California Energy Efficiency Strategic Plan (Draft)

Rulemaking 06-04-010

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www.californiaenergyefficiency.com

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Abbreviations & Acronyms

AB32	Assembly Bill 32/California Global Warming Solutions Act of 2006 *www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf*
AC	Air Conditioning
ACEEE	American Council for an Energy-Efficient Economy *www.aceee.org*
AIA	American Institute of Architects *www.aia.org*
AMI	Advanced Metering Infrastructure
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers *www.ashrae.org*
BBEES	Big Bold, Energy Efficiency Strategies *Three programmatic initiatives identified by the California Public Utilities Commission in Decision 07-10-032*
BIRA	Building Industry Research Alliance *www.bira.ws*
BuRec	Bureau of Reclamation *www.usbr.gov*
CARB (or ARB)	California Air Resources Board *www.arb.ca.gov*
CAB	California Architects Board *www.cab.ca.gov*
CDFA	California Department of Food and Agriculture *www.cdfa.ca.gov*
CEC	California Energy Commission *www.energy.ca.gov*

CEESP	California Energy Efficiency Strategic Plan *www.californiaenergyefficiency.com*
CSLB	California State License Board *www.cslb.ca.gov*
CPUC	California Public Utilities Commission *www.cpuc.ca.gov/puc*
CSI	California Solar Initiative *www.gosolarcalifornia.ca.gov*
C&S	Codes and Standards
CEE	Consortium for Energy Efficiency *www.cee1.org*
DR	Demand Response
DSM	Demand-Side Management
DWR	California Department of Water Resources *www.water.ca.gov*
EE	Energy Efficiency
EM&V	Evaluation, Measurement and Verification
EMS	Energy Management System
EPRI	Electric Power Research Institute *www.epri.com*
ET	Emerging Technology or Emerging Technologies
ETCC	Emerging Technologies Coordinating Council *www.etcc-ca.com*
GHG	Greenhouse Gas
GWh	Gigawatt Hour
HERS	Home Energy Rating System *www.energy.ca.gov/HERS*

HVAC	Heating, Ventilation and Air Conditioning
ICLEI	International Council for Local Environmental Initiatives *www.iclei.org*
IDs	Irrigation Districts
IEPR	Integrated Energy Policy Report *www.energy.ca.gov/2007_energypolicy/index.html*
IOU	Investor-Owned Utility
kWh	Kilowatt Hour
LBNL	Lawrence Berkeley National Laboratory *www.lbl.gov*
LCD	Liquid Crystal Display
LEED	Leadership in Energy and Environmental Design *www.usgbc.org/leed*
LIEE	Low Income Energy Efficiency
ME&O	Marketing, Education and Outreach
MT	Market Transformation
Mth	Million Therms (of natural gas)
MW	Megawatt (of power)
MWh	Megawatt Hour (of electricity)
NRCS	Natural Resources Conservation Service *www.nrcs.usda.gov*
NREL	National Renewable Energy Laboratory *www.nrel.gov*
O&M	Operations and Maintenance
PIER	Public Interest Energy Research *www.energy.ca.gov/pier*

POU	Publicly Owned Utility
R&D	Research and Development
SGIP	Self-Generation Incentive Program *www.cpuc.ca.gov/PUC/energy/051005_sgip.htm*
USDA	U.S. Department of Agriculture *www.usda.gov*
USDOE	U.S. Department of Energy *www.energy.gov*
USEPA	U.S. Environmental Protection Agency *www.epa.gov*
WE&T	Workforce Education and Training
ZNE	Zero Net Energy

Preface

This *California Energy Efficiency Strategic Plan (Draft)* was prepared by California's four investor-owned utilities: Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Edison, and Southern California Gas Company (the IOUs). It was completed under California Public Utilities Commission (CPUC) Decision 07-10-032 dated October 18, 2007. This order called for the IOUs to: "no later than February 1, 2008, jointly submit to the Administrative Law Judge assigned to this proceeding and the Energy Division a single statewide preliminary Strategic Plan as set forth in this Order" and to "file a final strategic plan as a joint application no later than May 15, 2008."

In its Decision the CPUC indicated the importance of being inclusive and promoting a broad exchange of ideas and analysis. The CPUC directed its staff to "… ensure a broad set of stakeholders is invited to participate in this process, stretching beyond those organizations typically seen in CPUC proceedings." They also specifically invited continued collaboration with CEC staff. Thus, the CPUC convened and guided the planning forums and the development of the *Strategic Plan*, while noting that the creation of the *Plan* is the responsibility of the IOUs.

This draft *Plan* was completed during three months and included participation by many individuals and organizations in 14 working groups. Some 36 workshops were held, involving over 1,100 participants; they are listed in the Appendix. Input was collected into sector and cross-cutting reports by staff of the CPUC and IOUs and their consultants. These working group reports served as the basis for the preparation of this draft *Strategic Plan*; they are included in the Appendix. Up-to-date information about the *Strategic Plan* and the strategic planning process—including the schedule of upcoming public meetings in San Diego, Los Angeles and San Francisco—can be found at the *California 2009-2020 Energy Efficiency Strategic Planning* website, www.californiaenergyefficiency.com.

The IOUs thank the hundreds of individuals and organizations who contributed to the California Energy Efficiency Strategic Planning process. We look forward to working with them and others in the months and years ahead on this critical issue.

Executive Summary

California is demanding a next generation of energy efficiency to meet its energy, environmental and economic goals to 2020 and beyond. This *California Energy Efficiency Strategic Plan (Draft)* is the first step in a new, ongoing, statewide strategic planning effort. The objective of this effort is to define innovative new paths to aggressively deliver energy efficiency to homes, offices, factories and farms—and to significantly contribute to the state's goal of having a reasonably priced, stable, reliable and clean portfolio of energy resources.

This draft *Plan* is a product of the state's investor-owned utilities (IOUs), prepared at the direction and guidance of the California Public Utilities Commission (CPUC). It reflects the IOUs' consideration and synthesis of extensive input received from 14 working groups and 36 stakeholder workshops involving more than 1,100 participants, convened by the CPUC to inform the *Plan*.

The ideas in this *Plan* are a first attempt at a broad (and eventually comprehensive) long-term vision for energy efficiency efforts in California. Additional analysis will be needed to determine the viability of the strategies as well as the many specific activities needed to reach the long-term goals. In addition, the IOUs anticipate that there will be continual revisions to this *Plan* to address California's changing environment, including changes in the marketplace, consumer behavior, and state policies. The IOUs present a proposal to continue the energy efficiency strategic planning process, including additional analysis, in the Long-Term Planning chapter of this *Plan*.

This first *Plan* provides no balancing of costs, benefits, and priorities, but it does provide a basis for the IOUs' 2009-11 energy efficiency portfolio proposals. The IOUs' 2009-11 portfolio proposals will contain specific proposals for the activities they can start during that timeframe in support of this *Plan*. The IOUs are optimistic that other key California stakeholders will join in future revisions that will refine and expand this *Plan* to become a blueprint for reaching the state's ambitious energy goals.

Foundation

The energy efficiency strategic planning process builds on California's longstanding commitment to energy efficiency. Under the leadership of CPUC Assigned Commissioner Dian Grueneich, the process formally began in October 2007[1] with the launch of the CPUC-convened working groups and workshop sessions. In January 2008, the CPUC conveners provided their reports to the IOUs for consideration in developing this *Plan*. This draft *Plan* will be revised based on a public review process and filed with the CPUC as a final *Plan* by May 15, 2008.

Commissioner Grueneich and the Commission identified three "pillars" for this *Plan*: innovation, integration and collaboration. Consistent with these watchwords, the 2020 vision established in this *Plan* has three parts:

1. Energy is used extremely efficiently by energy consumers.

2. All cost-effective, reliable, and feasible energy efficiency measures and actions are implemented in an integrated manner.
3. Energy efficiency generates significant reductions in greenhouse gas emissions.

This vision embraces the three programmatic initiatives established by the CPUC, known as the "Big Bold Energy Efficiency Strategies:"

- All new residential construction in California will be zero net energy by 2020.
- All new commercial construction in California will be zero net energy by 2030.
- Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate.

From the Low Income Energy Efficiency proceeding, the Commission has added the following vision for low income consumers:[2]

- "To provide all eligible consumers the opportunity to participate in the LIEE programs and to offer those who wish to participate all cost-effective energy efficiency measures in their residences by 2020."

Transforming the Market

A fundamental change in energy efficiency is required for California to meet these goals. Not only must efficiency be acquired as a near-term resource, but a *permanent market transformation* must be achieved by continually incorporating efficiency gains into buildings and product markets until it becomes either naturally occurring or required in codes or standards.

The IOUs must successfully implement a wide range of strategies in this market transformation, but IOU actions alone cannot achieve the state's goals. Other market players must take complementary actions, many of which are outlined in this *Plan*. To that end, the IOUs restate their commitment here to work collaboratively with others to achieve California's energy efficiency goals.

This *Plan* is organized around four vertical market sectors—residential, commercial, industrial and agricultural—and six cross-cutting sectors—HVAC systems; Workforce Education & Training; Marketing, Education & Outreach; Emerging Technologies; Codes & Standards; and Demand-Side Management Integration. The *Plan* also targets specific strategies to two groups important to achievement of California's energy efficiency goals: Local Governments and low income consumers.

Strategies for the Next Generation of Energy Efficiency

The strategies in the draft *Plan* help energy efficiency continue its evolution from resource acquisition to permanent market transformation and greater savings. Key among the strategies are:

1. Take a broad series of actions toward zero net energy new buildings and very low energy existing buildings—both residential and commercial—to set a high bar that

energizes market players and other stakeholders to focus on transformational approaches.

2. Transform businesses through continuous energy improvement processes, branding and certification.
3. Adopt much more stringent and comprehensive energy Codes & Standards, especially for buildings, and greatly improve code compliance and enforcement to prevent the loss of gained ground over time.
4. Develop a shared vision and process for energy, climate and air regulatory coordination in California and for integrating mandatory efficiency Codes & Standards with voluntary efficiency programs, such as utility incentives, consumer education and "beyond code" activities.
5. Greatly accelerate the development and commercialization of new and emerging technologies to enable market transformation.
6. Provide consumers with tools and information to help them understand not only the importance of efficiency, but the many opportunities for implementing through innovative financing, incentives, benchmarks, new technology and other means.
7. Train the next generation of the efficiency-related workforce and improve the knowledge and skills of the current generation—from local code officials, factory energy managers and HVAC technicians to school teachers—to develop the human resources needed to achieve market transformation.
8. Transform HVAC—including its products, companies, employees and even its customers—to develop, install and maintain highly efficient and peak-friendly systems.

The IOUs will use the information generated from this planning process to inform their 2009-2011 and future energy efficiency portfolios. The IOUs view this initial strategic planning cycle as the beginning of a sustained planning process with all of California's energy efficiency stakeholders.

Summary of Strategies

Commercial Sector Strategies

Vision: *Commercial buildings will be put on a path to zero net energy by 2030 for all new buildings and for many existing ones. Innovative technologies and practices will dramatically grow in use in the coming years through a combination of technology development, financing and incentives, Codes & Standards and market pull.*

Strategies:

- Support aggressive enhancement and enforcement of California building energy Codes & Standards.
- Align commercial building labels, benchmarking and Operations & Maintenance practices to address energy efficiency.
- Target financing and incentives to meet the objectives of the *Strategic Plan.*
- Promote Integrated Design for new zero net energy commercial buildings, and renovations of existing buildings.

Residential Sector Strategies

Vision: *Residential energy use will be transformed by 2020. Current and new channels of energy delivery will be strongly leveraged. Demand-side management (DSM) services will be fully integrated. Consumers will demand and the market will provide highly efficient products and services that will dramatically reduce energy use—with no loss of comfort or equipment efficacy—creating a "win" for the economy, the environment and society.*

Strategies:

- Pursue whole-house solutions in existing homes.
- Raise "plug load" efficiency.
- Advance residential new construction whole-house solutions on the path to zero net energy.
- Provide monitoring and visual display tools.
- Establish a consistent framework for new construction-savings determination.
- Coordinate emerging "green" or sustainability standards.
- Support aggressive enhancement and enforcement of California building energy Codes & Standards.
- Advance energy efficiency through local ordinances.
- Achieve full "one-stop shop" integration of DSM delivery.

Agricultural Sector Strategies

Vision*: Energy efficiency and renewable energy resource development will support the long-term profitability and stability of California agriculture, including through increased profitability, support of AB32 compliance, and support of renewable energy goals.*

Strategies:

- Establish and maintain a knowledge base sufficient to characterize the market and set goals to support planning for development of available energy efficiency and demand reduction resources.
- Promote the adoption of energy efficiency as standard practice through comprehensive workforce education and training programs.
- Develop an integrated marketing and outreach strategy for efficiency technologies and practices.
- Coordinate the goals, program designs, and funding of major sources of efficiency financing and incentives.
- Foster advances in equipment efficiency and improvement of management practices for irrigation pumping, process natural gas, and refrigeration.
- Maximize emerging technologies.

Industrial Sector Strategies

Vision: *California industry will be vibrant, profitable and embrace resource efficiency as a competitive advantage.*

Strategies:

- Leverage the marketing and competitive benefits of energy efficiency branding and certification using a continuous improvement process within industrial facilities.
- Provide integrated products to increase energy efficiency.
- Provide centralized technical and regulatory assistance for resource efficiency.
- Facilitate the direct involvement of industry in coordinated inter-agency planning for the energy efficiency portions of AB32 implementation.

Heating, Ventilation and Air Conditioning Strategies (HVAC)

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.*

Strategies:

- Develop new and emerging HVAC technologies for California's climate and buildings.
- Promote quality HVAC installation/maintenance and improve code compliance for peak load efficiency and performance.
- Deploy system diagnostics to maintain quality performance of HVAC systems.
- Promote whole-building performance to get better space conditioning.

Codes and Standards Strategies (C&S)

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

Strategies:

- Develop Codes & Standards that are more stringent and more comprehensively cover energy-consuming applications.
- Improve code compliance and enforcement.
- Improve code research and analysis.
- Improve coordination of energy Codes & Standards with other programs, policies and jurisdictions.

DSM Coordination and Integration Strategies

Vision: *All demand-side management programs are coordinated and, as appropriate, integrated to increase the penetration of energy efficiency and avoid lost opportunities.*

Strategies:

- Establish integration procedures and determine the limits of integration through pilot projects.
- Enhance regulatory coordination.
- Develop a shared vision and process for regulatory coordination in California.

Workforce Education and Training Strategies (WE&T)

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.*

Strategies:

- Foundation building, including preparing a needs assessment, evaluating cost-benefit analysis tools for investments in WE&T, creating a WE&T web portal, establishing ongoing dialogue with key players, and forming a WE&T task force.
- Focus specific strategies on K-12, adult education and community colleges, technical training, higher education programs, and minority, low-income and disadvantaged communities.

Marketing, Education and Outreach Strategies (ME&O)

Vision: *Californians are engaged as partners in the state's energy efficiency, demand-side management and clean energy efforts for 2009 and beyond with the dual goals of informing them of the importance of energy efficiency, and their opportunities to take action.*

Strategies:

- Explore the use of a recognizable and trustworthy brand for California's energy efficiency and other DSM consumer products and services.
- Utilize statewide segmentation research to develop targeted and highly relevant energy efficiency and DSM marketing messages to incite behavior change/action.
- Use social marketing techniques to build awareness and change consumer attitudes and perceptions.
- Explore developing a website with statewide information on GHG reductions, efficiency and DSM awareness and options.

Emerging Technologies Strategies (ET)

Vision: *Technology advancement related to energy use has matched—or even eclipsed—the consumer electronics industry in innovation, time to market and consumer acceptance.*

Strategies:

- Enhance market intelligence and behavioral research activities.
- Expand activities to create market pull for energy-efficient technologies.

- Promote upstream channels and investment in promising energy efficiency technologies.
- Drive product improvement and adoption activities.
- Focus on leading edge technologies.

Local Government Strategies

Vision: *By 2020, all of California's local governments will be operating within an energy efficiency and renewable resource environment that is characterized by integrated state approaches, local engagement and cooperation, and informed energy action.*

Strategies:

- Simplify and standardize state policies and codes guiding local building, community design and zoning codes.
- Build capacity for Local Governments to lead by example.
- Maximize energy efficiency in new and existing construction through Local Government policy.
- Rapidly upgrade and expand energy efficiency training and information for Local Governments.

Low Income Energy Efficiency Strategies (LIEE)

Vision: *"To provide all eligible consumers the opportunity to participate in the LIEE programs and to offer those who wish to participate all cost-effective energy efficiency measures in their residences by 2020."* [3]

Strategies:

- Employ consumer segmentation methods to improve program delivery, enhance participation and increase energy savings.
- Pursue collaboration with and leveraging of other programs.

Long-Term Planning

Vision: *California will have a long-term energy efficiency planning process that includes all principal stakeholders and defines strategies and goals supported by each stakeholder's short, medium and long-term plans and actions.*

1. Introduction

1.1. Past Accomplishments and Future Challenges

Led by the California Public Utilities Commission (CPUC) and California Energy Commission (CEC) and endorsed by Governor Schwarzenegger and the state legislature, California adopted in 2005 the *Energy Action Plan II,*[4] which declared:

> "[The] goal is for California's energy to be adequate, affordable, technologically advanced, and environmentally-sound…We need to develop and tap advanced technologies to achieve [the] goals of reliability, affordability and an environmentally-sound energy future…[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."

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 and documenting the widespread benefits of such activities. As the CEC notes in its 2007 *Integrated Energy Policy Report* (IEPR)[5]:

> "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."

Furthermore, the investor-owned utilities' (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 new public policy initiatives—especially the California Global Warming Solutions Act of 2006 (AB32)[6], which sets targets for greenhouse gas emission reductions across the state—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 12 countries in emission levels. Electricity generation, from both in-state and out-of-state resources, accounts for about 28% of California's emissions.[7] 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% from 2008-2018, with natural gas consumption projected to grow at somewhat less than 1% per year, mostly for electricity generation.[8]

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. The latter is quite large despite progress to date.

1.2. Policy Context

California's *Energy Action Plan* places energy efficiency first in the loading order of utility resources. This and other pivotal legislation and policy in California—such as AB32, AB2021 (which involves setting statewide energy efficiency goals), and the 2007 *Integrated Energy Policy Report* (IEPR)—are helping to create and sustain an environment where energy efficiency can continue to thrive. Other policy directives also involve efficiency. For example, the CPUC's Low Income Decision (07-12-051) emphasizes that utilities should treat low-income programs as an energy resource, and the California Solar Initiative (CSI) stipulates that all recipients undergo an energy audit. For this reason, there is even greater need for this *Strategic Plan* to provide a roadmap for integrating all energy efficiency and related policies.

