CA | Existing Buildings Energy Efficiency Action Plan

September 2015

CEC-400-2015-013-F

Abstract

The *Existing Buildings Energy Efficiency Action Plan* provides a 10-year roadmap to activate market forces and transform California's existing residential, commercial, and public building stock into high-performing and energy-efficient buildings. The results of this effort will be accelerated growth of energy efficiency markets, more effective targeting and delivery of building upgrade services, improved quality of occupant and investor decisions, and vastly improved performance of California's buildings. Equally important, this effort will deliver substantial energy savings and greenhouse gas emissions reductions, contributing to the collective goal of reducing the impacts of climate change while improving the resilience of the state's built environment and economy.

The plan provides a comprehensive framework centered on five goals, each with an objective and a series of strategies to achieve it. Each strategy includes industry and/or government implementation partners.

The plan begins with strategies to enhance government leadership in energy and water efficiency. Public buildings leading by example, a new statewide large commercial benchmarking and disclosure program, local government innovations, and better energy codes for existing buildings are examples of these leadership strategies. The plan then focuses on enabling improved decision-making, high-quality building upgrades, and increased financing options through access to reliable and actionable information. Easy, regular access to energy use data for building owners and their agents is a key tenet of this plan. Making efficiency project costs and savings information available to all market actors is another principal strategy. This roadmap articulates strategies to help consumers recognize the benefits and value of efficiency, supported by strategies that ensure the real estate and financial industries incorporate energy efficiency into property valuations. The plan also proposes strategies to ready the workforce to deliver high-quality efficiency solutions on a larger scale.

Keywords: Assembly Bill 758, auditing, benchmarking, building retrofits, California, California Long-Term Energy Efficiency Strategic Plan, commercial buildings, compliance, education and outreach, energy asset ratings, energy assessments, energy efficiency upgrades, energy performance, existing buildings, finance programs, green workforce development, greenhouse gas emissions, *Integrated Energy Policy Report*, marketing, multifamily buildings, nonresidential buildings, property valuation, public buildings, public leadership, residential buildings, retrocommissioning, Title 24, water efficiency

Message from Commissioner Andrew McAllister

As California contemplates how best to meet our goals for deep carbon emissions reductions—roughly 85 percent reduction from today's levels by 2050—it is clear that energy efficiency is central to whatever path we take. Pursuit of low-carbon energy sources will continue to drive system investments. In this regard, energy efficiency is special: at sufficient scale, it can mitigate the need for both fossil and renewable generation, thus increasing system flexibility and lowering costs of all potential scenarios. Energy efficiency, especially when integrated with demand response, can greatly facilitate our transition to a cleaner resource mix—a need accelerated by the retirement of the San Onofre Nuclear Generating Station and likely some portion of the aging once-through-cooled coastal generation fleet. In his inauguration speech on January 5, 2015, Governor Edmund G. Brown, Jr. set a goal to double the rate of efficiency savings in buildings in California through 2030, along with a transition toward cleaner fuels for space and water heating. We can and must create the conditions that drive greater deployment, by renewing and updating our commitment to intelligent delivery of efficiency-related technologies and services.

California is in an enviable position. Governor Brown is a longtime leader on issues of energy and environment. The author of Assembly Bill 758, Assemblymember Nancy Skinner, and many other legislators have put in place a statutory foundation that enables bold efficiency policies. Californians continue to prioritize these issues, both through their votes and their personal choices. California is already one of the most efficient state economies in the United States, with 41 percent less energy use per dollar of gross domestic product compared to the rest of the country[1]. Our innovation culture has developed and nurtured many clean energy technologies, practices and businesses. A diverse and growing portfolio of low- and zero-energy building retrofit projects provides concrete assurance of the possibilities within reach today.

But California is not on a trajectory to meet the aggressive efficiency goals set in the *2008 Long-Term Energy Efficiency Strategic Plan*.[2] Buildings constructed last century—particularly those built between 1960 and 1990, and especially in inland communities—present clear opportunities to use energy more effectively. Voluntary adoption has only partially captured the potential for energy-efficiency in those buildings. Policy and the market must approach property owners and residents by recognizing their constraints and helping them move ahead with well-conceived projects that both reduce energy consumption and improve their lives.

There are real, persistent barriers to action in existing building markets. Residents and building owners need simple access to understandable, reliable information, as well as consistent engagement with qualified service providers. Contractors confront high costs of customer acquisition, as well as navigation of and compliance with state and local building codes. Investors, if they are to participate in this market, expect robust performance metrics—and must have access to the data needed to determine them. Any mandatory actions—if they are required by statute, code, or a local energy ordinance—ought to be manageable to implement and to provide clear value to the resident and building owner. The volume of future building upgrade projects will indicate how successfully these and other barriers have been addressed. Effective solutions will be those that provide true value for California's building owners and energy users; after all, demand begins with them.

We have a clear record of success in harvesting cost-effective energy savings, through standards and the portfolios of ratepayer-funded efficiency programs. Direct utility procurement of efficiency may be

1 Next10, 2014 California Green Innovation Index, Next10.org.

2 CPUC, *California Long-Term Energy Efficiency Strategic Plan,* 2008: www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp.

another effective pathway for mobilizing efficiency resources; Southern California Edison has included some efficiency within its all-source procurement. Going forward, this approach might effectively complement the efficiency portfolio model. The Energy Commission and California Public Utilities Commission will continue to collaborate closely to ensure proper balance between codes and standards, voluntary programs and utility procurement.

As building code itself becomes more stringent, the gap widens between code and the existing building stock. We must find ways to encourage and assist less-efficient buildings to reach and even go beyond current code. Efficiency ought to be attractive and straightforward to implement and routine across the marketplace—in each building improvement project and equipment replacement.

Contained in this plan are many initiatives aimed at creating the conditions for scale-up, including:

- **Performance Benchmarking for Nonresidential Buildings.** Understanding the energy usage of a building, in relation both to others and to an objective standard, informs action. Assembly Bill 1103 is a first step; our long-term approach will cover more large buildings and work more seamlessly with the commercial building marketplace. U.S. cities including San Francisco, New York, Boston, Chicago and Seattle have adopted benchmarking programs. The State of California—large and diverse as it is—will build upon those experiences.
- **Information to Guide Action and Investment**. Every consumer of energy deserves straightforward access to relevant information. Further, the marketplace and local governments need access to geographic-specific information to meet their business, planning, and investment needs. A quickly growing array of third-party analytical tools, including many that leverage smart meter functionality, can produce high-quality, customer-specific intelligence at relatively low cost. Pervasive application of data analytics and other common-sense informational tools, provided either through utilities or direct-to-customer, will allow the energy efficiency marketplace to ideate and grow, over time encouraging a shift toward informed behavior and well-targeted investment. Consumer protection must be enhanced as this marketplace grows.
- **Government leadership**. The State can lead by example, by proactively upgrading state buildings for high performance. Further, the energy agencies – primarily the Energy Commission and California Public Utilities Commission – must continue to align to drive the collection, organization and management of data resources focused on energy and buildings, which are vital to track progress, ensure accountability, and inform policy. Local governments have critical jurisdiction over buildings and land use, as well as the duty to respond to the needs of their residents. The State should partner with, learn from, and support local jurisdictions developing innovative solutions to improve the energy performance of their communities.
- **Collaboration.** To dedicate resources effectively and achieve broad scale-up of energy efficiency, California seeks to align approaches wherever beneficial with the U.S. Department of Energy (DOE) and with other states. For example California plans to leverage federally funded tools for energy data exchange, benchmarking and building modeling. All implementation partners—utilities, contractors and architects, builders, owners, and financiers—stand to benefit from such standardization: in this age of networks, such alignment helps ensure we are investing our limited resources where they are truly needed.

California's commitment to energy efficiency is unwavering. Our vision is of a land served by buildings that provide pleasant, comfortable, and functional spaces without wasting energy. Innovation must reach each area of building energy services, preferably in an integrated fashion: lighting; shell; heating, ventilating, and air-conditioning technologies; plug loads; and responsiveness to grid events and rate signals. Success will require muscular policy measures, implemented smartly and consistently. Working together, I am certain that we can travel a clear path forward to our collective low-carbon future.

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Abbreviations and Acronyms

ACEEE	American Council for an Energy-Efficient Economy
AIA	American Institute of Architects
ARRA	American Recovery and Reinvestment Act
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BEDES	Building Energy Data Exchange Specification
BES	Building Efficiency Standards
BOMA	Building Owners and Managers Association
BPI	Building Performance Institute
BSC	Building Standards Commission
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority
California ISO	California Independent Systems Operator
CALBO	California Building Officials
CaLEAP	California Local Energy Assurance Planning
CalGreen	California Green Buildings Standards Code
CAR	California Association of Realtors
CARB	California Air Resources Board
CBEC	Commercial Building Energy Consumption
CCC	California Commissioning Collaborative
CDE	California Department of Education
Energy Commission	California Energy Commission
CEESP	State of California Long-Term Energy Efficiency Strategic Plan
CEUS	Commercial End-Use Survey
CPUC	California Public Utilities Commission
CSD	Community Services and Development
CSI	California Solar Initiative
CSLB	Contractors State License Board
DAS	Division of Apprenticeship Standards
DEODC	Division of Environmental Occupational Disease Control
DG	Distributed generation
DGS	Department of General Services
DIR	Division of Industrial Relations
DOE	Department of Energy
DOF	Department of Finance
DR	Demand response
DSA	Division of the State Architect
DWR	Department of Water Resources
EBEC	Existing Building Efficiency Collaborative
EBEE	Existing Buildings Energy Efficiency
EBO&M	Existing Building Operations & Maintenance
EE	Energy efficiency
EEM	Energy efficiency mortgages
EIA	Energy Information Administration
EPA	Environmental Protection Agency
EPD	Energy performance district
EPIC	Electric Program Investment Charge
ESA	Energy service agreements
ESCO	Energy services company
EUC	Energy Upgrade California
EUI	Energy Use Intensity
GHG	Greenhouse Gas
GO	Governor's Office
GWh	Gigawatt hour
HCD	Housing and Community Development
HERS	Home Energy Rating System
HVAC	Heating, ventilation, and air conditioning
IDSM	Integrated Demand Side Management
IEPR	*Integrated Energy Policy Report*
IHACI	Institute of Heating and Air Conditioning Industries
ILG	Institute for Local Government
IMT	Institute for Market Transformation
IOU	Investor-owned utility
KSA	Knowledge skills ability
LG	Local government
LGC	Local Government Commission
LGSEC	Local Government Sustainable Energy Coalition
LIEE	Low-income Energy Efficiency
ME&O	Marketing education and outreach
MEL	Miscellaneous electric load
MF	Multifamily
MLS	Multiple Listing Service
NAR	National Association of Realtors
NRDC	Natural Resources Defense Council
OBR	On bill repayment
OPR	Office of Planning and Research

PACE	Property-assessed clean energy financing
PCA	Property condition assessments
POU	Publicly owned utilities
PRC	Public Resources Code
PV	Photovoltaic
RCx	Retrocommissioning
REN	Regional energy network
RESNET	Residential Energy Services Network
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
SEEC	Statewide Energy Efficiency Collaborative
SEED	Standard Energy Efficiency Database
SEP	Strategic Energy Plan
TDV	Time-dependent valuation
WAP	Weatherization Assistance Program
WE&T	Workforce Education and Training
WHPA	Western HVAC Performance Alliance
WIB	Workforce Investment Boards
ZNE	Zero net energy

Executive Summary

Plan Purpose

The *Existing Buildings Energy Efficiency Action Plan* (*EBEE Action Plan*) is required by Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009), which recognized the need for California to address climate change through reduced energy consumption in existing buildings.

The *EBEE Action Plan* provides a 10-year framework to focus state and local governments, the building, contracting industries, and real estate industries, financial market actors, and other key stakeholders on achieving much greater energy and water efficiency in existing residential, commercial, and public buildings. The California Energy Commission intends to use its authority to the fullest extent, along with its strong partnership with the California Public Utilities Commission, to promote successful implementation of this plan.

The *EBEE Action Plan* covers all existing buildings in the single-family, multifamily, commercial, and public buildings sectors. The *EBEE Action Plan* is organized around five central goals and informed by a uniting vision for the future of California's existing buildings. Each of these goals and most of the strategies apply to all of the building sectors covered in the plan.

Vision

Robust and sustainable efficiency markets deliver multiple benefits to building owners and occupants through improvements, investments, and operation of existing homes, businesses, and public buildings.

Resulting in: Doubling of energy savings in California's buildings. *This is equivalent to a 20 percent reduction in statewide building energy use in 2030 compared to projected levels of usage and is realized by stimulating an $8 billion/year efficiency marketplace.*[3]

3 Based on calculations identified in *Energy Efficiency Financing in California* Harcourt Brown & Carey, July 2011. Appendix B, page 66.

Strategy Highlights

The *EBEE Action Plan* provides a broad range of strategies to realize the above vision; the strategies are detailed in Chapter 3. Following are the five core goals and overall objectives that guide this plan, with highlighted strategies that are particularly important.

Goal 1. Increased government leadership in energy efficiency

Objective: Policies, initiatives, and programs lead a long-term commitment to achieve energy efficiency at large scales.

Nonresidential Energy Benchmarking and Disclosure (S 1.2)

- Required periodic benchmarking of commercial and multifamily buildings above 50,000 square feet in floor area.
- Energy use metrics reported via ENERGY STAR® Portfolio Manager.
- Builds on Assembly Bill 1103 (Saldaña, Chapter 533, Statutes of 2007) reporting infrastructure; significantly expands covered building population.
- Encourages ongoing performance monitoring and continuous commissioning.
- Public disclosure for each building at second reporting cycle; disclosure policy informs building market transactions.

Modernize Assessments, Ratings, and Labels (S 1.3, 1.4)

Adopt minimum standards for residential and nonresidential performance assessments; modernize approaches for asset ratings and labels.

- Enable widespread use of third-party assessment tools for existing buildings.
- Adopt minimum performance certification for third-party tools and encourages their use.
- Make greater use of smart meter data and analytics.

- Reform Home Energy Rating System (HERS) as it applies to existing buildings (currently HERS II): simplify and clarify while aligning with Public Resources Code Section 25942.
- Establish energy asset ratings as the primary vehicle to incorporate energy efficiency into real estate and financial property valuations.

Codes and Compliance (S 1.5)

- Clarify building energy code as it applies to existing buildings, including multifamily properties.
- Evaluate compliance rates and savings shortfall; incorporate findings into solutions.
- Reduce project compliance costs for consumers and local governments; harvest additional savings.

Local Government Challenge Program (S 1.7)

Encourage local governments to implement innovative efficiency programs and gather relevant experience for wider application. Examples include:

- Aggressive efficiency for public buildings.
- Early implementation of nonresidential benchmarking and disclosure programs.
- Innovation in building permitting and code enforcement systems.
- Data-driven communitywide energy planning.
- Energy performance districts.

Existing Building Efficiency Collaborative (S 1.9)

A new collaboration led by the California Energy Commission (Energy Commission) and California Public Utilities Commission (CPUC), with active engagement of industry stakeholders, will provide plan implementation oversight. Coordination with other relevant agencies will occur, when warranted.

- Coordinate and align policy between agencies (energy forecasting, energy programs, broader carbon policies).
- Provide oversight of action plan implementation, evaluation and tracking.
- Promote ongoing industry engagement.
- Collect and maintain data needed to evaluate plan implementation; provide trend analyses.

Goal 2. Data-driven decision making

Objective: Building owners and residents demand energy efficiency services informed by the full range of information relevant to them.

Data Accessibility and Use (S 2.1)

Ensure the availability, ease of access, and usability of energy consumption data in all sectors.

- Utilities map meters to buildings, consistent with whole-building benchmarking.
- Adopt common data exchange protocols for energy use and building energy performance data; maintain utility tariffs in a machine-readable format on a public website.
- Provide efficiency project cost and savings data to all market actors.
- Provide data for policy-making and program targeting. Baselining and market tracking efforts use standardized data reporting systems.

Consumer-Focused Energy Efficiency, Program Design Enhancement (S2.2)

- Revamp efficiency program designs to respond better to customer needs and values, as well as industry practice.
- Understand and leverage key transaction events.
- Streamline processes to increase project participation.
- Institute periodic forums for industry and public *- for example, CSI "Public Forum" model.*
- Design programs based upon actual, verified performance rather than "deemed" savings.
- Design programs to incorporate building operations and behavior.
- Collaborate among energy and water agencies, utilities, local governments, and partners.

Goal 3. Increased building industry innovation and performance

Objective: A robust and sustainable building industry drives and satisfies demand.

Performance-Driven Industry and Programs (S 2.2, 3.2)

Focus California's approach on performance-based efficiency solutions.

- Explore and support monetization of energy savings, including through resource procurement.
- Promote long-term engagement by consumers; encourage innovative business approaches.
- Enable pervasive use of analytics to drive targeted improvements.

High-Performance Workforce, Education, and Training (S3.3)

Support the development and employment of a high-performance industry for every level of professional involved in energy efficiency transactions.

- Maintain high-performance curriculum to increase efficiency-related knowledge, skills, and abilities.
- Work with workforce investment and apprenticeship organizations to reach critical labor groups.
- Adopt minimum certification requirements for firms and workers in the major building sectors.
- Provide relevant training for real estate, financial, and appraiser communities.

Goal 4. Recognized value of energy efficiency upgrades

Objective: Building values reflect energy performance and associated benefits.

Targeted Marketing, Education, and Outreach (S 4.2)

Educate, motivate, and encourage consumers to take action on energy efficiency with a comprehensive suite of targeted marketing, education, and outreach materials.

- Develop strategies that communicate economic and energy benefits to decision-makers.
- Obtain business and civic leader commitments; foster energy competitions.
- Leverage Energy Upgrade California™.

Goal 5. Affordable and accessible energy efficiency solutions

Objective: Efficiency is an integral part of routine transactions and readily financed

Affordability and Financing (S5)

Support a broad range of financial tools and expansion of products to attract self-sustaining private capital markets.

- Establish value proposition with real estate ***and*** finance industries.
- Complete and evaluate CPUC/California Alternative Energy and Advanced Transportation Financing Authority financing pilots.
- Leverage existing financing/refinancing tools, including PACE and EEM.

Future Discussion and Evolution

Over the next 10 years, these strategies will be evaluated and refined as required to better support and ensure achieving the state's goals. Examples include the following:

- Move from disclosure/assessment to action.
- Evaluate other options to ease market implementation of efficiency at scale, including via utility resource procurement.
- Use new business models.
- Integrate societal and private value propositions.
- Align energy efficiency, distributed generation, and demand response efforts in existing buildings.
- Align water and energy policies for existing buildings.
- Assess and develop feasibility of zero-net-energy and near-zero-emission existing buildings.
- Track market; if necessary, move toward mandatory time-certain retrofits.

Implementation

This plan aims to mobilize market-based activity in California such that the existing $1.1 billion in annual ratepayer-funded programs is leveraged to activate sufficient private capital to reach an annual investment of at least $8 billion per year needed to significantly increase the scale of energy efficiency projects

statewide. The majority of government-led activities in this plan can be funded with existing resources and staffing levels. Financing to cover some new implementation costs, for example, those to build and maintain certain data infrastructure (S2.1.8-9), and resources for local government innovation (S1.7), will need to be identified.

The plan strategies are organized here by crosscutting goals; however, implementation must proceed to match the priorities, needs, and stakeholders for each building sector. Periodic assessment of implementation progress will inform each biennial *Integrated Energy Policy Report*, with new and updated strategies to be proposed, as needed.

Chapter I. Introduction

Overview

"When we think about California's future, no long term liability presents as great a danger to our wellbeing as the buildup of carbon dioxide and other greenhouse gases in the atmosphere."

Governor Jerry Brown, State of the State Speech, January 24, 2013

The *Existing Buildings Energy Efficiency Action Plan* (action plan) was prompted by the passage of Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009). Energy efficiency in existing buildings is an important element of an integrated approach to reducing the impacts of climate change and will complement sustainability efforts in the State, including renewable energy development, alternative transportation modes and technologies, and strategic land-use planning. The action plan will be integrated into California's *Long-Term Energy Efficiency Strategic Plan* representing the Existing Buildings Sector.

AB 758 directs the California Energy Commission (Energy Commission) to develop a plan to achieve cost-effective energy savings in California's existing residential and nonresidential buildings, and to report periodically on its implementation through the Energy Commission's biennial *Integrated Energy Policy Report (IEPR)*. The strategies in this plan will enable substantial energy savings and greenhouse gas emission reductions in California's existing buildings.

This plan strives to tackle some of the most pressing and persistent energy efficiency challenges, including:

- Establishing a clear value proposition to consumers, business owners, and building managers.
- Ensuring access to building energy usage and performance information and analysis.
- Building consumer demand.
- Opening pathways for investment.
- Creating a robust set of tools and resources to support the variety of market actors who will stimulate increased energy efficiency activities.

Efforts will encourage innovation, quality and accountability in the building upgrade industry. The ultimate objective is to activate the market to allow long-term, sustainable transformation.

Figure 1.0: Deep Retrofit of California Beach Home

Source: Lawrence Berkeley Labs, Environmental Energy Technologies Division eetd.lbl.gov

Meeting the Challenge

California has long been a leader in building energy efficiency, both at the time of construction and upon a major remodel or equipment replacement. Since the 1970s, California has established nation-leading building codes and appliance standards, a variety of ratepayer-funded programs, workforce education, and public outreach in an effort to reduce energy costs and carbon emissions. These efforts have generated multiple returns to the economy and environment.

California's appliance efficiency regulations alone have saved consumers more than $75 billion in electricity and natural gas costs since 1978. Today, California's building standards deliver new buildings that protect owners and occupants from high energy costs and benefit society for decades to come. The State will continue to leverage codes and standards to capture cost-effective energy efficiency opportunities in appliances and new buildings.

Energy efficiency upgrades to existing buildings can achieve up to 40 percent energy savings cost-

effectively.[4] Californians need to recognize value in building energy services so that they choose, in much greater numbers, to engage voluntarily in upgrade projects, behavior changes, and operational enhancements. As an alternative or complement to market-based solutions, the Legislature could mandate cost-effective upgrades to some or all existing buildings in the State. This measure could include phasing in the work by building vintage or climate zone and providing critical resources to assist disadvantaged communities. The energy agencies would be called upon to work with local officials and industry to define and fund upgrade work on a massive scale.

Process and Stakeholder Engagement

Stakeholder engagement is critical to the long-term success of AB 758 both for the creation of this action plan and for its implementation. To develop the action plan, the Energy Commission has engaged in a formal public engagement process and conducted numerous one-on-one and group stakeholder conversations. Once the action plan is adopted, the Energy Commission and its partners will periodically update its strategies; details about this engagement structure are provided in Chapter 4.

The Energy Commission issued the *Comprehensive Energy Efficiency Program for Existing Buildings Scoping Report* in September 2012 and held workshops to receive public input in October 2012.[5] In June 2013, the *Draft Action Plan for the Comprehensive Energy Efficiency Program for Existing Buildings* was the subject of three public workshops held in San Francisco, Fresno, and Los Angeles. The draft plan was also available for formal review and comment in summer 2013.

Based on this input, the Energy Commission substantially redrafted the first draft action plan to make it more market-driven, responsive to stakeholders, and specific. The revised draft was then released in March 2015 and went through a series of workshops through summer of 2015 as part of the IEPR process to further collect stakeholder feedback. This action plan reflects that input, the evaluation and consideration of more than 100 written comments, and additional stakeholder discussions. Staff will present the action plan for final Energy Commission adoption in fall of 2015. Implementation of several initiatives presented here will be further developed in the *2015 Integrated Energy Policy Report* process.

Plan Organization

The action plan delineates strategies, roles, and timeline, organized around five central goals that affect all building sectors.

Chapter 1. Plan overview, goals, building sector characterization, critical path "schedule," and key benchmarks for success.

Chapter 2. Plan background and policy context.

Chapter 3. Detailed presentation of the strategies, roles, and time frame of the plan.

Chapter 4. Implementation summary, schedule, and three-year sector-specific priorities, including a list of stakeholders for continued engagement.

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4 These projections vary; for example, see Grandade, Hannah Choi, Jon Creyts, Anton Derkach, et al, *Unlocking Energy Efficiency in the U.S. Economy*, McKinsey & Company, 2009.

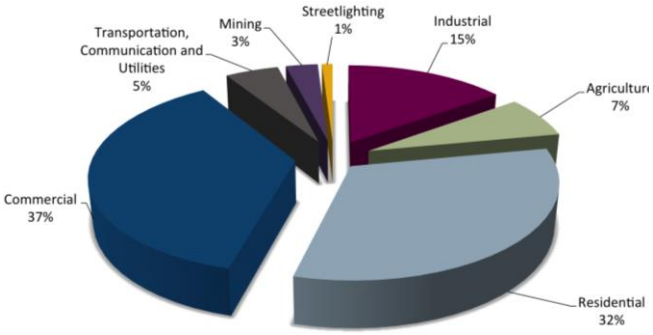
5 Brook, Martha, Christine Collopy, Devorah Eden, et al, *Comprehensive Energy Efficiency Program for Existing Buildings Scoping Report*, California Energy Commission, Sacramento, August 2012, CEC-400-2012-015.

The Opportunity and Challenge for Energy Efficiency

The action plan encompasses all existing residential, commercial, and public buildings. It does not cover the industrial or agricultural sectors. California contains roughly 600,000 commercial buildings, 9 million single-family homes; and 4 million multifamily units.[6] The diversity of ownership, tenancy, and building characteristics will require a variety of relevant, focused solutions.

Residential and commercial buildings account for nearly 70 percent of statewide electricity use and 55 percent of natural gas use; they represent about 20 percent of all greenhouse gas emissions.[7] An estimated 50 percent of existing buildings in California were built before California's *Building Energy Efficiency Standards* went into effect in 1978.[8] Buildings of later vintages also have significant opportunities for lighting, shell, and mechanical system efficiency improvements. Ongoing technological developments, as well as recent improvements in lighting efficiency and building control, are available in the building industry to save energy in and improve the functionality of all buildings, regardless of vintage. The following section provides a brief overview of each of the main building sectors covered in this action plan and the opportunities and challenges related to improving energy efficiency.

Figure 1.1: California Electricity Consumption by Sector



Source: California Energy Commission, Integrated Energy Policy Report, 2008.

Overview of Trends, Opportunities, and Challenges Impacting Energy Efficiency

California invests about $1.1 billion annually to promote and implement energy efficiency in buildings. The state's long-term commitment to efficiency has resulted in billions of dollars in savings to businesses and residents, reduced utility bills for millions of low-income households, electricity bills 20 percent lower than the national average, and avoided carbon emissions equivalent to those of 400,000 cars, just in the last two years.[9] Following is a brief overview of the key trends, opportunities, and challenges that are relevant for this plan and its implementation.

Figure 1.2: Drivers for Energy Efficiency Demand

Source: http://www.efficiencyfirst.org/static/files/promise_long_na.pptx.

Energy Efficiency as a Key Resource: Studies continue to support the concept that energy efficiency is a critical element of energy policy that can reduce the need for new generation.[10]

6 Commercial figures from CEUS 2003; residential figures from Department of Finance 2011.

7International Panel on Climate Change (IPCC), *Climate Change 2014: Mitigation of Climate Change*, December 2013.

8 California Energy Commission, *2011 IEPR*, document CEC-100-2011-001-CMF, page 63.

9 NRDC, *Scaling Up California's Energy Efficiency to Save Money and Reduce Pollution*, fact sheet, March 2014.

10 Molina, Maggie, *The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs*, March 2014, Report Number U1402, for American Council for an Energy-Efficient Economy.

The loading order[11], with efficiency and demand response as the highest priorities, continues to be central to California policy and is a core component of diverse, reliable, low-carbon energy supplies.

Property Valuation: Improved building performance directly reduces the carrying cost of any building, yet the market does not recognize this important cost factor in real estate valuations. Proper valuation will require adoption of standardized measures of energy efficiency in appraisals, mortgage calculations, and lease negotiations. In this way, the recognition of energy efficiency as a tangible benefit will be broadened, allowing the private sector to make informed energy decisions.

Long-Term Program Cycle: Historically, the CPUC and investor-owned utilities (IOUs) have operated on two- to three-year program cycles for energy efficiency portfolio development and implementation, requiring nearly constant planning by implementers and limiting program agility. The CPUC is moving to a 10-year rolling cycle, allowing for more flexible program improvements and ongoing changes in response to market evolution.

Land-Use Patterns: Energy-use intensity varies depending on building density, income patterns, and education levels. Understanding variations in land-use development and building trends is critical for creating effective strategies to reduce energy consumption.[12]

Electric Vehicles: Increased purchasing of electric vehicles is expected to increase electricity consumption in California by more than 6,000 gigawatt-hours (GWh) annually by 2024, creating additional loads to commercial and residential buildings to consider in reduction targets.[13] At the same time, electric vehicles present intriguing opportunities to provide grid flexibility by offsetting increased renewables and frequent overgeneration.

Information and Knowledge: A central tenet of energy efficiency behavior change is that consumers need to understand how they use energy. Historically, gaining access to energy consumption information, either customer-specific or thoughtfully combined, has been difficult for the customer, local governments, third-party implementers, and even community choice aggregators.[14] Property owners in particular need these data to better understand their buildings and make well-considered energy-related improvements. Market actors can use the various forms, this data might take, to develop and tune innovative delivery and financing models.

Marketing and Education: Marketing, education, and outreach are important components of any market transformation effort. In 2010, the State adopted Energy Upgrade California as the statewide clean energy umbrella brand for energy management solutions in the residential and small commercial markets. In 2014, the brand was expanded to encompass all elements of energy management.[15]

Oversight of Efficiency Activities: The oversight of energy efficiency efforts is primarily the purview of the Energy Commission and CPUC. Linking efficiency to climate goals and electric system operations also requires coordination with the California Air Resources Board and the California Independent System

11 The loading order consists of decreasing electricity demand by increasing energy efficiency and demand response, and meeting new generation needs first with renewable and distributed generation resources, and second with clean fossil-fueled generation. The loading order was adopted in the 2003 Energy Action Plan prepared by the energy agencies and the Energy Commission's 2003 Integrated Energy Policy Report (2003 Energy Report) used the loading order as the foundation for its recommended energy policies and decisions. http://www.energy.ca.gov/2005publications/CEC-400-2005-043/CEC-400-2005-043.PDF

12 Jones, Christopher, and Daniel M. Kammen, *Spatial Distribution of U.S. Household carbon Footprints Reveals Suburbanization Undermines Greenhouse Gas Benefits of Urban Population Density*, Energy and Resources Group, Goldman School of Public Policy, and Department of Nuclear Engineering, University of California, Berkeley, December 13, 2013.

