Goal 3: Local governments lead by example with their own facilities and energy usage practices.

Cities and counties can lead by example and embrace energy efficiency in their facilities. There are many examples already of local governments undertaking major actions to reduce energy usage in their own facilities. Examples of specific goals that local governments can set for their buildings include:

- Require all owned and leased buildings to be benchmarked, sub-metered, commissioned by 2012, and upgraded to the next level of energy efficiency by 2015.
- Require LEED Certified and LEED Silver (or their equivalents) for all new local government facilities.
- Require LEED Existing Building Silver for existing local government facilities, by a specified date.
- Achieve all cost-effective or economic energy efficiency in their facilities, by a specified date.
- Require commissioning for new buildings, and re-commissioning and retro-commissioning of existing buildings.

A sustained, comprehensive effort to extend these efforts statewide should be undertaken. In order to accomplish this goal, providing local governments with additional staff and technical resources is needed.

Goal 3: Lead by Example

Implementation Plan and Timeline			
Strategies	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
3-1: Adopt specific goals for efficiency of local government buildings, including:	<ul style="list-style-type: none"> Showcase innovative EE, other DSM relevant to achieving ZNE buildings. Implement local policies for LEED new construction and existing buildings. Develop and install showcase sites. 	<ul style="list-style-type: none"> Complete benchmarking and LEED policy implementation. Launch statewide program. 	<ul style="list-style-type: none"> Implement statewide.
3-2: Require commissioning for new buildings, and re-commissioning and retro-commissioning of existing buildings.	<ul style="list-style-type: none"> Test programs. Mandatory requirements in place statewide by 12/2011. 	<ul style="list-style-type: none"> Ongoing refinement and improvement. 	<ul style="list-style-type: none"> Ongoing
3-3: Improve access to financing to support LG EE/DSM, such as lowering interest rate of Energy Commission's loan fund, and utility on-bill financing.	<ul style="list-style-type: none"> Identify various financing tools available to LGs. Modify as appropriate. 	<ul style="list-style-type: none"> Ongoing implementation. 	<ul style="list-style-type: none"> Ongoing
3-4: Explore creation of line item in LG budgets or other options that allow EE cost savings to be returned to the department and/or projects that provided the savings to fund additional efficiency.	<ul style="list-style-type: none"> Exploration complete by 12/2009. Implementation plan in place by 6/2010 if warranted. 	<ul style="list-style-type: none"> Ongoing implementation. 	<ul style="list-style-type: none"> Ongoing
3-5: Develop innovation Incubator that competitively selects initiatives for inclusion in LG pilot projects.	<ul style="list-style-type: none"> Develop and begin first projects by 12/2009. 	<ul style="list-style-type: none"> Ongoing refinement and expansion. 	<ul style="list-style-type: none"> Ongoing

Goal 4: Local governments lead their communities with innovative programs for energy efficiency, sustainability, and climate change.

Local governments are in a unique position to implement innovative, long-term, cross-cutting programs promoting energy efficiency, sustainability, and reduced carbon emissions. Their ability to interact with businesses and residents is unique and needs to be engaged far beyond current efforts, to support California's

aggressive energy efficiency and global warming goals.

There are various resources available to aid local governments. Non-profit associations,⁴⁴ for-profits, state agencies, utilities and others can give technical assistance; offer targeted online and written tools; and share an over-

arching vision and best practices in conferences and workshops. Additionally, local governments can and do commit themselves and/or their communities to externally developed relevant commitments, such as the United Nation's Urban Environmental Accord or ICLEI's Cities for Climate Protection campaign.

Local governments also have a number of regulatory carrots and sticks including: community design requirements; land use and zoning policies that promote energy efficiency and smart growth; requiring redevelopment agencies to address energy efficiency in development contracts, and; negotiating energy efficiency into developer agreements on major projects.

The success of this goal will require not only resources from the state, utilities, non-profits

and the business community but the commitment of local governments and their leaders to use their leadership and legal authority in new and often challenging ways. A necessary step is to support organizations serving local governments at the state level (e.g., League of California Cities; County Supervisors Association of California; Institute for Local Government), regional levels (e.g., ABAG, AMBAG, SANDAG, SCAG), and non-profits so they can leverage their activities with local governments on energy and environmental issues. This could include: creating a statewide liaison position focused on energy efficiency programs; enhanced and expanded technical assistance; targeted online tools; information on best practices; and conference and workshop activities.