This *Plan* also upholds other efforts to promote cost-effective energy efficiency at the state and national level. The *Plan* fully embraces the goals set by the California Energy Commission (CEC) and California Air Resources Board (CARB) to meet the state's energy needs while reducing greenhouse gases. Additionally, California is affected by and benefits from the actions of the federal government and other states. For example, the recently enacted federal *Energy Independence and Security Act of 2007* includes many provisions associated with 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.[9]

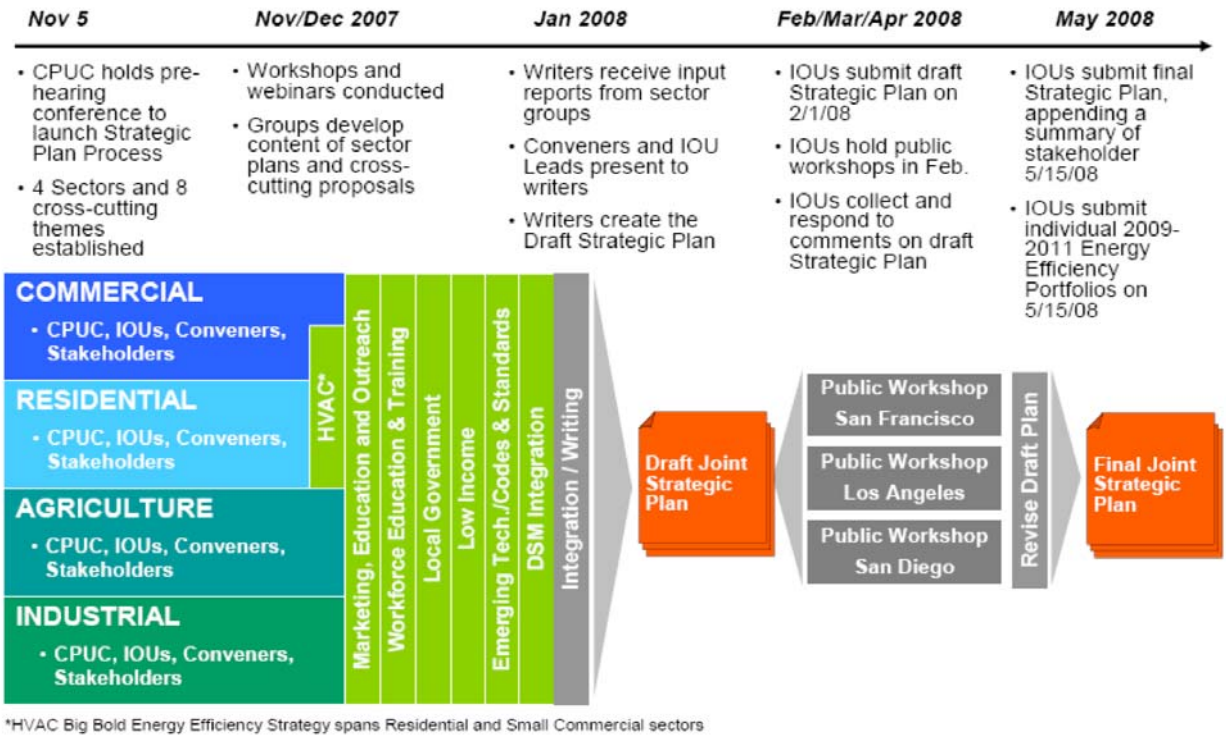
This *Strategic Plan* hopes to achieve a new energy efficiency planning and coordination landscape in California. The *Plan* recommends strategies and goals that are not restricted by geographical, jurisdictional, regulatory, or political boundaries. This *Plan* aims to bring together other participants beyond the CPUC and the IOUs, such as publicly owned utilities, the financial and building industries, partnerships with cities and counties, other state agencies, businesses and consumers to work together toward common energy efficiency goals. Achieving these goals means working collaboratively over the long-term instead of creating and delivering programs independent of one another.

1.3. Strategic Planning Process

The CPUC's recent Decision (07-10-032) directs IOUs to develop this *California Energy Efficiency Strategic Plan (Draft)*. The strategic planning process began in earnest on November 5, 2007 with a public hearing led by CPUC Commissioner Dian Grueneich. During November and December 2007, working groups for four "vertical" market

sectors—residential, commercial, industrial and agricultural—and eight cross-cutting sectors—HVAC systems, DSM Coordination & Integration, Workforce Education & Training, Marketing Education & Outreach, Emerging Technologies, Codes & Standards, Low Income, and Local Governments—held 36 public stakeholder workshops led by appointed conveners. The objective of these meetings was to develop an action plan for each market sector and each cross-cutting sector. In January, these plans were provided to the IOUs to inform this draft *Strategic Plan*. Figure 1 outlines the strategic planning process.

Figure 1: Strategic Planning Process



1.4. Strategic Vision and Goals

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

1. Energy is used extremely efficiently by energy consumers.
2. All cost-effective, reliable, and feasible energy efficiency measures and actions are implemented in an integrated manner.
3. Energy efficiency generates significant reductions in greenhouse gas emissions.

This vision embraces the three specific goals, known as the "Big Bold Energy Efficiency Strategies," or Program Initiatives, established by the CPUC in D.07-10-032 on October 18, 2007:

1. All new residential construction in California will be zero net energy by 2020;
2. All new commercial construction in California will be zero net energy by 2030, and
3. Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate.

A fundamental change in energy efficiency is required for California to meet these goals. Not only must efficiency be acquired as a near-term resource, a *permanent market transformation* must be achieved by continually incorporating efficiency gains into buildings, product markets and Codes & Standards until it becomes standard operating procedure.

The IOUs must successfully implement a wide range of strategies in this market transformation, but IOU actions alone cannot achieve the state's goals. Other market players must take complementary actions, many of which are outlined in this *Plan.* To that end, the IOUs restate their commitment here to work collaboratively with others to achieve California's energy efficiency goals.

1.5. Embracing Market Transformation

This *Plan* seeks to move beyond the immediate focus of three-year program periods to a broader long-term strategic focus—and one that permanently transforms markets so that using energy efficiently represents not a special action, but "business as usual."

Market transformation is both a cross-cutting strategy and a desired "end-point." It is defined as long-lasting sustainable changes in the structure or functioning of a market achieved by reducing barriers to the adoption of energy efficiency measures to the point where further publicly funded intervention is no longer appropriate in that specific market.[10] Transformation of the energy efficiency market requires changes in both energy

user behaviors and the supply chain of services and products that end-users rely on to efficiently use energy.

Several mechanisms can be used to advance market transformation, including utility programs. These are employed to encourage 1) suppliers and manufacturers to *sell* efficiency products or services to "push" the market or 2) 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, reliable results as resource acquisition programs, but instead result in a much larger, medium- to long-term result that can yield a much larger payoff of energy efficiency. Transformation is an evolutionary process, and markets are not necessarily transformed only once, but continuously.

Market transformation is 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 effects in all sectors by 2020 and meeting overall goals set by the Commission, even as resource acquisition continues to play a key role in IOU efficiency activities.

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

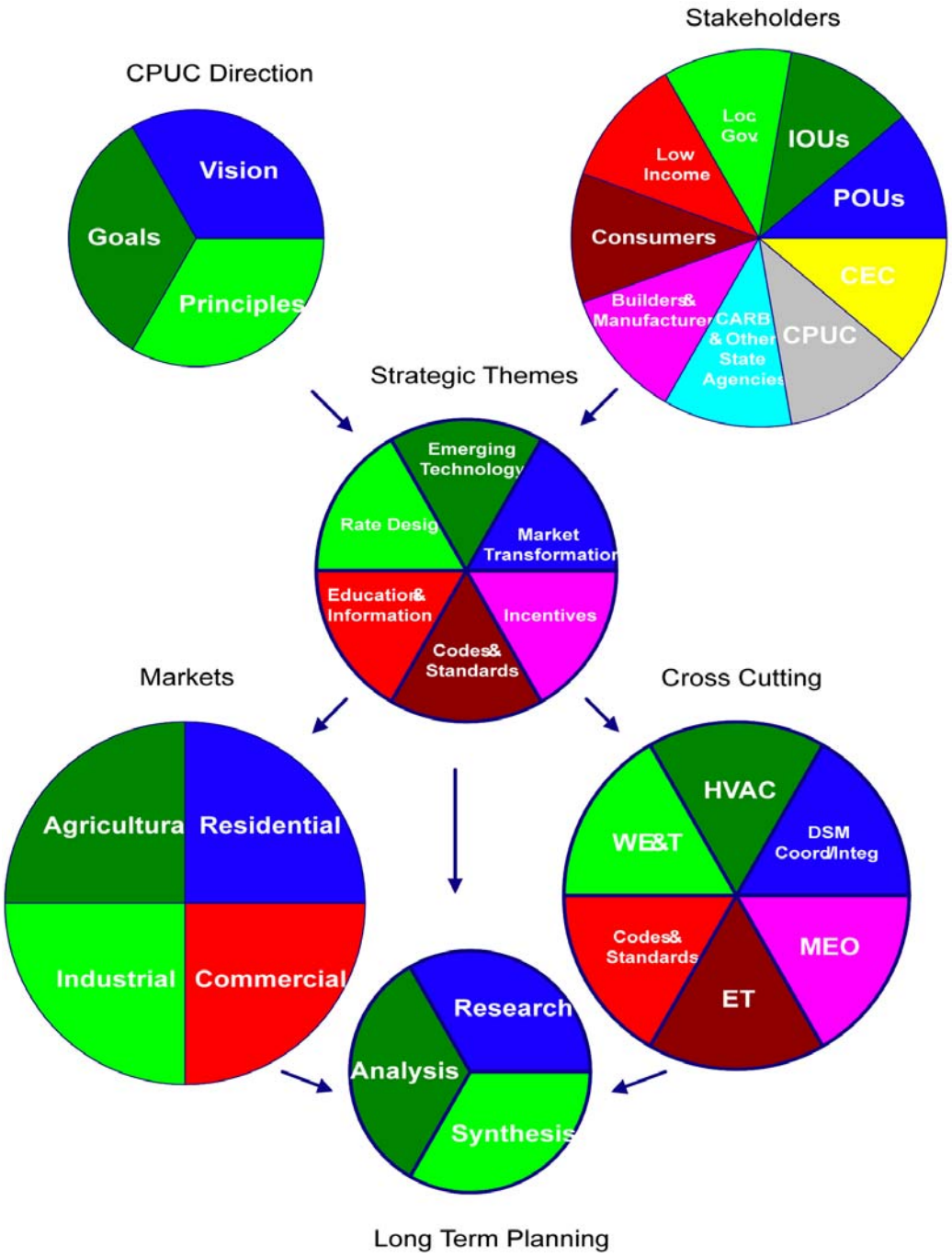
1. ***Incentives*** include rebates, innovative or discounted financing, and/or non-financial support to consumers who implement energy efficiency practices and measures that go beyond current practice or mandates. Incentives are the "carrots" that help *pull* consumers into choosing the efficient option.
2. ***Codes & 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.
3. ***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.
4. ***Market Transformation*** is both a cross-cutting strategy and a desired "end-point," as described above.
5. ***Price and Rate Design*** can incent 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."

6. ***Emerging Technologies*** rely on research, development, demonstration and/or deployment to move energy-efficient products and developments from the lab bench into the commercial marketplace.

The IOUs will use the information generated from the strategic planning process to inform their 2009-2011 and future energy efficiency portfolios. The IOUs view this initial strategic planning cycle as the beginning of a sustained planning process with all of California's energy efficiency stakeholders.

Figure 1.1 schematically summarizes the relationships between the strategic themes and other elements of this *Plan*.

Figure 1.1: Structure of Strategic Planning Relationships



It should be noted that this *Plan* does not specifically address three important elements of energy efficiency. These are evaluation, 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 cycles of strategic planning are likely to address these issues.

Most of the strategies in this *Strategic Plan* do not require changes in state or federal law or the regulations of other agencies. Specifically, activities to be implemented in 2009-2011 are primarily 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 would be useful—or even essential—to achieve the desired cost-effective energy efficiency over the 2009-2020 period.

In developing this *Plan*, issues arose with respect to whether near-term modifications to the CPUC's energy efficiency regulatory framework could enhance the ability of the IOUs to pursue near-term activities in which they have a significant role. These issues include the treatment of *Plan*-related costs in the IOUs' 2009-2011 Energy Efficiency Portfolio Application, the measurement and attribution of energy savings from *Plan* activities, the need for unprecedented collaboration across a wide range of California stakeholders, and maintaining momentum through the *Plan* toward California's goals. These issues are addressed in Chapter 15.

2. Residential Sector

2.1. Vision

Residential energy use will be transformed by 2020. Current and new channels of energy delivery will be strongly leveraged. Demand-side management (DSM) services will be fully integrated. Consumers will demand and the market will provide highly efficient products and services that will dramatically reduce energy use—with no loss of comfort or equipment efficacy—creating a "win" for the economy, the environment and society.

This vision is premised on a process of: setting extremely high goals; pursuing the most promising strategies, and continuously learning, revising, and advancing new approaches. To achieve the vision, energy efficiency programs must evolve to foster significant changes in residential markets for energy-using technologies and energy efficiency services.

2.2. Profile

California's 12.6 million households use about one-third of the electricity consumed in the state, and 36% of total natural gas consumption.[11] About a third of all households live in multi-family structures and two-thirds in single-family homes. The residential sector spans the full diversity of California geography, climate, and demographics. Electricity is primarily used for lighting (22%) and equipment in the home (mainly consumer electronics, 15%; refrigerators and freezers, 19%; air conditioners, 10%). Natural gas is used almost exclusively for water and space heating (44% each).

2.3. Goals

The Commission set intermediate- and long-term goals for the sector:

- By 2011, 50% of residential new construction will meet Tier II standards of the New Solar Homes Program.
- By 2020, all new residential construction will be zero net energy.[12]

In both timeframes, the goals are truly aspirational. They go beyond the CPUC's current energy-savings goals, which themselves require capturing energy efficiency potential faster than the normal rate of equipment turnover.[13]

The objective in setting these aspirational goals is to stimulate participation in energy efficiency programs and provide motivation for the additional efforts needed to:

- Increase the uptake of energy efficiency.
- Continually draw new and emerging technologies into the marketplace.

- Create "energy efficiency as a way of life" among Californians by 2020.

The goals and strategies defined in this *Plan* relate to the use of energy associated with facilities and buildings. With respect to greenhouse gas emissions, however, there is a nexus between transportation and all market sectors. Examples include the location of people's homes in relation to where they work or shop, and the outlook for widespread use within the residential and commercial sectors of electric grid systems to charge plug-in hybrid vehicles. This first draft *California Energy Efficiency Strategic Plan* leaves it to future strategic planning cycles to address the buildings/transportation nexus.

2.4. Top-Level Strategies

Strategy 1: Pursue Whole-House Solutions in Existing Homes. *Cost-effectively promote energy savings that target technical fixes (deployment of specific devices), whole-house systems (building shell, air conditioning, etc.) and emerging deep energy reduction initiatives.*[14]

This strategy envisions raising the cost effectiveness of residential energy and demand-reduction approaches (program "packages") by incorporating new, highly cost-effective measures. Further, effectiveness will be increased through:

- Utilizing R&D to ensure availability of more efficient, less costly measures, diagnostic and communication tools.
- Integrating delivery of energy efficiency, appropriate demand response and preferred on-site renewable energy measures.
- Supporting aggressive enhancement and enforcement of building energy Codes & Standards.
- Enhancing information (labels, web comparisons, AMI, etc.) to enable optimal consumer choice.
- Moving consumer demand (market transformation) through enhanced Marketing, Education & Outreach (see separate chapter).
- Partnering in an organized manner with local governments on improved code enforcement and pilot code improvements (see Strategy #7 below).

Possible short-term activities include:

- Continuing to isolate decision triggers for consumer desire for increased energy efficiency and refining marketing/targeting strategies.
- Developing pilots (possibly including showcase home remodels), with expansion to larger effort as information platforms (AMI) reach large-scale deployment.
- Completing R&D on packages of whole-house upgrades, including feedback systems for reinforcing savings and providing diagnostics on house energy performance[15].

Mid-term activities focus on full program deployment in a context of continuous improvement. An inflow of new, more efficient, less costly technologies, and improved availability of private capital will be critical to this context.

Strategy 2: Raise Plug Load Efficiency. *Develop comprehensive, innovative initiatives to cost-effectively address 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 "energy thieves" of the ubiquitous 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.

The basic pattern is to:

- Identify "triggers" to stimulate consumer willingness to choose more efficient devices.
- Work with research organizations to develop emerging technology focusing on smarter products with lower energy requirements.
- Provide upstream rebates or other incentives to bring significant numbers of such products to market.
- Inform consumers and create demand for such products through information and market transformation activities, including:
  - Using unbiased labels and websites ("*Consumer Reports*" approach).
  - Keeping energy efficiency "cool" in consumers' minds.
- Lock in savings with rising California and potentially federal standards.

Short-term products could include smart power strips and increasingly informative visual displays. Mid-term efforts could include increasing consumer awareness and stimulating more efficient use of products, which might require specific consumer behavioral research. Utilities could also work to increase the availability of more efficient products by working with LCD and other electronics manufacturers. Work with manufacturers will require long-term relationships to assure receptivity and continuity of effort. For the long term, a potentially productive opportunity could be in-home visual displays integrated with advanced metering infrastructure (AMI)-driven information platforms.

Strategy 3: Advance Residential New Construction Whole-House Solutions toward Zero Net Energy. *Continually increase demand for and supply of lower energy homes based on new technologies, new building approaches, and regulatory/policy solutions to achieve a "zero net energy home."*

The Commission's "Big Bold" goals are the focus of this strategy. Execution requires overcoming a number of significant barriers:

- Creating significant consumer demand to incent production builders to progressively move to lower energy homes. Such homes must be attractive and cost-competitive to be attractive to consumers.
- Developing and bringing new cost-effective technologies (materials, fabrication techniques and building methods) into builders' designs and building processes.
- Overcoming the low cost-effectiveness under current CPUC-adopted avoided costs of even 30-40% improvements over existing (2005) building standards. This might require reassessing the value of technology breakthroughs in enabling a wide dispersion of low-cost energy efficiency measures throughout residential applications.
- Clearing a host of local and state regulatory issues including:
  - Determining which preferred local generation can be included in such homes or communities.
  - Identifying authorized permitting, inspection and approval processes.
  - Improving home energy usage measurement and modeling approaches, recording energy usage and using measurements to improve future home energy research, design and programs.
  - Developing and deploying low-cost, easily verified labeling and rating system(s).

Success will require cooperation among interested state agencies, utilities, and the home building industry.

Key short-term actions are:

- Leverage experience with current low-energy homes (Roseville);
- Complete California Solar Initiative (CSI) requirements and determine additional potential improvements;
- Work with the California Energy Commission (CEC), Public Interest Energy Research (PIER), National Laboratories (LBNL, NREL) and others to foster technological innovation;
- Carefully align technologies (or prospective technologies) with suitable climates and geographies to obtain successful technology or market test results;
- Effectively target market low-energy homes to specific consumers;
- Test different combinations of CSI and new residential home programs for maximum effect on builders and consumers. Include integrated programs (demand response, enhanced AMI).

Mid-term actions include:

- Careful up-scaling of production of low-energy homes in the most applicable climate zones;
- Highly targeted marketing to support consumer demand.

Long-term actions include:

- Full deployment in California's interior and costal climates.

The new multi-family dwellings sub-sector could follow the same strategy with a short lag. While zero net energy usage cannot now be clearly defined, goals and strategies should be developed to support program planning for 2012.

2.5. Additional Strategies

The following strategies are also of importance for the residential sector. Furthermore, several relevant cross-cutting strategies are described elsewhere in this *Plan*.

Strategy 4: Provide Monitoring and Visual Display Tools. *Provide residential consumers with the information they need to operate their homes or buildings in a more efficient manner through AMI systems for monitoring energy, water, and indoor air quality.*

Historically, the monthly bill provided the only feedback for residential consumers, limiting their ability to effectively control energy consumption. Only the most significant actions (e.g., replacing a 20-year-old refrigerator) had noticeable impact. Near real-time feedback is required to enable residential consumers to learn to manage their energy (and other utility) use. It is also required to enable them to maintain and improve upon their energy efficiency performance.

Over the next decade, the opportunity exists to progressively raise the bar through:

- Improved technical capability, including the ability to show various types of usage (electric, gas, water, indoor air quality) or data (outdoor and indoor temperature), and programmable characteristics (electric usage since last bill, last month, last date set by user; compared to historical periods, etc.).
- Improved consumer capability, including ease of use and understanding the link between changes in equipment operation and usage. In addition, installation must be easy and error-proof for residents and installing contractors. This is a promising area for emerging technology leveraging industry research organizations (PIER, EPRI).