13 California Energy Commission, *California Energy Demand 2014-2024 Final Forecast*, January 2014, pages 3-4.

14 Community Choice Aggregators (CCAs) are governmental entities formed by cities and counties to serve the energy requirements of their local residents and businesses. Decision 12-12-036 December 20, 2012. http://www.cpuc.ca.gov/NR/rdonlyres/0534F66E-61D3-44FE-AE9D-939BD00CDCAA/0/CodeofConduct_D1212036.pdf

15 http://energyupgradeca.org/en/about.

Operator, respectively. Other state agencies, including the Department of General Services, Department of Education, and Division of the State Architect, oversee significant parts of the built environment. Local governments are responsible for verifying compliance with building code, and alongside utilities, nonprofits, and others, often play important roles in implementing efficiency programs. Similarly, water usage in buildings has a strong energy component, and coordinating with the numerous regional water agencies and programs overseen by the Department of Water Resources and the Water Resources Control Board is essential. Coordination across agencies and with implementers and the marketplace will improve program effectiveness, align goals and measures, and reduce duplicative effort.[16] [17]

Compliance: California's *Building Energy Efficiency Standards* are the most advanced in the United States. The latest update, the *2013 Building Energy Efficiency Standards,* is projected to save Californians $1.6 billion in energy costs over the next 30 years.[18] The 2016 update will take additional steps toward ensuring all cost-effective efficiency is included at time of construction. Alterations of existing buildings, especially homes, often take place without building permits, and compliance with building codes and the energy standards is uncertain. Addressing the application, compliance, and enforcement of building standards in existing buildings is a high priority.

Energy Efficiency Project Performance: Variability in the actual performance of energy efficiency improvements is natural and manageable if kept within reasonable limits. Almost 80 percent of California utility customers have smart meters, which can provide unprecedented ability to identify opportunities for and assess impacts of efficiency measures, both for individual projects and across portfolios. New diagnostic technologies can better track performance and provide useful, timely feedback to operators and installers. Appropriately gathered, these data can help understand patterns and support investors across their portfolios. Such insights can help ensure transparency and accountability of the energy efficiency industry and increase the quality of installations.

"Code-as-Baseline": The increasing stringency of California's *Building Energy Efficiency Standards* widens the performance gap between existing buildings and current code. This increasing stringency both makes "to-code" projects in existing buildings more challenging (and expensive) than before and reduces the potential for "above-code" measures for a given project.[19] In addition, the cost-effectiveness analysis that supports these increasingly stringent codes is based on the cost of incorporating efficiency measures into new construction, which is significantly lower than for existing buildings. At the same time, ratepayer-funded incentive programs are generally allowed to claim only the "above-code" energy savings of a project. Therefore, "to-code" projects have little or no program support, while "above-code" savings opportunities represent only incremental savings and tend to be more complex. If this disconnect between codes and voluntary programs is not addressed, attractive improvements in existing buildings may go unrealized or be driven underground. State agencies must better understand the extent of unrealized savings and the potential role of energy efficiency programs to make a positive impact.

16 Goodhill, Gina and Mary Luevano, "California's Comprehensive Law on Energy Efficiency in Existing Buildings: Leading the Way," paper presented at ACEEE Summer Study on Energy Efficiency in Buildings, 2012, p. 8-105.

17 Taylor, Mac "*Energy Efficiency and Alternative Energy Programs*," Sacramento: California Legislative Analyst's Office, 2012.

18 California Energy Commission, *California Energy Commission 2012 Accomplishments,* 2013

19 The Cadmus Group, Commercial Building Market Characterization for Savi*ngs by Design Program: Study ID: SCE0312.01,* Southern California Edison, 2011.

Building Sectors and Market Characterization

The following section provides a brief overview of each of the main existing building sectors covered in this plan and the opportunities and challenges related to increasing energy efficiency.

Single Family

The single-family market (buildings with 1-4 dwelling units) is a challenging arena in which to achieve deep energy savings due to the diversity in housing stock, socio-economic and demographic makeup, property owner preferences, behaviors, knowledge of energy, and differences in climate zones. Increasing energy efficiency in the single-family market has many barriers, including a perception among homeowners that they are already doing everything they can or that it is too expensive to make improvements.[20]

According to the Energy Information Administration, California households use 62 million British thermal units (Btus) of energy per home per year, 31 percent lower than the U.S. average. Californians use natural gas to heat their homes, more than the rest of the country (59 percent). Nearly 60 percent of homes in California have air conditioning, primarily central air. About 44 percent of all energy used in homes is for appliances, lighting, and electronics (often referred to as *plug loads* and *miscellaneous electric loads* [MELs]).[21]

Single-Family Sector (1-4 units)

Number of Buildings

8,983,000 attached and detached

1,116,000 2- through 4-unit homes

Total: 10,099,000 (73 percent of residential buildings)

Annual Energy Use

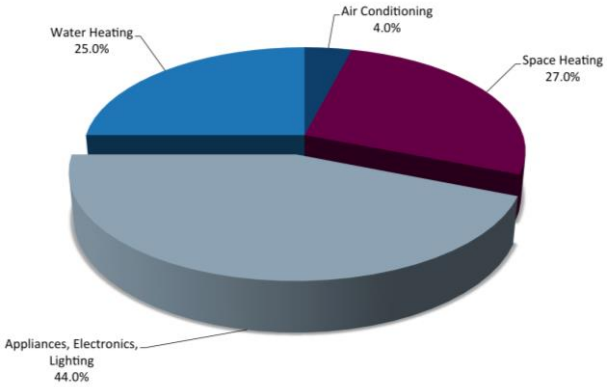
35 percent of building energy use (not including industrial)

Approximately 76 percent of all residential energy use (not including 2-4 unit multifamily)

Key Building Industry Actors

- Licensed general contractors
- Building Performance Institute-certified contractors; Building Performance Contractors
- Home Energy Rating System Raters
- Specialty contractors including heating, ventilating, and air conditioning, weatherization, and remodeling
- Real estate brokers and agents
- Mortgage brokers and lenders

Figure 1.3: California Residential Energy Consumption by End Use



Source: EIA Residential Fact Sheet, 2009

20 The block and tackle group + Greenburg, *Energy Upgrade California Top Line Messaging Summary* July 24, 2013.

21 www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/ca.pdf.

Opportunities and Challenges for the Single-Family Market

California's single-family market offers both opportunities and challenges to achieving high levels of energy efficiency. As mentioned in the sidebar on page 8, residential energy use represents 35 percent of all building energy consumption. Nearly 80 percent of potential savings in the residential sector can come from single-family homes.[22] Below is a summary of some of the key opportunities and challenges addressed in the plan.

Opportunities

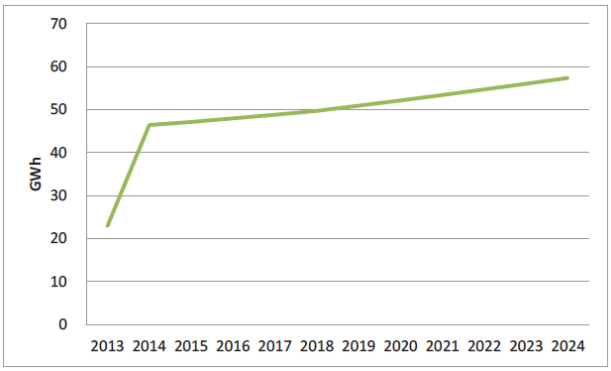
Potential Savings: Lighting, shell, HVAC, and appliance plug loads have the largest energy-saving potential, with appliance plug loads providing a potential 25 percent of savings.[23]

Behavior: While quantifying the actual savings available from behavior programs is difficult, it is anticipated that there are substantial opportunities to achieve higher savings in the residential sector through behavior programs as illustrated in Figure 1.4.[24]

Targeted Efforts: Based on the Potential and Goals Study conducted by Navigant, some of California's extreme climate zones (the Red Bluff, Stockton, Fresno, Barstow, and Brawley regions) with older single-family housing offer the greatest opportunity to realize whole-house (shell and HVAC measures integrated in a single project) energy efficiency improvements.[25]

Non-Energy Benefits: There is the potential to expand awareness and uptake of energy efficiency in the residential market by expanding messaging and emphasis on non-energy benefits, such as increased comfort, improved health, and environmental benefits. Furthermore, focusing on trigger events such as purchasing a new home or replacing major equipment can lead to increased interest and participation in whole-house programs. Recent surveys indicate that cost savings is the primary motivator to be energy-efficient.[26]

Figure 1.4: 2011 Residential Behavior Program Savings Potential



Source: Potential and Goals Study, Navigant, Page 155

Going Green: According to a 2011 McGraw Hill Survey, green retrofits and remodels provide one of the greatest opportunities in the residential market. In 2011, 34 of builders were considered "green," but less than 20 percent of their projects incorporated green measures. It is anticipated that by 2016, more than 75 percent of builders will be considered "green" with 60 percent of their projects incorporating green measures.[27]

22 Navigant Consulting, *2013 California Energy Efficiency Potential and Goals Study*, February 14, 2014, page 164.

23 Ibid., page 163.

24 Ibid., page 155.

25Navigant Consulting, *Analysis to Update Energy Efficiency Potential, Goals, And Targets for 2013 And Beyond*, March 19, 2012, page 54.

26 Navigant Consulting, *2013 California Energy Efficiency Potential and Goals Study*, February 14, 2014, pg. 144.

27 *The State of Green Building*, Results from McGraw Hill 2011/2012 Green Home Builders and Remodelers Survey, February 2012.

Challenges

Obscure Value Proposition: While basic energy efficiency measures may be common to most homes, costs and savings of deep energy efficiency improvements can be highly variable.[28] Thus, targeting homes for a specific measure, or defining the optimal project scope for a given home, can be complex. Further, where residential tenure in a given property is short–typically about 5-8 years in California, depending on the economy and housing market–consumers may not recoup the value of a deep retrofit project while they own the home.

Marketplace and Property Valuation: Energy efficiency is not recognized in property listings, appraisals, or valuation processes. As a result, real estate professionals (appraisers, mortgage lenders, and brokers) do not universally recognize or understand the value of energy efficiency improvements. California lacks a single, well-understood metric for quantifying energy efficiency in the market to help these professionals integrate energy efficiency features and values into their business transactions.

Uneven Quality and Delivery of Services: More than half of all home performance companies have fewer than 20 employees and would benefit from training, including "soft skills," such as sales and customer service[29], which are necessary to communicate the complexities of whole-house energy efficiency.

Consumer Awareness: Consumer awareness of the characteristics and benefits of efficiency is not sufficient to motivate proactive decisions. Even with perfect information, consumers do not always make rational decisions to prioritize efficiency.[30] Further, potential participants perceive residential energy efficiency programs as overly onerous and slow, with too few benefits.[31]

Compliance With Building Standards (for additions and alterations): Current estimates are that fewer than 10 percent of all residential HVAC replacements are performed under a building permit. However, little data are available that document energy savings lost as a result of unpermitted work. There is limited perceived value in the marketplace for contractors and homeowners in getting permits for HVAC replacement. Moreover, many building departments, especially those with limited resources, prioritize other parts of the building code above the energy standards and may not follow state-level direction consistently.

28 Ungar Lowell, Rodney Sobin, Neal Humphrey, et al, "Guiding the Invisible Hand: Policies to Address Market Barriers to Energy Efficiency," paper presented at ACEEE Summer Study on Energy Efficiency in Buildings, p. 6-324; Jon Creyts, Hannah Choi Granade, and Kenneth J. Ostrowksi, *US Energy Savings: Opportunities and Challenges,* McKinsey & Company, 2010.

29 Redman, Elizabeth, *The Home Performance Industry Perspective on Training and Workforce Development,* Home Performance Resource Center, 2010.

30 Fuller, Merrian C., et.al, *Driving Demand for Home Energy Improvements,* Berkeley: LBNL, 2010, p 28; Ungar, Lowell, Rodney Sobin, Neal Humphrey, et al, "Guiding the Invisible Hand: Policies to Address Market Barriers to Energy Efficiency," paper presented at ACEEE Summer Study on Energy Efficiency in Buildings, p. 6-324.

31 Ibid, Fuller, et.al, p. 23.

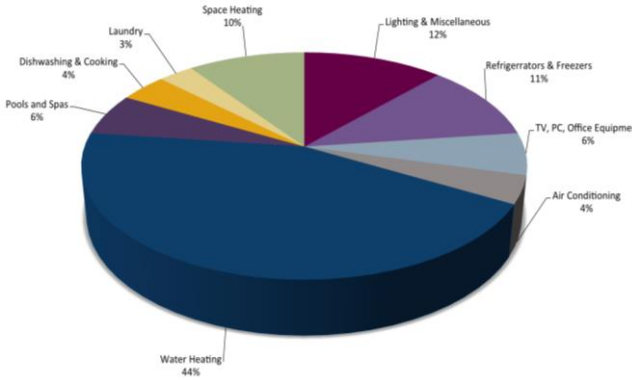
Multifamily (5+ units)

Energy savings goals in the multifamily sector cannot be accomplished by expanding single-family or modifying commercial building approaches. The critical elements that set multifamily apart include the size and complexity of buildings and systems, variability of ownership structure, split payment of utility costs between owners and tenants, limited financing products, and varied tenant sophistication and resources.

An added complexity in the multifamily sector is the high percentage of residents who are renters (90 percent) and low-income (more than 40 percent).[32] Another important characteristic is that most multifamily buildings (more than 90 percent) are located in metropolitan areas and associated suburbs, primarily Los Angeles, San Diego, Orange County, and the San Francisco Bay Area.[33]

The highest energy uses in multifamily homes are space heating (22 percent) and water heating (39 percent).

Figure 1.5: Multifamily Unit Electrical Use



Source: From 2010 California Residential Appliance Saturation Survey

Multifamily Sector (5+ units)

Number of Buildings
Total: 3,126,000 (23 percent of residential buildings)

Annual Energy Use
11 percent of Building Energy Use (not including industrial)

Nearly 24 percent of all residential energy use (includes 2-4 unit buildings)

Vintage
More than **70 percent** of California's existing multifamily buildings were constructed before there were building energy efficiency standards (pre-1978).

Key Building Industry Actors

- Property owners
- Property/facility managers
- Architects and engineers
- General contractors
- Real estate brokers
- Lenders, financial brokers, and underwriters

Types of Multifamily Buildings
Multifamily builidngs come in a variety of physcial sub-types and occupant types, which makes it difficult to implement standard energy efficency solutions.

Types include garden-style attached units, apartments, condominiumsmixed-use, senior housing/assisted living, special needs, single-room occupancy, co-op housing, and dormitories.

Sources: Department of Finance and National Multi Housing Council
Based on 2010 and 2012 data.

32 The Cadmus Group, Inc. *ESA Program Multifamily Segment Study.* Prepared for Pacific Gas and Electric. Dec 4, 2013.

33 Housing and Community Development, Statewide Housing Plan, 1990 – 1997, page 36-38.

Opportunities and Challenges for the Multifamily Market

Below is a summary of the opportunities and challenges for the multifamily market.

Multifamily Sector Opportunities

Potential Savings: Multifamily dwellings have significant opportunities to increase efficiency, especially in the areas of water heating and distribution, space heating, and lighting, which collectively account for 72 percent of total site energy consumption (excluding common area loads such as pool heating) and landscaping, the main source of water consumption.[34] The Benningfield Group's 2009 national report on multifamily energy efficiency potential indicates that there is potential for an estimated 30 percent improvement in energy savings in multifamily buildings, resulting in $9 billion annually to building owners nationwide.[35]

Tenant Star: The Federal Energy Efficiency Improvement Act of 2014 creates a free, voluntary certification and recognition program to promote energy efficiency during design and occupancy of leased spaces. The intent of this program is to help property owners and tenants save money through greater energy efficiency inspired by providing knowledge of their usage and promoting the value of energy efficiency.[36]

Trigger Events: During the life cycle of a multifamily building, there are specific times when it is most cost effective and convenient for the developer or owner to make energy and green upgrades. Upgrade programs can tailor services to take advantage of these entry points, such as:

- Unit-by-unit upgrades with tenant turnover (appliances, windows, water measures).
- The typical 15-year financing cycle of affordable housing.
- Roof replacement.
- Major equipment replacement.
- Major renovation.

Multifamily Sector Challenges

Inconsistent Definition of Multifamily: There is inconsistency in the definitions of single-family and multifamily among agencies, utilities, and other stakeholders (that is, 5+ units in a building compared to Title 24 code definition of three or more stories regardless of units.) Applying California's *Building Energy Efficiency Standards* presents challenges to multifamily developers, given the hybrid residential/nonresidential character.

Inadequate Access to Billing Data and Unit Energy Use: Multifamily buildings either have a master meter where utility costs are simply allocated equally across all units or they are individually metered, in which case usage data is inaccessible to property owners. In both cases, decision-makers (property owners and building managers) have inadequate access to information that could help them identify heavy energy users or system problems that could be addressed by operational, behavioral, or physical improvements.

Split Incentive: Eighty-eight percent of multifamily households are renters; most pay utility bills but do not have control over building or equipment improvements that could lower them.[37] Building owners typically pay for common area utilities (garage, lobby, landscape) but may not be able to influence tenant behavior that could help control costs.

Lack of Financing: Multifamily buildings typically require several layers of financing from multiple sources to complete major renovations and upgrades. This layering, a general risk-averse underwriting market, and a lack of quantifiable valuation of efficiency make it very difficult to arrange financing for

34 http://sustainca.org/programs/green_housing/multifamily_housing_opportunity

35 The Benningfield Group, *U.S. Multifamily Energy Efficiency Potential by 2020.* Prepared for The Energy Foundation, October 27, 2009, pg. 5.

36 https://energycommerce.house.gov/fact-sheet/energy-efficiency-improvement-act-2014.

37 *Overlooked and Untapped: Unlocking the Energy-Efficiency Potential in Multifamily Housing.* Benningfield Group. 2010. NOTE: This report uses a mix of national and California-centric data sets.

energy efficiency measures. A 2011 CPUC study identifying needs and gaps for energy efficiency financing in California estimates a total investment of $8.1 billion to achieve a 25 percent reduction in energy use of the existing multifamily building stock.[38]

Complexity of Affordable Housing Financing: While similar in most other aspects to market-rate housing, affordable housing financing mechanisms are different, and the developers have more stringent requirements to obtain loans and make investments for high-performance buildings. The U.S. Department of Housing and Urban Development has prioritized building performance in federally assisted housing, and California's agencies will participate in that effort.

Program Delivery Model: Many multifamily energy efficiency programs use program contractor delivery models. However, multifamily property owners tend to rely on established relationships with specialty contractors not specifically engaged in energy efficiency. Therefore, contractors may not be as effective a channel for energy efficiency as trained raters and auditors.[39]

38 Harcourt, Brown & Carey, *Energy Efficiency Financing in California*, report to the California Public Utilities Commission, July 2011.

39 Findings from the Multifamily Subcommittee of the California Home Energy Retrofit Coordinating Committee, *Improving California's Multifamily Buildings: Opportunities and Recommendations for Green Retrofit & Rehab Programs*, April 11, 2011, page 4.

Commercial

The commercial building sector is perhaps the most complex of all the sectors covered in this plan. Commercial buildings vary greatly in size, use, location, occupant, and ownership structure. The complexity of building types is increased by the differences in building owner and occupant needs, end uses, interests, and sophistication, particularly as it relates to energy and water efficiency. The *Commercial End Use Survey* (CEUS) update currently underway at the Energy Commission will provide updated California-specific data for this building population.

Commercial Sector*

Number of Buildings

Nearly 600,000 including retail, industrial, and office

Annual Energy Use

54 percent of building energy use (not including industrial)

See Figure 1.6 for energy use by building type

Key Building Industry Actors

- Facility managers
- Large general contractor firms
- Small contractors firms
- Specialty contractors, including HVAC, weatherization, and remodeling
- Architecture and engineering firms
- Developers and real estate brokers
- Lenders, financial brokers, and underwriters

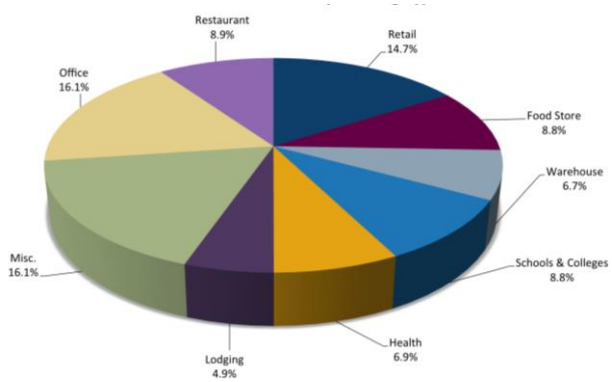
Source: *California Commercial End-Use Survey*, Energy Commission

* Much of the data for commercial buildings include industrial and public buildings. Therefore, these figures should be used as general estimates and not exact figures. Data are from 2010-2012.

End Uses

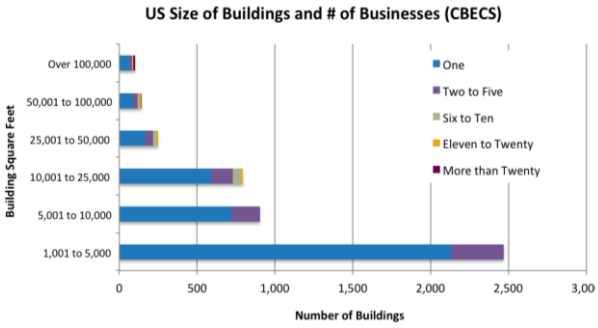
Energy use intensity (EUI – energy use per square foot per year) varies by building use. Restaurants and food stores with refrigeration have the highest energy intensities at about 2 times more than large office buildings and 3 times the energy use intensity of the average commercial building. Overall, restaurants and food stores with refrigeration represent 17.7 percent of energy use in the commercial sector. Offices represent 16.1 percent. Unrefrigerated warehouses have the lowest energy-use intensities.[40] Understanding opportunities for savings and targeting activities based on high energy use intensities are important elements to this sector, as well as for ongoing stakeholder and market engagement.

Figure 1.6: Commercial Electrical Use by Building Type



Source: California Commercial End-Use Survey (CEUS) 2004

Figure 1.7: Size of Buildings in USA and Number of Businesses



40 Calculated based on the *California Commercial End-Use Survey,* "Table E-3:Electric Energy Intensities by Building Type and End Uses", 2004, page 12.

Owners and Investors

The ownership structure of commercial buildings often determines management style, decision-making, level of knowledge, and resources available to make upgrades, as well as potential barriers to uptake. The U.S. Department of Energy reports in its *Buildings Energy Data Book*" that 47 percent of all commercial buildings in the United States are owner-occupied, indicating the opportunity for energy efficiency measures to affect the owners directly. Another 49 percent is not owner-occupied and is likely managed by a professional facility manager or firm. The remainder is unoccupied.

More than 50 percent of commercial buildings nationwide are less than 5,000 square feet, and 82 percent of those contain only one business. Another 36 percent of commercial buildings are between 5,000 and 25,000 square feet, with 74 percent containing one business. Only 10 percent of commercial buildings are more than 25,000 square feet.[41] This indicates the importance of addressing the small and medium-size building sector and potentially focusing on the single tenant instead of the larger buildings with multiple tenants.

The commercial market is dominated by several key industries in terms of dollars, in large part due to the size of the projects. McGraw Hill found that 70 percent of projects greater than $50 million have Leadership in Energy and Environmental Design (LEED) specifications in the plans. This presents an opportunity for influencing the overall market.

Below are the estimated national markets, of which California represents roughly 12 percent, with the highest percentage of "green" building penetration:

- Education $13 billion-$16 billion
- Health Care $8 billion-$9 billion
- Office $7 billion-$8 billion
- Public Buildings $3 billion-$4 billion

41 Energy Information Administration, *Commercial Building Energy Consumption Survey 2003.* www.eia.gov/consumption/commercial/data/2003/.

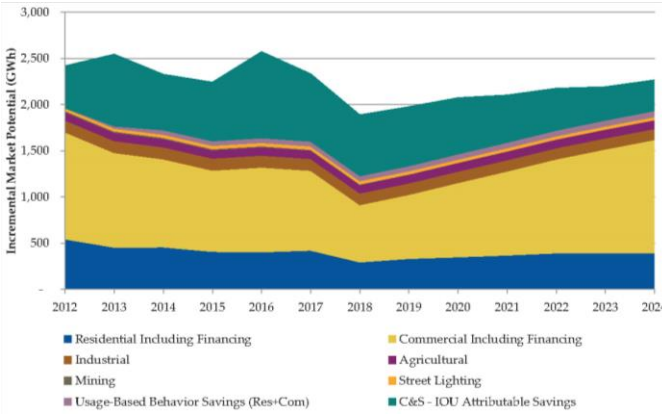
Opportunities and Challenges for the Commercial Market

Following is a summary of opportunities and challenges for the commercial sector.

Commercial Building Sector Opportunities

Reduced Operation Costs: Energy efficiency improvements (physical, operational, and behavioral) have a direct effect on operating costs and can provide strong motivation for upgrades. Furthermore, there is increasing understanding that "green" buildings bring non-energy benefits such as improved employee retention, health, and productivity, which also affect operating efficiencies and costs.[42]

Figure 1.8: Incremental Annual Market Potential by Sector



Source: Navigant, Potential and Goals Study, 2014

High Energy-Saving Potential: The greatest energy savings potential, according to the *2013 Navigant California Potential and Goals Study*, is in commercial buildings, (See Figure 1.8) particularly in lighting. Whole-building retrofits also offer significant potential to save energy. In addition, according to the *2013 Standards Impact Analysis Report*, the largest energy savings potential from nonresidential energy standards for existing buildings exists in lighting, roof, and HVAC alterations.

Green Demand: McGraw Hill's 2011 Construction Survey indicates that there is a growing demand for

42 *Green Outlook 2011, Green Trends Driving Growth*, McGraw Hill Construction, 2011.

green buildings driven in large part by energy-related savings. The top three drivers are:[43]

- Energy use and cost.
- Need to provide sustainability services (67 percent of corporate leaders believe their customers have a need for sustainability services).
- Demand for "green" buildings (78 percent of architects and engineers, and 81 percent of contractors indicate that their clients are demanding green)

Market Growth: The McGraw Hill survey estimates that the nonresidential retrofit market will triple by 2015, growing from 7-12 percent or $3 billion in 2010 to 25-33 percent of the market and $14 billion-$18 billion in 2015. If smaller renovations are included, this number could be twice as much. Seventy-five percent of respondents indicated they plan to incorporate energy efficiency in their upgrades. Continued incentives and effort in existing buildings will ensure that retrofits will represent the largest portion of the commercial market.[44]

LEED for Existing Buildings: All building managers and owners in the McGraw Hill survey indicated they would add additional LEED Existing Buildings Operations and Maintenance (EBO & M)) to portfolios in the next three years – 83 percent for ENERGY STAR and 33 percent for LEED for new buildings. This shows a strong interest in updating existing building stock to green standards.[45]

Trigger Points for Improvements: There are several key trigger points for commercial buildings that can be leveraged for energy efficiency:

- Building sale, tenant change, or lease renewal
- Redesign of a space
- Maintenance agreement renewal
- Mortgage refinance

Commercial Building Sector Challenges

Lack of Good Data:

Energy consumption and the value of associated efficiency savings can be difficult to measure due to imperfect metering and data availability for tenants and owners, as well as uncertainty about future energy prices.[46]

Lack of Awareness:

- Owners of small and medium-size buildings and real estate brokers have limited awareness of energy savings opportunities and the benefits of green buildings.[47]
- Most tenants do not consider operating costs (such as utility bills) when negotiating a lease and tend to base decisions on lease cost alone.[48]

Misplaced/Misaligned Incentives (insufficient return on investment):

- Lack of perceived value of energy efficiency in building operating costs results in suboptimal investment in efficiency improvements. Other investments are valued higher by tenants or required by law and have higher priority.
- Split incentive problem: The *split incentive* refers to the divergent needs of a landlord and tenant: the decision-maker for efficiency investment does not pay the energy bills and has little incentive to reduce them.[49] When the tenant pays utilities, the owner's incentive to make improvements is limited because upgrades may not lead to increased rents. Tenants must have the owner's permission to upgrade leased space. When the owner pays the utilities, they generally wait until a space is vacant to make improvements.[50]

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43 *Green Outlook 2011, Green Trends Driving Growth,* McGraw Hill Construction, 2011.

44 Ibid.

45 Ibid.

46 Vaidyanathan, Shruit, Steve Adel, Jennifer Amann, et al, *Overcoming Market Barriers and Using Market Forces to Advance Energy Efficiency,* Washington, D.C.: ACEEE, 2013.

47 Green Building Initiative Task Force, *Green Building Action Plan: Back-Up Technical Document – Rationale, Specific Actions, and Timeline,* Cal EPA, 2004.

48 Green Building Initiative Task Force, 2004.

49 Vaidyanathan, Nadel, Amann, et al, 2013; Green Building Initiative Task Force, 2004; Thorne and Nadel, 2003.

50 Bell, Casey J., Stephanie Sienkowski, and Sameer Kwatra, *Financing for Multi-Tenant Building Efficiency: Why this Market is Underserved and What Can Be Done to Reach It,* Washington, D.C.: ACEEE, 2013.