Goal 4: Community Leadership

Implementation Plan and Timeline			
Strategies	Near Term 2009 – 2011	Mid Term 2012 – 2015	Long Term 2016 – 2020
4-1: LGs commit to clean energy/climate change leadership.	<ul style="list-style-type: none"> Assist local gov't's in commitments; develop and communicate appropriate messages. 	<ul style="list-style-type: none"> Ongoing implementation. 	<ul style="list-style-type: none"> Ongoing implementation.
4-2: Use local governments' general plan energy and other elements to promote energy efficiency, sustainability and climate change.	<ul style="list-style-type: none"> Develop model General Plan amendments. Leadership LG's adopting elements. Publicize to LGs. 	<ul style="list-style-type: none"> Expand inclusion in general plans. By 2015, inclusion in all local gov't plans. 	<ul style="list-style-type: none"> Ongoing implementation.
4-3: Statewide liaison to assist LG in EE/sustainability/climate change programs	<ul style="list-style-type: none"> Provide EE liaison as of 1/1/09. Provide sustainability liaison as of 7/1/09 Provide climate change liaison as of 1/1/10 	<ul style="list-style-type: none"> Ongoing implementation. 	<ul style="list-style-type: none"> Ongoing implementation.
4-4: Develop local projects that integrate EE/DSM/water/wastewater end use.	<ul style="list-style-type: none"> Identify issues to better integration. Develop and implement pilot projects. 	<ul style="list-style-type: none"> Expand implementation. 	<ul style="list-style-type: none"> Ongoing implementation
4-5: Develop EE-related "carrots" and "sticks" using local zoning and development authority.	<ul style="list-style-type: none"> Plan approaches by 12/2009. Launch approaches by 12/2010. Approach in place by 6/2009. Requirement in place by 12/2010. 	<ul style="list-style-type: none"> Ongoing refinement of approaches based on feedback from implementation efforts. 	<ul style="list-style-type: none"> Ongoing implementation

Goal 5: Local government energy efficiency expertise becomes widespread and typical.

Many local governments do not have adequate dedicated staff or resources to move proactively on energy efficiency in their own or community buildings. They also often lack capacity or awareness to promote building and zoning codes that would dramatically accelerate green, efficient buildings within their jurisdictions. The workforce education and training strategies outlined elsewhere in this *Plan* are one vehicle for attacking these issues. Another is the standardization of tiered voluntary building codes across the state (as described in Strategy

1) which will be easier for local governments to embrace and promote than if codes are developed independently each time. Even so, a focused effort on development of local government energy efficiency expertise is critical to the State's energy efficiency goals. Programs such as the regional technical assistance and education centers in Marin, Ventura, and Humboldt that work with local governments, schools, and special districts in their areas, are an example of effective training programs.

Goal 5: Local Government Energy Efficiency Expertise

Implementation Plan and Timeline			
Strategies	Near Term 2009 – 2011	Short Term 2012 – 2015	Long Term 2016 – 2020
5-1: Create a menu of products, services, approved technologies and delivery channels for local governments that currently lack deep expertise in energy efficiency.	<ul style="list-style-type: none"> Identify menu by 9/2009. Plan for delivery of menu in place by 12/2009. Begin delivery by 3/2010. 	<ul style="list-style-type: none"> Ongoing implementation. 	<ul style="list-style-type: none"> Ongoing implementation.
5-2: Develop model local ordinances/programs to assist LGs participate in regional coordinated efforts for EE, DSM, renewables, green buildings, and zoning.	<ul style="list-style-type: none"> Complete model ordinances/programs by 2009. Leadership gov't s begin pilots. Communicate information on a peer-to-peer basis. 	<ul style="list-style-type: none"> Ongoing implementation. 	<ul style="list-style-type: none"> Ongoing implementation.
5-3: Establish a statewide effort to facilitate peer-to-peer learning, such as a "local champions" program or a governor's invitation-only local government leaders' summit.	<ul style="list-style-type: none"> Identify the most suitable peer-to-peer learning vehicle by 6/2009. Implement peer-to-peer learning vehicle by 12/2009. 	<ul style="list-style-type: none"> Ongoing refinement and improvement. 	<ul style="list-style-type: none"> Ongoing implementation.
5-4: Statewide technical assistance program for LGs, including peer-to-peer expertise exchange	<ul style="list-style-type: none"> Develop program in 2009. 	<ul style="list-style-type: none"> Implement statewide in 2010. 	<ul style="list-style-type: none"> Ongoing implementation.