Short-term actions include utility service territory pilots and the use of cross-functional stakeholder groups to assess and coordinate technology choices. The most significant barrier is research to determine energy savings. Without clear indications of savings, there is little rationale for AMI to be an energy-efficiency measure.

Strategy 5: Establish a Consistent Framework for New Construction Savings Determination. *Establish a statewide residential performance modeling methodology adopted by the CPUC (especially the Energy Division) and the CEC.*

New construction energy efficiency programs utilize building performance models to measure savings. A recent CPUC impact study used an alternative approach that computed lower savings than compliance model calculations. This discrepancy raises a risk of CPUC *ex post* measurement contradicting CEC model results.

The CEC and CPUC need to consider reconciling their approaches by 2011 to provide a firm foundation for future building compliance determination and program design and savings measurement. Without reconciliation, it will be difficult to reliably design programs and the prospective cost-effectiveness of new construction and major retrofit measures will become questionable.

Strategy 6: Coordinate Emerging "Green" or Sustainability Standards. *Green building and "beyond code" programs for moving buildings, developments, and even new cities toward zero net energy will make the most rapid progress if coordinated under statewide direction promoting statewide consistency.*

This strategy[16] integrates two activities: local governments desire to go beyond state building codes, and the certainty that a discontinuous landscape of different and perhaps conflicting requirements will soon curtail progress. Accordingly, the strategy is to:

1. Coordinate cities as testing grounds for "beyond code" construction, and
2. Build on test cities' experience to develop, establish, and continually improve an advancing, statewide standard featuring:
   - Transparency for easily accessible and understood requirements and procedures;
   - Credibility through independent verification, and
   - Provision by any qualified party.

The CEC could lead this effort coordinating city efforts as "test beds" to determine what works best in moving to more efficient building standards. A key focus would be to determine what efficiency measures integrate well with other dimensions of "green" or sustainable buildings or developments. It would need to be joined to the strategy of periodically enhancing the Title 24 mandatory code, as described below.

Near-term, the CEC could publish a provisional, performance-based, reference (standard) for residential "green building" in California. This would be advisory and create a reference from which to gauge further improvements. The process could be leveraged working with PIER and other research organizations (LBNL, NREL, BIRA) to assess and provide the foundation for recommendations, including monitoring and measurement approaches.

There is no agreed-upon way to measure and count savings from projects larger than individual buildings, so cost-effectiveness from many more innovative activities, (e.g., sustainable communities) is undefined, creating a barrier to funding these "beyond code" developments. In 2009-2011, the CPUC could authorize the IOUs to pursue pilots in which they partner in such developments promoting the energy savings, including fresh and waste water, transportation, etc. The CPUC and CEC could use these pilots to develop impact measurement protocols for site, project or even whole community energy savings.

Strategy 7: Support Aggressive Enhancement and Enforcement of California Building Energy Codes & Standards. *Steadily increase the stringency and comprehensiveness of the Title 24 residential building code on a triennial basis and a pre-determined desired trajectory; couple the code with voluntary performance tiers that go beyond code.*

To achieve the high levels of energy savings envisioned in this *Plan*, energy Codes & Standards must be strongly enhanced—both by increasing their stringency and by covering more end uses.

The Title 24 energy code is updated and tightened on a triennial basis by the CEC. It can be progressively done so over the coming years on a desirable trajectory to goals for the year 2020. Additionally, it should be linked to two tiers of "beyond code" voluntary standards. Together, this trio of one mandatory and two voluntary levels comprise a "bronze-silver-gold" approach to residential efficiency performance. (As described later in this chapter, the voluntary tiers can be used as reference points for green/sustainability objectives, utility incentives, local government ordinances, etc.)

Success of this initiative depends upon:

- Alignment of regulatory and/or legislative direction among the CEC, CPUC, and Building Standards Commission to support the goals.
- Technical and analytical work to establish the framework of minimum and voluntary levels of higher performing building standards.
- Enforcement of Codes & Standards, requiring resources to train code compliance inspectors and staff.

Specific actions to implement this initiative are:

1. Establish a graduated, steep path of minimum residential Codes & Standards toward the long-term vision of progressively more efficient new, renovated and existing buildings. Adopt two tiers of voluntary standards more efficient than the minimum mandatory. (Short Term)

2. Adjust the code on a triennial schedule on the desired trajectory, aiming for the overall 2020 target. At each adjustment, this 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.) (Short, Mid Terms)
3. Enhance Title 24 to address all energy end uses and especially plug loads (e.g., home office equipment). (Short, Mid Terms)
4. Develop coordinated companion strategies to create demand in the marketplace for ultra-efficient housing through a variety of tools including information, marketing tactics, and financial incentives (as discussed elsewhere in this chapter). (Short Term)

Strategy 8: Advance Energy Efficiency through Local Ordinances.

The roles of local governments are described in Chapter 12; local government actions specific to the residential sector include:

- Add energy into cities' general plans.
- Adopt local ordinances requiring new building energy performance superior to state standards.
- Ensure compliance with all local or state standards.
- Require performance modeling at time of sale or approval of major renovation.
- Use local planning and zoning to encourage or require DSM integration in multi-family/high-density housing, (e.g., passive design features or district heating and cooling).

Barriers include the lack of measurable savings to validate cost-effectiveness, the growing disparity of local conditions creating barriers to builders and developers, and the lack of capacity among building officials, building department employees and common tools to measure impacts and outcomes.

Short-term actions include identifying interested local governments, communicating with building officials and owners, analyzing local codes for promising improvements, promoting expedited plan review, reducing city fees or other incentives for participants, and joining state agencies and utilities with city officials to foster efficient layout of communities ("smart growth").

Strategy 9: Achieve Full "One-Stop Shop" Integration of DSM Delivery.

The integration of demand-side management—including energy efficiency, demand response, and preferred renewable energy resources—is discussed in Chapter 8. It can be promoted in the residential sector by recommending the most cost-effective and beneficial bundle of DSM measures suited to consumers' needs. (For local government partnerships, explore integrating other services.) Key barriers to full DSM integration include

determining acceptable practices for accounting, auditing, and evaluation—all factors that lay the foundation for savings determination and future integration.

Key short-term actions include pilot testing of virtual and/or physical one-stop shops. These pilot initiatives can vary and test different options for bundling of measures, benchmarking, visual display sales, whole-house approaches, and exploring the inclusion of water, waste, etc.

The following summary table (Table 2.1) lists the three top-level strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. The six additional strategies described above are also noted in Table 2.1. The listed stakeholders are identified at this time as having a major role in defining and/or implementing the top-level strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example homeowners, are also critical to the ultimate success of each strategy.

Table 2.1 Residential Strategies, Near-Term Actions and Principal Stakeholders

Top Level Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Existing Whole-House Solutions. Identify innovative strategies to cost-effectively promote whole-house strategies.	▪ Continue to isolate decision triggers ▪ Conduct pilot programs ▪ Complete R&D on packages of whole house upgrades ▪ Create feedback loops to drive behavior	▪ Utilities ▪ CEC ▪ CPUC
Strategy 2: Raise Plug Load Efficiency. Develop comprehensive, innovative initiatives to cost-effectively address the growth of plug load energy consumption through technological and behavioral solutions.	▪ Promote smart power strips and increasingly informative visual displays ▪ Coordinate pilot programs and determine best methods of reaching and influencing customers, retailers and manufacturers ▪ Work with stakeholder to support development of state labeling system in absence of federal labeling system	▪ CEC ▪ Research organizations such as LBNL
Strategy 3: New Construction Whole-House Solutions. Identify and pursue innovative strategies to significantly enhance home performance and reduce the consumer costs on the path to zero net energy.	▪ Carefully align technologies with suitable climates and geographies ▪ Market low energy homes to specific consumer segments ▪ Recruit, train and incent production builders to participate in RNC programs	▪ CEC ▪ Utilities ▪ Research organizations
Additional Strategies **Strategy 4:** Visual Monitoring and Display Tools **Strategy 5:** Consistent New Construction Savings Measurement **Strategy 6:** "Green" Code Development and Coordination **Strategy 7:** Enhanced Local Code Compliance **Strategy 8:** Local Government Opportunities **Strategy 9:** DSM Integration and "One-Stop-Shop"		

3. Commercial Sector

3.1. Vision and Goals

Commercial buildings will be put on a path to zero net energy by 2030 for all new buildings and for many existing ones.[17] *Innovative technologies and practices will dramatically grow in use in the coming years through a combination of technology development, financing and incentives, Codes & Standards and market pull.*

Several ambitious goals are needed to transform the energy patterns of commercial buildings, California's largest energy-consuming sector:

- All new construction building starts and a significant number of existing buildings will be zero net energy by 2030.
- The HVAC industry is transformed to yield optimal performance for systems used by commercial consumers.
- Markets provide both demand "pull" and supply "push" for zero net, and ultra low, energy buildings.
- Utility programs are integrated and provide price signals, financing mechanisms and other incentives for owners/managers and builders/producers of zero-energy buildings.
- The CPUC, IOUs, CEC and other key players use the vision statement as the basis for long-term strategic planning and actions, assuring other market participants of their goals and intents through 2030.

A particular challenge is that while some commercial building types can readily reach zero net energy today (e.g., unconditioned warehouses), others simply won't be able to do it for some time (e.g., restaurants). Managing this challenge will require a strategy to disaggregate the commercial sector with a stair-step scale of zero net energy requirements over time.

3.2. Profile

As the largest consumer of electricity in California, commercial buildings are key to successfully transforming the state's energy consumption patterns. Thirty-eight percent of the state's power and over one-quarter of its natural gas consumption lights, cools, heats, refrigerates and provides other services[18] for California's 5 billion-square-feet of offices, stores, restaurants, warehouses, schools, hospitals and other commercial buildings.[19]

The diverse and dispersed commercial sector is arguably the best opportunity to adopt successful and cost-effective energy efficiency strategies. Not surprisingly, two of the three "Big Bold" Programmatic Initiatives adopted by the CPUC target this sector. The investor-owned utilities strongly share the commitment of the Commission and the state to significantly improve the energy efficiency performance of commercial buildings—both existing and future. This *Plan*

lays out strategies for achieving success for energy efficiency in the commercial buildings sector by 2030.

3.3. Strategies

Strategy 1: Support Aggressive Enhancement and Enforcement of California Building Energy Codes & Standards.

The highest priority strategic initiative is regulatory action. To achieve the high levels of energy savings envisioned in this *Plan*, energy Codes & Standards must be more aggressive and cover a larger portion of the existing buildings sector.

The preferred approach is a progressive set of energy Codes & Standards that steadily tightens over the coming years, linked to two tiers of voluntary higher ("beyond code") standards. Together, the mandatory and voluntary standards comprise a "bronze-silver-gold" hierarchy of building performance tiers. The voluntary tiers should be used as reference points for utility incentives, public recognition of highly efficient buildings, local government ordinances, and other policy and market-based drivers for getting buildings designed and built beyond the minimum efficiency levels in the building code.

Success of this initiative depends upon:

- Alignment of legislative direction and/or regulatory policy among the CEC, CPUC, and Building Standards Commission to support the goal of zero net energy (ZNE) buildings.
- Technical and analytical work to establish the framework of minimum and voluntary levels of higher performing building standards.
- Enforcement of Codes & Standards, requiring resources to train code compliance inspectors and staff, and to periodically evaluate their performance.

Specific actions to implement this initiative are:

1. Establish a graduated, steep path of minimum Codes & Standards toward the long-term vision of progressively more efficient new, renovated and existing buildings. Establish two tiers of voluntary standards that are more efficient than the minimum mandatory. (Short Term)
2. Adjust the code on a triennial schedule on a pre-determined "trajectory" aimed for the overall 2030 target. At each adjustment, 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.) (Short, Mid Terms)
3. Apply an analogous scheme to renovations of existing buildings. Begin by lowering the renovation threshold at which minimum Codes & Standards are applied to an entire existing structure, such as if the area of renovation is 25% or more of the entire facility square footage, or 2,000-square-feet, whichever is lower. (Short Term)

4. Enhance Title 24 to address all energy end uses and especially plug loads (e.g., copying machines, printers), the fastest-growing end use for commercial sector electricity. (Short, Mid Terms)
5. Develop coordinated companion strategies to create demand in the marketplace for high-scoring buildings through a variety of tools, including information, marketing tactics, and financial incentives (as discussed below). (Short Term)

Strategy 2: Align Commercial Building Labels, Benchmarking and Operations & Maintenance Practices to Address Energy Efficiency.

The second strategic initiative uses a combination of regulatory and market forces to help owners and developers value the economic advantage of high-performing buildings, thereby creating a "market pull" for buildings that are energy efficient.

Simple, recognizable protocols for low-carbon and high-efficiency attributes of commercial buildings will encourage owners to demand—and, in turn, markets to deliver—the design, construction, operation and maintenance, usage and renovation of energy-efficient buildings. (The LEED rating system has become a *de facto* "green" label, but does not provide specific information on a building's energy or carbon performance.) Annual energy and carbon labels are needed for populated buildings on a whole-building basis to send signals to market players that actual (not just designed) building energy performance is of value in commercial building markets.

In conjunction with these activities, the commercial building industry and its partners, such as utilities, could sponsor "*Path to Zero*" commercial buildings. A *Path to Zero* initiative would provide—in a coordinated, goal-oriented and assertive manner—real-world experience and data on emerging technologies and practices and designs that are potential components of future zero net and ultra-low energy buildings.

Specific actions for implementing this initiative include:

1. Establish mandatory energy and carbon labeling and benchmarks. (Short Term)
2. Establish benchmark-driven incentives by utilities, governments and others to encourage a steady improvement in building benchmark scores. (Short, Mid Terms)
3. Set minimum energy benchmarks to retain building certificates of occupancy. (Mid Term)
4. Change building codes to require, and otherwise encourage: (Mid Term)
   - Sub-metering for tenants.
   - Metering and data management capabilities in new buildings to provide the infrastructure for automated diagnostics that help assess breakdowns continuously to maintain desired operations. Add related capabilities for renovations and existing buildings when applicable.
   - Self-diagnostic EMS controls.

5. Develop additional tools and strategies for understanding how information and behavioral strategies can reduce energy consumption in commercial buildings. (Short Term)
6. Explore and adopt practices that address the tenant/owner "split incentives" issue. (Short, Mid Terms)
7. Develop tools and industry standards to improve commissioning and retro-commissioning. (Short Term)
8. Establish building operator training programs to provide customized training for retro-commissioning and other needed functions. (Short Term)
9. Require all state-owned and leased buildings to be benchmarked, sub-metered, commissioned by 2012 and upgraded to the next level of energy efficiency by 2015. Other public buildings, especially those that receive significant financial support from the state, will also need to meet this requirement. (Short, Mid Terms)

Strategy 3: Target Financing and Incentives to Meet the Objectives of the Strategic Plan.

The challenge of reaching zero net energy 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, while ensuring that available funds are used optimally. The IOUs, CPUC, and others should establish a Zero/Low-Energy Financing Task Force made up of members of the commercial building and the financial/investment industries, as well as academics and stakeholders.

The Task Force will need to remain cognizant of the wide range of applicable settings, including CPUC policy regarding ratepayer funding, CARB regulations implementing AB32, legislative action regarding the use of taxpayer funds and bonding authority and private capital market finance mechanisms. It should be chartered to:

1. Develop innovative and effective financing tools for ZNE and ultra low-energy new buildings, such as long-term loans, or loans that remain with the property through owner/occupant turnover. (Short, Mid Terms)
2. Develop innovative and effective financing tools for major improvements in the energy efficiency of existing buildings. (Short, Mid Terms)
3. Investigate how to best leverage external funding (e.g., those provided by utilities and/or government) for ZNE/ultra-low new buildings, and major efficiency upgrades of existing buildings. (Short Term)
4. Explore who can provide meaningful incentives beyond those financed by ratepayers and taxpayers. (Short Term)

Finance-related incentives for high-efficiency commercial buildings that could be provided by local governments include:

1. Providing expedited permitting to buildings that are designed to meet either of the voluntary beyond-code tiers described in Commercial Strategy 1.

2. Considering offering reduced entitlement fees for buildings reaching the highest voluntary tier, with any shortfall in necessary revenue recouped from higher fees on less efficient buildings. (Known as a "fee-bate" approach, it can be set to be revenue neutral.)

Strategy 4: Promote Integrated Design for New Zero Net Energy Commercial Buildings and Renovations of Existing Buildings.

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. By integrating across professions and responsibilities at the start of the project, energy strategies can be analyzed and optimized for performance, efficiency and cost. Integrated design can and should also collaboratively bring together the "upstream" architectural and engineering professionals with the financing and construction teams who typically have great influence over a project's eventual energy performance. (In fact, integrated design can be taken beyond individual buildings to consider community-level energy and carbon impacts.)

Specific actions to guide building designers and construction companies in attaining highly efficient buildings include:

1. The CPUC, utilities, American Institute of Architects (AIA), and California Architects Board (CAB) working together to develop a multi-pronged approach to advance the practice of integrated design. This will be achieved by providing requirements, guidelines, and training for practicing and emerging design professionals in architectural and engineering schools and as they enter the workforce. (Short, Mid Terms)
2. The CPUC, utilities, CEC and others work with AIA and CAB to promote the use of integrated design and related activities in California. (Short, Mid Terms)
3. Supporting building commissioning, retro-commissioning, and ongoing building measurement and verification in order to ensure that buildings are constructed and renovated as well as (or better than) they are designed, and in turn, operated efficiently. (Short, Mid Terms)

The following summary table (Table 3.1) lists the four strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example commercial building owners and developers, are also critical to the ultimate success of each strategy.

Table 3.1 Commercial Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Support aggressive enhancement and enforcement of California building energy Codes & Standards.	▪ Establish two tiers of voluntary standards more efficient than the minimum mandatory ▪ Adjust the code on a triennial schedule ▪ Apply an analogous scheme to renovations of existing buildings ▪ Enhance Title 24 to address all energy end uses ▪ Develop coordinated companion strategies to create demand in the marketplace	▪ CEC ▪ Utilities ▪ DOE/EPA ▪ Research organizations, such as LBNL ▪ Builders/owners and there associations ▪ Federal government
Strategy 2: Align commercial building labels, benchmarking and operations & maintenance practices.	▪ Establish mandatory energy and carbon labeling and benchmarks ▪ Establish benchmark-driven incentives ▪ Develop additional tools and strategies for information and behavioral strategies ▪ Explore and adopt practices that address the tenant/owner “split incentives” issue ▪ Develop tools and industry standards to improve commissioning ▪ Establish building operator training programs ▪ Require all state-owned and leased buildings to be benchmarked, sub-metered, commissioned	▪ CEC ▪ CPUC ▪ Utilities ▪ DOE/EPA ▪ Research organizations, such as LBNL ▪ Builders/owners and there associations ▪ Federal government
Strategy 3: Target financing and incentives to meet the objectives of the *Strategic Plan*.	▪ Develop innovative financing tools ▪ Investigate how to leverage external funding ▪ Explore who can provide meaningful incentives beyond ratepayers and taxpayers	▪ CPUC/CEC ▪ Utilities ▪ Legislature ▪ Finance industry ▪ Building industry
Strategy 4: Promote integrated design for new zero net energy commercial buildings, and renovations of existing buildings.	▪ Advance the practice of integrated design ▪ Supporting building commissioning, retro-commissioning, and ongoing building M&V	▪ AIA, ASHRAE, GBC ▪ Building industry ▪ CPUC/CEC ▪ Utilities

4. Industrial Sector

4.1. Vision and Goal

California industry will be vibrant, profitable and embrace resource efficiency as a competitive advantage.