- Short payback time frames - Small and medium-size businesses typically require 6 to 18 months for payback on efficiency improvements and large businesses 2 to 3 years, resulting in less uptake of deeper and more expensive improvements.[51]

Market Structure Challenges:

- Owners of small and medium-size businesses may not have the credit needed for capital-intensive system upgrades. Owners need proof that savings will outweigh costs.
- Owners of small and medium-size businesses are harder to reach than owners of larger businesses.
- In more diverse communities, efficiency service providers and programs may have difficulty reaching owners of small and medium-size businesses.[52]
- Owners of small and medium businesses are less likely to know where to find reliable efficiency-focused contractors and qualified retrocommissioning providers.[53]
- Access to capital or qualifying for financing is not enough on its own to inspire energy improvements. Management priorities for debt, working capital, and payback time frames all influence appetite for investment in a building.
- Buildings that are not professionally managed may face a variety of informational obstacles and debt constraints.[54] The owners of these buildings often lack the technical resources and knowledge to carry out effective energy efficiency measures.

Integrating Energy Efficiency Into the Property Valuation Process:

- Existing loan underwriting practices provide no incentive for building owners to make their buildings more energy–efficient, and typically underwriting does not account for risks associated with the level or volatility of the energy costs of a commercial building.
- Energy service companies (ESCOs) typically serve government and larger commercial operations with integrated energy efficiency solutions, including financing improvements, within in one establishment and do not offer the same level of services to small and medium-size businesses.[55]
- Property condition assessments (PCAs) used to underwrite commercial mortgages often have minimal consideration of energy efficiency and are not standardized; therefore, lenders cannot translate the PCAs into useable measures of the expected level and volatility of the energy consumption of a building. This means that efficient buildings and inefficient buildings are offered the same mortgage terms, despite having different investment risks.[56]

51 Ibid.

52 Southern California Edison, *SCE Annual Narrative,* 2013.

53 Thorne, Jennifer and Steve Nadel, *Retrocommissioning: Program Strategies to Capture Energy Savings in Existing Buildings*, Washington, D.C.: ACEEE, 2003.

54 Ibid; Green Building Initiative Task Force, 2004

55 Harcourt, Brown, and Carey, *Energy Efficiency Financing in California Needs and Gaps: Preliminary Assessment and Recommendations,* San Francisco: CPUC, 2011, p. 34.

56 Jaffe, Dwight, Richard Stanton, and Nancy Wallace, "Energy Efficiency and Commercial Mortgage-Valuation, paper presented at the Fisher Center Working Papers Series, Berkeley, September 13, 2011.

Public

Public buildings provide a dual role in the *EBEE Action Plan* - first as an opportunity to increase energy savings across an entire sector that can save the government money, and second, as a model for energy and water efficiency for the commercial sector. Often public buildings are categorized as nonresidential or commercial. However, in this Plan, public buildings are categorized separately to enable implementation focus on the distinct opportunities and challenges they present. For this Plan, public buildings include all state, local, and federal government buildings, as well as public schools.

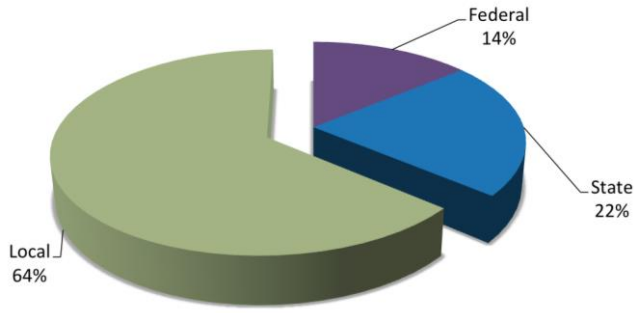
Opportunities and Challenges for Public Buildings

There are substantial opportunities to save energy in public buildings, but there are differences between jurisdictions, inconsistencies in resource availability, and competing priorities. Following is a summary of the opportunities and challenges facing energy efficiency improvements in public buildings.

Public Building Sector Opportunities

Mandated Improvements: A series of executive orders from the Governor's Office effectively mandate energy assessments and/or upgrades in state buildings, and many local governments have adopted ordinances aimed at improving the energy performance of buildings they own and manage. The University of California system has set a goal to achieve zero net energy across its campuses. Continued and expanded support for government agencies to meet these goals is critical to capture the potential energy savings offered in this sector.

Figure 1.9: Government-Owned Buildings Nationwide



Source: EIA

Public Buildings

Number of Buildings

State Buildings

DGS reports about 12,800 state-leased or -owned buildings with a total of more than over 125 million square feet of floor space.

Local Government Buildings

Definitive data are not available for the number of local government buildings in California. Based on the 64 percent national average of local government buildings (see Figure 1.9), there are an estimated 35,000 to 40,000 local government buildings in California.

Schools

K-12: About 12,800 schools; more than 714 million square feet.

California Community Colleges: 112 campuses; 5,281 buildings; 75.6 million square feet.

California State Universities: More than 2,000 buildings; 90 million square feet.

University of California System: 5,775 buildings; 129 million square feet.

Key Building Industry Actors

- Department of General Services
- Local government agencies
- Local government IOU partnerships
- Energy services companies

Sources: EIA, Energy Commission, Department of Finance

Model for Energy Efficiency: The McGraw Hill Construction Survey indicates that public buildings represent about 7 percent of the green, nonresidential market and offer an important opportunity for sustainable programs. The public nature of these buildings provides a showcase opportunity for businesses and consumers.[57]

57 *Green Outlook 2011, Green Trends Driving Growth,* McGraw Hill Construction, 2011.

Public Building Sector Challenges

Financial Constraints: Government and institutional organizations do not typically prioritize energy improvements as part of their overall capital improvement budgets, especially when utility bill savings accrue to their operating budget.[58] In addition, many state agencies do not manage their own buildings and rely on the Department of General Services to approve improvement budgets and manage the buildings effectively.

Small Jurisdiction Capacity and Resources: There is a general lack of technical assistance and procurement service support[59], as well as a lack of technical knowledge, staff, and resources to make energy efficiency management operational and effective, particularly in smaller municipalities.[60]

- Many small public agencies lack resources to create and implement climate action plans within which buildings are a key component.
- Lack of consistent, detailed information and technical assistance to evaluate municipal facility usage and identify high priority savings opportunities inhibits local governments' ability to define optimal pathways to reach energy and greenhouse gas goals.

58 Harcourt, Brown, and Carey, *Energy Efficiency Financing in California Needs and Gaps: Preliminary Assessment and Recommendations,* San Francisco: CPUC, 2011, p. 34.

59 Ibid.

60 PG&E, *Pacific Gas and Electric Company 2010-20112 Energy Efficiency Portfolio Local Program Implementation Plan Government Partnership Master,* San Francisco: PG&E, 2011.

Plan Framework

The *EBEE Action Plan* is propelled by a long-term vision and organized around five goals, each with specific objectives. These goals have been developed in response to stakeholder and partner agency input. Figure 1.10 provides the details of these elements as well as a summary of the primary strategies of the plan.

Principles

The plan principles illustrated in Figure 1.10 are important touchstones in the development of the *EBEE Action Plan* to ensure that strategies, initiatives, and objectives are in line with stakeholder values and the approach to achieving the state's goals.

Market-Centered

The market – consumers, property owners, tenants, and industry – constitute the primary focus of the action plan, and associated requirements, interests, and objectives inform and direct the strategies.

User-Focused

Achieving energy efficiency goals requires a broad range of approaches that address the needs of building owners and tenants through varied service delivery models and a wide range of tools.

Performance-Driven

Instead of dictating the path to each goal, the plan identifies outcomes, and provides potential tools, resources, and activities to generate innovation, accountability, and performance.

Scalable

The strategies and activities of the plan must be developed to allow for expansion and implementation at a large scale, avoiding niche programs.

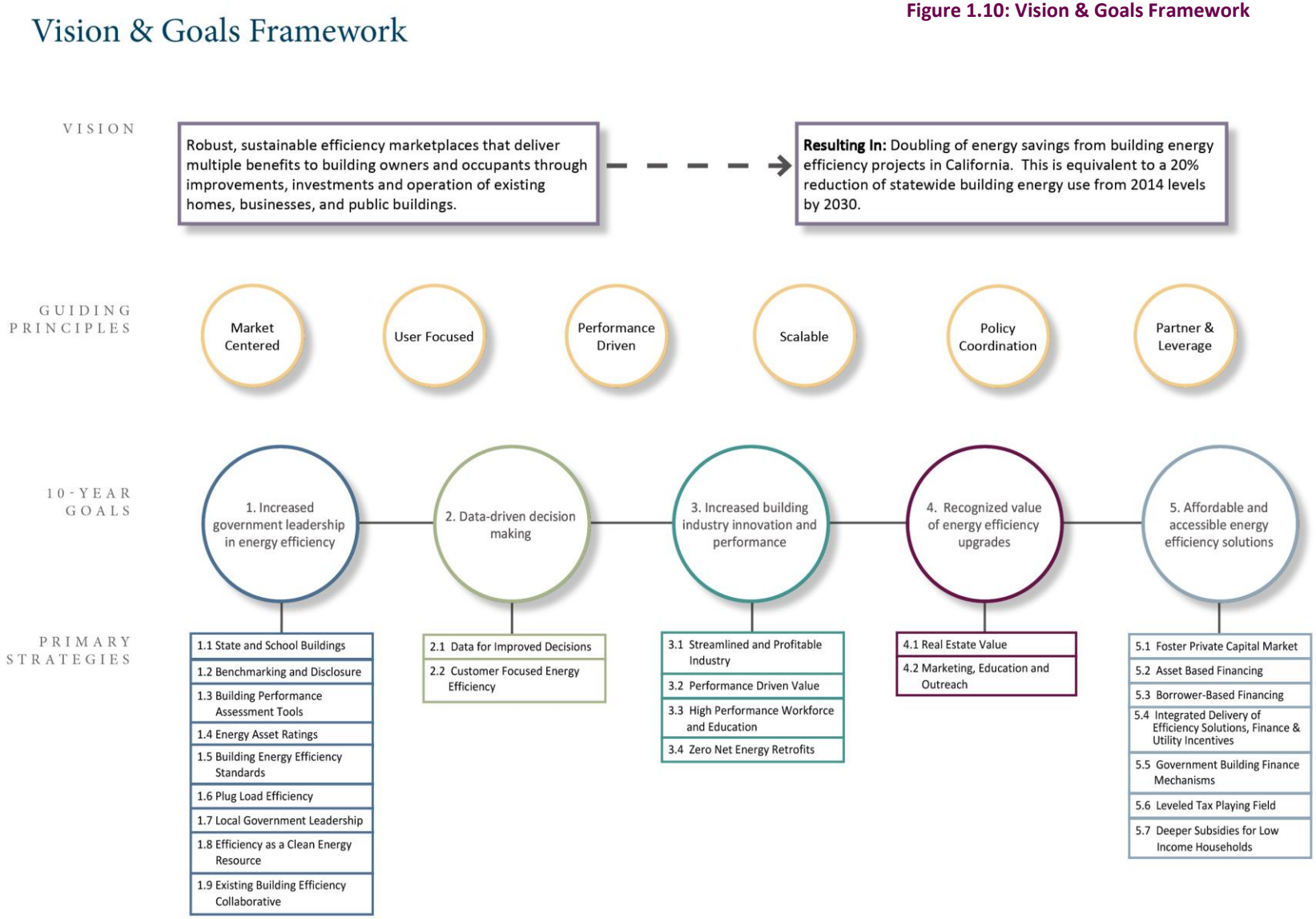
Policy Coordination

The plan will support and encourage ongoing coordination among state agencies – particularly the Energy Commission, CPUC, and ARB – as well as support and expand coordination of policy direction with federal, state, regional, and local governments.

Partner and Leverage

California's efficiency efforts should leverage not only ratepayer-funded energy efficiency programs, but other relevant activities, such as the California Solar Initiative and ENERGY STAR Building Challenge. The plan envisions activating partnerships with trade organizations, manufacturers, software developers, schools, and other third parties who can help innovate and expand their collective reach.

Figure 1.10: Vision & Goals Framework



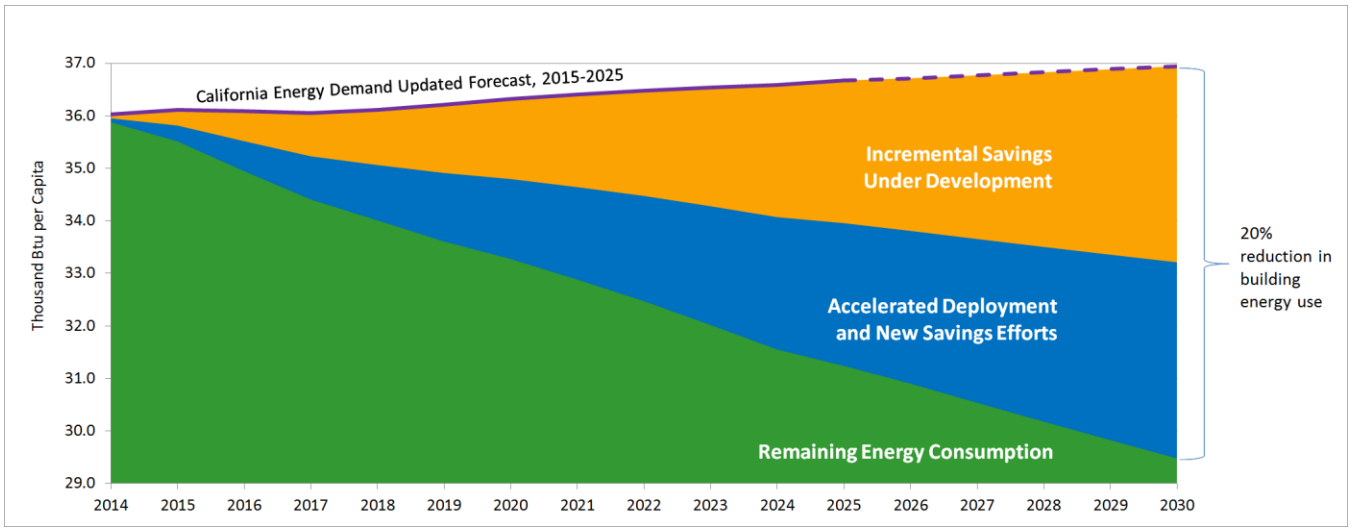
Source: California Energy Commission

Milestones and Outcomes

The success of this plan requires consistent and aggressive implementation. Equally important is the ability to measure success to adapt, evolve, and adjust strategies. The following are primary milestones implementers will use to assess and adapt the plan over the next 10 years:

- By 2016, all California utilities provide whole-building energy use data to building owners and their agents upon request.
- By 2018, the energy agencies use analytical tools containing granular, statewide data on energy usage and building characteristics to track the evolution of energy usage, identify market trends, understand compliance with state and local codes, and update policies and programs to maintain and enhance effectiveness.
- By 2016, building owners and occupants have easy access (directly or via their chosen service providers) to detailed energy usage data. By 2017, they routinely use this information to inform their decisions.
- By 2017, a time-certain benchmarking program is in place for nonresidential buildings more than 50,000 square feet.
- By 2017, energy and cost savings information for state and school building retrofits is publicly available.
- Every two years, starting in 2017, the Existing Building Efficiency Collaborative evaluates plan progress and reports findings in the *Integrated Energy Policy Report.*
- By 2018, energy asset ratings are considered in real estate appraisals and included in property listings.
- By 2018, establish baseline code compliance rate for residential HVAC replacements. By 2021, improve compliance to 80 percent.
- The *2019 Building Energy Efficiency Standards* provide directed guidance and simplified approaches for compliance and enforcement of code requirements for existing building alterations.
- By 2020, retrofit project compliance with the *Building Energy Efficiency Standards* is at 90 percent and is achieved at lower cost.
- By 2020, brokers and underwriters routinely consider asset ratings and other energy performance indicators when determining housing expense-to-income and commercial debt service coverage ratios.
- By 2020, the financial value of energy savings is a clear driver for private investment in energy efficiency and supports development of alternative, innovative business models to both satisfy and drive market demand.
- By 2020, industry quality assurance is a routine job completion practice.
- By 2020, a certified, high-performing workforce is enabled to support energy efficiency industry in California.
- By 2020, utility resource procurement programs play an increased role in achieving energy savings.
- By 2030, California has achieved double the energy efficiency savings trajectory in the additional achievable energy efficiency mid-case scenario in the *California Energy Demand Updated Forecast, 2015-2025*. This is aligned with the goals Governor Brown announced in his 2015 inaugural address and is a key component for achieving California's long-term greenhouse gas emissions reduction goals. This goal will result in lower total building energy use in 2030 than in 2014, despite population and economic growth, and is equivalent to a 20 percent reduction in usage compared to current projected 2030 levels.

Figure 1.11: Reduced Building Energy Consumption per Capita by Doubling Energy Savings



Source: California Energy Commission

Figure 1.11 depicts Governor Brown's goal to double energy efficiency savings in buildings by 2030. Data from the adopted *California Energy Demand Updated Forecast, 2015-2025* (the most recent adopted demand forecast) stops in 2025 but was projected to 2030 for this chart. The expected electricity and natural gas use in buildings is divided by the expected California population to derive per capita energy consumption.

The double energy savings goal for buildings assumes achievement of the energy efficiency from currently adopted and funded policies, standards, and programs. The highest (purple) trend line includes these "committed" savings. The orange wedge (Incremental Savings Under Development) represents the electricity and natural gas per capita savings projected to occur in IOU and POU service territories through planned California and U.S. appliance efficiency standards, Building Energy Efficiency Standards through 2022, and continuous implementation of approved ratepayer-funded energy efficiency programs.[61] The blue wedge (Accelerated Deployment and New Savings Efforts) represents a doubling of the per capita savings expected from incremental savings under development. This second savings wedge will be achieved in part by the efficiency savings from investments and behavioral changes made by consumers and businesses outside of any incentive program. However, the vast majority of these additional savings will result from new efforts and revised approaches. Achieving the Governor's goal will ensure the building sector contributes its share to meet California's long-term greenhouse gas reduction goals. The goals and strategies to realize these increased energy savings comprise this plan.

61 POU electricity efficiency savings are set at 25% of IOU electricity efficiency savings until the California Energy Demand Forecast, 2016-2026 is completed. The 25% is based on relative program expenditures and savings rates between the IOUs and POUs.

Photo. DMV Headquarters, Sacramento, LEED Silver Renovation, CVAIA Award Winner. Source: California Department of General Services

Chapter II. Policy Context

Overview

"...As utility and state planners face increasing uncertainty and rising supply costs in their long-term planning...they should look to energy efficiency as a reliable and consistent 'first fuel' in their loading order of energy options."

The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs, Maggie Molina, March 2014, Report Number U1402, American Council for an Energy-Efficient Economy

This chapter provides the context for the *EBEE Action Plan* and summarizes other policies and programs that complement and support the development and implementation of this plan.

Energy efficiency has long been California's top priority resource to meet new electricity needs. This preference was formalized in the state's first *Energy Action Plan,* adopted in 2003.[62] The *Energy Action Plan*, updated in 2005[63] and 2008[64], established a loading order of energy resources to meet the state's growing electricity needs first with energy efficiency and demand response, then with renewable energy and distributed generation, and finally with clean fossil fuel sources and infrastructure improvements.

The investor-owned utilities (IOUs) and publicly owned utilities (POUs) together reported an investment of more than $1.1 billion (including electricity, natural gas, and low-income programs) in 2012 for energy efficiency programs across California, resulting in more than 4,300 gigawatt-hours (GWh) saved, as shown in Figure 2.1.[65] The utilities are expected to continue this level of investment and remain a critical partner in achieving the state's energy efficiency goals.

Figure 2.1: IOU and POU Electricity Savings and Program Expenditures 2011-2012

	IOUs		POUs	
	2011	2012	2011	2012
Electricity Savings (GWh)	3557	3898	456	440
Peak Demand Reduction (MW)	644	678	81	82
Expenditures ($ Millions)	$959	$1,004	$129	$127

Source: Reports from CPUC and California Municipal Utilities Association (CMUA)

Figure 2.2 on the following page provides a snapshot of California's energy policy history since 1974.

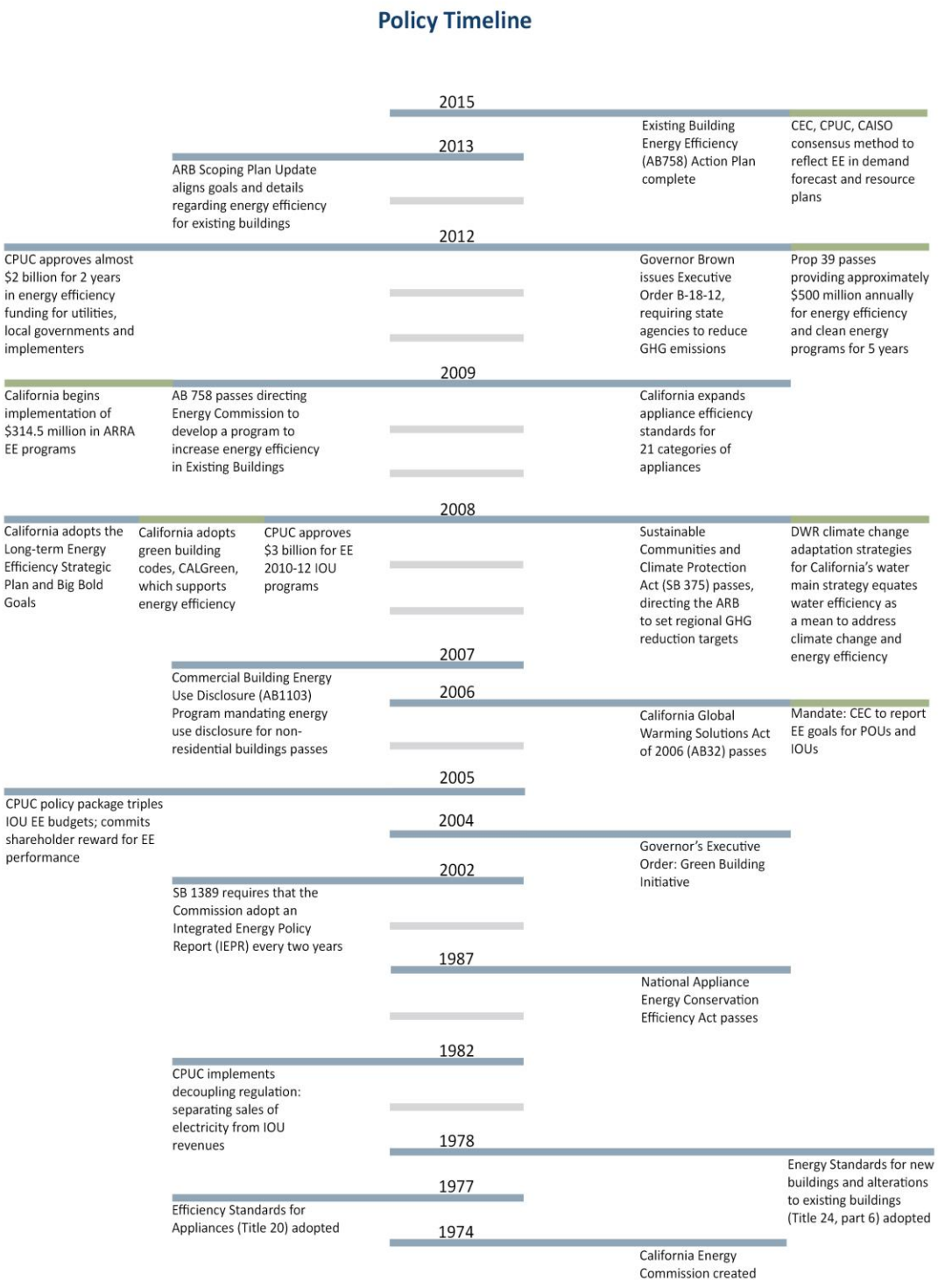
62 State of California, 2003. http://www.energy.ca.gov/energy_action_plan/2003-05-08_ACTION_PLAN.PDF.

63 State of California, 2005. http://www.energy.ca.gov/energy_action_plan/2005-09-21_EAP2_FINAL.PDF.

64 State of California, 2008. http://www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF.

65 Energy Commission, *Achieving Cost Effective Energy Efficiency in California: 2013 Status Update*, Energy Commission, CEC-200-2014-002, March 2014, page 1, http://www.energy.ca.gov/2014publications/CEC-200-2014-002/CEC-200-2014-002.pdf.

Figure 2.2: California Energy Policy Timeline



Source: California Energy Commission

Summary of Relevant Legislation and Policies

The following is a summary of relevant policy and legislation that affect existing buildings and energy efficiency in California.

California Long-Term Energy Efficiency Strategic Plan

The *California Long-Term Energy Efficiency Strategic Plan (CEESP)*, drafted in 2008[66] and updated in 2011[67], provides an overarching plan and "Big Bold Goals" to achieve California's energy efficiency and greenhouse gas (GHG) reduction goals. The CEESP was jointly developed by the California Public Utilities Commission (CPUC) and the California Energy Commission (Energy Commission) and calls for reducing energy consumption in existing residential buildings by 40 percent by 2020 and reaching zero net energy (ZNE) in 50 percent of California's existing commercial buildings by 2030. It also advises moving away from a single-measure approach and toward a building-as-a-system approach to achieve deep energy savings.[68] The CEESP is being updated, and this *EBEE Action Plan* is intended to become the existing residential and commercial buildings strategy sections. This likely includes modifying some of the current CEESP goals to be in line with market and sector realities.

Integrated Energy Policy Report

Every two years, the Energy Commission releases the *Integrated Energy Policy Report* (*IEPR*). The *IEPR* provides a comprehensive assessment of essential energy issues in California, along with recommendations for how to address market and regulatory challenges. In addition, the *IEPR* provides a forecast of energy supply and demand that is used as baseline planning data by key state agencies including the Energy Commission, CPUC, and the California Independent System Operator Corporation (California ISO). AB 758 implementation findings will be incorporated into future IEPR reports.

Assembly Bill 758

AB 758 (Skinner, Chapter 470, Statutes of 2009)[69] requires the Energy Commission, in collaboration with the CPUC and stakeholders, to develop a comprehensive plan to achieve greater energy efficiency in the state's existing buildings. AB 758 provides the impetus and direction for this action plan and to implement radical improvements in the energy performance of existing buildings required to achieve California's energy and climate goals. However, regulatory solutions alone will not accomplish this; true success will require a wide array of participants and funding sources to apply creative, systemic, and market-based solutions.

Over the last five years, the Energy Commission and the CPUC have been deeply engaged in piloting approaches to improving energy efficiency in existing buildings, leveraging American Recovery and

Figure 2.3: AB 758 Author Assemblymember Nancy Skinner

Source: http://usgbc-california.org/tag/green-hard-hat-award/

66 CPUC, 2008, http://www.cpuc.ca.gov/NR/rdonlyres/D4321448-208C-48F9-9F62-1BBB14A8D717/0/EEStrategicPlan.pdf

67 CPUC, 2011, http://www.cpuc.ca.gov/NR/rdonlyres/A54B59C2-D571-440D-9477-3363726F573A/0/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf

68 CPUC, *California Long Term Energy Efficiency Strategic Plan: Achieving Maximum Energy Savings in California for 2009 and Beyond,* CPUC, San Francisco, September 2008.

69 State of California, 2009, http://www.energy.ca.gov/ab758/documents/ab_758_bill_20091011_chaptered.pdf

Reinvestment Act (ARRA) funds to establish a stronger foundation for the building performance industry, and increasing understanding of the opportunities and challenges of energy efficiency. This action plan, designed to implement the AB 758 mandate, builds on those best practices and lessons learned from partners, industry, local governments, and customers. While the ARRA funding provided an influx of capital to develop and kick-start crucial components of the market, there is extensive work still to be done to create a robust and sustainable market and achieve the goals of AB 758.

AB 758 provides knowledgeable and practical direction for approaching the building upgrade challenge, acknowledges the multifaceted nature of such an undertaking, and calls on the Energy Commission to develop an approach that addresses the many facets of successful energy efficiency upgrades. Moreover, the statute directs the Energy Commission to work with key stakeholders to accomplish the goals of this action plan. The Energy Commission is identified as the primary implementing agency while outlining specific roles for the CPUC, the IOUs, the POUs, and local governments.

AB 758 specifically requires the Energy Commission to consider the following to achieve greater savings in the state's existing residential and nonresidential building stock:

- The amount of **annual and peak energy savings, GHG reductions, and projected customer utility bill savings** that will accrue from the program.
- The most **cost-effective means and reasonable time frames** to achieve the goals of the program.
- The **various climate zones** within the State.
- An appropriate method to **inform and educate** the public about the need for, benefits of, and environmental impacts of the comprehensive energy efficiency program.
- The most **effective way to report building energy assessment results** and the corresponding energy efficiency improvements to the owner of the residential or nonresidential building.
- **Existing statutory and regulatory requirements** to achieve energy savings and GHG emission reductions.
- A **broad range of implementation approaches**, including both utility and nonutility administration of energy efficiency programs.