¹ Decision 07-10-032.

² “Energy Action Plan II, Implementation Roadmap for Energy Policies”, California Energy Commission and California Public Utilities Commission, September 21, 2005.

³ California Energy Commission, 2007 Integrated Energy Policy Report (2007 IEPR), adopted December 5, 2007, Energy Commission-100-2007-008-CMF.

⁴ California Health and Safety Code, §§ 38500 et seq. (AB 32); see, Climate Action Team Report to the Governor, April 2006, http://www.climatechange.ca.gov/climate_action_team/reports/2006-04-03_FINAL_CAT_REPORT.PDF.

⁵ 2007 IEPR.

⁶ 2007 IEPR.

⁷ California Air Resources Board, *Climate Change Draft Scoping Plan*, June 2008, pg. 13.

⁸ Id. pgs 21-22.

⁹ Additionally, California is affected by and benefits from the actions of the federal government and other states. For example, the federal Energy Independence and Security Act of 2007 includes many provisions on energy efficiency, such as appliance and efficiency standards and new research, development, and deployment authority. Additionally, the CPUC and 16 other California organizations have agreed to pursue energy efficiency as part of the National Action Plan for Energy Efficiency.

¹⁰ Transcripts of the three stakeholder workshops—as well as the written comments submitted—are available on the strategic planning website: www.californiaenergyefficiency.com.

⁷ The CPUC has defined “Zero Net Energy” as the implementation of a combination of building energy efficiency design features and on-site clean distributed generation that result in no net purchases from the electricity or gas grid, at the level of a single “project” seeking development entitlements and building code permits. Definition of zero net energy at this scale enables a wider range of technologies to be considered and deployed, including district heating and cooling systems and/or small-scale renewable energy projects that serve more than one home or business.

⁸ D.98-04-063, Appendix A. Also see for example, Tom Eckman, Nancy Benner, and Fred Gordon. 1992. “It’s 2002: Do You Know Where Your Demand-Side Management Policies and Programs Are?” In Proceedings of the ACEEE 1992 Summer Study on Energy Efficiency in Buildings, 5.1-5.17. Washington, D.C.: American Council for an Energy-Efficient Economy; and Steven Nadel, Jennifer Thorne, Bill Prindle, and R. Neal Elliott. “Market Transformation: Substantial Progress from a Decade of Work.” Report Number A036, ACEEE, 2003.

¹¹ 2007 IEPR.

¹² California is served by well over 60 electricity and natural gas distribution companies. (Energy Commission at <http://www.energy.ca.gov/electricity/utilities.html#300>; and U.S. Census Bureau, 1997 Economic Census December 29, 1999, which counts over 200 utilities) Some smaller utilities may not offer residential customers opportunities to participate in energy efficiency programs. However, a large majority of California residents are served by utilities that do offer energy efficiency programs. (See also endnote 3 below.)

¹³ Thirty percent (30%) is the proportion of IOU-served residential households qualifying for Low Income Energy Efficiency (LIEE) programs. IOUs serve about 10.5 million residential customers (CPUC at <http://www.cpuc.ca.gov/PUC/energy/>), or approximately 83% of California households. The proportion of LIEE-qualifying households served by publicly-owned utilities is assumed to be similar.

¹⁴ Chapter 534, Statutes of 2007, see, Pub.Resources Code sec. 25402.5.4,

¹⁵ 2007 IEPR, pp. 88.

¹⁶ California Public Utilities Commission, Decision 07-10-032.

¹⁷ At the end of 2007 (prior to the mortgage crisis), only one-in-three of the state’s households could afford a conventional entry level home, an improvement from one-in-four a year earlier, but still challenging for prospective home buyers. Housing Affordability Improves as Prices and Rates Decline, Robert A. Kleinhenz, California Association of Realtors, February 2008 at www.car.org/index.php?id=MzgZMTc=.