The primary strategic goal for industry is to minimize the energy intensity of California products.

4.2. Profile

California industry consumes approximately 51,000 GWh each year, including mining, data centers, and water/wastewater facilities.[20] Industrial natural gas use is estimated at 730,000 million cubic feet annually.[21] A peak industrial demand of approximately 4,700 MW is estimated for industrial facilities served by the California IOUs.[22] Industry represents approximately 16% of the total electricity use in the state, 33% of the natural gas use[23], 22% of the total energy use[24], and more than 20% of end use CO_2 emissions.[25]

Recent estimates also suggest that roughly 3% of California's electricity use and 14% of its non-power plant natural gas use can be attributed to the treatment, distribution, and use of water by the California industrial sector.[26] Based on the state's latest greenhouse gas (GHG) emissions inventory, this energy use generates around 10% of California's non-transportation related GHG emissions arising from fossil fuel combustion.[27]

Industrial consumers and their representatives identified a number of significant barriers to participation in utility programs and/or adoption of energy efficiency measures:

- Regulatory uncertainty and conflicting regulatory goals.
- A primary focus on 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 operating parameters required to comply with current energy efficiency policies limit benefits/participation due to "free-ridership" rules do not 1) recognize or reward the benefits of documented process or operational changes, and 2) limit or preclude very large projects that may result in substantial energy savings and corresponding GHG reductions.
- Difficulty in accessing industry-relevant technical assistance.
- Inadequate availability of highly qualified personnel in specialized industries.

4.3. Strategies

Energy efficiency is consistent with general industrial business priorities. Companies that have embraced efficiency as a competitive or operational tool have been successful. The strategic challenge is to overcome the identified barriers to investment in efficiency. The industrial sector strategy incorporates four of the overarching strategic themes within three specific sector strategies: incentives, information, market transformation in the form of education, and emerging technologies.

The intent of the industrial strategies is to 1) identify a path toward achieving significant energy efficiency improvement and corresponding reductions in GHG emissions, and 2) provide a context for maintaining, and perhaps improving, the competitiveness of California's industries in the process. It is important to note that, with the possible exception of small facilities, highly prescriptive approaches are neither well received nor very successful for improving energy efficiency in industry. Most industrial facilities are highly organized around complex procedures designed to maintain operational efficiency and safety and must find their own path for integrating new goals and requirements that fit into these complex operational environments. The industrial sector responds well to policies that establish a goal or target along with a range of acceptable parameters within which the company or facility can exercise considerable discretion on the specific method or path. For much of the industrial sector, growth of physical facilities is very limited, requiring energy efficiency efforts to focus largely on improvements to existing infrastructure. The strategies that follow are built upon this understanding.

The industrial sector strategy depends upon the elimination of conflicting regulations, and the resulting uncertainty, that can be barriers to adopting energy efficiency. Cooperation and coordination among relevant California regulatory agencies is essential toward this end; therefore, the strategy makes the following assumptions about the regulatory environment:

1. The CPUC will continue to be successful in its efforts to foster meaningful integration across demand-side agendas.
2. The legislature, regulatory agencies and the governor's office will work together to promote mutually supportive laws and regulations affecting the industrial sector in this arena.
3. CARB will issue rules that encourage early adoption of actions to mitigate GHG emissions.

Strategy 1: Leverage the Marketing and Competitive Benefits of Energy Efficiency Branding and Certification Using a Continuous Improvement Process within Industrial Facilities.[28]

This strategy provides a set of performance criteria for companies that seek to exceed minimum regulatory requirements and any negotiated agreement targets by actively managing their energy use over time. To realize the benefits of this strategy, training will be needed to prepare a cadre of industry professionals (consultants, plant engineers in larger facilities, and equipment suppliers and service providers) to provide energy management assistance, in-depth system assessment services, and resource utilization assistance. Existing programs, such as those offered by USDOE's Industrial Technology Program and USEPA's ENERGY STAR for

Industry could provide substantial cost-share opportunities and in-kind assistance, especially if linked to certification. Training will also be required for industry to effectively use energy management and system assessment standards.

By participating in a recognized national effort to certify industrial facilities for energy efficiency, California would be assisting its industries to:

1. More easily reach their GHG emission reduction targets via a supported, structured program based on proven best practices.
2. Develop market recognition for their energy efficiency and GHG reduction efforts through third-party certification, thus increasing global competitiveness, especially for industries that market directly to consumers.
3. Provide a tangible way to encourage greater energy efficiency throughout their supply chain.

Near-Term Actions

- Participate in national planning process.
- Pilot a certification program in 8-10 California industrial facilities.

Mid-Term Actions

- Publish results of the pilot and determine whether to launch a full statewide program.
- Depending on decision, launch statewide certification program.

Strategy 2: Provide Integrated Products to Increase the Benefits of Energy Efficiency.

The essence of this strategy is the continuous evolution and enhancement of utility incentive programs for industry based on regular feedback from industrial consumers, consultants, service providers, and other stakeholder groups coupled with regular, targeted program evaluations. The evolution begins by providing consumers with programs that integrate as possible, energy, emissions, water and waste disposal actions.

Short-Term Actions

- Conduct pilot demonstrations to test changes in utility programs to provide utility incentives for energy efficient process improvements (defined as documented, measurable evidence of energy management resulting in improved energy efficiency via projects, process, and operational improvements).
- Provide ongoing feedback from annual evaluations of program results to assist utilities in “continuously improving” new program offerings.
- Revise rules regarding “free ridership” and early replacement to recognize the reality of industrial decision making, including regulatory coordination.

Mid-Term Actions

- Change utility incentive program elements that tested well during the 2009-2011 pilot demonstration period.

Strategy 3: Provide Centralized Technical and Regulatory Assistance for Resource Efficiency.

Industrial facilities are not just large buildings that can be effectively served by programs designed for the commercial sector—their principal use of energy is to create products or transform materials. Most industrial facilities have management systems in place for materials, labor, and other resources that could be enhanced to include energy management as well as other environmental factors. But international experience has demonstrated that these changes will not become widespread without supporting policies and programs. The goal is to develop supporting conditions for continuous improvement in California industry for resource utilization, encompassing all aspects of energy utilization, GHG emission reduction, water conservation, waste disposal, and air quality. The essence of this strategy is to facilitate rather than inhibit adoption of energy efficiency through centralized and easily accessed information and resources.

Short Term Actions

- Develop and launch seamless, centralized, statewide access for California industry to technical assistance to support more effective utilization of energy resources.

Mid-Term Actions

- Extend the seamless, centralized, statewide access for California industry to technical and regulatory assistance to support more effective utilization of energy and water resources, GHG emissions reduction, more effective waste disposal, and improved air quality.

Strategy 4: Facilitate the Direct Involvement of Industry in Coordinated Interagency Planning for the Energy Efficiency Portions of AB32 Implementation.

While acknowledging that the Air Resources Board has already taken steps to engage industry via the Economic and Technology Advancement Advisory Committee (ETAAC), efforts to more broadly engage industry in identifying and accounting for early actions would be very beneficial in assisting the state in meeting the goals of AB32. A Climate Action Team for Industry is needed to ensure that industry has a direct voice in the planning process. Active engagement of industrial consumers will bring significant support and goodwill to the process of achieving AB32 goals.

The following summary table (Table 4.1) lists the four strategies described in this chapter as well as a listing of some related near-term actions (for the first three strategies) and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example industrial energy users, are also critical to the ultimate success of each strategy.

Table 4.1 Industrial Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Leverage the marketing and competitive benefits of energy efficiency branding and certification using a continuous improvement process within industrial facilities.	▪ Participate in national planning process ▪ Pilot a certification program in 8-10 California industrial facilities	▪ Industry groups such as CMTA ▪ Utilities ▪ CEC ▪ DOE/EPA ▪ Research organizations, such as LBNL
Strategy 2: Provide integrated products to increase the benefits of energy efficiency.	▪ Conduct pilot demonstrations ▪ Provide ongoing feedback from annual evaluations ▪ Revise rules regarding "free-ridership" and early replacement	▪ Utilities ▪ CPUC ▪ CEC
Strategy 3: Provide centralized technical and regulatory assistance for resource efficiency.	▪ Develop and launch centralized, statewide access for California industry to technical assistance	▪ CEC ▪ CPUC ▪ Utilities ▪ Industry groups such as CMTA
Strategy 4: Facilitate the direct involvement of industry in coordinated interagency planning for the energy efficiency portions of AB32 implementation.		▪ CARB ▪ CPUC ▪ CEC

5. Agricultural Sector

5.1. Vision and Goals

Energy efficiency and renewable energy resource development will support the long-term profitability and stability of California agriculture, including through increased profitability, support of AB32 compliance, and support of renewable energy goals.

The rationale for this vision is:

- *Increased profitability.* Cost-effective energy efficiency lowers operating costs, contributing to increased profitability of the sector.
- *Support of AB32 compliance.* Agriculture will be affected by regulations implementing AB32. Energy efficiency and renewable energy resource development are strategies for reducing greenhouse gas emissions.
- *Support of renewable energy goals.* Integration of energy efficiency and agricultural renewable energy (biogas, solar) potential can contribute to the achievement of California's Renewable Portfolio Standard goals (20% renewable energy by 2010 and 30% by 2030) and the 25x'25 initiative goal (25% of total energy from renewable resources by 2025).

Setting realistic, concrete, long-term goals for energy efficiency and renewable energy resource development within the agricultural sector is complicated by the quality of data currently available. For this reason, the IOUs have deferred development of long-term goals for the sector to the next strategic planning cycle. Successful implementation of strategies and actions outlined in this first cycle will influence those goals. IOU actions during this cycle will be guided by shorter-term goals developed through regular program planning cycles consistent with this *Strategic Plan*.

5.2. Profile

The agricultural sector accounts for about 7% of California's overall electricity consumption and consists of a diverse set of market segments: irrigated agriculture, refrigerated warehouses, dairies, vineyards and wineries, post-harvest processing, greenhouses and nurseries, and confined animal feeding operations (feedlots and poultry houses).

Six broad themes characterize this sector over the timeframe of this *Plan*:

- Increasing pressures for production efficiency resulting from a convergence of climate change, water competition from urban centers, and increasing globalization.
- Concentration of energy consumption in three end uses: irrigation, process heat applications and refrigeration.

- Lack of consistency in energy data across the utilities and government agencies that collect and maintain data on the sector.
- Opportunities to develop renewable energy resources (solar and biogas) and increase demand response contributions through new rate options and opt-in programs.
- Continuing consolidation of farming into agribusiness enterprises, concentrating decisions affecting energy consumption in the hands of fewer decision makers.
- Increasing regulatory pressures encompassing energy, air and water that increase the likelihood of conflicts among regulatory goals, programs and outcomes.

Water and agriculture are tightly linked. This strategic planning cycle addresses only onsite (on-farm) linkages, and—pending the outcome of pilot activities—not the broader water-energy nexus that includes the energy already embedded in water when it is delivered to agricultural sites. Future cycles must address energy consumed all along the water supply chain, from points of original production to points of consumption within the agricultural sector.

5.3. Strategies

Over the timeframe of this *Strategic Plan*, California's investor-owned utilities and participating stakeholders will focus on six strategies drawing on four strategic themes: information, incentives, Market Transformation and Emerging Technologies. The strategies are designed to work together to support development of all available energy efficiency and demand reduction resources within the sector that are cost-effective, reliable and feasible.

Five cross-cutting strategies are particularly important for achieving the vision established for the agricultural sector: DSM Coordination & Integration; Workforce Education & Training; Marketing, Education & Outreach; Emerging Technologies; and Market Transformation.

Action steps are incorporated into three of the six agricultural sector strategies, and will be implemented in coordination with the overall cross-cutting strategies. Other cross-cutting actions that are more generic to all sectors are described in their own chapters. Actions targeting local governments and low-income communities, described in dedicated chapters, also may play a role in meeting agricultural sector goals.

The six agricultural sector strategies were developed with feedback from a broad mix of stakeholders positioned to affect—or interested in affecting—energy consumption within the sector. Stakeholders participating in the strategy development process include representatives of:

- Agricultural owners and operators
- State regulatory agencies
- Environmental organizations
- Agricultural trade and lobbying organizations
- State and federal agencies addressing issues of air and water quality, agricultural policy and practices, and energy planning

Key barriers identified by these stakeholders include:

- A lack of up-to-date, statewide, segment-specific data on energy consumption and the potential for energy efficiency and renewable energy generation within the sector.
- Perceived operational risks arising from rapid changes in the overall business, environmental, and regulatory context of California agriculture.
- Uncertainties surrounding new technologies and techniques for tillage, harvest, irrigation, fertilization and chemical use; new formulations of fertilizers and chemicals, and genetically modified crops.
- Reluctance within the sector to accept higher first costs required to realize longer-term financial benefits and bear production risks associated with emerging or unproven technologies and practices.

The six strategies are:

Strategy 1: Market Characterization and Goal Setting. *Establish and maintain a knowledge base for California's agricultural sector sufficient to support planning for development of all available energy efficiency and demand reduction resources that are cost-effective, reliable and feasible.*

This strategy will ensure that decisions affecting energy efficiency and demand reduction within the sector are based on the highest quality and most comprehensive information possible, and coordinated across all major market participants and all relevant public policy initiatives.

Funded from ratepayer and taxpayer sources, key implementing actions will be:

- Conduct an energy characterization of the sector. (Short Term)
- Conduct a technical, economic and policy assessment of renewable energy potential within the sector. (Short Term)
- Coordinate data collection and sharing across key players. (Short Term)
- Develop benchmarking resources, tools and methods of recognition. (Short Term)
- Coordinate goals and supporting accounting systems across public policy initiatives affecting energy use within the sector. (Short, Mid, Long Terms)

Success of this strategy will require coordination and collaboration among the utilities serving agricultural loads (including IOUs, POUs and irrigation districts), the CEC and the CPUC. Contributions from a broad cast of other stakeholders also will be valuable, including CARB (including the Agriculture Climate Action Team), the Department of Water Resources (DWR), the Department of Food and Agriculture (CDFA), colleges and universities, the Bureau of Reclamation (BuRec), and industry associations.

Strategy 2: Workforce Education & Training. *Promote the adoption of energy efficiency as standard practice across the breadth and depth of California's agricultural sector through comprehensive education and training programs targeting:*

- Agricultural owners, facilities managers and operators
- Systems engineers, designers and builders
- Equipment manufacturers and vendors
- Energy services companies and consultants
- Students in educational disciplines affecting California agriculture
- Federal, state and local agricultural advisers (e.g., Cooperative Extension Service, Agriculture Commissioners' offices)

This strategy will be integrated and coordinated with the cross-cutting Workforce Education & Training strategies described in this *Plan*. Success will draw on the contributions of many stakeholders including: the IOUs, POUs, irrigation districts (IDs); local government partnerships; the CEC; the Workforce Education &Training Task Force, colleges and universities, industry associations, certificate programs, and local governments.

Strategy 3: Marketing, Education & Outreach. *Increase the penetration of energy efficiency technologies and practices throughout California's agricultural sector by developing an integrated marketing, education and outreach strategy that:*

- Takes full advantage of existing channels of communication with the agricultural community;
- Innovates new channels wherever productive and possible, and
- Stimulates demand by California consumers for energy-efficient food products.

The purpose is to ensure that information about energy efficiency in agricultural processes is disseminated as broadly and with as much credibility as possible throughout the sector, and that consumers understand the extent and value of energy efficiency embedded in the products they select. Efforts will be integrated and coordinated with the cross-cutting ME&O strategies. Many stakeholders have valuable contributions to make to this strategy, including: the POUs, IDs, CEC, CPUC, DWR, BuRec, USDA-NRCS, CARB, the state Water Resources Control Board, UC Coop Extension, USDA-NRCS, local government (agriculture Commissioners' offices), and trade associations.

Implementing actions will be funded from a combination of ratepayer and taxpayer sources. Actions specific to the needs of the agricultural sector include:

- Identify channels and partners for effective ME&O to the sector and individual segments. (Short Term)
- Establish a centralized clearinghouse for all technical, programmatic, regulatory, and incentive information (including best practices case studies). (Mid Term)
- Integrate ME&O to consumers of agricultural products with "green agriculture" awareness programs and with other ME&O programs and messages under the CEESP. (Mid Term)

Strategy 4: Financing and Incentives. *Support the adoption of energy efficiency within California's agricultural sector by coordinating the goals, program designs, and funding of the major sources of financing and incentives, including:*

- Water conservation and quality improvement funding
- CEC emerging technology funds
- Local air quality improvement funds
- Federal tax credits
- IOU and POU energy efficiency incentives

This strategy will assure that financing and incentives targeted to all aspects of agricultural operations are consistent—and not at cross purposes—with realization of the full energy efficiency potential of agricultural processes. In addition to the utilities (IOUs POUs, and IDs) participants will include other energy, air, and water funding entities. Both the CEC and the CPUC also have contributions to make.

Implementing actions will be ratepayer- and taxpayer-funded. Key action items are:

- Establish a permanent task force across energy, air, and water funding entities as a clearinghouse for program information and processes. (Short, Mid Term)
- Negotiate and implement a memorandum of understanding to coordinate program goals, design and funding across funding entities. (Short, Mid, Long Term)
- Work with and through the governor's office and legislature to avoid legislative and regulatory conflicts within the sector. (Short, Mid, Long Terms)

Strategy 5: Process Energy Intensity. *Foster advances in equipment efficiency and improvement of management practices to reduce energy consumption for irrigation pumping, process natural gas, and refrigeration throughout California's agricultural sector.*

This targeted market transformation and integrated demand-side strategy will assure continuous advances in equipment energy efficiency and management best practices supporting the most energy intensive end uses in California agriculture. Key players in this strategy will be the utilities (IOUs, POUs, IDs), CEC, CPUC, colleges and universities, USDOE, USDA, CDFA, industry associations, and the ME&O Task Force. Key actions specific to the agricultural sector will be ratepayer-funded:

- Achieve integration across market characterization (Strategy #1), emerging technologies (Strategy #6), and ME&O and WE&T (Strategies #2-3) functions. (Immediate, Short Term, Ongoing)
- Integrate specific actions targeting the three largest energy end uses in the sector into agricultural energy efficiency evaluations and projects. (Short Term, Ongoing)
- Clarify EM&V protocols for onsite water-related energy reductions. (Immediate, Short Term)

Strategy 6: Emerging Technologies. *Maximize the energy efficiency contributions of emerging technologies in California's agricultural sector through implementation of continuous processes to:*

- Identify the most promising emerging technologies;
- Actively manage these technologies through the early stages of their maturity curves, and
- Improve communication throughout the agricultural sector of emerging technology success stories.

This strategy will be integrated and coordinated with the cross-cutting emerging technologies strategies to assure that technologies with the most potential to advance energy efficiency in California agriculture are continuously identified, developed, proven and integrated into standard practice throughout the sector as early as possible. Key implementing actions specific to the agricultural sector are:

- Identify and implement emerging technology demonstration sites, and aggressively disseminate results through Strategy #3. (Short, Mid and Long Terms)
- Maximize the sector's potential for cost-effective energy generation by fully supporting the California Solar Initiative and the inter-agency Bioenergy Action Plan for California. (Short, Mid, Long Terms)

The following summary table (Table 5.1) lists the six strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example agricultural energy users and their industry associations, are also critical to the ultimate success of each strategy.