Nonresidential Building Energy Use Disclosure Program (AB 1103)

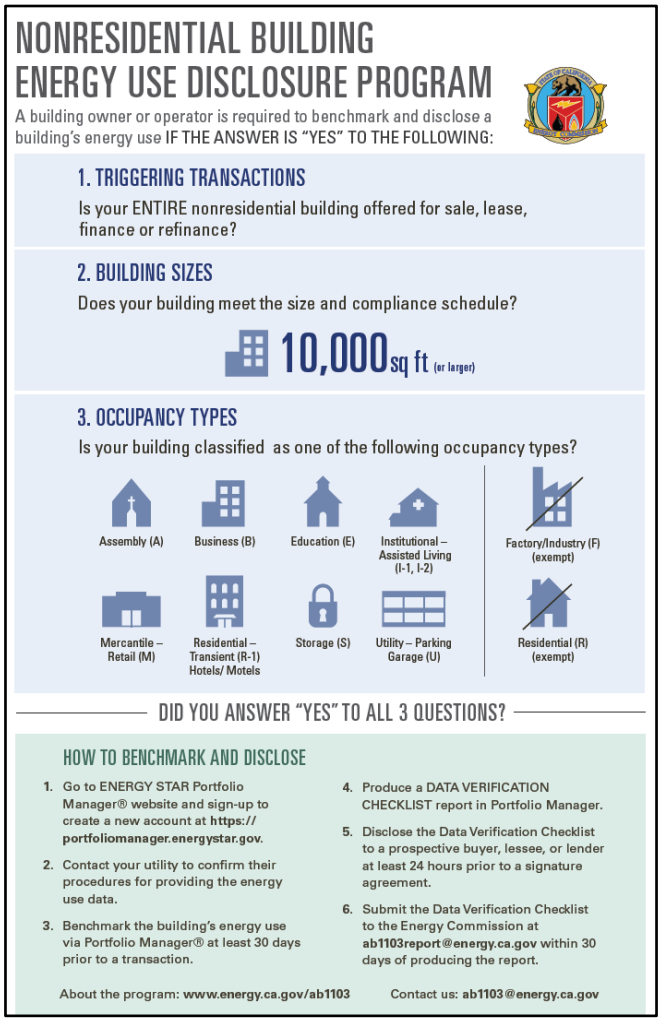
The Nonresidential Building Energy Use Disclosure Program (Assembly Bill 1103, Saldaña, Chapter 533, Statutes of 2007)[70] (Assembly Bill 531, Saldaña, Chapter 323, Statutes of 2009)[71] requires nonresidential building owners to benchmark and disclose general building information and energy usage data to prospective buyers, lessees, or lenders, and to the Energy Commission, using the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR Portfolio Manager. Figure 2.4 shows an infographic used to educate on the requirements of AB 1103.

As of January 1, 2014, commercial buildings 10,000 square feet and larger are required to comply when they are sold, leased, or refinanced. During the first six months, the Energy Commission received about 740 disclosure submittals. On July 2, 2014, the Energy Commission held a public workshop to discuss compliance issues and implementation barriers. AB 1103 program modifications by the Energy Commission are anticipated.

70 State of California, 2007, http://www.energy.ca.gov/ab1103/documents/ab_1103_bill_20071012_chaptered.pdf

71 State of California, 2009, http://www.energy.ca.gov/ab1103/documents/2011-09-12_workshop/2011-09-12_Assembly_Bill_531.pdf

Figure 2.4: AB 1103 Infographic



Source: California Energy Commission, 2014

Global Warming Solutions Act of 2006 (AB 32)

In June 2005, Governor Schwarzenegger established a goal to reduce California's GHG emissions below 1990 levels by 2020 and to 80 percent below 1990 levels by 2050. The Global Warming Solutions Act of 2006 (Assembly Bill 32, Núñez, Chapter 488, Statutes of 2006)[72] subsequently codified the 2020 GHG emission reduction target. In response to the goals outlined in AB 32, the Energy Commission's *2007 IEPR*[73] recommended targeting energy efficiency as a key strategy to address climate change, observing that efficiency programs can reduce demand, make businesses more competitive, and allow consumers to save money, improve health, and increase comfort.[74]

The *AB 32 2013 Scoping Plan Update*[75] lays out strategies to reach California's targets and increases the level of detail and attention to energy efficiency as a means to reduce global warming. The scoping plan states, "Buildings represent the second largest source of statewide GHG emissions, when accounting for electricity, natural gas, and water consumption." [76] Further, existing buildings provide significant untapped potential for energy savings, underscoring the importance of a comprehensive program to target efficiency improvements in all existing buildings.[77]

Equally important, many local governments in California have actively adopted AB 32 and have climate action plans or are planning to complete one. This provides an opportunity to link resources and

72 State of California, 2006, http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf

73 California Energy Commission, 2007, http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF

74 Garfield, Susanne, Carolyn Walker, and Yvonne Nelson, *2007 Integrated Energy Policy Report*, California Energy Commission, Sacramento, 2007, CEC-100-2007-008-CMF.

75 Air Resources Board, 2013, http://www.arb.ca.gov/cc/scopingplan/meetings/062613/panel_1.pdf

76 Air Resources Board, *First Update to the Climate Change Scoping Plan*, May 2014, page 82.

77 Ibid., page 83.

efforts regarding energy efficiency planning and policy with climate action planning at the local level.

The California Air Resources Board (ARB) has also committed to investing at least 25 percent of the cap-and-trade revenue it receives to benefit disadvantaged communities and households, with at least 10 percent of the projected funds to be targeted in disadvantaged communities.[78]

Defining Zero Net Code Building

"A Zero Net Energy (ZNE) Code building is one where the net of the amount of energy produced by on-site renewable energy resources is equal to the value of the energy consumed annually by the building, at the level of a single "project" seeking development entitlements and building code permits, measured using the California Energy Commission's Time Dependent Valuation (TDV) metric. A ZNE Code Building meets an Energy Use Intensity (EUIs) value designated in the Building Energy Standards by building type and climate zone that reflect best practices for highly efficient buildings."

-- Energy Commission, "2013 Integrated Energy Policy Report", January, 2014, pg. 36.

Time Dependent Valuation

"The concept behind TDV is that energy efficiency measure savings should be valued differently depending on which hours of the year the savings occur, to better reflect the actual costs of energy to consumers, to the utility system, and to society. The TDV method encourages building designers to design buildings that perform better during periods of high energy costs."

--Energy Commission, "Time Dependent Valuation of Energy for Developing Building Efficiency Standards", February, 2011

Green Buildings Action Plan (Executive Order B-18-12)

The Green Buildings Action Plan adopted in spring 2012 by Governor Brown's executive order[79] implements green building practices to improve energy, water, and materials efficiency improves air quality and working conditions for state employees; reduces costs to the State; and reduces environmental impacts from state operations. Specifically, state agencies must incorporate building commissioning for major renovations of buildings 5,000 square feet or larger that also have met a threshold EUI level; provide electric vehicle charging stations and appropriate infrastructure for the future; implement on-site power generation, if economically feasible; obtain an LEED "Silver" rating for any major renovations for state buildings larger than 10,000 square feet; enhance building operations and maintenance to be as energy efficient as possible; and reduce GHG and water use by 20 percent by 2020. In addition, state agencies must take measures toward achieving ZNE levels for 50 percent of existing square footage by 2025.

Zero Net Energy

The *CEESP* Big Bold Energy Efficiency Goals include a goal that all new residential buildings (three stories or less) are ZNE by 2020 and all new commercial buildings and 50 percent of existing commercial buildings achieve ZNE by 2030. Existing residential buildings are not included. The definition of a ZNE building has been adopted by the Energy Commission in the *2013 IEPR*[80] and is summarized in the sidebar to the right. Simply stated, a ZNE building is one that produces as much energy as it uses. In addition, definitions and standards for "ZNE-ready" (highly efficient buildings without renewable power) and "net-positive" (produce more energy than they use) buildings are being considered. The ZNE ready definition is particularly applicable to existing buildings and could be a goal for those owners who are completing deep retrofits and are remodeling their buildings to a high-performance standard. The

78 Air Resources Board, *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 Through 2015-16*, May 14, 2013, page 5.

79 State of California, 2012, http://gov.ca.gov/docs/Green_Building_Action_Plan_B.18.12.pdf

80 California Energy Commission, 2013, http://www.energy.ca.gov/2013publications/CEC-100-2013-001/CEC-100-2013-001-CMF.pdf

CPUC is updating its *ZNE Commercial Building Action Plan,*[81] and the strategies and goals of that plan are expected to be in line with this action plan as it relates to existing commercial buildings.

Integrated Demand-Side Management

The *CEESP* recognizes integrated demand-side management (IDSM) options, including energy efficiency (EE), demand response, and distributed generation as fundamental to achieving California's strategic energy goals. [82] The strategic plan describes the IDSM vision as:

"Energy efficiency, energy conservation, demand response, advanced metering, and distributed generation technologies are offered as elements of an integrated solution that supports energy and carbon reduction goals immediately, and eventually water and other resource conservation goals in the future."[83]

The *EBEE Action Plan* is focused on the energy efficiency element of IDSM and recognizes that it's a critical part of achieving the vision of IDSM and a more integrated approach to energy management in California. As appropriate, the implementation of the *EBEE Action Plan* will address findings from the current CPUC proceeding on IDSM, #R1410003.

Sustainable Communities and Climate Protection Act of 2008

The Sustainable Communities and Climate Protection Act (Senate Bill 375)[84] is a companion law to AB 32 that focuses primarily on reducing GHG emissions through aligning regional transportation planning goals with the *Climate Action Plan* and the *ARB Scoping Plan.*[85] Although it does not directly affect existing buildings, it does connect local government planning and resources allocation to the reduction of GHG emissions and regional housing planning.

Codes and Standards

Building Energy Efficiency Standards and Appliance Efficiency Regulations

The Warren-Alquist Act, enacted in 1974, mandated that the Energy Commission create and periodically update *Building Energy Efficiency Standards* for California. These standards address newly constructed buildings and additions and alterations to existing buildings. The standards have, in combination with appliance efficiency regulations and utility-sponsored incentive programs, substantially contributed to California's per capita electricity consumption levels remaining relatively flat since the mid-1970s.

California's building standards and appliance efficiency regulations are crucial to reducing GHG emissions of the electricity and natural gas sectors and to lowering the costs of energy to consumers. Since 1975, the standards have saved consumers roughly $74 billion in reduced electricity costs and avoided the need to build six 500-megawatt power plants.[86] The *2013 Building Energy Efficiency Standards*[87] are roughly 25 percent more stringent than the *2008 Standards* and are projected to save $1.6 billion in energy costs over the next 30 years. Recently adopted appliance efficiency regulations[88] for battery chargers are expected to save $300 million each year and eliminate 1 million metric tons of carbon emissions.[89] Appliance efficiency

81 CPUC, 2011, http://www.energy.ca.gov/2011_energypolicy/documents/2011-07-20_workshop/presentations/Jordana_Cammarata_ZNE_Energy_Vision_Commercial_Building_Action_plan.pdf.

82 CPUC, www.cpuc.ca.gov/NR/rdonlyres/1A990EF9-1D4F-4BE4-9B3E-0B8DE4700726/0/201314IDSMProgramFactSheet.pdf

83 CPUC, California Long-Term Energy Efficiency Strategic Plan, January 2011, page 71.

84 State of California, 2008, http://www.leginfo.ca.gov/pub/07-08/bill/sen/sb_0351-0400/sb_375_bill_20080930_chaptered.pdf.

85 Air Resources Board, 2008, http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm

86 Energy Commission, "California's Energy Efficiency Standards Have Saved $74 Billion,"

http://www.energy.ca.gov/efficiency/savings.html.

87 California Energy Commission, 2013, http://www.energy.ca.gov/title24/2013standards/.

88 California Energy Commission, 2014, http://www.energy.ca.gov/2014publications/CEC-400-2014-009/CEC-400-2014-009-CMF.pdf.

89 Energy Commission, "California Energy Commission 2012 Accomplishments,"

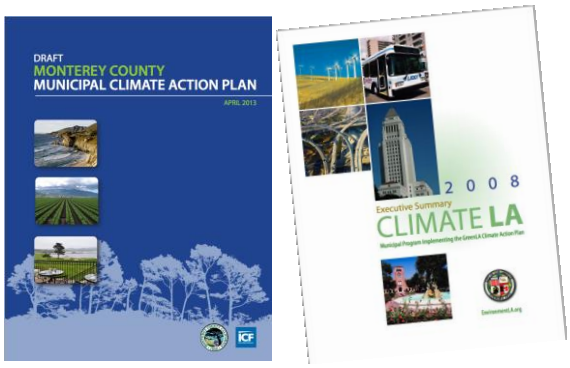
regulations provide an important opportunity to address the growing percentage of energy attributed to plug loads and miscellaneous electric loads in California. While the U.S. Department of Energy (DOE) now regulates the majority of appliances, the Energy Commission has the opportunity to improve energy efficiency of light-emitting diode lamps (LEDs), pool pumps, and spas, as well as variety of consumer electronics such as game consoles, computers, monitors, and displays.[90]

More than 55 percent of existing residential buildings and more than 40 percent of existing nonresidential buildings were built before the building standards were established and are required to comply with the standards when the buildings undergo some kinds of renovation, addition, or major equipment replacement. However, the standards are applied only when projects comply with local permitting rules and comply with the standards. If this cohort of buildings can be brought up to the current standards, it is estimated that California would realize major additional energy savings.

CalGreen – Green Building Standards Code

In 2010, California Green Buildings Standards Code[91] (CalGreen) became the first in the nation state-adopted green building code. In 2008, the Department of Housing and Community Development (HCD) authorized a voluntary version of the code that was subsequently approved by the California Building Standards Commission (BSC). Mandatory standards went into effect January 1, 2011. CalGreen covers five categories of building: planning and design energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. CalGreen includes both mandatory and voluntary measures. The voluntary measures are separated into two levels that can be used by more progressive communities and builders. CalGreen applies to both residential and nonresidential buildings.[92]

Figure 2.5: Samples of Climate Action Plans in California



Sources:
http://www.co.monterey.ca.us/planning/major/REF120044_DRAFT_MONTER
http://environmentla.org/pdf/ClimateLA_v5.pdf

Schools

Proposition 39[93], The Clean Energy Jobs Act, changed the income tax code and allocates projected revenue to California's General Fund and the Clean Energy Job Creation Fund, beginning with fiscal year 2013-14. This fund will provide up to $500 million a year for five years to public schools and community colleges or energy efficiency and clean energy projects. Proposition 39 presents a clear opportunity for public schools to leverage these funds for energy-related upgrades. In the process, public schools put in place the practices and informational infrastructure to best manage their facilities going forward. Further, their successes can be replicated throughout the nonresidential building stock.

Public Health

Energy consumption is not all that goes on in a given building; as a project is performed, care must be taken to ensure that adequate indoor air quality is maintained. California Department of Public Health's Division of Environmental and Occupational Disease Control (DEODC) includes

www.energy.ca.gov/releases/2013_releases/2012_Accomplishments.pdf.

90 Energy Commission, *2011 Integrated Energy Policy Report* CEC-100-2011-001-LCF, page 66.

91 State of California, 2010, http://www.documents.dgs.ca.gov/bsc/CALGreen/2010_CA_Green_Bldg.pdf

92 Building Standards Commission, www.bsc.ca.gov/Home/CALGreen.aspx.

93 State of California, 2013, http://www.leginfo.ca.gov/pub/13-14/bill/sen/sb_0051-0100/sb_73_bill_20130627_chaptered.pdf

the California Breathing Asthma Program, Childhood Lead Poisoning Prevention Program, Healthy Homes Program, and Environmental Health Laboratories. The Energy Commission and DEODC will work together during the implementation of this action plan to ensure alignment and avoid conflict with public health goals.

Current Data Access and Availability

Smart Grid Decision

The CPUC directed the utilities within its recently closed Smart Grid Proceeding (R.08-12-009)[94] to provide certain kinds and formats of energy usage data publicly and to state and local agencies. Specifically, it directs the utilities to provide the following (as excerpted from the final decision[95]):

- Publicly publish total monthly sum and average of customer electricity and natural gas usage by ZIP code and by customer class (that is, residential, commercial, industrial, and agriculture), as well as the number of accounts in the ZIP code by customer class.
- Regularly (yearly, quarterly, and monthly) provide local governments combined and anonymized usage and usage-related data by census block group.
- Provide energy data required by state and federal government entities to fulfill statutory obligations as required or if requested and in line with data regulations.
- Entities can request energy usage and usage-related data from utilities and receive action on the request and resolution of disputes over access to data.
- Form an Energy Data Access Committee to advise the utilities on process improvements and best practices and help mediate disagreements.

California Energy Efficiency Finance Pilots

The CPUC's decision[96] authorizing these finance pilots required that project and loan performance data be collected and tracked in a state or national database. The intent is to help expand information needed to attract and inform financial institutions and investors about energy efficiency projects and finance profiles to support future underwriting and product offerings. A working group compiled a preliminary report on recommended data content.

Agency-Level Informational Infrastructure

At the state level, the energy agencies have committed to work together in alignment on data access and other issues, to most effectively confront the state's challenges — chiefly transitioning California's energy systems away from carbon emissions, while simultaneously ensuring high reliability and reasonable cost. Maintaining persistent accountability to the Governor and Legislature is also critical. To balance these objectives, the Energy Commission, CPUC, and ARB leadership understands the central importance of modern, effective systems for collection, and appropriate management of policy-relevant energy data.

To ensure effective, efficient data collection and management, the Energy Commission will initiate an administrative rulemaking to update the regulations implementing the Energy Commission's data collection authority under the Warren-Alquist Act. Among the purposes of the rulemaking will be to:

- Define and support the policy-relevant data needs for implementation of this action plan and other state energy efficiency initiatives.
- Streamline data collection and avoid duplication of existing reporting structures by utilities and others, wherever possible.
- Ensure the most up-to-date protocols and information technology infrastructure for data access, security and data sharing across the energy agencies.

94 CPUC, 2012, http://www.cpuc.ca.gov/PUC/energy/smartgrid.htm

95 CPUC, *Decision Adopting Rules to Provide Access to Energy Usage and Usage-Related Data While Protecting Privacy of Personal Data*, Rulemaking 08-12-009, May 1, 2014.

96 CPUC, 2013, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M077/K182/77182202.pdf

National Programs: Partner and Coordinate

The U.S. EPA and the U.S. DOE have developed and are managing a range of energy efficiency programs and initiatives that could directly assist California in its efforts and provide models that the State could incorporate in the implementation of the *EBEE Action Plan*. Following is a brief listing that the action plan will consider in implementation:

- ENERGY STAR for Buildings
- WaterSense
- Home Performance with ENERGY STAR
- RESNET Home Energy Ratings (RESNET HERS)
- Home Energy Score
- Standard Energy Efficiency Data Platform (SEED)
- Building Energy Data Exchange Specification (BEDES)
- U.S. DOE Weatherization Assistance Program (WAP)
- Low Income Home Energy Assistance Program (through U.S. Health and Human Services Administration; provides five times the annual funding as WAP)

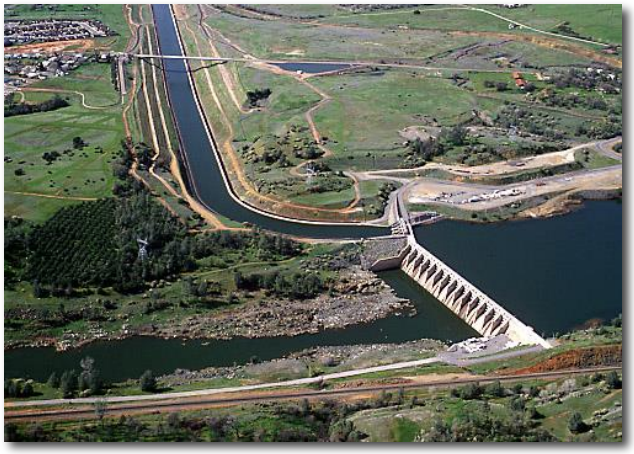
SEED Data Management Process - Data Repository for Organizations and Firms

The Department of Energy (DOE) has developed an open-source data platform called "Standardized Energy Efficiency Data" (SEED) that is available to state and local jurisdictions. SEED provides a standard mechanism to enter, manage and analyze data for an entire portfolio of buildings. The Energy Commission will use SEED for collection and organization of the energy project and consumption data from schools participating in Proposition 39. As information from other programs— that is, state buildings and nonresidential disclosure programs—is merged into California's SEED tool, analysis will permit expanded and increasingly robust understanding of the various sectors of the state's nonresidential building stock. The DOE will continue to update and enhance the tool working directly with the states, including California.

Source: IMT

Water Policy Context

Figure 2.6: California Water Project, Oroville.



Sources: http://www.water.ca.gov/swp/facilities/Oroville/thermalito.cfm

"Water and energy are critical resources that are reciprocally and mutually linked. Meeting energy needs depends upon the availability of water, often in large quantities, for mineral extraction and mining, fuel production, hydropower, and thermoelectric power plant cooling. Likewise, energy is required for the pumping, conveyance, treatment and conditioning, and distribution of water and for collection, treatment, and discharge of wastewater."

"Energy-Water Nexus: The Water Sector's Energy Use"
Congressional Research Service, January 2013, pg. 1.

The current drought presents a clear reminder that climate change is already here and requires bold action to protect this state from its direct and long-term impacts. After steady improvement in the design of most water fixtures over the last two decades, current technologies require much less water than many original fixtures in California's buildings. Large-scale change-out of older fixtures could save a great deal of water and would benefit from both consistent funding of water-utility incentive programs, and close coordination across energy and water agencies.

While the focus of this plan is energy efficiency, it is clear that incorporating and integrating water efficiency has direct impacts on energy usage in the State and in the particular buildings covered in this plan. It is estimated that water-related energy use is responsible for nearly 20 percent of the state's electricity and 30 percent of natural gas use, including the energy for moving, treating, and heating water. Demand and consumption from water use are growing. Much of this is due to industrial and agricultural use; however, the energy-water nexus in buildings is an important element to consider and address with energy efficiency policy.[97] California consumes roughly 2.9 trillion gallons of water per year for urban uses, including outdoor and indoor water use for residential and commercial buildings as well as industrial use. This translates to more than 25 terawatt hours of embedded electricity associated with treatment, distribution, heating, wastewater management, and conveyance. [98]

Water policy in California is more complex than energy policy due in large part to the highly autonomous roles of regional water agencies and oversight of federal laws related to water rights. The Energy Commission can engage in water policy by updating Title 24 water savings measures for newly constructed and existing buildings. The Energy Commission has some regulatory oversight for water efficiency through Title 20 Appliance Efficiency Standards and is setting minimum standards for faucets, toilets, and urinals. The CPUC regulates 20-30 percent of urban water delivered by IOUs and is planning a water-energy nexus proceeding to address how to cofund programs that reduce energy consumption by the water sector in supplying, conveying, treating, and distributing water.

The following agencies should be engaged in the future to streamline implementation and integration of water efficiency throughout the State.

- Department of Water Resources (DWR)
- State Water Resources Control Board
- Regional/Local Water Districts
- California Bay-Delta Authority
- California Urban Water Conservation Council

97 Energy Commission, *Final Staff Report - California's Water – Energy Relationship*, November 2005, CEC-700-2005-011-SF

98 Energy Commission, *IOU CASE Report: Toilets and Urinals Water Efficiency*, July 2013, Docket #12-AAER-2C.

- U. S. Bureau of Reclamation

Urban Water Management Plans

California urban water suppliers are required to develop urban water management plans to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. The DWR oversees and evaluates these plans, which are submitted every five years. (See Urban Water Management Planning Act - Division 6 Part 2.6 of the Water Code §10610 - 10656)[99]. These plans could be a mechanism to align regional planning efforts and help connect water use with GHG and energy efficiency.

99 DWR, 2010, http://www.water.ca.gov/urbanwatermanagement/docs/water_code-10610-10656.pdf

Statewide Coordination of Efficiency Activities

California has several coordination forums and groups that address energy efficiency in some regard. The table below is a summary of the most prominent ones. The Energy Commission will evaluate these organizations' ability to assist in the implementation of this action plan and will coordinate with them, as appropriate.

Organization	Primary Participants	Scope	Authority
Energy Principals Group	Executive Leadership from energy (CPUC, CEC and ISO), air (ARB) and water agencies	Regularly meet to discuss agency perspectives, strategies, and interagency coordination to meet California's GHG goal reductions	Advisory only
Water-Energy Team	State agencies who focus on reduction on GHG emissions	One of 11 sector working groups focused on implementing measures under the *ARB Scoping Plan*[100]	Strategy implementation
California Climate Adaptation Strategy	California Natural Resources Board, with other state agencies	Policy development and guidance by the Safeguarding California Plan[101]	Policy Development
Energy Upgrade California Home Upgrade Working Group	Residential-focused; utilities, implementers, nonprofits, local government, CPUC, Energy Commission, performance contractors	Provide tactical and strategic coordination and guidance for the Home Upgrade Program	Advisory only
Demand Analysis Working Group	Energy Commission, CPUC, California ISO, utilities, advocacy groups, and related stakeholders	Forum for organizations on topics related to demand forecasting, energy efficiency, demand response, customer-side distributed generation, energy procurement, and transmission planning	Information informs Energy Commission regulatory process, IEPR, CPUC long-term procurement and energy efficiency proceedings, and California ISO's transmission planning analysis
Statewide Energy Efficiency Collaborative (SEEC)	IOUs, local government, Energy Commission, CPUC, Local Government Commission, Institute for Local Government	Education, networking, and tools related to climate change and energy efficiency for members	None
California Solar Initiative (CSI) Public Forum	Implementers, Energy Commission, CPUC	The forum to provide all interested public stakeholders the opportunity to openly and collaboratively discuss CSI administrative and implementation issues	None

100 ARB, 2014, http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm.

101 California Natural Resources Agency, 2009, http://resources.ca.gov/climate/safeguarding/.

Photo. 1700 California Street, San Francisco Mixed Use Renovation.
Source www.sfenergywatch.com

Chapter III. Action Plan Strategies

Overview

The following chapter presents the goals and strategies that comprise California's long-term vision to improve and operate buildings and associated equipment with low energy and GHG footprints, at reasonable cost. Both public and private efforts are critical to success. Government must provide an environment for large-scale energy efficiency by example through its own actions, by high-level direction in the form of forward-thinking policies and programs, and by reducing barriers to progress wherever possible—at the same time ensuring consumer protections are in place.

In practice, most buildings will be upgraded without direct public intervention. Upgrades will be conceived, scoped, financed, installed, and commissioned by private entities, contractors, building professionals, banks, and other specialty firms. These agents must be able to engage simply and profitably without barriers, or the vision will be unattainable. The goals and strategies presented apply to all building sectors covered by this action plan—single-family residential, multifamily, commercial, and public buildings. This section also identifies those best positioned to address the strategy and their key partners. This section does not include all the stakeholders and market agents necessary to make the strategy successful. Focused implementation will continue in a variety of forums at the agencies, in partnership with local governments across the State, and with the full diversity of market agents. Indeed the market itself, and the strategies in this action plan, will be a work in progress, and positive movement will be captured through stakeholder processes going forward. Where additional resources are necessary, these discussions will be essential for developing the specifics needed to harness them.

Goal 1. Increased Government Leadership in Energy Efficiency

Objective: Policies, initiatives and programs signal a long-term commitment to the market and support market activation.

Strategy 1.1 State and School Buildings

The Governor's Executive Order B-18-12 requires aggressive improvements to the energy performance of state buildings, including space leased by the State. Timely execution and achievement of these goals will provide essential state government leadership, lend credibility to claims that cost-effective energy efficiency is achievable, demonstrate the value of improvements to the marketplace, and save taxpayer dollars.

California can look to the federal government for evidence of public agencies leading by example. The U.S. General Services Administration (GSA), one of the largest building property managers in the nation, published a Strategic Sustainability Performance Plan for 2010-2015 that delineates strategies to achieve a zero environmental footprint[102]. GSA building tenant education and outreach, bulk procurements, and continuous efficiency improvements are a few of the strategies included in this plan. The U.S. Department of Defense is employing innovative public/private partnerships to audit military base buildings and identify efficiency opportunities, using data collection and energy-modeling technologies to reduce the transaction costs of the audit processes[103].

Proposition 39, the Clean Energy Jobs Act of 2012, is providing hundreds of millions of dollars annually for five years to fund school energy-related upgrades. This new and substantive funding will result in significant improvements in school facilities and reduce school district operating costs. The Clean Energy Jobs Act is also creating a statewide approach to establish school energy use baselines and track energy performance improvements over time. This program will provide state leadership in the areas of energy efficiency project planning, implementation, monitoring, and evaluation. The most successful school energy upgrades will be showcased such that analogous projects can be considered in other building sectors.

The Division of the State Architect plans to work with interested school districts and leading architects and engineers to develop several best-practice school upgrade designs that will be exemplars of deep retrofit opportunities in school buildings. These innovative retrofit plans can then be implemented by school districts using Clean Energy Jobs program funding.

DGS Management Memo 15-04

Provides direction for all state agencies toward achieving the established performance targets of Executive Order B-18-12.

Sample of existing buildings performance targets:

- All existing state buildings more than 50,000 gross square feet complete LEED-EBOM certification.
- All existing state buildings reduce annual grid-based energy purchase by 20 percent compared to a 2003 baseline.
- All state agencies take measures towards achieving ZNE for at least 50 percent of state-owned building area managed.
- All renegotiated state building leases required to encourage lower-than-industry-standard energy and other resource use and participation in utility programs and alternative financing.

102 Johnson, Martha and Stephen Leeds, *FY 2010-2015 Strategic Sustainability Performance Plan*, U.S. General Services Administration.

103 "NREL Brings Precision, Savings to Energy Audits," accessed February 24, 2015, http://www.energyvortex.com/pages/headlinedetails.cfm?id=6603.