¹⁸ Federal, state and local governmental buildings and facilities are categorized as “commercial” and implicitly included in the strategies of this Chapter and periodically differentiated as warranted; additionally, local governmental buildings are discussed extensively in the Local Government chapter of this Strategic Plan.

¹⁹ One of the three Big Bold Programmatic Initiatives approved by the Commission is that: “All new commercial construction in California will be zero net energy by 2030.” D.07-10-032.

²⁰ California Energy Commission, *Options for Energy Efficiency in Existing Buildings* (December 2005) Energy Commission-400-2005-039-CMF.

²¹ Energy Commission at www.energy.ca.gov/electricity/consumption_by_sector.html

²² 2007 IEPR.

²³ California Air Resources Board, *Greenhouse Gas Emissions Inventory*, November 2007, Sacramento. It is important to note that industry is also responsible for a share of CO₂ from the electric power sector, not included in this value.

²⁴ 2007 IEPR.

²⁵ California Energy Commission, 2007 Integrated Energy Policy Report, Summary, p. 13.

²⁶ See <http://www.cdfa.ca.gov/agvision/>.

²⁷ AB 1103 (Saldana), 2007.

²⁸ This Plan examines residential and small commercial HVAC, and therefore implicitly assumes unitary equipment (packaged and split) that is 20 tons and below, rather than large, built-up HVAC. Large systems are an important energy efficiency and peak management issue but, pursuant to the Commission’s big, bold Programmatic Initiative in D.07-10-032, are not directly examined in this chapter as they have a very different marketplace dynamic than unitary systems. Many of the factors that influence efficiency of large systems are examined in the Commercial chapter.

²⁹ The HVAC portion of the strategic planning process was conducted in conjunction with the Energy Commission, as required by AB2021 (Levine, 2006) to “investigate options and develop a plan to improve the energy efficiency of, and to decrease the peak electricity demand of, air-conditioners.” The Strategic Plan draws heavily from the Energy Commission’s AB2021 report (“Strategic Plan T Reduce the Energy Impact of Air Conditioners”) as well as the participation in that process of representatives of the IOUs, CPUC, Energy Commission, HVAC industry and stakeholders.

³⁰ Chris Neme, John Proctor, and Steve Nadel, *National Energy Savings Potential from Addressing HVAC Installation Problems*; (Prepared for the U.S. EPA, February 1999.)

³¹ Section 306 of the recently enacted federal Energy Independence and Security Act of 2007 allows, for the first time, for the U.S. Secretary of Energy to set regional standards for certain HVAC equipment.

³² Appliances are, in fact, primarily regulated at the federal level; and for any product that is regulated at the federal level states are preempted from regulating. Buildings are primarily regulated at the state level; notable exceptions are manufactured housing (which is federally regulated) and hospitals.

³³ 2007 IEPR.

³⁴ Chris Neme, John Proctor, and Steve Nadel, *National Energy Savings Potential from Addressing HVAC Installation Problems* (Prepared for the U.S. EPA, February 1999).

³⁵ See for example Quantec, *Statewide Codes and Standards Market Adoption and Noncompliance Rates*. Prepared for Southern California Edison May 10, 2007.

³⁶ AB 2224, AB 2267, AB 24477, AB 2622, AB 2855, AB 3018, SB 1672.

³⁷ CPUC D.07-10-032, p. 59.

³⁸ D.07-10-032, pp. 64-65.

³⁹ This activity supports the plug load strategy in the Residential sector.

⁴⁰ “Local governments” primarily refers to cities and counties, which have land use authority. However, there are also important roles for regional government, metropolitan planning organizations, school and special districts and other local and regional government entities.

⁴¹ D.99-08-021, Ordering Para. 11. See also D.01-01-060 directing the utilities to increase partnerships with local governments to achieve energy efficiency at the local level.

⁴² D.99-08-021, Ordering Para. 11. See also D.01-01-060 directing the utilities to increase partnerships with local governments to achieve energy efficiency at the local level.

⁴³ Quantec, *Statewide Codes and Standards Market Adoption and Noncompliance Rates*. Prepared for Southern California Edison, May 10, 2007.

⁴⁴ These include the International Council for Local Environmental Initiatives (ICLEI)'s Local Governments for Sustainability, the Local Government Commission, and the Institute for Local Government's California Climate Action Network.