Table 5.1 Agricultural Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Market Characterization and Goal Setting. Establish and maintain a knowledge base sufficient to support planning for development of all available energy efficiency and demand reduction resources.	▪ Conduct energy characterization ▪ Conduct assessment of renewable energy potential ▪ Coordinate data collection and sharing ▪ Develop benchmarking tools ▪ Coordinate goals and supporting accounting systems across public policy initiatives	▪ CPUC ▪ CEC ▪ Utilities ▪ CARB ▪ DWR ▪ CDFA ▪ BuRec
Strategy 2: Workforce Education & Training. Promote the adoption of energy efficiency as standard practice through comprehensive education and training programs.	▪ Identify priorities, objectives and partners ▪ Develop training and certification programs	▪ WE&T Taskforce ▪ Gov't advisers (e.g., Extension Services) ▪ UC/CSU ▪ Community Colleges ▪ Utilities
Strategy 3: Marketing, Education & Outreach. Increase the penetration of energy efficiency technologies and practices through integrated marketing and outreach strategy.	▪ Identify channels and partners for effective ME&O to the sector and individual segments	▪ CPUC ▪ CEC ▪ CDFA ▪ WRCB ▪ Utilities
Strategy 4: Financing and Incentives. Support the adoption of energy efficiency by coordinating the goals, program designs, and funding of all major sources of financing and incentives.	▪ Establish a permanent task force across energy, air, and water funding entities as a clearinghouse ▪ MOU to coordinate programs across funding entities ▪ Avoid legislative and regulatory conflicts	▪ State/Federal Agricultural Credit Agency ▪ CPUC ▪ CEC ▪ Utilities ▪ CARB ▪ DWR ▪ CDFA ▪ BuRec

Key Strategies	Key Near-Term Actions	Key Stakeholders
Strategy 5: Process Energy Intensity. Foster advances in equipment efficiency and improvement of management practices to reduce energy consumption for irrigation pumping, process natural gas, and refrigeration.	▪ Achieve integration across market characterization ▪ Integrate specific actions targeting the three largest energy end uses in the sector ▪ Clarify M&V protocols for onsite water related energy reductions	▪ CEC ▪ Utilities ▪ CPUC ▪ Research organizations ▪ USDOE ▪ USDA ▪ CDFA
Strategy 6: Emerging Technologies. Maximize the energy efficiency contributions of emerging technologies.	▪ Identify and implement emerging technology demonstration sites, and aggressively disseminate results ▪ Maximize the sector's potential for cost-effective energy generation by fully supporting the California Solar Initiative and the inter-agency Bioenergy Action Plan	▪ CEC ▪ Utilities ▪ Research organizations

6. Heating, Ventilation & Air Conditioning

6.1. Vision and Goals

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.[29]

The successful transformation of Heating, Ventilation and Air Conditioning (HVAC) will deliver substantial efficiency and peak load reduction results for residential and small commercial consumers and California as a whole. It is built upon several underlying goals:

- Higher quality installation and maintenance, resulting in part from increased consumer awareness and training for HVAC technicians;
- More consistent and effective compliance, enforcement and verification of existing building standards;
- Development and widespread deployment of new air conditioning technologies optimized for the needs of California's climate, and of system diagnostics that can detect and report HVAC equipment problems, and
- Shifting building industry design and construction to integrated building performance as a standard practice.

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—as well as a leading opportunity to improve energy efficiency and reduce peak power demand. Accordingly, one of the three Programmatic Initiatives determined by the Commission is for the residential and small commercial HVAC industry to be reshaped to ensure optimal equipment performance.[30]

In 1976, 25% of new California homes had central air conditioning. Today, it is 95%, and new home size has increased by more than half. This has 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 30% 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.

Unfortunately, as air conditioning was becoming nearly ubiquitous in new California buildings, installation and maintenance practices suffered substantially as the HVAC industry struggled to provide qualified technicians and took advantage of market conditions that rarely valued quality installation and maintenance. Studies show that 15-50% of central air

conditioning systems were not being properly installed. Californians have paid a large price for this failure by the industry to ensure installation quality and the commensurate erosion in performance. Research shows that it has led to a 20-30% increase in the peak energy needed to provide consumers with the cooling and comfort they demand on hot summer afternoons[31] and an estimated 30% increase in carbon emissions.

HVAC is regulated in California's Title 20 and Title 24 building codes and by federal appliance standards. These Codes & Standards have become increasingly stringent in recent years and (along with related activities such as the promotion of Energy Star-compliant units by utilities and others) help promote the use of more efficient air conditioners. But several barriers reduce their effectiveness and will need to be addressed, including: the use of a national air conditioning metric that does not robustly measure—nevermind promote—the performance of air conditioners in hot, dry conditions such as ours; federal pre-emption of California's ability to set its own air conditioning efficiency standards[32]; inadequate installation and maintenance practices, and building design practices that do not take an integrated approach to lessen the need for AC.

There are numerous other impediments to highly efficient and/or "peak friendly" HVAC systems and practices, and tackling the issue demands a broad-based and aggressive approach with large and lasting results.

6.3. Strategies

Transforming HVAC will require the following strategies and the energetic and concerted actions of numerous key parties, including manufacturers, contractors, technicians and others in the HVAC industry; state, local and federal government agencies; research organizations, end users and electric utilities.[33]

Strategy 1: Develop New and Emerging HVAC Technologies for California's Climate and Buildings.

Strategies for advancing new and emerging technologies are discussed in a separate chapter of this *Plan*. With respect to HVAC in California, a key strategy is one that assertively identifies and commercializes promising new technologies appropriate for the California climate with an eye to peak demand performance in addition to overall energy efficiency.

Past improvements in HVAC energy efficiency have been the result of solid R&D by the HVAC manufacturers, utilities, government, and academia. At the heart of a statewide HVAC strategy is a call for the coordinated development of new and improved HVAC technologies (both equipment and controls, including two-way demand response and onboard diagnostics). Linkages between HVAC manufacturers and utilities will be a key element, as will be additional coordination, particularly around basic research and knowledge transfer by national and state laboratories and academia. Oversight for this strategy can be through an industry task force consisting of representatives from utilities, manufacturers, state governments, national laboratories and academia. As this issue has a regional impact, it would be advantageous to draw

participants from other states that could be interested (e.g., Nevada, Arizona, New Mexico and perhaps Texas).

Strategy 2: Promote Quality HVAC Installation/Maintenance and Improve Code Compliance for Peak Load Efficiency and Performance.

Consumers are not aware of the likelihood or the long-run cost of improperly installed systems and are, therefore, unlikely to seek quality installation. The IOUs, industry trade allies and the state should consider developing a California brand or aligning with a national brand to benchmark, recognize and/or certify quality installation and maintenance and high levels of HVAC technician competence. Subsequently, a marketing and education campaign can introduce and stimulate the demand for the new brand—communicating that quality work results in increased comfort, improved air quality and energy and cost savings.

The quality of HVAC installations can be improved by the development and popularization of such a brand, and:

- Workforce Education & Training for HVAC contractor technicians and sales reps. The first step is to determine the needed skills and audiences and develop training curricula and institutions. (Short Term)
- Education and outreach to increase consumer demand for quality installations and ongoing maintenance, including through seeking the new quality brand. (Short, Mid Terms)
- Regulatory policy changes that give utilities appropriate credit for HVAC education, training, and compliance activities. (Short Term)

The lack of widespread and consistent enforcement of building energy codes has created an environment that allows—if not encourages—HVAC contractors to not comply with state codes and local permitting processes, even though they risk potential penalties resulting from their non-compliance. Unfortunately, the result is that less than 10% of the HVAC systems installed pull permits, and a not much larger share of installations perform in compliance with Title 24.

Options for enhancing compliance with energy Codes & Standards in general can be found in a separate chapter of this *Plan*. With regard to HVAC, specific options include:

- An internet-based system that tracks the status of equipment, from the initial sale to contractors to the final quality check performed by third parties in the field. This would require a significant commitment led by the CEC and includes local building departments, contractor associations and the California State License Board. Development and pilot testing of such a system can begin immediately. Funding could come from existing tax revenues, permitting fees, penalties for non-complying contractors, or other sources. (Short, Mid Terms)
- Streamlined permitting process by local governments, in conjunction with state agencies and utilities. Pilots in this area can begin immediately, with external funding assistance for local governments. (Short Term)

- Simplifying the building code by changing the current quality control requirements for HVAC systems from optional compliance to mandatory measures that would be required for all homes. (Short Term)

Strategy 3: Deploy System Diagnostics to Maintain Quality Performance of HVAC Systems.

Diagnostic systems that automatically collect data and alert consumers and/or contractors when a fault or negative performance trend is detected 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 include promoting:

- Nationwide standards and/or guidelines for onboard diagnostic functionality and specifications for designated sensor mount locations; (Start in Short Term)
- Prioritization of in-field diagnostic and maintenance approaches based on the anticipated size of savings, cost of repairs, and the frequency of faults occurring; (Short Term)
- Benchmarking of existing diagnostic, repair and maintenance protocols, potentially including helping to create a national standard. (Mid Term)

An industry-wide task force should be established to develop the diagnostic protocols. Once protocols have been established, funding can be provided for the development of prototype systems. Subsequently, manufacturers are expected to fund the further development, manufacturing and deployment of diagnostic equipment.

Strategy 4: Promote Whole-Building Performance to Get Better Space Conditioning.

We believe that fundamental changes in current design and building practices are needed to achieve the energy savings desired by Californians. The need for air conditioning can be reduced without diminishing comfort and its effectiveness can be improved by 1) placing more emphasis on the whole building as a complete interactive system and improving the thermal integrity of structures, 2) moving ducts and equipment off the roof and out of hot attics, and 3) incorporating ductless systems, radiant heating and cooling, ground source heat pumps and thermal energy storage.

The primary barrier to such a strategy is that the building trades seldom work together on a complete design/build project. Furthermore, consumers view the increased initial expense as a financial hurdle to overcome as they typically do not factor life cycle costs, increased occupant comfort and reduced energy usage into their decision.

The strategy is to support the concept of designing the building as a complete system. Substantial building owner and design team incentives will be required. Programs could align with this concept to help facilitate the transition. Additionally, code-based solutions can be developed by the CEC and included in Title 24 to support whole building design concepts. Additional support for this strategy is needed from building trade organizations and academia to

provide educational outreach for architects, engineers, designers, contractors, and national organizations such as ASHRAE to lead development of design standards. (Short, Mid Terms)

The following summary table (Table 6.1) lists the four strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example local HVAC service companies and local governments (for code enforcement), are also critical to the ultimate success of each strategy.

Table 6.1 HVAC Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Develop new and emerging HVAC technologies for California's climate and buildings.	▪ Continue coordination and linkages between HVAC manufacturers and utilities	▪ CEC ▪ HVAC industry ▪ Utilities ▪ DOE/EPA ▪ Research organizations such as LBNL
Strategy 2: Promote quality HVAC installation/maintenance and improving code compliance for peak efficiency and performance.	▪ Conduct workforce education and training for HVAC technicians and sales reps ▪ Provide education and outreach to increase consumer demand for quality installations and ongoing maintenance ▪ Consider regulatory policy changes that give utilities appropriate credit for HVAC education	▪ WE&T Taskforce ▪ CEC ▪ HVAC industry ▪ Utilities
Strategy 3: Deploy system diagnostics to maintain quality performance of HVAC systems.	▪ Establish nationwide standards and/or guidelines for onboard diagnostic functionality and specifications ▪ Prioritize in-field diagnostic and maintenance approaches	▪ DOE/EPA ▪ HVAC industry ▪ Utilities ▪ CPUC, CEC
Strategy 4: Promote whole-building performance to get better space conditioning.	▪ Support architect and mechanical engineer usage of the concept of designing the building as a complete system	▪ AIA, ASHRAE ▪ Design/building/HVAC industries ▪ CEC ▪ Utilities

7. Codes & Standards

7.1. Vision and Goals

A broad range of aggressive and continually improving energy Codes & Standards will be adopted to greatly accelerate the widespread deployment of zero-net and highly efficient buildings and equipment. The effectiveness of Codes & 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 unprecedented reliance on mandatory Codes & Standards—both energy codes for building and standards for appliances and equipment efficiency—and pressure for them to perform.

There are several elements of better Codes & Standards performance, all of which need to be successfully addressed:

- Greater stringency in the underlying codes;
- More comprehensive coverage of end uses, including plug loads and building operations;
- Better enforcement and compliance;
- More sophisticated analytics regarding whole buildings and measures, and
- Improved understanding of energy decision makers and their response to market interventions.

Codes & Standards' impact, while enormous, can be enhanced and made even more successful and cost-effective if:

- Integrated with non-regulatory market transformation efforts, such as utility incentives and rebates, Energy Star and other benchmarking, builder and consumer education, etc.;
- Optimized with other regulations, especially AB32 and ambient air quality rules and federal and non-California state energy efficiency standards, and
- Jointly advanced by many entities—public and private—beyond the CPUC and IOUs.

7.2. Profile

There is no policy tool more essential for the widespread and persistent transformation of energy performance in California than energy Codes & 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 standards[34] —to cost-effectively reduce the energy consumption of commercial buildings, homes and appliances. The

effectiveness of energy Codes & Standards is beyond debate—the CEC's 2007 *Integrated Energy Policy Report*[35] 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 & 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.

Barriers to the use or optimal efficacy of Codes & Standards include:

1. Compliance varies enormously, especially with respect to building codes, but is often quite poor.
2. They rely on several units of government: set by the CEC, enforced principally by local governments, and can be preempted by the federal government.
3. They limit consumer and builder/manufacturer choice, which can be controversial.
4. They regulate building design, rather than on actual building performance or use *per se*.
5. Other regulations (such as those addressing global climate change) can and should have a positive impact, but also can confuse or even interfere with energy Codes & Standards if not done optimally.

7.3. Strategies

The strategies described below pursue both sides of the Codes & Standards coin: developing enhanced regulations "on paper," and improving their real world effectiveness, cost-effectiveness and compliance. 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.

Strategy 1: Develop Codes & Standards that Are More Stringent and More Comprehensively Cover Energy-Consuming Applications.

There is a *de facto* symbiotic relationship between more stringent Codes & 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.

The CEC already re-visits and tightens Title 24 building codes on a triennial basis. But 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 AB32—prompts a strategy of new efforts to make the code more stringent and cover more end uses and measures. Elements include:

- Adopting a progressive set of building codes that steadily tighten over the coming years on a pre-determined "trajectory" that aims for the overall 2030 target.

Furthermore, the mandatory code should be linked to two tiers of voluntary higher standards. Together, the three levels comprise a "bronze-silver-gold" approach.[36] (Short, Mid Terms)

  - The trio of mandatory/voluntary standards would be adjusted on a triennial schedule, establishing a "stepped" pattern of tightening standards (i.e., 2011's "gold" becomes 2014's "silver" and 2017's mandatory minimum.)
  - The voluntary tiers would be used for a variety of measures—including utility incentives, public recognition of highly efficient buildings, local governments that want to adopt ordinances that go beyond Title 24—to get buildings designed and built beyond minimum code levels.
  - Lowering the renovation threshold at which the code applies to an entire existing structure can be done similarly, such as if the area of renovation is 25% or more of the entire facility square footage, or 2,000-square-feet, whichever is lower.

- Expanding Titles 24 and 20 to address all significant energy end uses. First on the list are plug loads (e.g., copy machines, printers, battery chargers), which cumulatively are very fast growing; other potential areas include server farms, process loads and water use. (Short, Mid Terms)
- Enhancing Title 24 to include whole-building solutions that currently do not get credit, such as orientation, building size and exterior elements. (Short, Mid Terms)
- Reviewing the statutory framework by which California sets Codes & Standards may be appropriate to ensure that it remains effective for future conditions and needs. (Short Term)

Strategy 2: Improve Code Compliance and Enforcement.

Compliance with California's efficiency Codes & Standards varies enormously, especially with respect to building codes. For example, less than 10% of HVAC systems installed have permits pulled and 30-50% 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% increase in the peak energy needed to provide consumers with the cooling they demand on hot summer afternoons.[37] It has been estimated that a substantial fraction (estimated to be at least 30%) 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.[38]

Measures to greatly improve compliance with efficiency regulations are critical and include:

- Increased training and support for local building code officials: (Short Term)
  - Increase and target education and training for local building officials, focusing on code compliance.
  - Simplify code documentation, and even the code itself, to be more user friendly. Although the code may grow more complex with its increasing stringency and

coverage, it should be reviewed for opportunities to simplify or supersede elements that are unduly complex.

  - Develop and deploy compliance tools and programs to streamline the permit and inspection process.

- Measures for members of regulated industries: (Short, Mid Term)
  - Streamline the permitting process by local governments, in conjunction with state agencies and utilities. Pilots in this area can begin in the near term to explore options and results.
  - Explore an Internet-based system that tracks the status of HVAC equipment, from the initial sale to contractors to the final quality check performed by third parties in the field.
  - Improve accuracy and ease of simulation tools.
  - Provide or support targeted workforce education and training for industry participants, such as home builders and HVAC contractor technicians.
- Encouraging others to support improved practices: (Short, Mid Term)
  - Investigate developing a California brand or align with a national brand, potentially the Energy Star brand, that will certify quality installation and maintenance and/or high levels of HVAC technician competence.
  - Explore, with local government, options for third party-provided compliance, such as using Home Energy Rating System (HERS) raters.
  - Consider regulatory policy changes that give utilities appropriate credit for code compliance activities.

Strategy 3: Improve Code Research and Analysis.

The increasing reliance on regulations, and ones that strive for new levels of stringency and comprehensiveness, will be well served by new research and analysis of how buildings and equipment behave—as well as of how the individuals and companies that build and use them behave.

- Since the future baseline for codes is likely to be zero rather than a relative baseline of previous energy use as is now the case, analysis should commence that will help the code move toward a zero-based approach. (Short Term)
- Analyze, with the goal of future code development, approaches for whole buildings, non-covered end uses (e.g., plug loads) and measures that are not currently credited by Title 24 (e.g., building orientation). (Short Term)
- Review and improve as needed test standards. (Short, Mid Terms)
- Conduct tests and evaluations of potential code change measures. (Short, Mid Terms)
- Increase research and analysis regarding how behavior affects the use of buildings and equipment and code compliance (or lack thereof). (Short Term)

Strategy 4: Improve Coordination of Energy Codes & Standards with Other Programs, Policies and Jurisdictions.

More than most other efficiency policy options, Codes & 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 are committed to playing a larger role in the future to support and/or facilitate future efforts.

- *Coordinate with Other Jurisdictions.* The CEC has lead responsibility for Title 20 and 24 regulations but their work is greatly affected, positively and negatively, by other governmental bodies. (Short, Mid Term)
  - The federal government has primary responsibility for appliance/equipment standards. In fact, if a given product is regulated by the federal government, state regulations are pre-empted.
  - Local governments in California enforce Title 24, as discussed in the compliance strategy in this section.
  - The statutory framework may be amended by the legislature and governor.
  - Although California is a very large market in its own, its adoption of appliance/equipment standards can be benefited by parallel action of other states.
- *Coordinate with Other Regulations*. Several current and future regulations affect energy use, but none more so than those that will be promulgated pursuant to AB32. CARB, the CPUC and the CEC will need to continue to communicate and coordinate to ensure that the overlapping efficiency and climate goals substantively support each other and do not send mixed direction to regulated parties. (Short Term)
- *Coordinate with Other Efficiency Programs*. Codes & Standards by their nature are more focused on eliminating inefficient products and practices than on developing or popularizing new highly efficient ones. Accordingly, Codes & Standards should be coordinated with efficiency programs that do just that, namely: (Short, Mid Term)
  - Utility incentive and rebate programs
  - Emerging technology and R&D efforts
  - Voluntary benchmarking and labeling schemes, such as Energy Star, LEED and ASHRAE
  - Government-supported incentives, such as federal tax credits
  - Efforts promoting efficiency for building types that are not regulated by Title 24 (e.g. hospitals), such as voluntary energy codes for those building types
- *Coordinate with Affected Parties*. Although regulations can be contentious, they benefit from good communication with affected parties, in particular the regulated industries (both individual companies and trade associations) as well as key stakeholders, such as efficiency advocates. Robust communication can improve Codes & Standards: (Short, Mid Term)

- Enhanced intelligence about existing or anticipated technologies and products, including their cost, performance and usage.
- An avenue to negotiate before adoption regarding stringency, covered products and deadlines.
- Opportunities to better enforce the Codes & Standards and identify problems and violators.