Strategy	Metrics/Timeframe	Lead/Partners
1.1.1 State Buildings: Achieve dramatically improved performance levels for all state buildings, as mandated by EO B-18-12. (Also see Strategies 1.6 and 5.5)	*2015 and ongoing*	*DGS, DOF/ Treasurers Office, DSA, Sustainable Building Working Group, CEC, GO*
• **DGS Capacity:** Build capacity at Department of General Services (DGS) to accelerate state buildings energy use disclosure, deep-efficiency project scoping, upgrade implementation, energy performance contracting and execution of demonstration ZNE at state buildings.		
• **Provide Investment Decision Support to Department of Finance and Treasurer:** Assist DOF and Treasurer to understand and value energy efficiency improvements for state buildings. ○ Pilot energy efficiency risk assessment approaches using data collected from DGS American Recovery and Reinvestment Act funded projects. ○ Develop data collection specifications that support financial risk assessments; require use of this data collection protocol in all future state building energy efficiency projects.		*DGS, DOF/ CEC, Treasurers Office*
• **Employ available credit instruments:** Use budget and/or state-level credit instruments that can provide larger pools of capital for state building energy efficiency projects. • **Agency Accountability:** Each agency and department will track the energy performance metrics (consumption, EUI) of the properties under its purview, and be responsible for overall reductions in alignment with the executive order. • **State Leasing:** Continue requirements for all new state agency commercial building leases to include either an ENERGY STAR certification or a minimum Portfolio Manager energy performance benchmark. • **Purchase Agreements:** Use the state's purchasing power to deploy high-efficiency equipment, appliances, and devices in state-owned and state-leased buildings.		
1.1.2 Clean Energy Jobs Act: Implement school building energy upgrades over the lifetime of this program. Create lasting statewide impacts on school building performance. In later program years, use results to influence efficiency actions in both building and finance sectors.	*Ongoing*	*CEC,CDE/ Local Educational Agencies (LEAs)*
1.1.3 DSA Deep Retrofit Exemplars: Produce detailed plans for deep energy retrofits of several California school buildings/campuses. Develop and disseminate case studies for school districts, explaining deep retrofit opportunities, and identifying where the designs will be applicable to school buildings across the State.	*2016 - 2017*	*DSA/A&E firms, LEAs*

Strategy 1.2 Nonresidential Benchmarking and Disclosure

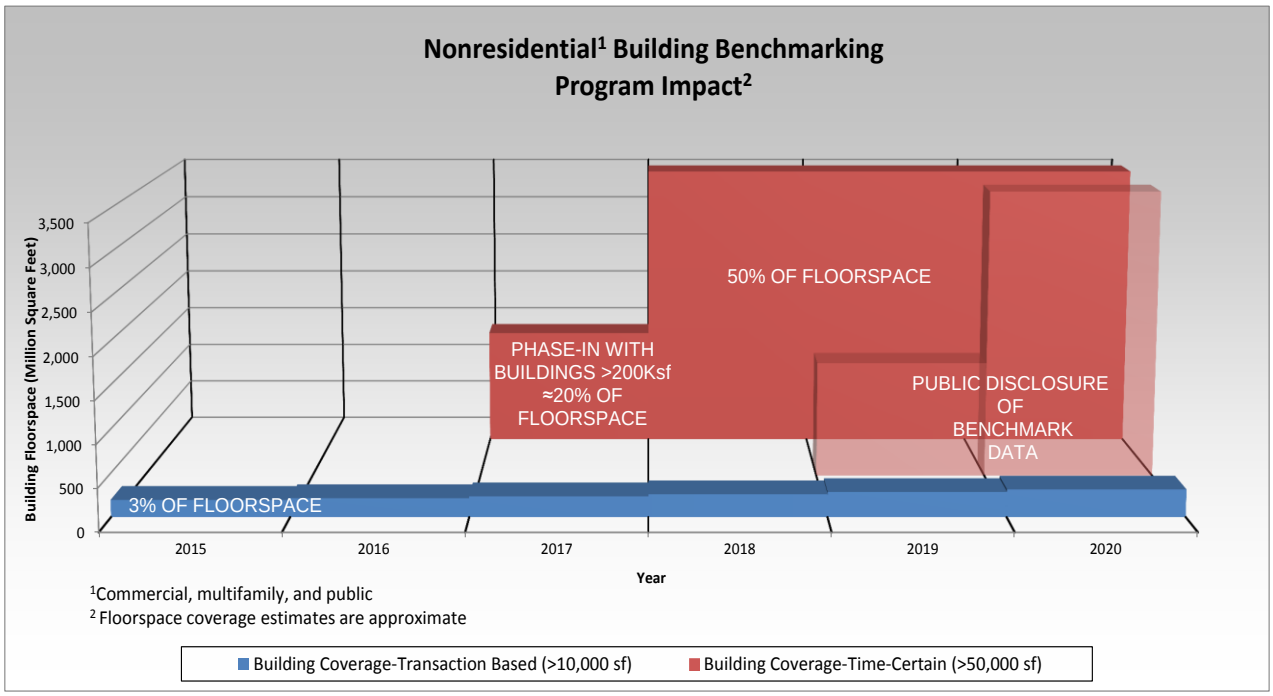
"[Benchmarking and disclosure policies] have the potential to influence the real estate decisions of tens of thousands of businesses, tenants, investors, pension funds, lenders and building owners and operators.
Needless to say, that is no small thing."

Institute for Market Transformation (IMT), "Building Energy Transparency, A Framework for Implementing US Commercial Energy Rating and Disclosure Policy", July 2011

Knowledge of one's energy use, placed in the proper context, can be a powerful motivator for making energy efficiency improvements. Jurisdictions across the country, including New York City, Boston, Seattle, Chicago, and San Francisco, have instituted nonresidential benchmarking and disclosure policies. California's experience implementing the time-of-transaction benchmarking program (AB 1103) has produced lessons for what a workable and impactful benchmarking effort will entail. Furthermore, widely accepted, standardized tools developed, and supported by the federal government and already used in California provide the essential infrastructure to implement a time-certain benchmarking and disclosure program at relatively low cost. Benchmarking information, provided to the Energy Commission by building owners, will improve statewide policy and planning by contributing real-world energy performance data for nonresidential buildings. That said, the primary intent for this strategy is to motivate private building energy performance improvements.

The vast majority of commercial buildings are relatively small (less than 50,000 square feet). Large commercial buildings are few in number but represent a high percentage of the state's floorspace and are responsible for a large percentage of the state's energy consumption. Owners of large commercial buildings typically have adequate resources to implement benchmarking, so this portion of the sector is well suited for a time-certain benchmarking and public disclosure program. This program will apply to all nonresidential buildings above 50,000 gross square feet of floor area and will be performed periodically at intervals to be determined by the CEC. For this strategy, "nonresidential" refers to commercial, public,

Figure 3.1: Statewide Whole-Building Energy Benchmarking and Disclosure



Source: California Energy Commission

and multifamily buildings. Building owners and utilities will upload building characteristics and energy use data to the EPA's ENERGY STAR Portfolio Manager®. For each building, the benchmarking score and/or aggregate energy consumption will become public after the second benchmarking cycle, again with details to be defined through a rulemaking process.

The Energy Commission will work with jurisdictions that have existing or emerging benchmarking ordinances to ensure alignment with the statewide program. Local governments are encouraged to implement programs with more stringent and/or comprehensive requirements than those of the statewide program, and the Energy Commission will work to ensure minimal additional effort is required for statewide compliance. The program will be implemented over several years in a manner that dovetails with AB 1103, per Figure 3.1. For example, reported benchmarking data for buildings above 50,000 square feet will be deemed compliant with AB 1103, such that no additional effort is required by the building owner, other than providing the information to a prospective buyer, lessee, or lender. Commercial buildings smaller than 50,000 square feet will still be subject to the AB 1103 regulations—owners of covered buildings above 10,000 square feet must continue to provide benchmarking information to a prospective buyer, lessee, or lender and the Energy Commission at the time of sale, lease, or finance.

Rulemaking and program development will address:

- Phase-in and coordination with local jurisdictions.
- Whole-building energy use data aggregation protocols for utilities.
- Support services and other tools to enable straightforward compliance.
- Leveraging Portfolio Manager and other tools to encourage continuous assessment of energy performance beyond basic compliance.
- Strategies to move building owners, managers, and tenants from knowledge to action.
- Expanding the program to cover smaller buildings.

Easy access to energy use data for building owners will be essential to the success of this program. Staff will hold a workshop in fall 2015 to propose an aggregation threshold and discuss other requirements for whole-building data access. While this workshop will focus on clarifying these matters for the time-of-transaction program currently in place (AB 1103), it will create precedents for the time-certain program taking effect in 2017.

Future Potential Additional Mandatory Elements

The energy agencies will evaluate market trends and the growth of energy efficiency upgrades over the first three years of the time-certain benchmarking and disclosure program. Based on that evaluation, the Energy Commission will determine if, under future *Existing Buildings Energy Efficiency Action Plan* updates, it will recommend, to the Governor's office and legislature, mandatory actions for consistently low-performing buildings. Such requirements might include cost-effective retrofit measures and/or retrocommissioning, and could be accompanied by support tools such as direct technical assistance and accessible financing. The Energy Commission will also consider including smaller buildings in the program at that time.

Strategy	Metrics/Time Frame	Lead/Partners
1.2 Statewide Nonresidential Benchmarking: Establish a statewide energy benchmarking program with eventual public disclosure for commercial, public, and multifamily buildings above 50,000 sf gross floor area.	*Phased, 2015 - 2021. State buildings beginning 2016.*	*CEC/CPUC, Utilities, Pacific Coast Collaborative (PCC)*
1.2.1 Update Time-of-Transaction (AB 1103) Regulations: • Streamline access to whole-building energy use data for building owners. • Implement an aggregation threshold that will enable simple access to useful, actionable data for building owners, while respecting tenant privacy. • Work with utilities to map building addresses to meters.	*Prerulemaking and Rulemaking 2015; New regulations effective 2016*	*CEC/EPA, Utilities*
1.2.2 Time-Certain Benchmarking and Disclosure Rulemaking: Determine program structure, requirements, high-level process, and timeline.	*Prerulemaking and Rulemaking in 2016; New regulations effective 2017*	*CEC/PCC*
1.2.3 Benchmarking and Reporting Infrastructure Development: • Evaluate the Standard Energy Efficiency Data platform for matching utility data with physical property information and storing benchmarking data. • Partner with local governments to employ a database infrastructure for public disclosure of benchmarking data. • Work with the EPA to ensure the seamless integration of Portfolio Manager and California's benchmarking and disclosure database.	*Fully operational in 2016*	*CEC/DOE, EPA, LGs, PCC*
1.2.4 Implement Statewide Program: • Monitor and facilitate compliance with the benchmarking and disclosure regulations. • Establish clear metrics to evaluate effectiveness.	*Phased 2018 - 2022*	*CEC/CPUC, Utilities,*
1.2.5 Potential Mandatory Programs: • Review the benchmarking and disclosure programs to determine whether they motivate improvements and result in sufficient savings. • Determine whether mandatory retrofits and/or retrocommissioning are necessary to deepen savings. • Determine whether the program should be extended to smaller buildings.	*Evaluation of disclosure policy effectiveness within 2 –5 years of implementation for each sector*	*CEC, CPUC/GO, Legislature*

Strategy 1.3 Minimum Standards for Building Performance Assessment Tools

The proposed lower building size limit for Strategy 1.2, nonresidential benchmarking, is 50,000 gross square feet. Most buildings fall below this threshold, and these smaller buildings in total represent a greater savings potential. The stock of smaller buildings is tremendously diverse and invites a less centralized approach than mandatory benchmarking.

Several increasingly high-quality "no-touch" analytical tools are available using smart meter data, producing insights that would have been unattainable just a few years ago. More traditional engineering-based assessment tools are also available, including on-site testing and measurement. Such assessments are helpful to troubleshoot physical problems in a building and to estimate the expected energy savings of planned improvements. Both approaches—"no-touch" assessments and physical models informed by field measurements—can provide consumers and business owners a basis on which to build a prioritized list of energy-saving opportunities, and to provide contacts for follow-up based on those results. Opening up the market to a diversity of tools will enable the best minds in the marketplace to provide these services at much greater scale, using technology to achieve lower cost—especially important for the retrofit market.

While these advancements in metering technologies and assessment strategies can provide increased awareness of building upgrade opportunities, there is also great risk of consumers receiving conflicting advice from various tools and/or recommendations that are not cost-effective. This strategy seeks to increase the penetration and relevance of modern assessment tools, while ensuring minimum performance thresholds are met. The goal is for consumers to have access to all analysis options that help them make good decisions. The Energy Commission aims to provide a clearinghouse for these decision support tools without undue complexity and costs for tool vendors.

The Energy Commission will work with stakeholders to develop tool performance criteria, then evaluate and approve tools based on these criteria. The Commission will maintain a statewide list of approved tools. The utilities can then enable the use of all tools on the list.

With the advice of their utility, local government, or efficiency service provider, building owners will choose the assessment tools that offer the most highly relevant information for their circumstances. Energy usage and/or assessment information will *not* be required to be provided to the Commission or any other outside entity; it will be provided only to the property owner/account holder and the customer-approved third-party provider of the analytics.

HERS II Whole House Program

Public Resources Code (PRC) 25942 (also referred to as HERS legislation) requires the Commission to put in place a statewide system that provides performance assessments for residential buildings along with prioritized recommended upgrades. That system is called Home Energy Rating System (HERS) II. An upcoming Energy Commission rulemaking will examine multiple aspects of the HERS program and make substantive changes to resolve known issues and align with current industry assessment practices. A clear need exists to distinguish residential performance assessments (to inform retrofit projects) from residential asset ratings (for property valuation), two important yet discrete elements of improving residential building energy efficiency. This proceeding will also provide the Commission an opportunity to articulate the role for existing and future assessment approaches aimed to serve the needs of the marketplace. These efforts will place the State in the role of oversight, rather than as a developer of residential energy assessment tools.

Strategy	*Metrics/Time Frame*	*Lead/Partners*
1.3. Minimum Standards for Assessment Tools		
1.3.1 Home Energy Rating System (HERS) II: Using the HERS II Rulemaking process and modifying the HERS II whole-house assessment protocols to align with current home upgrade program practices and other relevant industry protocols	*2018*	*CEC/CPUC, program implementers*
1.3.2 Minimum Standards for Smart Meter Data Analytics: Establish minimum qualification standards and evaluation protocols for eligible low- and no-touch home energy assessment tools.	*Completed by 2017*	*CEC/CPUC, program implementers*

Strategy 1.4 Uniform Energy Asset Ratings to Compare Building Properties

The State must provide leadership to establish standard property valuation or "asset rating" approaches for residential and commercial buildings. Asset ratings are well-aligned with the property appraisal process based on comparables, which evaluate the physical asset characteristics of the subject property relative to those of comparable properties. The expected energy use to be compared between properties is based on the physical features of the building, removing the ambiguity of comparing energy bills that result from widely varying operator behavior. Asset ratings are a practical way of separating out (or normalizing for) the efficiency of the building itself that benchmarking data alone cannot achieve.

For real estate investments and other financial transactions, valuing the energy performance of building properties requires uniform evaluation approaches adopted and made ready for use across all of California. HERS legislation requires that once a statewide rating system is in place, no home energy rating services may be performed in the State unless the Energy Commission determines that it conforms to the statewide system.

The objective of this strategy is to establish methods to rate the comparative value of building energy efficiency that have minimum transaction costs to implement, while including the important effects of field-verified performance to the extent possible.

To achieve broad market adoption in existing buildings, an asset rating tool must balance ease of use with technical rigor. The Energy Commission will review the residential and commercial building energy asset rating approaches that have been developed and/or adopted by U.S. DOE, Residential Energy Services Network (RESNET), Energy Commission (HERS), ASHRAE (Building Energy Quotient) and other states. The Commission will also explore options to reduce the energy modeling expertise needed by those who rate the energy performance of building properties to minimize the time and expense needed to calculate asset ratings. State leadership will come from the specification of the uniform rating methods to be used in market-focused tools, not from the provision of rating software that must be used by all market agents.

This strategy also includes the discussions and articulation needed to clarify how green building rating systems relate to energy asset rating systems. The Energy Commission will work with green building industry stakeholders to determine if and how California's HERS regulations govern any energy efficiency and clean energy valuation methods included in green building ratings. This strategy will strive to develop effective partnerships between green building and energy efficiency rating programs across the State.

Strategy	Metrics/Time Frame	Lead/Partners
1.4 Adopt uniform asset ratings to compare building properties:	*Uniform asset rating approaches specified by 2018*	
1.4.1 Standardize Home Energy Asset Rating Approach: Establish the specifications for residential building energy asset rating calculations. • Review currently available asset rating methods for use in California residential property comparisons. • Develop a California specification for asset rating calculations and labels that is consistent with national rating practices and satisfies the intent of PRC 25942 (HERS legislation). • Using a stakeholder process, develop or adopt a rating method for existing residential buildings that rates property assets at a reasonable cost. • Clarify role of third-party green building rating programs.		*CEC/DOE, RESNET, green building rating programs*
1.4.2 Standardize Commercial Building Energy Asset Rating Approach: Establish the specifications for commercial building energy asset rating calculations. • Review currently available asset rating methods for use in California commercial property comparisons. • Develop a California specification for asset rating calculations and labels that is consistent with national rating practices • Using a stakeholder process, develop or adopt a rating method for existing commercial buildings that rates property assets at a reasonable cost. • Clarify role of third-party green building rating programs.		*CEC/DOE, ASHRAE, green building rating programs*

Strategy 1.5 Building Efficiency Standards Development and Compliance

Building Efficiency Standards (BES, Title 24, Part 6, for both new and existing buildings) have been and will continue to be a significant contributor to the success of California's energy efficiency efforts. The state's goals are nation-leading: zero-net-energy residential new construction by 2020 and nonresidential by 2030. BES development has, to date, largely been driven by the new construction conversation; certainly implementation and compliance remain important areas of effort there. The gap between code compliance and existing buildings grows larger—as does the opportunity to harvest that savings potential. The industry needs a simple BES for existing buildings, and to find ways to simplify and offer incentives for those upgrades.

The Energy Commission will conduct a focused review of BES as they relate to existing buildings and make modifications as necessary to ensure that the requirements are both practical and will result in realized energy savings. To the extent possible, the Commission will simplify the processes needed to comply with BES for existing building upgrade projects, to improve manageability, and to reduce costs for building owners, local government building departments, and contractors. Furthermore, ensuring alignment of state laws for compliance requirements when public funds are used will encourage increased compliance.

A particular area of compliance-related concern is heating, ventilating, and air-conditioning (HVAC) systems. Upon HVAC replacement, building code requires that the system be field tested for proper performance, to ensure proper installation and efficient operation. However, HVAC contractors often bypass these and other requirements by failing to pull a building permit. Studies and industry expert opinion indicate that permitting rates for equipment replacement and building retrofit work can be abysmally low.[104] The contractor is avoiding building department verification that the installation is safe, and violating other laws including contractor licensure, business licensure, and worker's compensation laws. Currently there is no mechanism to (a) track specific HVAC equipment sold in the State. (b) ensure that the installed equipment is field–verified, or (c) match equipment to building department records to ensure that the installation was properly permitted. Without an equipment tracking system, building departments have no ability to know that installations take place, so they have no ability to determine if the equipment was installed in compliance with the field test requirements of the standards. There is little quantitative understanding of either the energy savings being lost by projects due to noncompliance with the standards or the related question of whether failure to permit correlates with energy-related noncompliance.

Many local governments face challenges and resource constraints in managing compliance and enforcement. Online permitting tools are being piloted in some local regions, and these, if successful, can help streamline the process and reduce costs. Known options include simple online processes for some equipment replacements, using electronic design files and compliance forms already available within a HERS registry, using handheld devices with appropriate compliance applications, and linking permit applications to utility and/or regional energy network (REN) efficiency program options.

To improve permitting rates and code compliance, owners and contractors need to see its clear value while perceiving the threat of consequences for unpermitted work. To start, stakeholders should collaborate to identify best practices in existing building upgrade permitting, similar to the Solar Permitting Best Practices Guide spearheaded by the Office of Planning and Research through a yearlong stakeholder process.[105]

Water efficiency is another area ripe with opportunity in existing buildings. Additional water efficiency

104 American Council for an Energy-Efficient Economy, *Role for Utilities in Enhancing Building Energy Code Compliance*, 2012.

105 California Office of Planning and Research, *California Solar Permitting Guidebook, Second Edition*, 2014.

measures in BES will need coordination between the code setting agencies in California and key stakeholders to better align plumbing code requirements with water efficiency objectives in the State.

Strategy	Metrics/Time Frame	Lead/Partners
1.5 Realize the Full Benefits of the Building Efficiency Standards for Existing Buildings:	*CEC initiates code redesign in 2017 for the 2019 cycle*	*CEC*
A. Improve BES as Applied to Existing Buildings		
1.5.1 Improve Clarity and Ease of Use: Develop approaches to simplify implementation of BES for existing buildings by unifying definitions with industry practice, by clarifying code requirements, and through the use of expert systems or other navigation tools.	*2017 - 2019*	*CEC/CPUC, program implementers*
1.5.2 Review BES for Cost-Effectiveness: Confirm that BES requirements are cost-effective when applied to existing buildings using careful review, industry engagement, and BES modifications, where needed.	*2017 - 2018*	*CEC*
1.5.3 Training and Communication: Enhance communication, education, and interactions with local governments to ease compliance with and enforcement of the standards. Develop effective consumer communication materials to market non-energy benefits of compliance.	*Ongoing*	*CEC, CPUC/program implementers*
1.5.4 Water End-Use Efficiency: Work with the relevant agencies and within the standards to address plumbing system and fixture issues impeding water end-use efficiency in existing buildings.	*2017 - 2018*	*CEC/HCD/BSC*
B. BES Compliance Improvement For Existing Buildings		
1.5.5 Understand the Compliance Shortfall: Work with local governments (LG), manufacturers, and contractors to determine compliance gap and understand the role of permitting and the needs of building departments.	*2015 - 2016*	*CEC, CPUC/OPR, LG, CSLB*
1.5.6 Pilot Programs: • Evaluate effect of LG online permitting pilots on process, cost reductions and installation quality and encourage use of a standard permitting platform. • Evaluate serial number tracking pilots on process, cost reductions, and installation quality.	*2016*	*CEC, CPUC/OPR, LG*
1.5.7 Compliance Plan: Based on research findings and pilot experience, develop a compliance strategic plan with best practices for EE permitting. Leverage CSLB authority to increase compliance.	*2017*	*CEC, OPR/LGs, CSLB*
1.5.8 Serial Number Tracking: If indicated as a critical resource for compliance improvement, establish HVAC equipment serial number tracking database**.**	*2017-2018*	*CEC*

Strategy 1.6 Plug-Load Efficiency

Plug-in equipment is expected to account for 69 percent of the growth in building electricity consumption by 2030[106]. This load growth is a major barrier to reaching California and U.S. greenhouse gas emission reduction goals. To curb this expected escalation of electricity use, it will be critical to:

- Increase the pace and scale of new and updated appliance efficiency standards.
- Expand the development of high-performance specifications for plug loads not suited to standards.
- Include these high-performance specifications in government and corporate bulk purchase agreements.
- Transform consumer behavior through effective public awareness campaigns.

California's *Appliance Efficiency Standards* (Title 20) have, for the last 40 years, been a strong and dependable foundation of energy efficiency for the State and the nation. The *Appliance Efficiency Standards* set minimum performance standards that are required for a broad range of equipment that are sold in California. The improved product efficiency leads to significant reductions in electricity, natural gas and/or water in the State. In existing buildings, the replacement of one piece of equipment, such as a water heater or an air conditioner, represents the most common efficiency upgrade. As appliance standard stringency increases, the energy performance of equipment in existing buildings are naturally upgraded by failure or other end-of-life replacement decisions. Since appliance and equipment replacements are relatively quick and inexpensive compared to other upgrade strategies, they are the easiest opportunities for near-term savings.

To realize these savings by continuing to advance appliance efficiency standards, standards development must keep pace with the increasingly rapid product development cycles for a large variety of equipment, appliances, and electronic devices. Where this proves impossible, and for appliances and devices not suited to standards, performance specifications can be used in bulk purchase agreements and rebate programs to realize plug-load energy-use reductions.

Finally, consumers play a huge role in plug-load electricity use. Opportunities to transform consumer behavior are covered in Strategies 2.2 (Consumer-Focused Energy Efficiency) and 4.2 (Marketing, Education, and Outreach).

106 Energy Information Agency, *Annual Energy Outlook 2014*.

Strategy	Metrics/Time Frame	Lead/Partners
1.6 Efficiency of Plug-in Loads		
A. Standards Lead to Technical Advancements		
1.6.1 Pursue New and Enhanced Appliance Standards: Encourage expanded application of leading technologies, such as mobile power management, interoperability, demand response, low idle-mode consumption, and so forth through new updates to appliance standards.	*Ongoing*	*CEC*
1.6.2 Enforcement (SB 454): Finalize and apply the Commission's enforcement regulations under SB 454.	*2015*	*CEC*
1.6.3 Advocacy and Technical Support: Support enhanced federal standards and participate in proceedings of the federal government and neighboring countries (Mexico, Canada).	*As needed*	*CEC/CPUC, program implementers, advocates*
B. Market Transformation Efforts		
1.6.4 Strategic Planning: Partner with other states to leverage research, resources, and standards across larger regions.	*Ongoing*	*CEC/PCC, CPUC, OPR*
1.6.5 Plug-Load Management Programs: Develop, encourage, and offer incentives for turnover of existing stocks and use of plug-load management devices and software and novel approaches to reduce standby consumption.	*Ongoing*	*CPUC/program implementers, CEC (EPIC)*
1.6.6 Specification Development: In some cases, new appliance standards cannot be adopted because of federal preemption or application-specific cost-effectiveness. Develop purchasing and replacement guidelines for products where large savings opportunities exist, but new standards cannot be adopted.	*Ongoing*	*CEC, CPUC/program implementers, CEC (EPIC)*
1.6.7 Purchase Agreements: Use large organization purchasing power to increase the efficiency of equipment and devices (lighting, appliances and so forth) used by employees and/or renters. State and local government procurements and low-income programs will focus on high-efficiency products. Promote adoption of such purchase agreements by managers of large multifamily property portfolios.	*Ongoing*	*DGS, LGs/large portfolio property managers, CSD, utilities-LIEE*

Strategy 1.7 Local Government Leadership

Local governments (LG) are essential loci for innovation. At the same time, one of the major challenges for many LGs is the lack of consistent funding sources for sustainability activities. LG obligations under Senate Bill 375 (Steinberg, Chapter 728, Statutes of 2008) dovetail well with efforts to improve the efficiency of the built environment. The State should encourage forward-thinking LGs to adopt policies and gather relevant experience for wider application, building in performance incentives where appropriate. Balancing statewide consistency with the flexibility to accommodate differences in local tools and resources, the Local Government Challenge builds on previous CEC collaborations with diverse local and regional governments by continuing to focus on areas such as:

- Aggressive efficiency for jurisdiction-owned buildings.
- Early adoption of nonresidential benchmarking and disclosure programs.
- Innovation in building permitting systems, and rigorous code enforcement.
- Significant increase in project flow for residential and small commercial upgrades.
- Data-driven communitywide energy planning
- Audit/assessment requirements at specific trigger points (for example, business license renewals).
- Energy performance districts (see sidebar).

Funding of around $13 million for this effort will come from leftover administration funds and repayment streams from several ARRA local and regional financing programs that have been closed. Ongoing funding of at least $20 million per year would allow this effort to flourish.

The California Air Resources Board's Cool California City Challenge is an example of a statewide initiative that promotes incentives for local governments to achieve environmental policy objectives. The challenge encourages cities to motivate their residents to reduce carbon footprints by lowering household energy use and vehicle travel. Sponsored by Energy Upgrade California, the challenge is a competition among participating cities, where prize money is awarded based on residential emission reductions achieved under the program.

Energy Performance District

An energy performance district (EPD) is a new approach for local governments to pilot either within local government partnership programs, REN activities or via new funding opportunities such as for climate action plans and local grants. An EPD is a specific area or neighborhood identified by a local government using energy data mapping tools to identify high opportunity areas (high energy users, vintage of buildings, and so on).

LG identifies "district"—potentially in connection with a business improvement district, residential neighborhood, or other assessment area using new regional decision-making data tools such as shown on pages 61-62. An energy savings goal is developed along with a 2–5 year plan to achieve those savings. Ideally, LGs are awarded with funding for achieving its goals and maintaining long-term performance in the district. Leading LGs in California have had varied successes with neighborhood approaches to project aggregation; the EPD model may be attractive for amplifying the successes of those efforts.

Sonoma County's energy, water, and climate protection agencies are piloting the Pay As You Save (PAYS) program in the town of Windsor, where water- and energy-saving measures are installed in homes with no upfront costs or debt incurred by property owners or tenants. The PAYS program adds a surcharge to participants' water and/or energy bills, and these charges are guaranteed to be lower than expected bill savings.[107] This government partnership with utilities to provide innovative solutions that dramatically reduce consumer transaction costs is a great example of local government leadership.

107 "Residential Programs," accessed February 24, 2015, http://sonomacountyenergy.org/residential-programs/

Strategy	Metrics/Time Frame	Lead/Partners
1.7 Local Government Leadership: Engage and recruit LGs to demonstrate leadership in energy efficiency through various programs, activities, and mechanisms.		
1.7.1 Challenge Program: Transition ARRA-funded local and regional financing programs to a grant process aimed at both innovative juridictions and disadvantaged communities. Include cities, counties, joint power authorities, metropolitan planning organizations, councils of governments and other local government consortia. Award assistance based on LG actions and adoption of policies for aggressive energy efficiency, disclosure, compliance and permitting. • Local governments apply in a competitive process • Disadvantaged communities can access separate, non-competitive grant funds • Ensure geographic and size diversity • Work with leading LGs on local benchmarking and upgrade programs. • Create a repository of best practices and lessons learned that can be readily shared. • Encourage data-driven local policy and targeted actions.	*Seed funding available and program launch in 2016*	*CEC, LGC/OPR*
1.7.2 Local Government Partnerships: Coordinate utility LG partnerships with the action plan goals and strategies to minimize duplication; actively share data to simplify LG jurisdictional activities to maximize energy-saving opportunities.	*2016 and ongoing*	*CPUC, POUs/program implementers*
1.7.3 Leverage Other Efforts: Leverage local climate action, general plan/land use, water conservation and other relevant planning mechanisms as a means to improve energy efficiency and reduce GHG (consistent with AB 32, *ARB Scoping Plan Update*). • Ensure access by land-use and climate action planners to better building energy use baseline data and location-specific estimates of energy savings potentials.	*2016 and ongoing*	*LG/ARB, OPR-Strategic Growth Council, CEC*

Strategy 1.8 Energy Efficiency as a Clean Distributed Energy Resource

Energy efficiency brings a wide range of benefits to users and communities: bill savings, comfort, property value enhancement, and community economic development, to name a few. In the narrower and critical context of today's electricity grid, efficiency operates alongside other resources, both distributed and large-scale, and where the specific qualities of each determine the respective market value. Procurement-based energy efficiency can, in theory, take into account the particular local and system impacts of energy efficiency alongside those of other resources, comparing, for example, the locational and temporal characteristics, persistence, reliability, and the like.

Procurement-based energy efficiency may be helpful for reaching the Governor's objective to double efficiency gains in existing buildings. In a procurement setting, many of the details around delivery of energy and related grid services would be contained in procurement contracts, rather than emerging from the energy efficiency program portfolio.

Even if a procurement model is successful, it will be a complement to, rather than a replacement of, collaborative and incentive-based program approaches. There will continue to be strong need for a program portfolio focused on energy efficiency market transformation.

Strategy	Metrics/Time Frame	Lead/Partners
1.8 Energy Efficiency as a Clean Distributed Energy Resource: Treat efficiency as a clean distributed energy resource for which utilities contract in a fashion analogous to large-scale generation.	*2016 and ongoing*	
1.8.1 Utility Procurement of Energy Efficiency: Further develop the utility procurement model for energy efficiency, building on the SCE Preferred Resources Pilot.		*CPUC, POUs/IOUs, CEC*
1.8.2 Market Transformation Program Portfolios: Evolve the energy efficiency program portfolios to focus more explicitly on market transformation activities in the upgrade marketplace. • Understand the phenomenon of code shortfall in existing buildings, and mobilize projects to close any gaps. • Revisit administration of market transformation efforts.		*CPUC/CEC, program implementers*
1.8.3 Long-Term Energy Supply Planning: Work across agencies to ensure the long-term demand forecast incorporates the complementary impacts of procurement, codes and standards, and market transformation programs as they relate to existing buildings; develop and/or advance analytics utilizing consumption data for purposes of forecasting and related program evaluation.		*CEC/CPUC, POUs/IOUs*

Strategy 1.9 Leadership: Existing Building Efficiency Collaborative

State, regional, and local governments provide leadership and proactively coordinate and align their efforts as much as possible.

Active, High-Level Leadership

Governor Brown's call for a doubling of efficiency savings from building energy efficiency projects reinforces the legislative mandate of AB 758 and increases the urgency underpinning this plan and the implementation of it; this is equivalent to a 20 percent reduction in statewide building energy use from 2014 levels by 2030. To ensure ongoing attention and consistency to these collective efforts, the Energy Commission and the CPUC in particular must develop and maintain alignment between themselves. In addition, engagement, access, and input are needed by the ARB, ISO, other relevant agencies—DGS, Department of Water Resources, State Water Resources Control Board, California Community Services and Development, the Departments of Labor, Transportation, Corrections, and others. High-level personnel assigned to lead AB 758 implementation at each agency will engage and coordinate actively with utilities, local and regional governments, water agencies, and industry representatives, as needed. The Energy Commission will keep the Governor's Office and Legislature informed of progress and any high-level barriers that emerge, as a matter of course, as implementation proceeds.

Strategy	Metrics/Time Frame	Lead/Partners
1.9 Energy Efficiency Collaborative – Statewide Agency Leadership: Form the Existing Building Efficiency Collaborative (EBEC) to lead and coordinate progress toward energy efficiency across the energy agencies.		
1.9.1 Governance Structure: Staff the EBEC with senior staff members from the Energy Commission and CPUC, who report to the Lead Commissioners; develop a collaboration structure that incorporates active engagement of key agencies, coordinates across relevant rulemakings, and maintains consistency with agency roles and authorities.	*2015*	*CEC, CPUC/ARB, ISO, GO, other agencies, as needed*
1.9.2 Agency Coordination and Stakeholder Engagement: Implement appropriate forums and methods to coordinate analysis, identify promising strategy options, monitor and report on strategy effectiveness, provide public briefings on *Action Plan* progress, and invite regular stakeholder feedback to identify and resolve issues.	*2016 and ongoing*	*CEC, CPUC/ARB, ISO, GO, other agencies, as needed*

Goal 2. Data-Driven Decision Making

Objective: Building owners and residents demand energy-efficiency services informed by the full range of information relevant to them.

Strategy 2.1 Modern, Accessible Data Resources

Consistent availability and access to the right kinds of information are foundational for both market activation and as a tool for monitoring the impacts and determining the effectiveness of local, regional, and state initiatives. Specifically, data tailored to the following audiences are critical:

1. Property owners and tenants, to inform their decision-making.
2. Existing building industry—energy efficiency design, construction, and investment communities—to support effective market analysis, business models, and product development.
3. State and local policy makers and program implementers, to enable properly conceived and targeted initiatives that consistently and effectively address their respective, complementary long-term goals.

Property Owner and Tenant Decision-Making

Property owners need access to data to manage their buildings from an informed position, understand potential problems, and plan and scope improvements. Multiple-metered buildings, particularly multifamily buildings, present particular challenges in this regard. Property owners have difficulty accessing tenant data, and most utilities do not offer even basic whole-building data aggregation services. Therefore, many owners cannot have a clear understanding of the energy consumption of the buildings they own. Tenants who pay energy bills directly can benefit from existing analytical tools to help them identify potentially effective operational and behavioral changes.

Enabling the Existing Building Industry

Market agents must to be able to leverage and analyze existing energy performance data—defined as both energy-use data and building systems information—to provide information to energy users and building owners about upgrade opportunities. Such informational resources support business planning by providing market intelligence on a level playing field. As an example, the California Solar Initiative (see sidebar) provided years of up-to-date, detailed project-level information to the market, with a very positive effect. Given that energy efficiency is at the top of California's loading order, it makes sense that there is an analogous, statewide data clearinghouse for building energy efficiency program participation.

California Solar Initiative

The California Solar Initiative (CSI) Solar Statistics database is an excellent example of a centralized, public-facing data repository that is widely used by policy makers, clean energy businesses, and consumers interested in solar energy. The CSI database was developed using detailed input from industry. This tool has collected, organized, and published detailed project-level information for the quarter-million net-metered photovoltaic (PV) systems that have been installed in California since 2007. The existence of the database has enabled market innovation, created administrative and ratepayer accountability, and played a key role in the scale-up of California's distributed solar economy.

Accurate information—on project composition and costs, buildings themselves, and pre-vs.-post energy consumption—can meet a number of complementary market needs, such as assessing project flow in each area, assessing the range of costs for a given measure, developing sector- and location-specific outreach, and understanding market opportunities as part of potential investors' due diligence. Investors use such performance metrics to gauge the risk of their prospective stake in a company delivering these services or directly in a portfolio of efficiency projects. Availability of such program information would permit building owners to understand the landscape of local contractors as part of their choice of firm with which to work on their projects.

Economic analysis of virtually any project requires detailed understanding of electric and gas rates. This information is already public, but the difficulty and expense of collecting and transposing it into useable form, and keeping it up to date, unnecessarily impedes the marketplace. A requirement that utilities post current rates in a standardized format would ensure that this basic piece of public information would be available to all players and would lower costs, at the benefit of both existing and aspiring market entrants.

State and Local Policy Development

Geographically specific data are an essential element for policy makers and local governments implementing energy efficiency programs. To better target programs, develop climate plans, and measure progress, these entities must have routine, inexpensive, and administratively simple access to energy-usage information held by the utilities that serve their jurisdictions. The use of regional and city-level mapping tools (Example: UrbanFootprint, illustrated in Figure 3.2) assists local and regional governments in understanding current and emerging energy-use patterns by building characteristics, energy use, demographics, and other criteria. Mapping tools are essential for identifying potential energy-saving opportunities in the community and targeting scarce resources.

For the state's energy agencies, reliable, location-specific load information is critical for meeting the policy and planning challenges in California. As localized resources emerge as key contributors to the state's clean energy future, local capacity areas become a central unit of analysis. Therefore, it is important to understand trends and resources over time and at the local level. The Energy Commission, along with the CPUC and California ISO, will establish baselines and monitoring methods for local-level load analysis, forecasting, and statewide policy planning. This effort will allow the agencies to deepen their agreement on a single demand forecast for their various planning endeavors, consistent with meeting the state's energy and carbon reduction goals. This analytical resource is necessary to establish a robust basis for EE as a resource. As such, it has the potential to help the State avoid redundant investment in new centralized infrastructure, primarily new natural gas-fired power plants.

Strategy	Metrics/Time Frame	Lead/Partners
2.1 Data For Improved Decisions: Ensure that Californians (consumers, industry, building owners, policy makers, and professionals), have access to appropriate data sources to make informed decisions related to energy efficiency.		
2.1.1 Data Exchange Protocols: Adopt and align common data exchange protocols to ensure streamlined collection, effective management, and security. • Engage closely with DOE-sponsored Building Energy Data Exchange Specification (BEDES). • Encourage or require widespread implementation of Green Button and Green Button Connect smart meter data exchange protocols. • Research and adopt standard protocol using real-time advanced metering infrastructure (AMI) data for EM&V.	*Ongoing and as needed; P39 protocols completed by 2015*	*CEC, CPUC/utilities, research institutions*
2.1.2 Benchmarking Data Infrastructure: Map meters to physical buildings and upload whole-building consumption data to Portfolio Manager, as needed.	*Ongoing; all utilities 2016*	*Utilities/CEC, CPUC*
2.1.3 Easy-to-Access Data and Analytics: Provide simple, standardized access to customers and their chosen service providers so they can easily understand their real-time energy use and assess needs. Develop solutions for multifamily buildings, particularly low-income and commercial buildings, including provision of regular and frequent building-level usage reports. Allow consumers to share/donate their data for consideration of possible EE upgrades.	*Ongoing; statewide by 2016*	*Utilities/CEC, CPUC, HUD*
2.1.4 Data for Local Government Use: Develop a standardized process for LG access to building-level energy-related data as needed for local policy development and implementation without having to complete a comprehensive security audit required by utilities.	*Ongoing; as requested by LGs*	*Utilities/CPUC, CEC/LG*
2.1.5 Standardized Rates Information: Maintain all applicable utility tariffs (rates) in a standardized, machine-readable format on a public website.	*System in place by 2016*	*Utilities / CEC, CPUC*
2.1.6 Public-Facing Energy Efficiency Program information: Publish project-level, locale-specific, real-time, anonymized information for ratepayer-funded efficiency program participants within a statewide public database (for example, CSI database).	*2017*	*CPUC, CEC/utilities, program implementers*
2.1.7 Integrated Database for Low-Income Programs: Integrate the WAP, Low-Income Home Energy Assistance Program (LIHEAP), Low-Income Weatherization Program (LIWP), and utility ESA databases as a step toward alignment of cost-effectiveness methods and streamlined delivery of energy efficiency services to low-income Californians.	*Ongoing*	*CPUC, CSD, utilities*

Strategy	Metrics/Time Frame	Lead/Partners
2.1.8 Energy Data Center: Create independent data center(s) where consumption data are collected from all utilities, protected securely, align customer data procedures, and made available to local governments, policy makers and researchers; institute secure transfer protocols to/from energy agencies.	*Ongoing; EDC operational by 2016*	*CPUC, CEC, POUs*
2.1.9 Energy Consumption Baselines: Establish energy-use baselines at appropriate granular, geographic, building type, and building vintage levels to track *Action Plan* and other policy impacts, possibly in coordination with the energy data center above.	*2015 - 2017*	*CEC, CPUC, POUs*
2.1.10 Local Area Load Forecasting Method: Develop data collection protocols, forecasting methods and tools for localizedconsideration of efficiency within the California Demand Forecast.	*Methodology 2015 IEPR; Implement 2017 IEPR*	*CEC/CPUC, ISO, POUs*

Figure 3.2: Regional Decision Making: Emerging Analytical Tools

Develop Building and Energy Use Data

Local/Regional Data

- Primary building data
  Building size, use, vintage, and other attributes.
- Modeled building data
  Derived from place and building types for existing or planned development.
- Land use plans or scenarios
  Local and regional plans indicate existing and potential land use and associated building characteristics.

State/CEC Data

- Energy use data by building type and climate zone
- Energy efficiency policies
  CEC or others may identify efficiency strategies and their assumed savings.

Utility/Other Data

- Primary energy use data
  May include data shared according to energy use disclosure requirements
- Audit data
- Census data

Establish Statewide Energy Baselines

Spatial Building Data

Location of existing buildings by climate zone and jurisdiction; linkage to other criteria.

Baseline Factors

Energy use intensity for buildings by building type/use, fuel type and climate zone.

Policy-Based Assumptions

Energy use intensity targets; retrofit rates; renewable energy portfolio targets.

Apply Analytical Tools

Regional and local users can use analytical tools (such as UrbanFootprint, to:

- Store data in a common schema that facilitates data review and sharing, and encourages consistency in data format and quality across jurisdictions and agencies.
- Analyze energy use, costs, and GHG emissions for existing buildings and new growth, as well as other sustainability metrics linked to land use scenarios and policy options.

Determine Energy and Sustainability Metrics

- Energy use, costs, and related GHG
- Other sustainability metrics, including: water use, costs, and related GHG; household travel and transporatation impacts; land consumption; fiscal impacts; and public health impacts.

Use Metrics for Improved Regional and Local Decision-Making

Climate Action Plan (CAP) policy development

Estimate and compare GHG impacts of energy savings with impacts of strategies for other sectors.

Local Energy Initiative Development

Compare the costs/ benefits of targeting specific building sectors or efficiency strategies.

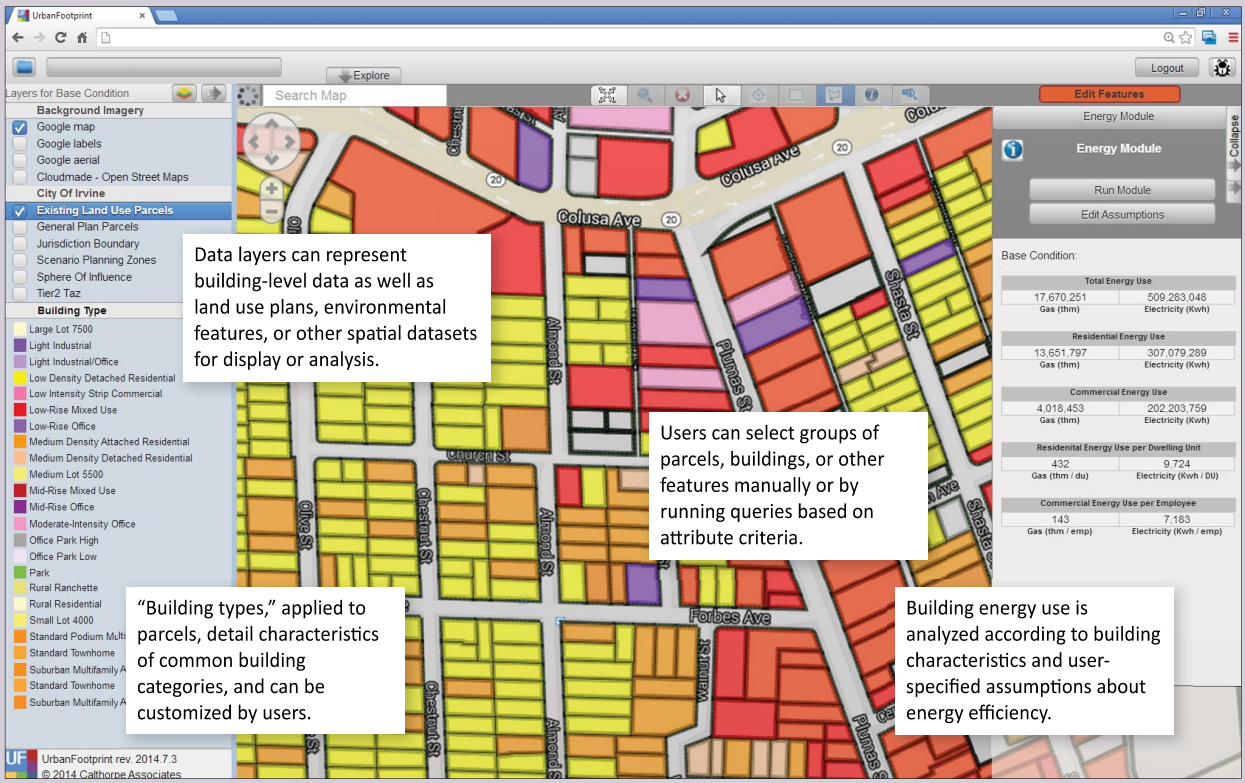
Land Use Planning

Inform regional Sustainable Community Strategies (SCS), local general and specific plans, and other land use plans.

Local Benchmarking / Monitoring

Use common analysis framework to monitor progress in a consistent manner across jurisdictions and over time.

Analytical Tool Example: UrbanFootprint



UrbanFootprint is a land use planning, modeling, and data organization framework designed to facilitate more informed planning by producing comprehensive results across a range of sustainability metrics. With geographic information systems (GIS) functionality served via a web-based interface, UrbanFootprint gives users the ability to map and analyze energy use and the impacts of efficiency strategies.

Scenarios account for existing buildings using best-available data, and future growth via the application of "place types" and their component "building types" to the landscape. Attributes of prototypical place and building types are informed by existing development, and used as the basis for estimating the impacts of different land use patterns on energy use, GHG emissions, and other environmental, fiscal, and communicty sustainability metrics.

Applying Results: From Energy Use Savings to GHG Reductions

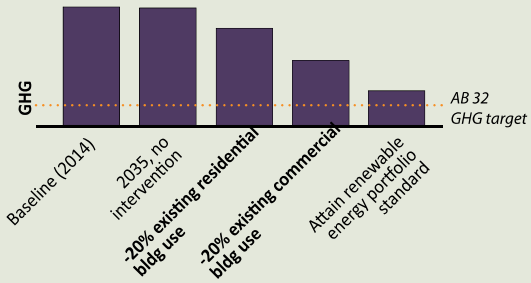
UrbanFootprint incorporates assumptions about energy efficiency strategies and energy resource mix into the future to project energy savings and associated reductions in GHG emissions, which can in turn be put into context with reductions from the transportation sector. For example:

Target 20% reduction in EUI for all exising single family homes in region by 2035

20 trillion BTU
energy saved annually

1.5 MMT
CO_2e saved annually

Comparing strategies:



Source: California Energy Commission

Strategy 2.2 Consumer-Focused Energy Efficiency

"Significant behavioral changes and improved knowledge are needed to create an energy-aware culture to deliver our ambitious energy targets. The most significant step in transforming the building sector will be to raise the profile of energy throughout the sector, the business world and wider society."

World Business Council for Sustainable Development, "Energy Efficiency in Buildings - Transforming the Market"

Enhanced Program Design and Targeted Marketing, Education, and Outreach: Flexibility for Achieving High-Performance Buildings

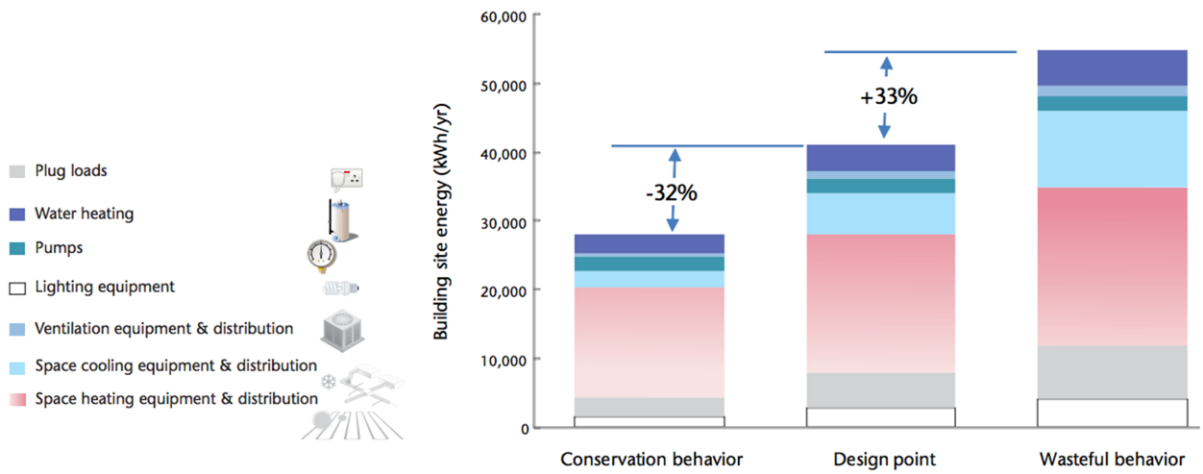
Moving forward, energy efficiency programs should provide effective, modular approaches to customer engagement by addressing each customer's needs and situation with a common sense, straightforward suite of options. The CPUC and the Energy Commission's joint work on the CEESP recommended that programs focus on a whole-building approach rather than promoting and paying incentives for "widgets" or single measures. Recent experience with whole-building programs has illustrated that many building owners are not prepared or capable of completing whole-building upgrades all at once. Rather, owners start from where they are and make changes incrementally. Such approaches are perfectly in line with both the customer's best interests and the state's goals so long as they result, over time, in optimized energy use in a given building. There is a need for consumers to understand all their options for energy efficiency. The current framework is segregated and difficult to understand. This strategy proposes more transparent and comprehensive information be made available to consumers.

Implementers can help to make energy efficiency improvements more attractive by allowing for phased improvements by providing technical assistance and guidance about how to sequence improvements over time, keeping in mind the importance of building science and best practices. Marketing, education, and outreach (ME&O) can educate consumers so they better understand and value energy improvements. For example, ME&O can be used to target messages to qualified consumers and to bundle improvements in ready-made packages designed with specific consumer segments in mind. In addition, programs can be better designed and more responsive by using all available data and gathering regular industry feedback. Further, implementers should consider the following areas when revamping and honing programs to better suit consumers.

Trigger Points

Every project represents a "touch point" for providing information and encouragement on energy efficiency. These touch points, in conjunction with events at various times during the useful life of a building, such as equipment failure, routine maintenance, remodeling, or major renovations, provide valuable

Figure 3.3: Wasteful vs Conservative Behavior



Source: World Business Council for Sustainable Development, *Energy Efficiency in Buildings - Transforming the Market*

opportunities to add efficiency measures. Providing multiple pathways to these measures will allow building owners and other decision makers to choose between single measures, multiple measures, comprehensive measures, or renewable self-generation projects. Pathways also need to provide a plan for building owners to pursue deeper upgrades over time and encourage sensible and cost-effective early change-out of appliances and equipment.

Behavior and Operations

Behavior and operations are key drivers of consumption, and understanding and influencing them should be central elements of energy efficiency programs. Behavior has been shown to provide quantifiable effects on energy consumption. Conservation can save up to 30 percent of the design costs of a building, while wasteful behavior can result in 30 percent more energy costs. (See Figure 3.3.) There are numerous opportunities to achieve savings at a lower price point than other, more cost-intensive efforts, such as replacing expensive equipment. Equally, effective building operations have significant effect on energy use for multifamily and commercial buildings, as illustrated with the Leadership in Energy and Environmental Design (LEED) Existing Building Operations and Maintenance (EBO&M) program.

Customer behavior changes range from single point-in-time actions, such as purchasing a more efficient measure, to habitual changes that affect building energy usage, including shifting appliance and equipment use to off-peak hours and customer opt-in for tools that provide immediate access to real-time usage data and costs. Studies are underway to better understand the overlap of efficiency, demand response, and conservation behavior-based savings, and what options exist for California based on the success of behavior programs in other states. As these opportunities and synergies are better understood, the next steps will likely include expanding the definition of behavior programs, developing strategy guidance based on which program options will cost-effectively generate behavior-based savings, and determining how behavior should be estimated in energy efficiency potential studies and, in turn, the state's energy efficiency goals.

Examples of areas in which behavior program offerings might be expanded are:

- **Time Varying (TV) Rates (opt-in or default)**—Time-varying rates offer some of the highest behavior change energy savings. As customers gain real-time access to their usage, they are sent a price signal and can adjust behavior accordingly.
- **Enhanced Billing**—Rather than limit behavior programs to a targeted subset of customers, which is how current behavior programs are structured, enhanced billing would present comparative energy usage and related cost information to **all** customers via their bill. An important consideration in adopting an enhanced billing intervention strategy is that it will likely require adjustments to the traditional efficiency program evaluation framework, as enhancing billing savings would be widespread and difficult to measure without a control group.
- **Free or Rebated Smart Thermostats**—A number of utilities around the country have adopted this approach for generating customer behavior change and efficiency/conservation savings. By enrolling in auto demand response or precooling programs, customers receive a free or steeply discounted smart thermostat.
- **Data Driven Customer Insight**— The delivery of personalized insights derived from individual household usage data combined with other data sources related to housing characteristics, weather patterns and other relevant factors can induce reductions in energy use through behavioral changes. Communicated separately from the utility bill, customers are informed how their household energy use compares with that of a peer group. The information may contain tailored tips and program promotions to further encourage the recipient to reduce his or her household energy consumption.
- **Expanded Use of smart Phone/Computer-Based Apps**—Companies such as Bidgely, Chai Energy, and Home Energy Analytics offer smart phone or computer-based applications that leverage smart meter data to, for example, break down consumption by end use, understand usage patterns, pinpoint opportunities for savings, and provide ongoing regular seasonal advice to customers.

- **Community-Based Peer-to-Peer Outreach**—Although perhaps limited in scale or application due to the time and budgets needed to train outreach personnel in targeted neighborhoods, research shows that such efforts can generate significant savings, in the range of 15–20 percent per household. The persistence of these savings, however, is not well understood.
- **Annual Remote End-Use Audit and Provision of Household Score**—This approach expands on the concept of providing information to motivate behavior by requiring utilities to produce an annual relative energy use score or ranking for all California IOU households, coupling usage data with publicly available building square footage estimates and, perhaps, occupancy levels. This approach can be coupled with enhanced billing and comparative energy usage information approaches, such as ranking of households by quintile and publication of this ranking on the utility bill.
- **Competitions—**Competitions span the gamut from campus and office challenges to neighborhood and city challenges. The "Cool Choices" office competition approach, developed in Wisconsin, appears to hold some promise for office-based competitions.

Targeted Programs

Using the assessment tools described in Strategy 1.3 and new sources of comparative data made available in Strategy 2.1, program implementers can better target resources to meet consumer needs. New tools accessing all available data can quickly and inexpensively provide key insights, even a relatively complete picture of the energy performance of a building. The plan recommends, as an example, prioritizing based on energy use as follows:

- High users receive highest priority and personal attention with a broad array of tangible offerings, including behavior programs.
- Mid-level users are encouraged to engage with online tools and education that explain targeted actions, including next-level energy efficiency (whole-building, PV, and solar thermal) and behavior measures.
- Low-level users are recognized as low-energy leaders and are encouraged to continue their behavior through awards and other recognition activities. These groups could become advocates in their community for energy-efficient behaviors and investments in comprehensive retrofits.
- Low-income users are provided quick access to direct install programs and enhanced support to understand their bills and consumption details. Targeted programs can also aid low-income users by working with building owners to scope and help finance the comprehensive retrofits that will best serve the building occupants.
- **Employee Education and Behavior Programs–** Regular, ongoing education and awareness and tools and resources for employees should be utilized to help reduce ongoing energy waste, especially as related to plug loads and MELS.
- **Facility Manager Regular Training –** Although often part of operations, training facility managers to understand energy management systems and related systems is critical to maintaining long-term energy savings. In addition, regular training will help make energy management routine and assist with the long-term behavior of managers.

Targeted ME&O can motivate consumers in these categories to act by supplementing energy use data with demographic and psychographic characteristics and tailor messaging and visual materials that speak to consumer values and beliefs related to energy use. The state's energy management brand, Energy Upgrade California®, uses five residential segments developed for the statewide ME&O program in 2009 and targets three of those segments with messaging.[108] The program is conducting research to develop segment profiles for targeting messages at small businesses in the commercial and industrial sectors.[109] The IOUs have extensive databases of

108 Opinion Dynamics Corporation. Memo Re: Market Segmentation Findings. December 2009 http://cpuc.ca.gov/NR/rdonlyres/9A3B6444-96AD-4A6D-A392-7588761C3A9D/0/OpinionDynamicsFinalSegmentationReport.pdf.

109 Energy Upgrade California Statewide ME&O kicked off small business research with Greenberg, Inc., in December 2014. Greenberg will develop segmentation profiles for small businesses by the state's definition by May 2015. These small businesses are categorized by their business type and not energy use and will apply to commercial and industrial sectors. Energy use will be considered in the segments. Categorization of small to medium to large enterprise varies widely by IOU service territory.

customer segmentation and can correlate these segments to energy usage, as well as map customer participation in energy efficiency programs by segment.

Developing Cohorts for Stronger Engagement

The *Action Plan* supports development of pilots and other activities that test the effectiveness of industry cohorts to create better and more cost-effective building energy efficiency improvements. Examples of industry cohorts include, but are not limited to, building owners within one community, owners of the same or similar building types, like businesses, and stakeholders focusing on specific energy end uses.

Small and Medium Commercial – Several IOUs, working with a third-party provider, are piloting an education and outreach approach for commercial businesses that brings them together in a program called "Sustainability Circles." This program creates cohorts of businesses and includes a series of meetings, discussions, engagement around best practices, and assistance with developing a sustainability action plan. Operational, behavioral, and physical improvements are incorporated into the plan. Results from this program thus far indicate a strong impetus for action, better working relationships with the utility partners, and increases in building improvement activities.

Multifamily and Corporate Cohorts—Cohort approaches may also be very effective for owners of multiple multifamily buildings, or portfolios of buildings. The vast majority of multifamily properties are located in a few metropolitan areas in California, particularly the Bay Area, San Diego, Orange County, and Los Angeles.[110] This approach reduces outreach and engagement costs and optimizes the opportunity to achieve savings over a large group of buildings.

There are also opportunities to engage corporations that own or lease a large number of buildings. The first step is to identify corporations that have portfolios of buildings that can be upgraded, focusing on California-based corporations with aligned missions (see Strategy 4.2).

110 National Multi Housing Council census data and see Appendix Excel Spreadsheet Tab 14.

Strategic Energy Plans and Technical Support Energy Centers

A strategic energy plan (SEP) is a roadmap to achieve individual, business, or organizational energy goals in a systematic and phased manner. A well-conceived SEP includes clear goals based on property owner needs; supports cost savings, increased comfort, and high indoor air quality; and integrates energy efficiency improvements with other planned building upgrades. SEPs also consider behavioral changes and operational improvements in addition to capital investments.

Sustainability Circles: Cohort Approach – Overview of SDG&E Pilot

"Sustainability Circles" is a third-party managed action-oriented program in partnership with local utility providers (being piloted in SDG&E territory) for small to mid-sized businesses and divisions of major corporations. The program is designed to improve energy and resource efficiency, improve profits, and increase competitive edge by incorporating sustainable business practices in business operations.