The following summary table (Table 7.1) lists the four strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example individual code officials, are also critical to the ultimate success of each strategy.

Table 7.1 Codes & Standards Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Develop Codes & Standards that are more stringent and more comprehensively cover energy-consuming applications.	▪ Adopt a progressive set of building codes ▪ Expand Titles 24 and 20 to address all significant energy end uses ▪ Enhance Title 24 to include whole building ▪ Review C&S statutory framework	▪ CEC ▪ DOE/EPA ▪ Legislature and Governor
Strategy 2: Improve code compliance and enforcement.	▪ Increase training and support for local building code officials ▪ Adopt specific measures for regulated industries ▪ Encourage others to support improved practices	▪ Local governments ▪ Utilities ▪ CEC
Strategy 3: Improve code research and analysis.	▪ 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 ▪ Review and improve as needed test standards ▪ Conduct tests and evaluations of potential code change measures ▪ Increase research and analysis regarding how behavior affects use of buildings and code compliance	▪ CEC ▪ Research organizations such as LBNL
Strategy 4: Improve coordination of energy Codes & Standards with other programs, policies and jurisdictions.	▪ Coordinate with other key jurisdictions, regulations, efficiency programs and affected parties	▪ CPUC, CEC, CARB ▪ Federal government ▪ Utilities ▪ Legislature ▪ Local governments

8. DSM Coordination and Integration

8.1. Vision and Goals

All demand-side management[39] *programs are coordinated and, as appropriate, integrated to increase the penetration of energy efficiency and to avoid lost opportunities.*

Short-Term Goals

1. Develop a working definition of integration that incorporates both the integration of technologies as part of comprehensive solutions and "transformational integration" that links policies and programs over a technology's lifecycle.
2. Identify the path to full DSM coordination and integration through a strategy that: 1) tests integrated delivery and, 2) creates a forum for ongoing exploration of the broader integration issues across technologies and all along the product lifecycle.

Long-Term Goals

1. Energy efficiency and conservation, demand response and distributed customer technologies are offered as elements of an integrated solution supporting sector net energy reduction goals. As well, a robust infrastructure has developed to support the delivery and maintenance of integrated solutions.
2. California regulatory agencies and other authorities coordinate their goals and efforts such that energy, water and GHG regulators use a common metric to the maximum extent possible for measurement.
3. Energy, water and GHG regulations are mutually supportive.

8.2. Profile

Views of the breadth and scope of this issue vary widely and range from data collection methods to overarching regulatory/social policies. For the purpose of discussing and identifying long-term goals, the broadest definition applies. However, in implementation, DSM integration refers to implementation of technologies and practices at two levels:

- Energy efficiency and conservation, demand response, demand reduction and customer generation (including renewable generation and combined heat and power, CHP)
- Energy, water and regulated greenhouse gases

Integration across DSM options and across energy, water and GHG agendas offers generally accepted opportunities to achieve greater benefits through synergy[40] and removes a significant barrier to participation by some consumers, particularly industrial consumers. The burden of sorting through myriad forms, program rules and operational elements of independent

efforts appears to inhibit adoption of measures and practices. Lack of integration can also create lost opportunities in which adoption of one type of measure precludes adoption of others.

Barriers, Risks, Uncertainties. Integrating across technologies and/or objectives is not simple:

- Administrative boundaries among and within agencies inhibit consistent goals and programs.
- There may be authority limits that prevent sufficient agency cooperation.
- The relationships among energy, water and GHG emissions are correlated, but not perfectly so (e.g., all actions to reduce GHG do not reduce energy demand and vice-versa).
- Knowledge/training gaps regarding DSM integration exist to varying extents among all stakeholder groups.

8.3. Strategies

Strategy 1: Establish Integration Procedures and Determine the Limits of Integration through Pilot Projects.

The best path to 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, customer 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 access to information. The pilots will be designed to provide insights into:

1. Internal organizational issues related to integrated delivery including cost allocation, accounting and project management.
2. Policy issues that constrain delivery of an integrated offering.
3. Technical issues associated with effectively and efficiently integrating technologies within a building.
4. Technology and other gaps.
5. Issues related to the market infrastructure for delivering a bundled offering (e.g., lack of coordination among involved trades, lack of post-installation support, etc.).
6. The reductions in net energy consumed by the buildings participating in the pilots.
7. The costs associated with the net energy reductions.
8. Consumer attitudes related to the bundled offering.

9. The availability and appropriateness of existing methodologies and analytical tools for determining the optimal mix of energy efficiency, customer generation and demand response.
10. The range of possible metrics to describe the benefits and costs of integrated products including environmental impacts.

Strategy 2: Develop a Shared Vision and Process for Regulatory Coordination, and Enhance Regulatory Coordination.

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 AB32 with its corresponding impact on both energy efficiency and conservation and GHG emissions is a key driver for action.

Near-Term Action

- Establish a framework for improved regulatory coordination and develop a shared vision for the state.

Mid-Term Action

- Develop and implement a comprehensive, coordinated long-term approach to the entire portfolio of regional, state, and local regulations affecting California efforts toward improving long-term effective utilization of energy resources while also achieving GHG emissions reduction, water conservation, waste disposal, and air quality requirements.

The following summary table (Table 8.1) lists the two strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example individual program managers, are also critical to the ultimate success of each strategy.

Table 8.1 DSM Integration Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Establish integration procedures and determine the limits of integration through pilot projects.	▪ Propose and launch pilots testing capabilities and effectiveness in the marketplace	▪ Utilities ▪ CPUC
Strategy 2: Improve regulatory coordination.	▪ Establish a framework for improved regulatory coordination and develop a shared vision and process for regulatory coordination in California	▪ CPUC ▪ CEC ▪ CARB ▪ Legislature ▪ Governor

9. Workforce Education & Training

9.1. Vision and Goals

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.

California must quickly increase statewide efforts to train people at all levels to plan, administer, and deliver energy efficiency, both in the public and private sectors. This effort will require concerted planning among secondary and post-secondary educational leaders, technical and professional organizations, state agencies, economic and labor development organizations, utilities, and construction and manufacturing businesses that deliver energy efficiency solutions. Such an effort requires a wide variety of initiatives and multiple funding sources beyond ratepayer funds.

9.2. Profile

One of the limitations to increased energy-efficiency activity is a shortage of human resources—people trained in the various aspects of energy-efficiency engineering, construction, maintenance, program design and implementation, financial analysis, etc. Energy efficiency industry representatives, both public and private, are often identified as a top barrier in the shortage of qualified people to support the implementation of energy efficiency activities. Thus, meeting the goals established in this *Plan* will require at least two categories of staffing requirements: completely new types of jobs that don't exist today (e.g., "corporate emissions manager") and supplemental training to existing positions (e.g., training stationary engineers to enhance their awareness of energy efficient operations).

Workforce Education & Training (WE&T) is a long-term, cross-cutting activity with important intersections throughout all market sectors. WE&T focuses on workforce issues—educating and training people to perform the jobs needed to reach California's clean energy goals. This is different than the broader cross-cutting activity of consumer education (i.e., informing people and organizations of efficiency opportunities), which is addressed in the Marketing, Education & Outreach chapter.

9.3. Strategies

The *Plan* recommends (a) immediate overarching actions and (b) for each education sector, both 2009-2011 actions and long-term strategies. However, it should be noted that those recommendations have not been validated by a formal needs assessment and represent only a snapshot of sector input. The overarching actions described below will initiate a process to more thoroughly define and vet the long-term WE&T strategy. All of the market sectors and other areas have specific WE&T strategies and actions that are important for reaching their vision and goals. Actions associated with WE&T that are only applicable to a given sector are described in

each applicable chapter; other actions that are more generic to all sectors are described in this section. Five activities are needed to drive long-term WE&T development and strategic planning.

1. **Conduct a 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 should be structured in such a way as to produce short-, near- and long-term strategies for implementation. The assessment should be completed by a third-party with its process managed by the CPUC and IOUs.
2. **Review Cost Effectiveness.** For any IOU involvement, assess the current cost-benefit mechanism and determine if it is an appropriate mechanism for Workforce Education & Training efforts.
3. **Create a WE&T-specific 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.
4. **Establish an Ongoing Dialogue With Market Players.** To maintain the momentum gained through this *Plan*, an ongoing dialogue with market and educational sectors needs to be created. Existing high-level forums (e.g., the New Energy Economy Summit) can be utilized to engage sector decision makers and legislative/gubernatorial representatives regarding continuous coordination and development of a statewide DSM workforce training and job creation strategic plan.
5. **Form an IOU/CPUC WE&T Task Force.** A task force would develop the needs assessment RFP, select the third party to conduct the needs assessment, and manage the needs assessment evaluation. This Task Force may also be involved in the ongoing dialogue that is described in this *Strategic Plan* for continuing development of statewide WE&T activities.

Workforce Education & Training needs are best organized and approached by identifying the enabling or supporting educational sectors. Five educational sectors were identified. The summary table below (Table 9.1) lists the overarching strategies/actions described in this chapter as well as some strategies/actions for each educational sector. Other potential actions are described in the WE&T convener report. There is also a listing of some principal stakeholders in Table 9.2. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example individual training institutions, are also critical to the ultimate success of each strategy.

Potential Funding Sources and Partnership Opportunities

Addressing these human resource requirements will require collaborative efforts of many entities. Below are those identified as potential participants in defining and/or providing WE&T resources.

- **Government.** California Department of Education, federal and state government and local governments to recruit train and prepare workforce candidates for technical and professional careers.
- **Financial institutions.** Leveraging the Community Re-Investment Act.
- **Community-based and non-profit organizations.** Leverage programs and/or organizations funded to provide education, career development and workforce training programs (i.e., Greenlining Institute, Apollo Alliance, etc.).
- **Industry organizations.** Co-funding with educational institutions, training centers and community-based organizations to recruit, train and prepare workforce candidates for technical and professional careers.
- **Labor organizations.** Co-funding with educational institutions, training centers and community-based organizations to recruit, train and prepare workforce candidates for technical and professional careers.
- **Investor-owned utilities.** Provide input for WE&T programs to address the technical and professional skills necessary to achieve California's economic energy efficiency potential.

Table 9.1 Objective and Example Actions by Educational Sector

Educational Sector	Objective	2009-11 Actions	Mid-Term Actions
K-12	Energy education should begin in primary grades and continue through high school. The energy education should address energy efficiency fundamentals and career potential in energy-related fields.	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.
Adult Education/ Community Colleges	Support the community college and adult education efforts to allow students to develop their education based on their career paths. Ensure that there are appropriate linkages with the K-12 educational sector. Utilize this sector to provide technical energy training.	Identify opportunities to utilize community colleges to provide technical training such as solar installation and building operator certification.	Coordinate with the community colleges and adult education sector to incorporate an energy component into their career laddering concept.
Technical Training (labor, trade and industrial organizations)	Assist with the current need for technically trained installers, energy auditors and building energy operators through training. Incorporate energy efficiency into traditional contractor roles such as plumbers and electricians.	Increase building operator training curricula, training and professional career development programs.	Assess the feasibility of foreign language classes for field workers to increase energy efficiency knowledge and proficiency.
Higher Education	Create or expand programs with energy focus and foster a green campus focus for campuses.	Utilize existing UC/CSU extension programs to incorporate a continuing education curriculum component.	Utility and industry organizations contribute to tailored curriculum.
Minority, Low-Income and Disadvantaged Communities	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.	Leverage Marketing Education & Outreach and task force to partner w/ community-based organizations and provide targeted outreach.	Train qualified diverse business enterprises from minority, low-income and disadvantaged communities to be more efficient.

Table 9.2 Workforce Education and Training Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Overarching. Five activities identified for creating integrated and collaborative support structure needed to drive long-term WE&T.	▪ Develop statewide WE&T needs assessment ▪ Analyze cost-benefit mechanisms for utility support ▪ Create WE&T specific web portal ▪ Establish an on-going dialogue with market actors ▪ Form WE&T Task Force	▪ Department of Education ▪ CPUC ▪ Utilities
K-12. Provide energy and environmental curriculum to promote the pursuit of energy efficient careers, as guided by high school career counselors.	▪ Identify opportunities to leverage governor's career technical initiative	▪ Department of Education ▪ School districts
Adult Education & Community Colleges. Drive enrollment by offering certification and degree programs that focus on energy efficiency and demand side management careers	▪ Identify opportunities to utilize community colleges to provide technical training such as solar installation and building operator certification	▪ California Community Colleges
Technical Training. Certify technicians and contractors and include financial analysis skills needed to sell energy efficient projects to consumers.	▪ Increase building operator training curriculums, training and professional career development programs in general	▪ Department of Education ▪ Industry associations
Higher Education Programs. Offer relevant degreed program tracks, courses, internship opportunities to support academic learning.	▪ Utilize existing UC/CSU extension programs to incorporate a continuing education curriculum component	▪ UC/CSU
Minority, Low-Income and Disadvantaged Communities. Target communities to reach a high degree of participation and graduation from training and education programs.	▪ Leverage ME&O and WE&T task forces to partner with CBOs and provide targeted outreach	▪ California Community Colleges ▪ CBOs

10. Marketing, Education & Outreach

10.1. Vision and Goal

Californians are engaged as partners in the state's energy efficiency, demand-side management and clean energy efforts for 2009 and beyond with the dual goals of informing them of the importance of energy efficiency, and their opportunities to take action.

ME&O activities will create and maintain a consumer culture in which the current emphasis on first-cost minimization and immediate results is supplanted by understanding and acceptance that energy efficiency investments are beneficial financially and environmentally.

10.2. Profile

Because many consumers believe they are already doing everything they can to save energy, convincing them they can do more and how they can do more is the key to maximizing participation. Synergistic advertising, marketing and outreach efforts should be applied in all market sectors to educate and inform consumers about what they can do and how to take specific action.

The ME&O strategies were created from insights gleaned from various thought leaders, marketing experts, and branding professionals who were invited to participate in the ME&O Task Force working group meetings. The task force, which was established by the CPUC and comprised of Commission and IOU representatives, will recommend a long-term strategic marketing plan.

The ME&O strategies are shaped by six major themes:

- **Integrated Marketing.** Accomplishing the long-term goal of maximizing energy savings and changing consumer behavior requires a marketing effort integrated across all stakeholders with responsibility for energy efficiency in all sectors. An effective marketing effort will move consumers through a continuum from awareness, to attitude change, to action. Consistent with this CPUC Decision, integrated marketing also involves integrated presentation of programs, products and services in a comprehensive manner that makes sense and maximizes benefits to the consumer.
- **Social Marketing.** A social marketing approach can be effective in creating emotional and intellectual drivers for making a commitment to change and participating in energy efficiency.
- **Branding.** The impact of statewide marketing efforts can be increased if actions and messages are consistent across all message sources. Branding of "California Energy Efficiency" with clear delineation of what the brand encompasses is key to achieving high levels of awareness statewide, and increased market penetration for the statewide utility programs envisioned in this *Plan*. In addition, linking the statewide brand to

programs offered by the utilities within their respective service territories will contribute to market penetration.

- **Technology.** The Internet offers cost-effective opportunities for creating and maintaining an ongoing energy efficiency dialogue to promote behavior change. "Smart meters" and "smart home" technology will enable consumers to better and more actively manage their energy use.
- **Demography.** ME&O must include cost-effective, "in-language" DSM solutions with appropriately shaped messages to maximize participation, market transformation and adoption of long-term energy efficiency behaviors.
- **Global Warming Awareness.** Although a majority of Californians are aware of climate change and believe it is occurring now and will continue into the future, many do not understand how they can take action to reduce their carbon footprint.

10.3. Strategies

The ME&O strategies are the engine of the ME&O strategic theme. Information communicated through the strategies may be integral to other strategic themes including incentives, Codes & Standards, Market Transformation, economics and rate design, and Emerging Technologies.

Further collaboration is needed to refine and further specify the strategies. This collaboration will involve the ME&O Task Force, industry leaders, public players (such as local government), developers, consumers, retailers, manufacturers, and marketing professionals (e.g., brand strategist, web portal developer, etc.).

Funding required to successfully implement the strategies will be from a combination of ratepayer and public sources, corporate sponsorships, Energy Star, and added-value opportunities earned through advertising/media buys (e.g., Public Service Announcements).

The ME&O strategies with key implementing actions are as follows:

Strategy 1: Explore the Use of a Recognizable and Trustworthy Brand for California's Energy Efficiency and Other DSM Consumer Products and Services.

- Assess equity in the current statewide Flex Your Power brand (Short Term)
- Launch integrated energy efficiency/DSM brand (Mid Term)
- Evaluate progress/refine strategy (Mid Term)

Strategy 2: Utilize Statewide Segmentation Research to Develop Targeted and Highly Relevant Energy Efficiency and DSM Marketing Messages to Incite Behavior Change/Action.

- Develop a plan to undertake research to define discrete consumer segments. (Short Term)

- Develop a plan to undertake research that will describe segmented interests, awareness, attitudes/perceptions related to energy efficiency and global warming messaging including common language/terminology. (Short Term)
- Evaluate progress/refine the segmentation. (Mid Term)

Strategy 3: Use Social Marketing Techniques to Build Awareness and Change Consumer Attitudes and Perceptions.

- Develop a roadmap for a social marketing approach. (Short Term)
- Evaluate progress/refine approach. (Mid Term)

Strategy 4: Explore Developing a Website with Statewide Information on GHG Reductions, Efficiency and DSM Awareness and Options.

- Explore developing a website to serve as a virtual "one-stop shop" for consumer access to information about energy efficiency, DSM, climate change, efficient products and services, and related environmental concerns.
- Assess equity of current Flex Your Power website. (Short Term)
- Enlist a technical expert to develop an energy efficiency/DSM website/portal that is "best in class," incorporates best practices, integrates statewide branding efforts and maximizes user engagement. (Short Term)
- Gear initial website/portal development efforts to energy efficiency/DSM industry. (Short Term)
- Enhance website/portal for consumer end use. (Mid Term)
- Examine current regulatory rules to identify barriers/constraints which may impede effective integration of programs and partners and implementation of the ME&O strategic plan. (Short Term)
- Integrate technology into ME&O efforts across all market sectors. (Short, Mid Terms)
- Establish clear objectives and metrics for the statewide campaign prior to its launch including appropriate evaluation mechanism. (Short Term)

The following summary table (Table 10.1) lists the four strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example marketing and media organizations, are also critical to the ultimate success of each strategy.

Table 10.1 Marketing, Education & Outreach Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Explore the use of a recognizable and trustworthy brand for California's energy efficiency and other DSM consumer products and services.	▪ Assess equity in the current statewide Flex Your Power brand	▪ CPUC ▪ CEC ▪ CARB ▪ Utilities
Strategy 2: Utilize statewide segmentation research to develop targeted and highly relevant energy efficiency and DSM marketing messages to incite behavior change/action.	▪ Develop a plan to undertake research to define discrete consumer segments ▪ Develop a plan to undertake research that will describe segmented interests, awareness, attitudes/perceptions related to energy efficiency and global warming messaging including common language/terminology	▪ CPUC ▪ CEC ▪ Utilities
Strategy 3: Use social marketing techniques to build awareness and change consumer attitudes and perceptions.	▪ Develop a roadmap for a social marketing approach	▪ CPUC ▪ CEC ▪ Utilities
Strategy 4: Explore developing a website with statewide information on GHG reductions, efficiency and DSM awareness and options.	▪ Enlist a technical expert to develop an energy efficiency/DSM website/portal ▪ Gear initial website/portal development efforts to energy efficiency/DSM industry ▪ Examine current regulatory rules to identify barriers/constraints Integrate technology into ME&O efforts ▪ Establish clear objectives and metrics for the statewide campaign	▪ CPUC ▪ CEC ▪ CARB ▪ Utilities

11. Emerging Technologies

11.1. Vision and Goals

Technology advancement related to energy use has matched—or even eclipsed— the consumer electronics industry in innovation, time to market and consumer acceptance.