Central to the program is bringing together cohorts of like businesses in a sustainable engagement program focused on those businesses' particular needs. By working together, businesses learn from each other's experiences and seem more willing to engage in sustainable practices. Initial feedback has been positive, and more specific details should be available as the pilots mature.

How the Program Works

- Six monthly all-day meetings
    - Pre-Circle 1-on-1 coaching
- Between meeting coaching
    - Build/enhance your Sustainability Team
- Develop a customized Sustainability Action Plan

Source: http://revsustainability.com/sustainability-circles/

Additional assistance can be provided from virtual or physical energy support centers where building owners and tenants go to receive a broad range of technical assistance to make their buildings more

energy-efficient. These hubs can provide a point of contact where owners find access to utility programs, financing, and professional services, as well as advice on how to navigate local programs and develop a strategic energy plan. A trusted agent (for example, local governments, nonprofits), likely partnering with utilities, can provide an environment where people get nonbiased information and guidance.

Another potential role for the Energy Center is to help building owners (especially commercial and multifamily building owners) identify the right contractor for their project. Currently, finding the right contractor or efficiency provider for an efficiency project can be difficult, especially when crossing multiple building systems such as stopping building shell infiltration, renovating roofing, optimizing HVAC, or integrating lighting control systems. Current online resources tend to offer only general information with little critical assessment or assurance that a contractor is appropriate for or even skilled for, needs of a specific building.

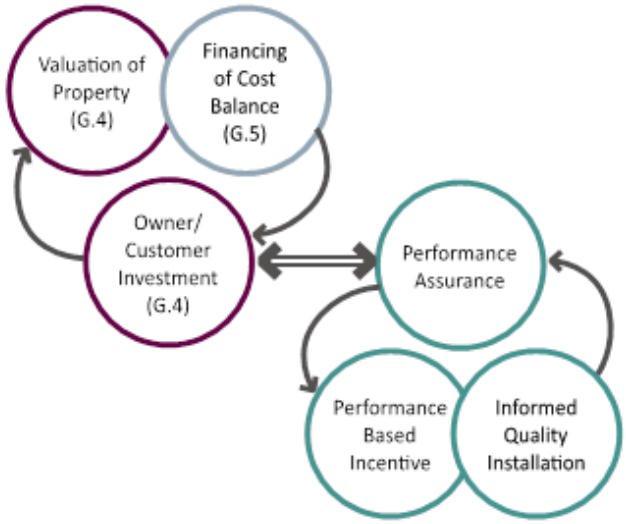
Strategy	Metrics/Time Frame	Lead/Partners
2.2 Consumer-Focused Energy Efficiency: Identify and support activities and programs that address the needs of occupants and owners using operational and performance data.		
2.2.1 Enhanced Program Design and ME&O: Transition to more multifaceted, incremental, and performance-oriented efficiency programs. • Incorporate all end-use energy sources, including water, plug loads, pools, irrigation, and exterior uses, into programs. • Incorporate trigger points to help reach consumers at key transaction points. • Establish behavior and operations as central elements impacting building energy consumption by incorporating them into programs, tracking, and evaluating. • Use ME&O to create a path that can connect consumers across programs and bundle actions based on their needs. • Measure program performance by percentage of eligible participating customers.	*Ongoing*	*CPUC, POUs/program implementers, LGs, EUC*
2.2.2 Expand Behavior Programs: Leverage current and expected innovations made possible with access to AMI data; plan and implement behavior programs with expanded scope and market reach.	*2016 and ongoing*	*CPUC, POUs/program implementers, LGs, EUC*
2.2.3 Targeted Programs: Support a range of targeted approaches to energy and water efficiency for property owners and occupants based on data-driven market segmentation and filtering. • Use data to develop and leverage consumer profiles and use those profiles to meet consumers where they are and motivate them to take the next action.	*2016 and ongoing*	*CPUC, POUs/program implementers, LGs, EUC*
2.2.4 Building/Portfolio Cohorts: Build on existing IOU pilots for small and medium-size commercial buildings that use a property owner cohort model to encourage engagement, awareness, value, and implementation of improvements to buildings including capital, operational, and behavior; consider designating cohorts based on building types, end use, and/or project types.	*Expand cohort program in 2016*	*CPUC, POUs/program implementers, LGs, EUC*

Strategy	Metrics/Time Frame	Lead/Partners
• Evaluate effectiveness of working with corporations to address energy use for a portfolio of buildings. • Develop asset-based classes for investor-ready projects.		
2.2.5 Strategic Energy Planning: Develop multiyear, sector-specific energy plans to implement energy and water efficiency improvements for property owners. *(Align with Strategy 1.7.)* • Establish and build on sector-specific owner advocates/agents and technical support centers (virtual or physical) in target regions or areas to simplify development of plans. • Provide directories of certified or program-qualified contractors and existing building professionals to help building owners complete projects. • Owners' agents provide ongoing technical assistance, including identifying and bringing together financing and tax credit opportunities, building improvement programs, energy management, and peer-to-peer elements.	*SEPs are systematically incorporated into programs beginning in 2016, phased by sector*	*LGs/program implementers, HUD*

Goal 3. Increased Building Industry Innovation and Performance

Objective: A robust and sustainable building industry thrives by satisfying demand.

Figure 3.4: Interdependencies of a performance based market



Sources: California Energy Commission

Goal 3 puts in place essential building blocks to scale up the industry's growth, profitably and with high performance, to maximize efficiency outcomes that result in a self-sustaining industry. The strategies of this goal build on Goal 2 (access to information) and Goal 4 (market recognition of benefits and value) and call upon Goal 5 (financial access and tools). California seeks to maximize the levels of efficiency achievements through widespread adoption within a voluntary market. This will require an expanded repertoire of knowledgeable retailers and contractors – skilled sales practices, "wholesale" incentives offered to upstream (manufacturers and building designers) and midstream (equipment distributors and services aggregators) agents in the efficiency market. For example, project timelines must be shortened and incentive payments and finance tools closely integrated into one-stop or coordinated transactions for solution delivery. Streamlining the efforts needed to voluntarily adopt efficiency improvements will expand the market capture of energy savings potential.

Strategy 3.1 Streamlined and Profitable Industry

A sustainable and robust marketplace for efficiency solution providers and contractors is central to the success of maximizing long-term energy efficiency outcomes. The *Action Plan* draws upon regulatory and policy environments to enable multiple business models with innovative strategies to succeed.

Scalable and Profitable Business Models

Energy efficiency, especially for existing buildings, is a complex business affected by detailed standards, cumbersome coordination across building trades, incentive program requirements designed to avoid overpaying for unrealized savings, and the variability of the buildings themselves—with different vintages, equipment and systems, construction methods, and widely varying occupant uses and owner/investor interests. At the same time, simplicity is the number one characteristic that stakeholders indicate is needed to make energy efficiency a more attractive business prospect. A more stable, predictable, and flexible business environment must be fostered in California to grow this industry to the desired scale.

Streamline

The existing building industry must pursue new business models and develop stronger performance approaches. Where incentives are needed to stimulate demand, programs must be streamlined – for example, in incentive calculation, savings verification, and quality control procedures. Accessible data are needed for efficiency providers to target the greatest opportunities across existing building inventories, adopt low-cost techniques to validate performance, and support long-term efficiency business investments.

Profitable Services and Programs

Efficiency solutions must be profitable, whether for efficiency-focused providers expanding in scale or as

routine elements of other building and equipment industries and services. Achieving this demands that the industry both organize itself and work hand-in-hand with government and utilities to define pathways to scale up efficiency profitably. For example, the Western HVAC Performance Alliance (WHPA) is a collaboration of HVAC manufacturers, contractors, facility managers, utilities, and government. WHPA has a mission to maximize the consumer benefits of HVAC and related energy efficiency services, provide support to individuals and organizations that deliver HVAC to consumers, and minimize HVAC-related energy use. WHPA's goal is to transform the residential and small commercial HVAC market to deliver high-quality technologies, equipment, installations, and maintenance to realize energy efficiency and peak-load reductions.

Solutions for All Sizes of Energy Users

Energy services companies (ESCOs) typically provide turnkey solutions for large commercial projects and public sector institutions. The size and complexity of those projects, as well as the financial stability of the client organizations, offer a profitable and sustainable market. This model provides several benefits, particularly in creating a point of contact for assessment, design, construction, financing, and performance monitoring. Furthermore, commercial contractors with access to financing can provide analogous services as ESCOs and serve smaller markets.

Large Commercial Market Transformation Assistance

While large commercial building owners typically have available resources to embark on efficiency upgrades, it remains critical to promote more aggressive performance improvements that include both capital investments and operational enhancements. Building Owners and Managers Association International (BOMA) has developed and is updating its BOMA Energy Performance Contract Model (BEPC). Also, in partnership with U.S. DOE's Better Building Challenge (BBC), sponsored by Los Angeles Department of Water and Power and Southern California Gas, and under the leadership of City of Los Angeles, Los Angeles BBC has developed the Accelerated Modernization Platform (AMP) for performance contracting process support. Using BEPC best practices and AMP process support, performance contracting in Los Angeles' large commercial sector is starting to increase substantially. This exemplar should be replicated across the state.

Small and Medium Commercial and Multifamily Focus

Identifying qualified contractors and builders able to profitably provide energy efficiency services for buildings of 5,000 to 25,000 square feet (approximately 35 percent of all commercial floor space), especially beyond fast-payback lighting solutions, is a tall challenge.

The plan recommends fostering scalable business models for the small and medium commercial and multifamily market, such as the energy services business model, or similar approaches that offer comparable benefits. This may include ways to combine solutions for multiple buildings (or portfolios) in packages that will enable ESCOs to service and achieve necessary scale, encouraging new contractual or financial techniques that combine performance guarantees with financial risk management mechanisms that spread efficiency project payments over future building owners and occupants, and possibly targeted business development and mentoring support to grow the capacity and skills of smaller or specialized contractors.

Strategy	Metrics/Time Frame	Lead/Partners
3.1 Streamlined and Profitable Industry: Promote a sustainable and robust efficiency marketplace by providing stable and effective support to contractors and other solution providers		
3.1.1 Sustainable and Effective Program Delivery: Enhance program portfolios to reduce transaction costs and dramatically increase effects in hard-to-reach sectors. • Streamline program requirements and operational procedures. Expand statewide programs with uniform designs. • Improve and expand direct-install programs for hard-to-reach populations. • Develop and implement new program designs for small and medium commercial and multifamily buildings. • Implement rolling program portfolios to solidify long-term funding commitments that align with business investment decisions. (Align with Strategy 1.9.)	*2016 and ongoing*	*CPUC, POUs, CEC/program implementers, LGs*
3.1.2 Industry Partners Programs: Develop partner programs with trade organizations and industry agents to address key market barriers and facilitate industry innovations (by sector and/or end use). • Provide broad access to market research program evaluation findings, understand market dynamics, share best practices, and foster industry engagement in determining effective efficiency strategies and approaches (for example, WHPA).	*Ongoing*	*CPUC,CEC,POUs/industry groups, program implementers, LGs*

Strategy 3.2 Performance-Driven Value

Accountable Performance: Tools and Incentives

"Using a simplified, more accurate and less costly rebate process that is tied to actual energy bills, contractors would likely be incented to guarantee savings and rebate amounts..."

Devon Hartman
Efficiency First California

New tools and compensation arrangements will allow building professionals to expand their services and pursue a broader range of work that both maximizes energy savings and builds long-term relationships with clients to ensure equipment and energy systems are performing optimally.

Feedback Practices

One of the biggest challenges is ensuring that quality installation and long-term maintenance enable full achievement of identified efficiency potential. While there are numerous regulatory safeguards in place regarding equipment and appliance standards, these often occur at a single point in time and do not ensure long-term performance or accountability from the technicians and professionals completing the installation work. California must develop and deploy better installation and performance feedback practices and tools for the efficiency services industry. Some might target quick on-site tests for instant verification of proper HVAC system integration, while others might use a few months of post-project smart meter data to confirm that expected savings levels are achieved.

Performance-Based Incentives

Many stakeholders suggest that efficiency incentives should go directly to contractors based on actual savings, and that these contractors would then be held accountable for long-term savings and performance of their installations. These incentives might be paid in lieu of, or by lowering, large incentives typically paid to motivate owners and managers to take on project performance risks.

Performance Validation Tools

Essential to both feedback practices and performance incentives is access to performance verification tools and data to inform contractors of installation quality. Moreover, technology solutions can be deployed to access and interpret smart meter data to verify performance or signal the need for adjustments. Such validation approaches can reward good results and build the confidence of building owners, lenders, and business investors. One such tool under development for residential efficiency is CalTRACK. (See sidebar.) Similar tools need to be developed for small and medium commercial projects.

Certifications and Assurances

Additional efforts should explore the merits of certification for efficiency firms, particularly in the small and medium building arena. Further work will be needed within the residential contractor industry to develop quality firm assurances, worker skills certifications, or other objective credentials that signal a reputation for quality work and realized energy savings.

Residential Software Verification Tools

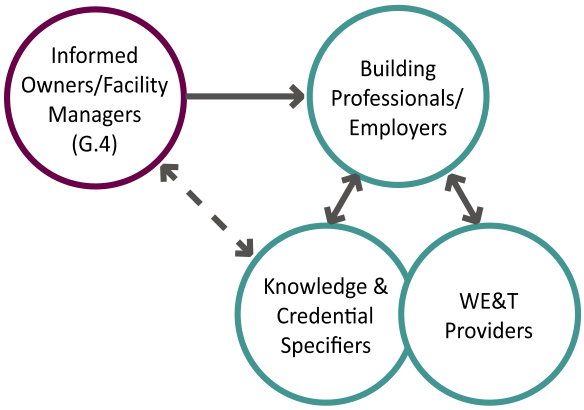
CalTEST: CalTEST is a testing process that allows a range of energy efficiency software tools to be verified with predictive accuracy by testing results based on a set of representative California homes. Software will use project data, and CalTEST will validate predictions against weather normalized actual performance of those homes. CalTEST is designed to allow diverse software tools into the California marketplace. The program launched in early 2015, and four new vendors have been approved.

CalTRACK: CalTRACK, still under development, will provide ongoing measurement and verification of actual savings provided by smart meter data for all home upgrade projects. CalTRACK compares predictions to weather-normalized energy usage data before and after a project and calculates actual savings and realization rate against predictions. These data can both adjust future predictions for greater accuracy and provide feedback to market actors on contractor performance and project outcomes. Contractor compensation and incentive payments can be tied to such performance verification.

Strategy	Metrics/Time Frame	Lead/Partners
3.2 Performance-Driven Value: Provide new tools and compensation arrangements to allow building professionals to expand their services and pursue additional work.		
3.2.1 Performance Assurance: Confirm energy savings outcomes using performance-based validation methods. • Develop effective verification tools to substantiate predicted energy savings for the residential and small/medium commercial sectors. • Promote widespread use of tools that provide feedback on actual delivery of promised savings. • Provide quick and easy access to energy usage data for use in performance verifications. (See Strategies 2.1.3 and 2.1.6.)	*Energy savings are predictably estimated and verified at substantially lower costs by 2018*	*CPUC, POUs/program implementers*
3.2.2 Incentives Tied to Performance: Employ performance-based incentives to support savings realization and LG persistence, in tandem with finance mechanisms (Goal 5) that manage cash flow.	*Pilots begin with utility 2016 programs*	*CPUC, POUs/program implementers*

Strategy 3.3 High-Performance Workforce and Education

Figure 3.5: Interdependencies of High Performance Workforce and Education



Sources: California Energy Commission

California offers a broad array of workforce, education and training (WE&T) programs for both basic building and trade skills, as well as specialized knowledge on sustainability, green buildings, and energy efficiency. Providers include workforce investment boards (WIBs), community colleges, professional trade associations, online education providers, registered apprenticeships, community-based nongovernmental organizations (NGOs), and utility-sponsored short courses. These entities provide a solid basis to prepare California's workforce to carry out high-performance solutions at each level of trade and professional employment in buildings and energy efficiency.

This nexus of WE&T opportunities will be more successful if there is a focused conversation within the industry as a whole, informed by efficiency experts who know where workforce practices need strengthening, the employers who need to understand and promote improvements in skill levels and quality assurance, and the WE&T community that must update the knowledge, abilities, and skills these training institutions provide. Efforts are needed across all levels in the building industry, from the trades to designers and engineers, from specialized diagnostics experts to building managers, and including building company sales professionals and performance-tracking analysts. Attention is needed on both the incumbent workforce that comprises the vast majority of building sector workers today, as well as those newly entering the industry and moving up.

U.S. DOE recently completed job task analyses to document the knowledge, skills, and abilities (KSAs) needed for single- and multifamily home energy upgrades[111]. Integrating the KSAs described here into California's WE&T activities is an important first step to improving industry job skills; however, these KSAs will also need to be expanded to cover the California energy efficiency standard requirements for HVAC equipment replacements, the second largest use of energy in California's buildings, after lighting. For example, HVAC contractors and other retrofit installation technicians need to understand and correctly implement the field verification protocols for HVAC airflow, fan wattage, and refrigerant charge testing, along with the duct leakage testing that is already included in DOE's job task analyses.

Development of California's efficiency workforce requires these areas of focus:

KSA Specifications Integrated Into Curriculum

Educational pathways from community colleges to building firms with "green" and efficiency apprenticeship programs are a weak link in today's system, in part due to the lack of clear specifications for performance-oriented efficiency jobs and, thus, the lack of employer demand for graduates with these KSAs. Curricula updates are needed to integrate additional building science into both college and trade pathways, including updates that provide familiarity with diagnostics and performance feedback tools.

Within the California Department of Industrial Relations, the Division of Apprenticeship Standards fully recognizes this need to ready California workers in the areas of clean energy and energy efficiency. In 2010 the California Apprenticeship Council mandated

111 http://energy.gov/eere/wipo/guidelines-home-energy-professionals-accredited-training.

updates to trades' minimum industry training criteria to include green components, and each apprenticeship program has updated their standards to include energy efficiency criteria.[112] Efforts are needed to confirm that all relevant apprenticeship standards as well as appropriate college curricula include the building science needed to realize the benefits of energy efficiency upgrades.

Utility Efficiency Programs to Create Demand for KSAs

In 2014, the Donald Vial Center on Employment in the Green Economy produced a report to help the CPUC guide the IOUs on workforce training priorities and approaches[113]. As summarized in the sidebar, key recommendations are made to both prepare the workforce to successfully deliver energy efficiency, and to increase the demand for these workforce services by setting standards or certification requirements for using utility rebate and incentive programs. The utilities and third parties are moving forward with a number of the report recommendations and will address the full spectrum over the coming years.

Quality Assurance Delivered by Practitioners

Just as the concept of high-performance buildings needs to be integrated into California business models, so the concept of quality assurance needs to be ingrained in the workforce and its supervisory ranks to ensure performance is achieved. To realize building improvements and system installations that meet or exceed code requirements, practitioners must be better versed in quality assurance at all stages of project design and implementation. For larger organizations, quality assurance-certified staff members will help achieve this, and in smaller settings, cross-trained staff will be effective.

Specialty Services Become Routine

Efficiency projects will be delivered with quality and minimum transaction costs once services now thought to be specialized are incorporated into conventional project identification, design, and implementation. For this to occur, WE&T opportunities must be expanded to include skill development in several key areas. Training and certifications for energy auditing should include the scope of retrocommissioning (RCx), for example. Retrocommissioning is a systematic method for investigating how and why an existing building's systems are operated and maintained, and identifying ways to improve overall building performance.[114] RCx training provides the tools and methods to identify and resolve operational problems, such that building energy systems are optimized and able to be maintained for ongoing performance. By integrating RCx investigations into energy audit protocols, both capital investments and operational improvements can be identified within the same opportunity assessment. Other areas of training and education that will increase efficiency project quality include integrated design management for major renovations, efficiency sales skills, and database management to support lead generation and performance monitoring by efficiency provider businesses. These services, in turn, must be rewarded and proved essential to scaled-up and profitable efficiency service business models.

Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilities

Donald Vial Center recommendations:

- Utility incentive programs should require that contractor and workforce standards be met.
- Utility WE&T programs should align with, leverage, and influence the state's principal training and education institutions.
- WE&T funds should be directed to organizations with core competencies in workforce training.
- Utility efficiency program portfolios should include skill-building opportunities for disadvantaged workers and broaden access to living wage jobs.

112 *California Apprenticeship Council Newsletter, third quarter 2013*, Division of Apprenticeship Standards, Department of Industrial Relations, 2013.

113 *Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilities*, The Donald Vial Center on Employment in the Green Economy, 2014.

114 *California Commissioning Guide: Existing Buildings,* California Commissioning Collaborative, 2006.

Strategy	Metrics/Time Frame	Lead/Partners
3.3 High-Performance Workforce, Education, and Training (WE&T): Implement WE&T strategies that integrate KSAs with WE&T curriculum; update training to include best practice building science and code requirements.		
3.3.1 Priority Sectors, Systems, and Workforce Categories: Using expert panels, set priorities for the building segments most likely to scale up soon for efficiency adoption, and identify which building systems and trades need the most improvement.	*2015 - Obtain consensus on prioritized targets for workforce development, using 2013-2014 California WE&T Needs Assessment as a base.*	*Program implementers, Community Colleges, trade/ apprentice programs*
3.3.2 Knowledge, Skills and Abilities (KSA) Specifications: Determine the need, feasibility, and type of required certification for providers of building code compliance and utility incentive programs, organized by building type and building sector.	*Incorporate KSAs into utility WE&T and state WE&T programs by 2016.*	*Employers, community colleges, DIR/DAS, WIBs, program implementers*
3.3.3 High-Performance Curriculum: Leverage U.S. DOE's Better Buildings Workforce Guidelines for technical professionals oriented to high-performance buildings for residential, multifamily, commercial and public sectors.	*Establish schedule and process by 2017* *Curriculum adopted and standardized in 2018*	*state universities, program implementers, WIBs, BOMA*
• Expand learning pathways to include online programs, intensive courses, and other formats and content that support both incumbent and new trade workers and professionals.	*Address once curriculum improvements made in 2018*	Same as above
3.3.4 Efficiency Marketing Included in Workforce Training: Train contractors and other market actors to sell energy efficiency. Integrate customer acquisition, the provision of financing options, and other marketing activities into industry business models.	*2015 - 2018*	*CEC (EPIC), CPUC, POUs/WE&T programs*
3.3.5 Industry-Delivered Quality Assurance: Promote the broad adoption of quality assurance programs with building and construction firms, including certification and training to integrate quality assurance throughout a company's organization. Encourage low-touch, consumer-friendly approaches to minimize transaction costs, where possible.	*QA programs are standard practice by 2020 in all sectors*	*Employers, WE&T programs/CPUC, POUs, CEC*
3.3.6 Special Skills Training: Include special skills training in core WE&T activities to help meet demand, spur innovation, and increase the body of knowledgeable building professionals.		
• Retrocommissioning (RCx): Work with the California Commissioning Collaborative (CCC) to integrate retrocommissioning curricula into core WE&T training and education programs.	*RCx is standard practice for buildings 25,000 sf and bigger by 2020*	*CCC, BOMA, trades organizations, utility WE&T programs,*
• Building Operator Certification: Integrate energy efficiency into building operator and property manager certification programs	*At least 50% of the commercial floor space is managed by certified operator/managers by 2020*	*BOMA and other real estate owner/manager organizations*

Strategy 3.4 Zero-Net-Energy Retrofits

Deep energy efficiency retrofits of existing buildings, where the remaining energy use can be met with on- or near-site distributed generation, will need to expand exponentially for California to meet the state's aggressive energy efficiency and greenhouse gas emission reduction goals. This strategy will ease this expansion of ZNE retrofits in California.

The building industry has demonstrated that zero-net-energy retrofits are both possible and practical for many building types. Multiple existing ZNE building exemplars are operating today in California, serving diverse businesses and consumers. These successful ZNE retrofit projects have been funded in various ways—some with public research and development dollars, some with utility-managed ratepayer dollars, and others with private capital[115]. The challenge is to apply best practice retrofit design strategies that result in ZNE levels of energy efficiency to as many building retrofit projects as possible. In addition, codes and standards need to address some of the unique requirements that may be required to achieve ZNE goals at scale, including the use of community-scale renewables to offset energy use. This will require collaboration from all sectors of the building industry and will be successful only when the other key elements of this plan are realized, such as WE&T, ME&O, and financing.

Strategy	Metrics/Time Frame	Lead/Partners
3.4 Scale Up Zero-Net-Energy Retrofits: Exponentially increase the number of ZNE retrofit projects completed in California.	*2017 and ongoing*	
3.4.1 Focus on Key Building Types: Look for opportunities in specific building sectors, such as K-12 schools and government buildings, where there is evidence of ZNE technical potential, current ZNE guidance, and available financing. For schools, see Strategy 1.1.3.		*CPUC, POUs, CEC/program implementers, DSA*
3.4.2 Develop and/or Enhance ZNE Retrofit Design Tool Kits: Identify building/business types well-suited for ZNE retrofits but where current ZNE guidance is scarce. Provide design and financing guidance to ease adoption of ZNE retrofit strategies.		*CPUC, POUs, CEC (EPIC)/program implementers*
3.4.3 Provide Incentives and Other Financing Mechanisms: Make financing widely available for ZNE retrofits.		*CPUC, POUs/program implementer, financial institutions*

115 http://newbuildings.org/getting-to-zero-buildings-database, New Buildings Institute, January 2015.

Goal 4. Recognized Value of Energy Efficiency Upgrades

Objective: Building values reflect energy performance and associated benefits.

Strategy 4.1 Real Estate Value

"[If] conservation improvements do not increase a property's 'bottom line' value…their costs can only come out of the property's equity, which is to the detriment of not only the seller, but to energy efficiency and improvement programs throughout the State."

Jennifer Svec
California Association of Realtors

Property Valuation

The absence of a systematic quantification of the value of energy and efficiency upgrades for nonresidential and residential building properties is a major barrier to energy efficiency investments. Research and customer surveys indicate that there is quantifiable value in energy efficiency, including operational cost reductions, healthier buildings, better employee and tenant retention, and higher resale and lease opportunities. However, the lack of simple, comparative, and standardized tools for use in the marketplace makes it difficult to ensure that value is realized predictably.[116]

In a transparent marketplace, energy costs and energy efficiency improvements are seamlessly incorporated into property valuation and appraisal. AB 1103 provides information about the performance of a commercial building at sale, lease, finance, or refinance. Governor Brown's 2010 *Clean Energy Jobs Plan* states: "This same program should be extended so that homebuyers receive information about a home's energy use before purchasing it."

Integrating energy efficiency into property valuation must be done carefully. Energy consumption is governed both by physical building characteristics and by human behavior. Property valuations must focus on the energy characteristics that will transfer with the property when ownership or lease arrangements change. Energy asset ratings, introduced in Strategy 1.4, are appropriate to both residential and nonresidential property valuations for this reason – the ratings apply to the building characteristics and purposely do not rate behavior or operational influences.

Steps to Valuing Energy Efficiency in Homes

- Ensure that efficiency improvements are incorporated into the appraisal. (Strategy 4.1.3)
- Work with partner financial institutions to ensure selection of qualified appraisers. (Strategy 5.2)
- Capitalize on existing high-quality continuing education and designation training. (Strategy 3.3)
- Document energy efficiency features and improvements using consistent, standardized methods. (Strategy 4.1.1)
- Disclose inventories of energy-efficient homes to track supply. (Strategy 4.1.4)
- Work with Multiple Listing Service (MLS) providers and other real estate tracking tools to include information on home energy improvements and/or home performance ratings. (Strategy 4.1.4)

Excerpts from "Unlocking the Value of Energy Efficient Homes", CNT Energy and the National Home Performance Council, pg 4-5, 2013.

There may also be value in the disclosure of utility bills as a proxy for an asset rating. Using bills, along with relevant energy use benchmarks for similar buildings in similar locations, may provide relative performance information to real estate decision makers. The plan

116 Kok, Nils, and Matthew E. Kahn, *The Value of Green Labels in the California Housing Market: An Economic Analysis of the Impact of Green Labeling on the Sales Price of a Home*, Sustainable Property Research, July 2012.; Fulton, Mark, Jake Baker, and Margot Brandenburg, *United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models*, Deutsche Bank Climate Advisors and The Rockefeller Foundation, New York, March 2012.

proposes strategies to better understand the value of energy use data for understanding the relative energy performance of building properties.

Brokers, Appraisers, and Financial Agents

"Green and energy efficient features, while not top priorities on every homeowner's wish list, are increasingly becoming need-to-know items for appraisers."

Valuation Review, "Adaptation, best practices key to appraising in new era" The Appraisal Foundation, March 2014

Real estate agents and brokers are often the only connection for homeowners and business owners to find, sell, or lease a property. Real estate brokers base their businesses on trust and effectiveness, and they have a substantial investment in identifying challenges to closing sales and quickly proposing solutions to them. Any barriers that arise are a problem. Complicating the transaction process with considerations for energy efficiency benefits falls into that category. Client demand for this information has the potential to be the most effective way to change broker's priorities.[117]

Mortgage underwriters need standardized, clear data that can assure them that efficiency investments do not add risk and may actually reduce risks of repayment. Standardization of appraisals and the value associated with measures must be simple, defensible, and based on accepted criteria.

One of the nation's largest trade organizations for appraisers, the Appraiser Institute, offers a "green addendum" for use in transactions, as well as provides advanced training on how to use the tool for credible appraisals. However, according to the Appraisal Institute's website, only 14 residential and 7 commercial appraisers in California have completed their "Valuation of Sustainable Building Professional Development Program." Training for agents and appraisers is essential to effectively market MLS fields that report high-performance home elements. California is well-placed to bring energy efficiency fields into all major MLS systems as there is a precedent established by the state's largest service, California Regional MLS, to bring the value of high performance homes into the real estate market[118].

The Bureau of Real Estate Appraisers reports there are more than 11,000 licensed appraisers in California. In January 2015, the Appraisal Foundation, the national organization for appraiser standards and qualifications, will begin incorporating green building elements into its qualifying and continuing education courses. This action plan suggests updates to the green addendum as needed to reflect energy related characteristics in buildings and to ensure that the energy efficiency metrics used are consistent with the goal to provide standardized methods that include building energy performance into both residential and nonresidential property valuations. This plan also includes reviewing other methods, as they become known, to include energy efficiency attributes in real estate appraisals.