The long-term goal of coordinated statewide Emerging Technologies (ET) programs is to identify, evaluate, and contribute to the deployment of incremental and game-changing technology innovations that drive consumer engagement and integrated energy program success.

Technology advancement is fundamental to achieving California's energy efficiency vision and goals. While technology breakthroughs do occur, the timing requirements of California's goals demand 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 and deployment, and demand-side program integration. Finally, since technology development benefits from user feedback, market testing is critical.

To meet the needs of more fully integrated demand-side initiatives, including especially the Big Bold programmatic initiatives defined by the CPUC, four basic concepts shape the strategies proposed to support technology advancement:

- ***Target resources on technology that supports Big Bold goals and leverage resources wherever it is productive.*** Achieving the goals of California's energy efficiency agenda requires profound improvement in the efficiency of equipment as well as new technologies aimed at achieving more efficiency from existing buildings than can be achieved almost at any cost today. Also, working together with other sources of funds to achieve common goals provides leverage to achieve orders of magnitude increases in benefits.
- ***Integrate "customer side of the meter" activities.*** Broaden the Emerging Technologies program focus to address combinations of energy efficiency, demand response, renewable generation, permanent load shifting, and GHG initiatives.
- ***Expand market intelligence activities and include social science research on the role of human factors in technology adoption and use.*** Achieving the goals of the Big Bold initiatives—and more importantly, managing the pace of climate change—will require understanding and leveraging markets, consumer behavior and their interactions with technology.
- ***Expand piloting/trials and facilitate and expand technical, market and operational feedback.*** Expand existing and create new alliances with state, national and international ET assessment partners such as CEC PIER, municipal utilities, the New York State Energy Research and Development Authority, EPRI, Gas Technology Institute, national labs, and customer groups. Upstream relationships and channels are

also useful to generate support leading to the increase in the utilization of efficient products.

In addition, more and faster feedback will be required to and from the general research and development community, utility and non-utility pilot programs and large-scale utility programs and general market satisfaction/performance. Such feedback will help to increase the pace of technological change, which is needed to accomplish increasingly aggressive energy- and demand-reduction goals. In addition, improving the capture and communication of best practices in technology implementation will be required to maximize the contributions of promising new technologies to achieve more aggressive energy goals.

Addressing these themes will require several changes to the priorities and methods of technology programs. These include increased emphasis on targeted technologies, market channels for delivering innovations that show promise after initial trials, understanding the role of behavior in the adoption and use of technology and creating feedback loops to the general research and development community to ensure the most effective and expeditious research and development and ET process possible.

The Emerging Technologies Coordinating Council (ETCC) was founded in 2000 to coordinate statewide emerging technology efforts directed at energy efficiency and renewable resource development. While the ETCC will continue to be a valuable forum, efforts must reach further back into the R&D process and deeper into the operational environments of technologies to better understand the behavioral elements of purchasing and operations. However, as reflected in the strategies below, the composition of the ETCC may evolve over time as required to engage new stakeholders in the ET process.

11.2. Profile

Technology advances through numerous stages from concept to prototype to demonstration to market introduction. Once introduced, technologies go through several additional phases from the leading edge to general acceptance, if successful. Of course, not all technologies complete both processes. Also, the processes are not cleanly linear. For example, technology re-engineering/modification can occur at many points in response to various forms of feedback. Progress through these stages is influenced by both direct (subjective and objective evaluation) and indirect (market performance/demand) feedback. As such, the path from R&D to the marketplace is as circular as it is linear.

Currently, utilities support energy efficiency technology advancement through programs that identify, evaluate, and contribute to the deployment of technology innovations to drive the success of demand-side energy programs. This focus is consistent with goals established by the ETCC.

11.3. Strategies

New technologies that use the minimum energy as well as new energy efficiency technologies (e.g., insulation) are fundamental to a transformed market. However, neither utility

programs nor the ETCC create technology or drive technology advancement. Utility programs can only support the process and create an element of market pull such as for super-efficient refrigerators. California's energy efficiency goals require substantial changes in all stages of the technology advancement cycle including technical, marketing and operational. To that end, among the first priorities is to develop a technology business plan. The goal of the plan is to target and leverage existing resources to the maximum extent to stimulate the profound transformation in technology and related market dynamics that are needed. The technology business plan will be developed in concert with the CEC and other state agencies that fund technology programs and initiatives. Strategies to help them emerge more quickly and forcefully include:

Strategy 1: Enhance Market Intelligence and Behavioral Research Activities.

Ramp up targeted market intelligence-gathering and feedback activities related to energy efficient technologies, including:

- 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.

Strategy 2: Expand Activities to Create Market Pull for Energy-Efficient Technologies.

Develop knowledge-management systems to streamline feedback processes, increase ET program effectiveness, and prevent duplication of effort; leverage results from successful performance assessments/positive market feedback and employ knowledge transfer from successful technologies/technology applications outside California to establish and communicate market demand/acceptance.

Strategy 3: Promote Upstream Channels and Investment in Promising Energy Efficiency Technologies.

Create an investor-ET network to share market demand and channel intelligence, technology assessment results, and expedited access to incentive programs. Establish enterprise incubators for integrating technologies into production programs. Expand and establish upstream relationships and channels (e.g., manufacturing processes and distribution) to effectively target and generate support for energy-related technology that leads to the increase of the development and utilization of energy-efficient products and practices.

Strategy 4: Drive Product Improvement and Adoption Activities.

Work collaboratively with technology providers and the R&D community to promote cost-effective performance enhancements of existing technologies for increased consumer demand and market penetration. As with entrepreneurs and investors, a potential approach is sharing market intelligence, technology assessment results, and expedited access to incentive programs.

Strategy 5: Focus on the "Leading Edge"

A strategic focus on the leading edge of technology, products and practices is needed to balance embedded trends toward increased attention to the mainstream. The leading edge needs to be nurtured, including strong engagement with (and study of) existing zero net energy buildings and other leading edge projects by the research and development community and to emerging technologies programs.

The following summary table (Table 11.1) lists the five strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example individual technology companies, are also critical to the ultimate success of each strategy.

Table 11.1 Emerging Technologies Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Enhance market intelligence and behavioral research activities.	▪ Identify and prioritize consumer needs, behavioral drivers, and decision processes ▪ Assess technology specific market potential	▪ CEC ▪ Utilities ▪ Industry stakeholders
Strategy 2: Expand activities to create market pull for energy-efficient technologies.	▪ Develop knowledge management systems	▪ CEC ▪ Utilities ▪ Industry stakeholders
Strategy 3: Promote upstream channels and investment in promising energy efficiency technologies.	▪ Create an investor-ET network to share market demand and channel intelligence, technology assessment results, and expedited access to incentive programs	▪ CEC ▪ Utilities ▪ Industry stakeholders
Strategy 4: Drive product improvement and adoption activities.	▪ Work collaboratively with technology providers and the R&D community to promote cost-effective performance enhancements of existing technologies	▪ CPUC ▪ CEC ▪ CARB ▪ IOU ▪ Industry stakeholders
Strategy 5: Focus on the “Leading Edge.”		▪ CEC ▪ CARB ▪ Utilities ▪ Industry stakeholders

12. Roles of Local Governments

12.1. Vision

By 2020, all of California's local governments will be operating within an energy efficiency and renewable resource environment that is characterized by integrated state approaches, local engagement and cooperation, and informed energy action.

Local engagement and cooperation. Cities and counties can actively engage energy efficiency and greenhouse gas issues, and participate in local and regional initiatives targeting energy efficiency.

Informed energy action. Cities and counties can aggressively pursue energy efficiency goals and work with their respective utilities to formulate community outreach to impact the energy usage of their constituents.

Best practices and education. All government buildings and infrastructure can showcase energy efficiency best practices. Professional licensing examinations should include an energy component for inspectors and contractors licensing.

Integrated state approaches. Cities can pursue their energy efficiency policies more effectively if state agencies' policies, strategies and actions regarding energy efficiency become better integrated across energy efficiency, demand response, and environmentally preferred renewable energy.

12.2. Profile

Local governments perform a number of key functions relating to promoting energy efficiency, energy conservation and renewable energy resource development. Any statewide plan must recognize, strengthen and reinforce the capacity and interest of local governments in carrying out functions including:

- Setting goals and establishing policies and programs, including "green" or "sustainable" communities;
- Leading by example, with built projects and implementation of policies;
- Enforcing state energy efficiency codes;
- Adopting local codes for new and existing buildings that are stricter than the state's Title 24; and
- Creating incentives for projects that voluntarily exceed state and local minimum energy codes.

The term "local government" refers primarily to cities and counties, which have land use authority. However, there are also important roles for regional government, metropolitan planning organizations, school districts and special districts.

12.3. Strategies

The integration of mandatory Codes & Standards with incentives for voluntary "beyond code" actions is an approach highlighted within this *Plan*. The *Plan* calls for a progressive set of minimum Codes & Standards that steadily tightens over time, linked to two tiers of voluntary higher ("beyond code") standards. Together, the mandatory and voluntary standards comprise a "bronze-silver-gold" hierarchy of building performance that can used for a variety of local government initiatives to surpass Title 24, such as local ordinances and as reference points for public recognition and procurement of exemplary buildings.

Some market sectors—notably the residential and commercial sectors—have specific local government strategies and actions that are important for reaching their vision and goals. Those strategies are described in the respective market sector chapters. Strategies and actions that are more generic to all sectors are described in this section.

Strategy 1: Simplify and Standardize State Policies and Codes Guiding Local Building, Community Design and Zoning Codes.

Although local governments need the freedom to develop unique building, community design and zoning codes for their jurisdictions, too much variation can discourage developers from consistently creating energy-efficient and green buildings on a statewide or regional scale. This strategy will help make local codes more consistent community-to-community while preserving flexibility for community-specific approaches.

In addition to local governments, key participants in this strategy will be the CEC and CPUC, the IOUs and other utilities, and the legislature. Key implementing actions are:

- Achieve the enactment of legislation and/or promulgation of regulations:
  - To implement consistent building codes comprising mandatory "bronze" and voluntary "silver" levels, and leaving a "gold" tier of code level for local governments to customize to their unique policy preferences. (Short Term)
  - To require disclosure, rating and/or energy efficiency upgrades when a property changes hands. (Short Term)
  - Establish statewide energy rating systems for all buildings. (Short, Mid Terms)
- Develop model local ordinances or programs to assist cities and counties that wish to participate in regional, coordinated efforts for energy efficiency, renewables, green buildings, and zoning. (Short Term)
- Establish expedited permitting and entitlement approval processes, fee structures and other incentives for green buildings and developments. (Short Term)

- Dramatically improve enforcement of building and zoning codes, and enforcement of state HVAC permitting and inspection requirements. (Short Term)

Strategy 2: Build Capacity for Local Governments to Lead by Example.

In order to effectively promote energy efficiency in their communities, cities and counties can lead by example and embrace energy efficiency in their own facilities. While many local governments are able to undertake energy efficiency projects, many still do not have the staff or resources to undertake such activities. This strategy addresses that problem.

Key participants in the strategy will be local governments, the CEC and CPUC, and the utilities. Cornerstone activities envisioned under this strategy are:

- Mechanisms to encourage cutting-edge initiatives and innovation, such as an *Innovation Incubator* that competitively selects initiatives for presentation and inclusion in local government pilot projects. (Short Term)
- A statewide effort to enable and facilitate peer-to-peer learning, such as a "local champions" program or a governor's invitation-only local government leaders' summit. (Short Term).

Other important actions, some arising from the workshop process, could include:

- Creation of incentive programs to facilitate local and regional agency projects that are smaller than 500,000 kWh per year and are best managed using standard performance contracts. (Short Term)
- Addressing the incentive/disincentive effects of utility tariffs for small electrical generation using sustainable energy development and alternative energy resources such as photovoltaics. (Short Term)
- Development of peer-to-peer training and "roving consultant" programs organized at the state or regional level. (Short Term)
- Lowering the interest rate of the CEC's low-interest loan fund for public agencies below its current rate of 3.95% to support local government energy efficiency initiatives. (Short Term)

Strategy 3: Maximize Energy Efficiency in New and Existing Construction through Local Government Policy.

In many jurisdictions, outdated zoning codes actually prohibit smart growth, but funds and capacity do not exist in-house to upgrade them. Local governments, however, have an array of policy tools at their disposal. A broad vision for more resource efficient communities is useful if set forth in general plans.

Collaboration and cooperation among the utilities, the CEC and CPUC, local governments and other market players will advance this strategy. A topic for early discussion is

whether and how public goods charge funding might be used to support development or updating of general plan energy elements.

Key implementing actions for this strategy are:

- Require commissioning for new buildings, and re-commissioning and retro-commissioning of existing buildings.
- Reduce peak electricity load in summer months in inland areas through increased permitting, inspection and enforcement of codes pertaining to HVAC to improve HVAC installation quality.
- Institute community design, land use and zoning policies that promote energy efficiency and smart growth.
- Explore creation of a line item in city and county budgets or other options that allow energy efficiency cost savings to be returned to the department and/or projects that provided the savings, in order to fund additional energy efficiency.
- Require redevelopment agencies to address energy efficiency in development contracts.
- Negotiate energy efficiency into developer agreements on major projects.
- Create local point-of-sale and point-of-lease energy efficiency requirements, and building energy ratings that must be disclosed at these points**.**

Strategy 4: Rapidly Upgrade and Expand Energy Efficiency Training and Information for Local Governments.

Many local governments no longer have dedicated energy staff and/or lack 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 & Training strategies outlined elsewhere in this *Plan* are one vehicle for attacking these issues. Other implementing actions are:

- Leading local governments give technical assistance to local governments with less capacity, and share models and best practices through networking, workshops and other means.
- Create opportunities for more regional technical assistance and education centers such as those in Marin, Ventura and Humboldt to work with local governments, schools and special districts in their areas.
- Statewide nonprofit organizations—such as the International Council for Local Environmental Initiatives (ICLEI), Local Governments for Sustainability, and Local Government Commission and Institute for Local Government—can give technical assistance, offer targeted online and written tools, and share the overarching vision, and best practices in conferences and workshops.

- Offer various appropriate training for local government and public school-elected officials, decision makers, and building, maintenance and planning staffs.
- Create a menu of products, services, approved technologies and delivery channels for local governments that currently lack deep expertise in energy efficiency.

The following summary table (Table 12.1) lists the four strategies described in this chapter as well as a listing of some related near-term actions and principal stakeholders. These stakeholders are identified at this time as having a major role in defining and/or implementing the strategies. This list of stakeholders is not intended to be exclusive since other stakeholders, for example individual commercial, industrial, residential and agricultural energy users, are also critical to the ultimate success of each strategy.

Table 12.1 Local Government Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Simplify and standardize state policies and codes guiding local building, community design and zoning codes.	▪ Achieve the enactment of legislation and/or promulgation of regulation ▪ Develop model ordinances/programs ▪ Establish expedited permitting/ entitlement approval processes, fee structures and other incentives ▪ Dramatically improve enforcement of building and zoning codes and enforcement of HVAC permitting and inspection requirements	▪ CEC ▪ Local government associations ▪ Local governments ▪ Utilities
Strategy 2: Build capacity for local governments to lead by example.	▪ Encourage innovation ▪ Enable and recognize peer-to-peer learning ▪ Create small incentive programs ▪ Address IOU tariff incentives and disincentives ▪ Develop peer-to-peer training ▪ Lower interest rate of CEC low-interest loan fund	▪ Local gov't associations ▪ Local governments ▪ Utilities ▪ CEC ▪ CPUC ▪ Nonprofit organizations
Strategy 3: Maximize energy efficiency in new and existing construction through local government policy.	▪ Require commissioning and retro-commissioning ▪ Reduce peak electricity load in summer months in inland areas HVAC installation quality ▪ Institute community design, land use and zoning policies ▪ Explore options that allow energy efficiency cost savings to be returned to the department and/or projects that provided the savings ▪ Require redevelopment agencies to address energy efficiency in development contracts ▪ Negotiate energy efficiency into developer agreements ▪ Create local point-of-sale and point-of-lease energy efficiency requirements	▪ CEC ▪ Local government associations ▪ Local governments, cities ▪ Utilities

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 4: Rapidly upgrade and expand energy efficiency training and information for local governments.	▪ Leading local governments give technical assistance ▪ Create opportunities for more regional technical assistance and education ▪ Have statewide nonprofit organizations give technical assistance ▪ Offer various appropriate training for local government and public school elected officials, decision makers, and building, maintenance and planning staffs ▪ Create a menu of products, services, approved technologies and delivery channels for local governments that currently lack deep expertise in energy efficiency	▪ CEC ▪ Local government associations ▪ Local governments ▪ Utilities

13. Low Income Energy Efficiency

In its recent Decision on Low Income Energy Efficiency (LIEE Decision)[41], the Commission called for a fresh look at LIEE programs. The purpose of this fresh look would be to consider an expanded role for LIEE programs as an energy resource for California, working in concert with other efforts to address climate change and for meeting the needs of more low income customers.

Because of the short timeframe available for consideration of LIEE issues following the Commission's final Decision issued December 24, 2007, the LIEE sector did not have the benefit of the extensive input and review processes available to other sectors in the development of this draft *Plan*. Accordingly, this LIEE chapter of the *Plan* is preliminary, and will be more fully developed prior to filing of a final *Plan* by May 15, 2008, consistent with the policies and guidelines set forth in the LIEE Decision. Additionally, as required by the LIEE Decision,[42] the LIEE chapter of the final *Plan* will include an appendix listing resources and tools for low income programs, a training plan for LIEE programs, and a discussion of the low income program elements of the California Solar Initiative.

13.1. Vision and Goals

The Commission's Decision contains the following vision for LIEE programs, which is supported by the stakeholders:

> *"To provide all eligible customers the opportunity to participate in the LIEE programs and to offer those who wish to participate all cost-effective energy efficiency measures in their residences by 2020."* [43]

The ongoing process of developing this portion of the CEESP will consider specific goals supporting this vision.

13.2. Profile

Customers qualified for LIEE programs represent up to 30% of the IOUs residential customers, or about 5.5 million households. These customers cover the geographic and demographic spectrum, living in single and multi-family housing, and in both urban and rural situations. In the past ten years, LIEE programs have provided about 1.6 million low income customers a varying array of energy-related services including home weatherization, refrigerator replacement, repair and replacement of heating and air conditioning equipment, and CFL distribution. Operating under a legislative mandate, these programs seek to provide the benefits of energy efficiency to those who otherwise would be unable to obtain those benefits.

Stakeholders expect to further articulate the strategic issues raised by the Commission's vision, but central are:

- Refining the methodology to determine cost-effectiveness, including non-energy benefits;

- Widening customers' ability to participate;
- Privacy and confidentiality issues which inhibit or preclude data exchange among stakeholders;
- Cost/budget/resource constraints;
- Creating appropriate incentives to create "proactive" customer behaviors; and
- Proximity of service providers to participants.

13.3. Strategies

NOTE: The following represent preliminary strategies based on a compressed planning process. These strategies will be revisited, and additional strategies may be developed, for inclusion in the final Plan to be filed by May 15, 2008.

Strategy 1: Develop Customer Segmentation to Improve Program Delivery, Increasing the Opportunities for Program Participation and Enhanced Energy Savings.

Initially, four dimensions could be explored for concentrating efforts: geography, demographic descriptions (e.g., language preference), social networks and level of energy use. While this list may expand over time, it represents an extension of current approaches. Segmentation may offer the following benefits:

- Reveal concentrations of customers which can be served more cost-effectively;
- Promote more effective use of community-based organizations and other low income customer service providers;
- Refinement of energy efficiency and environmental messages including education and outreach materials and targeting of customers with high energy savings potential;
- Concentrating program deliveries to achieve economies in delivery, material purchasing and resources; and
- The opportunity to develop multiple program delivery options to match potential for energy savings (as indicated by level of energy use), capturing more of the available cost-effective savings.

Recommendation

Short Term: Work with stakeholders to identify customer segments, using the dimensions described above as a starting point; pilot test initial segmentation results for improving delivery strategies.

Mid Term: Further develop segmentation and apply to program design elements to increase energy savings.

Strategy 2: Pursue Collaboration with and Leveraging of Other Programs.

Significant opportunities may exist to better achieve the Commission's objectives and reduce energy use among LIEE qualifying customers through ongoing collaboration among the utilities and state and federal agencies providing services to the low income community.

Stakeholders perceive that resources could be used more efficiently (leveraged) if there were success in tracking where services have already been provided through utility, local, state, and federal programs, and in leveraging the provision of services among these same programs. This may be a longer-term objective and is likely to involve multiple government agencies.

Recommendation

Short Term: Identify key areas where leveraging and data sharing would be possible and advantageous; identify and address privacy and confidentiality issues, including potential changes to policy or legislation where applicable; begin outreach work to further coordination.

Mid Term: Extend leveraging and data sharing across additional providers.

The following summary table (Table 13.1) shows short-term actions and principal stakeholders related to the strategies described in this chapter. The list of stakeholders reflects those deemed at this time as having a major role in defining or implementing the strategies. This listing of stakeholders is not intended to be exclusive; other stakeholders—for example individual consumers—are also critical to the ultimate success of each strategy.

Table 13.1 Low Income Strategies, Near-Term Actions and Principal Stakeholders

Key Strategies	Key Near-Term Actions	Principal Stakeholders
Strategy 1: Employ consumer segmentation methods to improve program delivery, enhance participation and increasing energy savings.	▪ Work with stakeholders to identify customer segments, using the dimensions described above as a starting point; pilot test initial segmentation results for improving delivery strategies	▪ CPUC ▪ Dept. of Community Services and Development ▪ Utilities ▪ CBOs
Strategy 2: Pursue collaboration with and leveraging of other programs.	▪ Identify key areas where leveraging and data sharing would be possible and advantageous; identify and address privacy and confidentiality issues, including potential changes to policy or legislation where applicable; begin outreach work to further coordination	▪ CPUC ▪ CEC ▪ Local Governments ▪ Utilities

14. Long-Term Planning

14.1. Vision and Goals

California will have a long-term energy efficiency planning process that includes all principal stakeholders and defines strategies and goals supported by each stakeholder's short-, medium- and long-term plans and actions.

For strategic plans to be effective they need to be "living" documents that are regularly evaluated for:

1. Performance (i.e., whether the actions taken to implement the *Plan*'s strategies are satisfactorily meeting *Plan* goals), and

2. Relevance in light of changing information, technology and market conditions.

This chapter briefly lays out a vision of a sustained planning process for all of California's energy efficiency stakeholders that will help shape long-term goals and strategies for all participants, including the IOUs.

The CPUC and others have identified a number of concepts that the strategic planning process should include such as a long-term focus and the participation of many stakeholders. The IOUs agree that, among other considerations, the design of strategic plans should:

- Not get trapped by "conditions precedent"—that all actions by one participant are not dependent for success on the actions of others.
- Use judgment-based decision making in the planning process, and not rely exclusively on specific scoring criteria or the assumed "perfection" of data or analyses.
- Gather a solid foundation of information, including the results of new pilot activities—such as those planned by the IOUs for 2009-2011—to inform future-year planning efforts and test innovative strategies.
- Assume that technology, markets and policy settings will change (perhaps unpredictably); remain strategic and long-term, and not serve just as *de facto* near-term program plans.

14.2. Profile

Under the guidance of the CPUC, the IOUs have prepared this *Plan* as the first step to start an ongoing statewide strategic planning effort that delivers steadily increasing energy savings. Combined with the CPUC's three-year planning cycle for IOU energy efficiency programs and funding, this long-term planning process provides an integrated mechanism for defining paths to achieve California's energy efficiency and related energy, economic and environmental goals.

For California to achieve the vision and goals identified in this *Plan*, the following must happen:

- Energy efficiency markets continually and fundamentally change. This change includes achieving market transformation through continual incorporation of efficiency gains into Codes & Standards and increasing commercialization of cost-effective energy efficiency services.
- The IOUs and other participants successfully implement a wide range of strategies that complement and support each other.
- The planning effort is a cooperative process among the utilities and other key participants in energy efficiency markets, some of whom will also have vital actions and essential planning functions within their purview.

14.3. Statewide Long-Term Planning Cycle

A standard approach to strategic planning entails establishing a vision, goals and strategies in an iterative process involving the evaluation of market forces (potential, barriers, current offerings, etc.), resources, costs and other relevant considerations to define risks, benefits and the potential for success of various strategies. This process results in determination of critical success factors and identification of participants and specific objectives, strategies and actions—in this case for both the state as a whole and individual market sectors. The process that started in fall 2007 produced a great deal of data from many stakeholders. Unfortunately, the schedule was compressed, and did not produce all of the information needed for effective planning; nor was there full participation by all key stakeholders.

The IOUs envision that the next planning cycle will last almost a year and will:

- Enroll more key stakeholders prior to initiating the planning cycle, and cooperatively develop 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, on Workforce Education & Training or on technology development—establishing promotional initiatives for leaders in each area.
- Complete 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 of procurement plans at utilities, the CEC, and the California Independent System Operator (CAISO).
- Complete data analysis and necessary modeling efforts including addressing the costs, cost-effectiveness, rate and consumer cost impacts, and risks/benefits of strategies to properly select and prioritize activities and funding sources. This activity also includes evaluating performance to-date with respect to goals established in the prior cycle of strategic planning.
- Conduct public workshops open to all stakeholders to provide planning input and to vet planning documents. This would include specific tracks including leading

representatives for the four market sectors—residential, commercial, industrial and agricultural—to ensure these tracks had the highest level of representation.

- Discuss commitments with key participants identified as having responsibility for funding or implementing strategies. These discussions must include state agencies and publicly owned utilities.
- Prepare a draft *Plan* for review and reaction by key stakeholders. IOU activities would be subject to regular approval by the CPUC.

The CPUC has established a three-year planning cycle for IOU energy efficiency portfolios. A similar three-year model is suggested for updating the *California Energy Efficiency Strategic Plan*. The IOUs' next three-year portfolio planning cycle starts with program plans due in the spring of 2011, and program implementation beginning in 2012. Consistent with this planning cycle, the next long-term strategic plan should be initiated at the end of 2009 and completed by mid-2010.

14.4. Additional IOU Long-Term Planning Activities

The IOUs have—and will continue to develop—other long-term planning activities. These include long-term planning activities associated with energy procurement, a process that operates on a 10- to 20-year planning horizon. The IOUs view energy procurement and long-term energy efficiency planning as kindred processes, and envision facilitating the ongoing California energy efficiency strategic planning process under direction of the CPUC and in cooperation with other stakeholders, particularly the CEC and CAISO.

In addition to the periodic update to the *Plan*, the CPUC and utilities would host an annual "California Energy Efficiency Summit." This spring event would review *Plan* activities in the previous year, outline near-term actions and showcase exemplary accomplishments. It would be open to all those involved in the *Plan's* strategies.

To facilitate technology awareness and transfer, a portion of this Summit would be devoted to demonstrating promising new technologies. This would be a "best of the best" of new technologies showing promise for California's unique geographic, demographic and demand-side management market conditions. The showcased technologies would focus on energy efficiency, but also include the technologies in other demand-side areas which could function synergistically with energy efficiency, including demand response, AMI-enabled technologies, and other preferred demand-side resources. [44]

In addition, the IOUs will necessarily expand their market transformational activities, coordinating on a statewide and national level. For years, they have built a network of market transformation relationships directly on the national stage and through national organizations (e.g., the American Council for an Energy Efficient Economy, ACEEE, and the Consortium for Energy Efficiency (CEE). These relationships have been essential in helping promote national and state energy efficiency legislation, and national and state Codes & Standards. To make the *Plan* work best for California, the IOUs will increase their efforts to coordinate on the state and national stage.

To leverage that expertise, the IOUs will cooperatively organize and conduct a California Energy Efficiency Alliance (CEEA) to provide a forum for any energy efficiency program administrator in California willing to contribute resources and coordinate activities to further the objectives and strategies in the *Plan*. Quarterly meetings (one in conjunction with the Summit described above) of California energy efficiency program administrators would be held to:

1. Support coordination of programs designed to continually transform the California marketplace for energy efficiency;
2. Coordinate with other regional EE program administrators program activities beneficial across different regions; and
3. Align with the efforts of national organizations promoting energy efficiency (e.g., ACEEE and CEE).

Meetings of the CEEA would be open, with a focus on aligning the activities of the administrators with resources to contribute to common interests and shared results.

15. Policy Issues Raised by the *California Energy Efficiency Strategic Plan*

During the strategic planning process, the IOUs and other stakeholders encountered a number of challenges that can impede successful implementation of the *Strategic Plan.* While specific barriers are presented in other sections of this *Plan*, three key challenges regarding efficiency rules are:

- **Achievement of the *Plan*'s vision and goals will entail significant costs, affecting cost-effectiveness analysis.** Unfortunately, many of the needed strategies will not present identifiable savings—for example those needed for Market Transformation; Marketing, Education, & Outreach; Workforce Education & Training; and Emerging Technologies—and thus will negatively impact the cost-effectiveness of an IOU's energy efficiency portfolio. Ensuring adequate financial support for the *Plan*'s vision and goals presents a challenge in light of this cost-effectiveness sensitivity—and invites considering specialized treatment of these costs in the IOUs' portfolios.
- **Measuring progress in and achievement of the *Plan*'s vision and goals presents a challenge to the historical definition of attribution (free-ridership).** This *Plan* places great focus on collaboration with multiple state and industry players, integration with several demand-side management initiatives and world-class innovation, making it increasingly difficult for the state's consumers who adopt efficiency to cite or attribute the source of their decisions. The concern over attribution of savings to utility programs presents a challenge and likely inconsistency with the goals of rapid market transformation and integration that will need to be addressed.
- **An unprecedented collaboration between stakeholders and agencies is needed to achieve the goals in this *Plan*.** As seen throughout the *Plan*, IOUs, industry organizations, local governments, state agencies, POUs, and research institutions, among others, are called to action to bring about the next generation of energy efficiency. Achievement of this goal will require the whole of these groups' actions to be greater than the sum of the parts, which requires extraordinary collaboration, innovation and integration, and leadership by the CPUC and IOUs.

  Coordination and collaboration are particularly important with two California entities: the California Energy Commission, with its mandate regarding California energy policy and regulation; and the California Independent System Operator, with its responsibility for maintaining reliable electric service in the state.

  Additionally, maintaining momentum of the strategic planning process is essential to its success. It is also a challenge considering the myriad multi-faceted state and industry objectives. Many stakeholders have contributed to the development of this *Plan* over the past few months and their participation remains critical as elements of this *Plan* are implemented, continually reexamined and enhanced. Particularly because technology, regulatory policies and consumer behavior—among other factors—will change, stakeholders should remain engaged in the long-term planning

process. The IOUs recommend a long-term planning process in Chapter 14, and note that it demands the continued active involvement of stakeholders.

Appropriately addressing the three key policy challenges will result in increased energy efficiency and demand-side resources, and a much greater likelihood of successful implementation of the *Plan*. The IOUs may propose solutions to these challenges in their 2009-11 portfolio applications or in the final *Strategic Plan*.

It is important also to recognize that deep penetration of energy efficiency, demand response, distributed generation, zero net energy buildings, and vehicle-to-grid will result in less dependence on utility-provided resources and more reliance on customer-owned sources of generation. This may result in a different customer-utility paradigm than exists today and may pose potential challenges for grid operations and revenue collection. This issue will need to be addressed in the longer-term by key actors, particularly the CPUC, CAISO, and IOUs.

Attachment A: Low Income Solar Programs

On February 5, 2007, the California Public Utilities Commission (Commission) issued an Assigned Commissioner Ruling (ACR) ordering the Commission's Energy Division to design the Single Family Low Income (SFLI) Solar Program and the California Solar Initiative (CSI) Program Administrators (PA) to design the Multifamily Low Income (MFLI) Solar Program. The Commission approved the SFLI Solar Program in Decision 07-11-045 and has since assumed responsibility for the development of the MFLI Solar Program. The SFLI Solar Program will be administered by a single statewide Program Manager to be selected by the Energy Division through a Request for Proposals (RFP).

The SFLI Solar Program includes a requirement that applicants enroll in the Low Income Energy Efficiency (LIEE) program, if eligible, and have all feasible LIEE measures installed prior to receiving a solar incentive, or be on the waiting list for installation.

Applicants must include an energy efficiency audit with their incentive application. Whether the audit will be performed through the LIEE or Energy Efficiency (EE) program will depend on the eligibility of the applicant, as the eligibility criteria of the Low Income Solar Programs are different than that for the LIEE program.[45] This will likely require some sort of reconciliation before the SFLI Solar Program can begin because LIEE audits are typically done in person, whereas EE audits can be done over the phone.

The Program Manager will review the audit along with the application to determine the maximum system size that can receive an incentive through the low-income incentive program. The maximum system size that can receive low-income solar incentives will be based on customer usage, adjusted for estimated energy savings resulting from either:

- Installation of all feasible LIEE measures (for those applicants who qualify), or
- For applicants who do not qualify for LIEE, installation of all feasible measures that would be covered if they were LIEE eligible.

Because LIEE and EE program measures are not identical, this threatens to introduce a different set of standards depending on the applicant's income level.

Integration of the Low Income Solar Programs with the LIEE and EE will occur through Marketing, Education & Outreach efforts as ordered in D.07-10-032. In addition, LIEE and EE program staff will need to coordinate with those entities administering the Low Income Solar Programs to ensure that applicants will receive their efficiency measures when their photovoltaic systems are installed. This will reduce the burden placed on the applicant of having to take an unreasonable amount of time from work to be available to meet solar and energy efficiency contractors.

Notes

[1] CPUC Decision 07-10-032, October 18, 2007.

[2] D.07-12-051, page 4.

[3] D.07-12-051, page 4.

[4] State of California, *Energy Action Plan II*, Implementation Roadmap for Energy Policies California Energy Commission and California Public Utilities Commission, September 21, 2005.

[5] California Energy Commission 2007 *Integrated Energy Policy Report*, adopted December 5, 2007, CEC-100-2007-008-CMF.

[6] California Health & 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.

[7] 2007 *IEPR.*

[8] 2007 *IEPR.*

[9] See "Memorandum of Understanding Pledging the Support of the State of California for the National Action Plan for Energy Efficiency" http://www.cpuc.ca.gov/cleanenergy/design/docs/CA%20Memorandum_of_Understanding_7-29.pdf

[10] 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] CEC at www.energy.ca.gov/electricity/consumption_by_sector.html

[12] The workshop report discusses the CPUC's and alternative perspectives on the meaning of zero net energy. Suffice it to say that all approaches represent a perspective so distant from current practice that most would serve as a goal for the near term, with meaningful refinement appropriate in the next or even a subsequent revision of this *Plan*.

[13] The workshop advanced additional metrics and goals (see workshop report). Notably, it put forward a sector goal of a 40% reduction in energy used in 2020 by homes existing in 2008. This expressed the concern that significant energy usage reductions must also come from existing buildings.

[14] This is described more fully in the Low Income chapter; the largest barrier is that the deep energy reduction strategy is not cost-effective today due to high materials and installations costs at each participating site.

[15] Since 1950, many homes were built with many common features (same builder or same tract) providing the opportunity for packages of improvements which could be installed at lower cost.

[16] This strategy was originally called "Standardization of Standards."

[17] 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.

[18] The largest commercial sector electricity uses are lighting (35%), space conditioning (29%) and refrigeration (13%).

[19] Office buildings represent 25% of the sector's total power use, retail is 15%, restaurants and food stores at 9% each.

[20] 2007 *IEPR*. Other estimates include 33,000 GWh for the California IOUs from KEMA, LBNL, and Quantum Consulting. 2006. *California Industrial Existing Construction Energy Efficiency Potential Study,* final report to Pacific Gas and Electric, CALMAC Study PGE0252.01 [excluding data centers, water/wastewater facilities, mining, and oil extraction] and 51,000 GWh from the Energy Information Agency 2006. *California Table 8. Retail Sales, Revenue, and Average Retail Price by Sector, 1990 Through 2006*

[21] Energy Information Agency 2006. Natural Gas Consumption by End Use for California 2001-2006.

[22] 2005 industrial participation in reliability and day ahead demand response programs were 1857 and 1044 MW respectively. Quantum Consulting. 2006. *Evaluation of 2005 Statewide Large Nonresidential Day-Ahead and Reliability Demand Response Programs: Final Report*.

[23] CEC at www.energy.ca.gov/electricity/consumption_by_sector.html

[24] 2007 *IEPR*.

[25] 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 CO_2 from the electric power sector, not included in this value.

[26] 2007 *IEPR*.

[27] CEC (2006). Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004. CEC-600-2006-013-SF. December; and CEC (2007). Revisions to the 1990 to 2004 Greenhouse Gas Emissions Inventory Report.

[28] Recognition should ultimately include water resources, waste management, and improved air quality.

[29] This *Plan* examines residential and small commercial HVAC, and therefore implicitly assumes packaged units rather than large built-up HVAC; this is pursuant to the Commission's big, bold Programmatic Initiative in D.07-10-032.

[30] It should be noted the HVAC portion of the strategic planning process was conducted in conjunction with the CEC, which was 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 draft *Strategic Plan* draws heavily from the CEC's forthcoming AB2021 report ("Recommended Strategic Plan to Transform the Existing HVAC

Industry and Achieve Additional Peak Savings, Sustainable Profitability, and Increased Consumer Comfort") as well as the participation in that process of representatives of the IOUs, CPUC, CEC, HVAC industry and stakeholders.

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

[32] It should be noted that 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.

[33] Other strategies that are important for transforming the HVAC industry are described on a multi-sectoral basis elsewhere in "cross-cutting" sections of this *Strategic Plan*.

[34] 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.

[35] 2007 *IEPR*.

[36] Note that this is the same as the first strategy described in the Commercial Buildings chapter of this *Plan*.

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

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

[39] DSM programs include energy efficiency, conservation, demand response and customer generation (including SGIP, CSI, and CHP).

[40] David Nemtzow, Dan Delurey and Chris King "The Green Effect: How Demand Response Programs Contribute to Energy Efficiency and Environmental Quality," *Public Utilities Fortnightly*, March 2007.

[41] D.07-12-051, December 24, 2007.

[42] D.07-12-051, page 90.

[43] D.07-12-051, page 4.

[44] At present at least five national organizations promote new energy efficiency technologies through annual conferences or ongoing activities. The purpose of the California Summit would be to explore those most suitable for the state.

[45] Eligibility for the Low Income Solar Programs is established in Public Utilities Code Section 2852, whereas the eligibility for Low Income Energy Efficiency programs was most recently established by the CPUC in D.05-10-044 as 200% of the federal poverty guideline.