This strategy aims to establish routine inclusion of energy efficiency information in all real estate transactions. If this objective is not realized through these voluntary actions, then legislative and/or regulatory approaches will be recommended.

Colorado Green Real Estate Initiative

- Developed by the Colorado Office of Energy in collaboration with Real Estate and Appraisal industries.
- Voluntary data shared on residential Multiple Listing Services (MLS).
- Standardized data formatted for consistency in MLS.
- Allows communication of energy efficiency and green home features from buyer to seller.
- Supported by 90 percent of MLS services in the state.

117 Stakeholder Interview, Diane Vkric, WayPoint Building Group, April 2014.

118 http://crmls.org/reference/MatrixListingManagementManual.pdf, pg 23

Green Leases

When a tenant is negotiating a lease, there is an opportunity for the property owner (or agent) and the tenant to discuss and consider energy costs in addition to straight lease costs. A relatively new tool to promote this discussion is a green lease or green lease clause. The specifics change based on the building and business type but center on the same concept—removing the split incentive issue and providing equal benefits to tenants and owners for energy-efficient improvements. A green lease clause enables the building owner to incorporate requirements such as monitoring tenant space energy use through submetering and passing on both the costs and the overall operating savings of green building improvements to the tenant. Equally, a green lease clause could allow the tenants to negotiate improvements to the building, monitor actual energy use, and pay for what the space actually uses rather than paying a prorata share of the utility cost of the entire building based solely on occupied square footage.

Strategy	Metrics/Time Frame	Lead/Partners
4.1 Real Estate Value: Work collaboratively with real estate industry, underwriters, and financial agents to adopt property asset-related energy characteristics in building valuation and to integrate energy efficiency into all transactions.	*Energy Efficiency is integrated into all real estate transactions by 2018*	*CEC, Appraisal industry/CPUC, POUs*
4.1.1 Pilot Energy Asset Ratings With the Real Estate Industry: Introduce the uniform property valuation approaches established in Strategy 1.4 to appraisers, commercial leasing agents, and other real estate actors. • Partner with California appraisers, leasing agents, local governments, and rating tool providers to pilot the building energy asset rating methods adopted in Strategy 1.4. • Modify the final specifications for the uniform building energy asset rating methods based on industry feedback gathered in the above pilots.	*2017*	*CEC, LGs, Appraisal industry/IMT*
4.1.2 Energy and Water Cost Savings: Develop and compile information on building life-cycle and/or building occupant tenure cost reductions for energy and water efficiency measures. Develop separate cost savings estimates as needed for each unique commercial business category and building type, as well as unique residential dwelling type. Incorporate regional (for example, climate) differences in expected cost savings information, when appropriate.	*2016 - 2017*	*CEC, CPUC/program implementers*
4.1.3 Energy Efficiency Appraisals: Work with industry agents to advocate and expand the inclusion of the value of energy in appraisals. • Evaluate the green addendum and other relevant tools for applicability in valuing California properties for energy efficiency. • Incorporate energy asset ratings (4.1.1) and cumulative cost savings (4.1.2) into residential and nonresidential property appraisal processes.	*Energy efficiency in appraisals is standard practice by 2020 and accepted by financial institutions*	*CEC, LGs, Appraisal industry/IMT*
4.1.4 Property Listings: Incorporate energy efficiency into property and lease listings. Include energy asset ratings as soon as is practical.	*3rd party real estate listings include energy as a standard feature in 2017*	*MLS boards, Local listing services, CAR*

Strategy	Metrics/Time Frame	Lead/Partners
4.1.5 Green Leases: Deploy green leases (or green lease clauses) to align the costs and benefits of energy efficiency investments between building owners and tenants. • Collaborate with real estate industry to develop and to disseminate green lease templates, education, and information to owners and tenants. • Offer technical and/or financial assistance to implement green leases as appropriate for specific market sectors.	*Green lease clauses are standard by 2020 for commercial and multifamily buildings*	*LGs, commercial leasing agents, real estate data companies*

Strategy 4.2 Marketing, Education, and Outreach

"While a portion of consumers will always be motivated by price alone, it is important to note that many consumers can be motivated, in some manner, by a larger collection of value propositions beyond price."

Greg Guthridge, Tony Masella, Serge Colle, Aaron Saint. *The New Energy Consumer: Architecting for the Future.* Accenture: June 2014.

Communicating the Value of Energy Efficiency

Consumers have an increasingly stratified understanding of and care for their energy consumption – with one end being energy-literate, concerned consumers, and the other end a large contingent motivated only by price, if at all.[119] ME&O plays an important role in educating consumers about the benefits, opportunities, and need to move them along the spectrum from disconnected or "energy agnostic" to leading achiever or "energy literate." To spur action, the benefits of energy efficiency must be identified and communicated as value propositions for specific stakeholders. What works for one category of consumers may not appeal to another, and benefits perceived by certain stakeholders, such as policy makers or industry, may not motivate consumers.

ME&O can provide the framework and toolset to package the benefits and value of energy efficiency if it is customer-centric, targeted, data-and-research-driven, disruptive, and comprehensive. Innovative program design and delivery, as outlined in Strategy 2.2, can deliver on the value proposition promised by ME&O and generate further returns by customer reference and referral. This is increasingly important as consumers are connected and influenced by social media and have instant access to information. A comprehensive real estate strategy should not only focus on realtor outreach, education and valuation, but should leverage online platforms (for example, Zillow), which are becoming an increasingly wide-scale way for consumers to access real estate information.

How committed is a business to sustainability?
It depends on its mission!

Stage 1. Obligated to maximize profits and adhere to green practices only as required by regulations.
Stage 2. Have green regulatory policy in its mission and meets it to the basic legal level.
Stage 3. Proactively pursues green consistent with its mission, but has not integrated practices into its general business and institutional policies.
Stage 4. Company has rebranded as a committed, sustainable company and integrates "green" practices throughout their work and business efforts.
Stage 5. Sustainable driven company and has a value-driven approach and is a "holistic, restorative company".

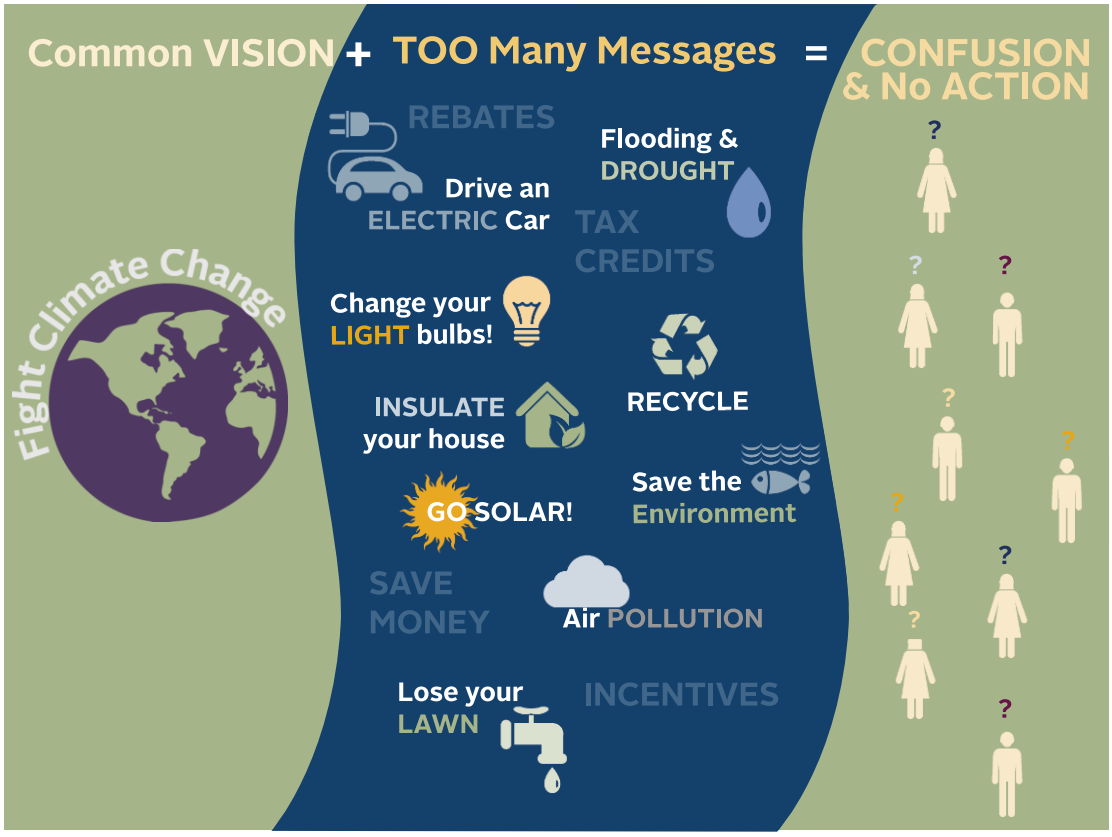
Source: McGraw Hill, "Business Benefits of Green Building", 2010.

Breaking through background noise to achieve actual engagement and resulting action is difficult (see Figure 3.4). To achieve Strategies 2.2 and 4.2, ME&O and program designers must work together to align objectives and messages to provide programs that work for the targeted consumer. Campaign materials, channels, and reach methods must provide a compelling call to action.[120]

119 Guthridge, Greg, Tony Masella, Serge Colle, Aaron Saint. *The New Energy Consumer: Architecting for the Future.* Accenture: June 2014

120 MIG, Inc., *Market Research Report – Energy Upgrade California*, for Association of Bay Area Governments, Los Angeles and Alameda County, July 20, 2010.

Figure 3.6: Breaking Through the Noise of So Many Messages



Source: California Energy Commission

Coordination of Statewide ME&O and Market Transformation

To achieve significant advances in energy efficiency, California will need to focus on transforming markets such that efficiency is inherent in business practices and consumer behavior. A statewide market transformation that is separate from but coordinated with utility and local government efficiency initiatives can accelerate and sustain market adoption of energy efficiency products, services, and practices by targeting specific markets and designing intervention strategies. Much can be learned from the successful market transformation activities in the northwest and northeast regions of the United States.[121] [122] Investment in a state energy brand creates an opportunity to effectively engage and activate a fragmented audience.[123] Energy Upgrade California is California's brand for energy management. Its focus has evolved from deep retrofits to demand-side energy management. The CPUC, Energy Commission, the statewide ME&O program administrator California Center for Sustainable Energy (CSE), IOUs, RENs, and others continue to make significant strides to develop a central resource for the residential and small business sectors, providing both a platform to launch marketing and outreach campaigns and a destination for coordinated information about demand-side management programs, services, and actions available. Statewide efforts for ME&O should continue to be coordinated under EUC, while local efforts continue to be conducted under their respective brands. This Plan envisions a coordinated strategy that engages residential and business decision-makers and

121 Northwest Energy Efficiency Alliance, http://neea.org/.

122 Northeast Energy Efficiency Partnership, www.neep.org/.

123 State energy brands exist in several states, including Connecticut, Oregon, Maine, Massachusetts, Michigan, New York, Rhode Island, and Wisconsin.

leaders, and inspires them to become advocates for the State's goals and influencers[124] by committing to energy efficiency on behalf of their agencies or organizations. It is important to note that simple and innovative program design and delivery is the critical path to achieving consumer action.

ZNE Recognition Initiative

Developed by a consortium of state agencies, and supported by the Governor's Office, the AIA California Council is working with partners to launch a Recognition Initiative in 2015.

The proposed initiative operates on two levels. The first level is a **California ZNE Leadership Commitment Campaign,** designed to encourage California corporations and government entities to commit to ZNE and other low-carbon practices. These commitments will be specific and tangible, highly visible, and a key part of California's leadership in carbon reduction.

The second level is an awards program focused on recognizing actual achievements in the design, construction, and operation of ZNE homes and buildings. **The ZNE Performance Awards** will be developed in a partnership between a broad coalition of government and utilities working with specific trade associations and other groups involved in the built environment.

Purpose

- Recognize and support outstanding leadership in pursuing low-carbon solutions in the built environment.
- Educate and raise awareness with California decision makers and leaders, the business community, government, and building professionals regarding the benefits and opportunities created by ZNE buildings.
- Demonstrate California's leadership in moving to a carbon neutral economy.

124 Cialdini, R. Influence: The Psychology of Persuasion Revised Edition. Harper Business December 2006.

Commitment, Competition, and Identity: Using Behavior Research to Innovate ME&O

Growing evidence suggests that one way to get increased adoption of energy efficiency measures is to compel individuals and firms to make a tangible commitment to action—to turn off unused lights, to monitor energy consumption, to develop an energy plan, or to invest in energy-efficient products or services, for example. In the study *Commitment and Behavior Change: Evidence From the Field,"*[125] researchers discovered that they were able to improve environmental behaviors by getting a very specific, limited commitment from participants. General or broad commitments to "do the right thing" were not as effective. Research on the use of competitions and messages that make certain behaviors normal known as "social norming" are also very promising in experimental behavioral pilots.

This concept works in a business setting as well. An industry survey conducted in 2010 found that businesses that had the highest level of sustainability integrated into their mission and adopted by their leadership were much more likely to engage and invest in green practices (sidebar, page 80). Further, "...these firms view green as a part of their profit missions and as a potential market opportunity, either through new services, investments or new customer penetration."[126] Obtaining commitment from businesses, civic leaders, and property owners through targeted ME&O activities; fostering energy competition among them; and delivering targeted ME&O to them can correlate their identification, or sense of belonging, with energy efficiency actions, as well as increase the uptake of energy efficiency projects. A new initiative hosted by the American Institute of Architects (AIA) California Council will be launched in 2015 building on this concept and other similar efforts. (See sidebar.)

125 Baca-Motes et al. "Commitment and Behavior Change: Evidence From the Field." Journal of Consumer Research: February 2013.

126 Business Benefits of Green Building McGraw Hill, 2010.

Strategy	Metrics/Time Frame	Lead/Partners
4.2 Targeted Data- and Research-Driven ME&O: Educate, motivate, and activate consumers to take action on energy efficiency as part of their demand-side energy management with a comprehensive and complementary suite of targeted ME&O.		
4.2.1 Establish Statewide Market Transformation Entity • Solicit for and select an organization to implement market transformation in coordination with other energy efficiency initiatives	*2016*	*CPUC, CEC*
4.2.2 Align Statewide ME&O Efforts With *EBEE Action Plan*: • Assign Existing Building Efficiency Collaborative oversight of Energy Upgrade California brand activities. ○ Determine the extent of alignment and coordination of *Action Plan* programs with use of the Energy Upgrade California brand. • Encourage behavior and operational marketing messages by Energy Upgrade California in line with plan goals.	*2016 and ongoing* *Marketing plan complete by 2016; activities begin in 2017*	*CPUC/EUC, POUs, LGs, CEC, EUC partners* *CPUC, POUs, LGs/EUC*
4.2.3 Decision-Maker-Focused Marketing and Outreach: Develop an influencer strategy that focuses on communicating the value proposition for decision-makers and leaders in California for the key strategies in this *Action Plan*. • Develop and disseminate case studies and best practices with leaders based on sector and/or end use. Complete ongoing implementation and feedback processes to ensure effectiveness of activities. • Leverage and extend outreach efforts completed in CaLEAP[127] and other local energy- and climate-planning efforts. • Leverage existing channels of community leaders in real estate, financing, manufacturing, construction, and architecture trades. Engage and activate partnerships with manufacturers and distributors.		
4.2.4 Energy Upgrade California: Align energy efficiency elements of Energy Upgrade California ME&O with *Action Plan* and determine relationship to programs. • Use business and civic leader commitments and competition to stimulate local action. • Encourage behavior and operational marketing messages by Energy Upgrade California in line with Plan goals.	*2016*	*EUC/CPUC,POUs, CEC, EUC partners*

127 California Local Energy Assurance Planning (CaLEAP) is a California Energy Commission-sponsored project to assist local governments throughout the state in preparing plans to ensure that key assets are resilient to disasters that effect energy. The process considers all aspects of emergency management (prepare for, respond to, recover from, and mitigate against).

Goal 5. Affordable and Accessible Energy Efficiency Soluions

Objective: Efficiency is an integral part of routine transactions and readily financed.

Efficiency is first in the loading order for energy investment because it is cheaper than expanding electric and gas supplies. Reaching the policy goal for building energy efficiency upgrades is estimated to require investment of at least $8 billion per year, with private capital accounting for the majority.[128] Currently, $1.1 billion a year is spent by utility ratepayer incentive funds and building owner investments. This amount is not sufficient to achieve California's energy and climate goals and means that solutions must leverage private capital. Therefore, state agencies must adopt policies and support actions that will catalyze the private market.

Current finance products used for efficiency are primarily one-off, unsecured loans with short terms and high interest. Efficiency is not typically incorporated into long-term mortgage debt. New long-term finance programs are needed that match cash flow benefits with lower risk-informed interest rates based on robust data from loan repayment histories of large portfolios of efficiency-specific transactions. Essentially, efficiency needs the kinds of finance programs that the solar industry has created.

Recent Activities

In alignment with AB 758, the Energy Commission piloted LG-operated credit support and interest subsidy programs for unsecured loans to the single-family market, subsidizing interest rates and seeking longer loan terms with ARRA funds from 2010-2012. During that time, Property Assessed Clean Energy (PACE) programs that provide secured lien capital assessments tied to property tax payment obligations were introduced for residential and commercial programs. Due to issues in the federal mortgage arena, residential PACE was slow to scale up. More recently, PACE financing in some form is available in most of the State, often with multiple, similar offerings covering the same jurisdiction. The largest of these in terms of capital throughput is the HERO residential PACE program. (See sidebar.)

HERO Financing Program

HERO is a residential PACE energy efficiency finance program now available in 20 counties in California. According to the website, "HERO is unique in that it provides financing for approved energy efficient, water efficient, and renewable energy products. HERO finances 100% of the cost to purchase and install eligible products. HERO offers low -fixed interest rates, flexible payment terms including 5/10/15/20 years for most products, and repayments are made through your property taxes. Additionally, if the property is sold before the HERO Financing is paid in full, the remaining payments can be passed on to a new property owner."

Also prompted by AB 758, the CPUC began working to assess broader market needs for financing to substitute for or augment PACE in 2010. For 2015–2016, the CPUC, with the California Alternative Energy and Advanced Transportation (CAEATA) Financing Authority, will deploy utility ratepayer funds to launch statewide efficiency finance pilots aimed at attracting private capital for unsecured financing to targeted market sectors. Pilot loan and repayment history will be compiled in a master database accessible by financial institutions. Pilots include:

- California Hub for Energy Efficiency Financing (CHEEF) Pilot Programs
  The California Hub for Energy Efficiency Financing Pilot Programs leverage private capital to help customers of the state's investor-owned utilities (Pacific Gas and Electric, Southern California Edison, Southern California Gas and San Diego Gas & Electric) obtain financing for energy efficiency retrofits.
- Sales Tax Exclusion (STE)
  The Sales Tax Exclusion Program provides a sales tax exclusion for advanced manufacturing projects or for companies that design, manufacture, produce, or assemble

128 Based on calculations identified in Energy Efficiency Financing in California. Harcourt Brown & Carey, July 2011. Appendix B, page 66.

advanced transportation or alternative source products, components, or systems.

- Clean Energy Upgrade Financing Program
  The Clean Energy Upgrade Financing Program provides assistance in the form of credit enhancements to financial institutions making loans for energy efficiency and renewable energy improvements on residential properties.
- Property Assessed Clean Energy (PACE) Loss Reserve Program
  The PACE Loss Reserve Program helps residential PACE financing programs in California reduce first mortgage lenders' risk associated with PACE assessments.
- Bond Financing
  CAEATFA issues tax-exempt bonds to finance green projects.

The investment community has emphasized that to invest in energy efficiency project finance, it needs more project standardization and reliable financial and energy performance data. The Environmental Defense Fund sponsors the Investor Confidence Project (ICP) to address these needs. The standardization promoted by the ICP is the first step in creating an asset class of energy renovation projects that can attract large-scale capital. The ICP is being considered in California, New York, Texas, Connecticut, and Europe as part of commercial PACE, benchmarking, and utility finance programs. As California increases commercial and multifamily retrofit programs, the ICP represents a best practice that can align efforts and help establish a consistent statewide market for energy efficiency project finance.

Creating a Robust Self-Sustaining Market

The *EBEE Action Plan* envisions a broad platform of traditional mortgage, PACE, and unsecured financing, all offered in a robust self-sustaining market, ultimately rolled into project portfolios categorized by relative security. Market development will encourage buyers and lenders to select appropriate finance products matched to the "trigger events" or circumstances under which property owners undertake energy improvements. The challenge to using effective finance instruments will be in capturing the market values of efficiency improvements and repayment histories into the finance industry. In tandem, new business models as discussed in Goal 4 can incorporate financing solutions alongside the new and expanded efficiency delivery solutions.

Even with better loan terms stretching to 10 or 20 years, there will be property owners for whom efficiency investments either do not pencil out or are not a priority. Utility ratepayer or other government funds and incentives will be needed to motivate and support building improvements with long-term paybacks. Low-income households will also need deeper interest rate or efficiency subsidies to cover the costs of improvements. In both cases, the need for additional capital funds and/or credit risk support could come from utility ratepayer funds, greenhouse gas allowance funds, or new arrangements for utilities to invest their own capital in efficiency much as they do now for energy supply infrastructure.

Investor Confidence Project

A framework for energy efficiency project development that provides consistent standards, documentation and verification:

- Reduces transaction costs
- Improves project performance
- Produces better data

Project development specifications cover:

- Establishing project baselines
- Calculating energy savings
- Verifying operational performance
- Training
- Project documentation
- Operations, maintenance, and monitoring
- Measurement and verification

Public Building Financing

Public buildings at state and local levels, including schools, present special needs for financing. Many factors contribute to the unique situations—long histories of bond funding with limitations on additional debt, squeezed annual operating budgets, competing priorities for facility upgrades or expansion, and

budgets subject to annual legislative appropriations. Solutions are needed to support efficiency improvements that may include grants, revolving loan funds, or other leveraged arrangements structured to work around the unique circumstances of these facilities.

One of the first universal steps is to experiment with new finance products offering lower interest rates and longer-term lending. These transactions should be used to build robust databases to inform the finance industry of project and repayment performance, as well as document market value gains from buildings with these improvements. A second step requires streamlining transaction costs and identifying effective ways to incorporate efficiency value into regular building and lending valuations. These, in turn, will enable traditional building mortgages to support both existing and new energy improvements.

To attract private capital at scale and with good terms requires standardized platforms and lending transactions, as well as fast, automated transaction systems for underwriting, loan origination, and servicing. At scale, secondary financial markets will support continued expansion of capital at terms attractive to engage property owners.

The following advancements must also attract and expand primarily private capital investments to support a mature energy efficiency market:

- Promote private capital engagement to support the efficiency value proposition, making energy efficiency equivalent to paying for electricity and gas – for example, by scaling up the Performance Contracting model and pushing costs down where possible through scale and competition.
- Financing products matched to improvement trigger points, including mortgages.
- Finance tenors (periods) that match timing of cash flow benefits.
- Contractor, finance, and utility incentive transactions coordinated for easy procedures and timelines.
- Federal tax treatment of efficiency on par with renewable energy investments.
- Utility incentives targeted to achieve efficiency levels beyond what markets now support.
- Funds available for deeper subsidies to low-income households.

Public Building Financing

Financial Assistance Programs for energy efficiency in public buildings:

Government Programs:

- Proposition 39 funds for schools and community colleges (grants)
- CEC's Bright Schools Program (technical assistance)
- CEC's Energy Conservation Assistance Act (low-interest financing for public building energy efficiency and renewable projects)
- CEC's revolving loan program for state facilities (ARRA and Cap & Trade funds)
- Statewide Energy Efficiency Program (SWEEP) (CA Infrastructure Bank's planned financing to State and local government facilities)

Utility Programs:

- Technical assistance
- Incentives and rebates
- Government partnership programs
- On-bill financing (direct utility loan capital)
- On-bill repayment of private loans
- Quality assurance

Strategy	Metrics/Time Frame	Lead/Partners
Strategy 5.1 Foster Private Capital Market Establish a robust financing market infrastructure that will attract large private capital.		
5.1.1 State Finance Council: Establish a unified state council to shepherd clean energy capital offerings and identify priority needs.	*GB 2015*	*Infrastructure Bank*
5.1.2 Database: Develop a unified database of finance payment and project performance histories.	*Database contract to start 2016*	*CPUC/CAEATFA, LGs*
5.1.3 Pilots: Assess IOU financing pilots (credit enhancements, on-bill repayment) alongside PACE and other finance products.	*Evaluation findings in phases 2016 - 2017*	*CPUC and CAEATFA, LGs*
5.1.4 Evaluation of priorities: Review priority needs in the market and assess need to develop or promote additional products, for example, energy service agreements (ESAs).	*2016 - 2017*	*Interagency Council, LGs*
5.1.5 Trigger Point Financing: Ensure availability of finance products that are matched to improvement trigger points (property sale, renovation, occupancy changes, equipment replacement).	*2016 - 2017*	*Interagency Council, LGs*
Strategy 5.2 Asset-Based Financing Foster the development of easy-to-access financing mechanisms tied to building asset.		
5.2.1 Mortgages That Value Efficiency: Advocate for energy efficiency to be incorporated into the mortgage valuation and underwriting process. Promote and expand the use of energy efficiency mortgages (EEM) by establishing a rating or value standard for underwriters. (See Strategy 1.4.)	*2016*	*CEC/CA Mortgage industry; DOE, EPA, Nat'l mortgage orgs regulators*
5.2.2 PACE: Support the implementation of Property Assessed Clean Energy financing (PACE) for residential and commercial properties.		*CAEATFA/* LGC,SEEC,ILG, LGs
5.2.3 Split Incentives: Assess and encourage new cost recovery mechanisms such as surcharge on tenant meters or "green leases" to surmount "split incentive" dilemma.	*CPUC proceeding (e.g. per AB 2017) 2016*	*CPUC/utilities, multifamily and commercial real estate leaders, POUs, LGs*

Strategy	Metrics/Time Frame	Lead/Partners
Strategy 5.3 Borrower-Based Financing Obtain attractive terms and broader eligibility for unsecured (projects < $25K, equipment replacement) owner/occupant loans. • Develop alternative credit criteria (for example, bill payment history). • Targeted enhanced credit support for new borrowers (for example, UCC-1 or collateral). • Potential to securitize bundled loans on secondary market at a good cost of capital.	*CPUC/CAEATFA pilot evaluations (2016+)* *2014 - 2016*	*CPUC, CAEATFA, LGs*
Strategy 5.4 Integrated and Streamlined Delivery of Efficiency Solutions, Finance, and Utility Incentives	*Phased implementation 2014 - 2016 during CAEATFA pilots*	
5.4.1 Streamlined Timing: Identify and deploy solutions for prompt processing of loans and incentives to avoid or minimize cash flow gap between loan funding and any postinstallation rebate payment.		*CPUC, program implementers, LGs*
5.4.2 Targeted Incentives: Reassess the role of front-end incentives once financing becomes widely and easily available at good terms. Transition incentives to selected technologies, target markets, and/or trigger points.	*Pilots evaluation 2016/ CPUC guidance for 2017+ programs/ POUs consider on own*	*CPUC / CEC*
5.4.3 Alternative Models: Explore alternative capital sources and/or turnkey efficiency services, where invested capital is repaid via (e.g.): • "Preferred resource" utility procurement mechanism (See Strategy 1.8) • Owner/occupant energy service tariff	*Possible CPUC proceeding 2015 - 2016*	*CPUC, CAEATFA, LGs, utilities (IOUs and POUs)*
Strategy 5.5 Government Building Finance Mechanisms Ease funding mechanisms to support special needs of government energy efficiency improvements. (See Strategy 1.1.1.)	*Assess need, volume, credit qualities by 2015*	*Infrastructure Bank*
5.5.1 Revolving Funds: Expand existing revolving funds for local, schools, and state government building energy improvements. Determine government borrower needs, capital source, balance sheet treatment, and merits of on-bill repayment via utility bills.	*Plan in 2015 for capital pools and participation, then launch in 2016*	*Infrastructure bank/ESCOs, capital markets, CPUC, utilities*
5.5.2 ESAs: Develop and promote energy service agreements (similar to solar power purchase agreements) as hybrid of utility bill plus energy improvement repayment.	*As soon as market innovation develops*	*ESCOs, utilities, LGs*
Strategy 5.6 Leveled Tax Playing Field Work to align federal and state tax treatments (credits and depreciation) for energy efficiency improvements with those for renewable energy.	*Begin discussions 2015*	*CEC/NASEO, USDOE*

Strategy	Metrics/Time Frame	Lead/Partners
Strategy 5.7 Establish Deeper Subsidies for Full Participation by Low-Income Households	*Revised programs in place by 2016*	
5.7.1 Balanced Assistance Options: Work with stakeholders to assess optimal balance of assistance options across financing, on-bill repayment tied to meter, and grants or direct installation to maximize water and energy efficiency levels, using ratepayer, occupant, or other funds.	*CPUC 2014 directive to low income proceeding, design in 2015, deploy 2016*	*CPUC/utilities/* program implementers, LGs
5.7.2 Cap-and Trade-Funds: Assess changes to or coordination between utility and cap-and-trade fund allocations to low-income households for energy improvements.	*Effective for 2016*	*CSD/ ARB/CPUC, LGs*
5.7.3 Multifamily Buildings: Integrate low-income household services with building owner eligibility for regular energy efficiency programs to increase efficiency levels in multifamily buildings with low-income occupants.	*2015 - 2017 cycle low-income programs and budgets*	*CPUC/IOUs,* POUs on own, LGs

Photo. Energy Upgrade California Mobile Outreach
Source: California Center for Sustainable Energy

Chapter IV. Implementation

Implementation Summary and Timeline

Chapter 4 brings the strategies of the plan together with a sector-by-sector summary of priorities and dependencies, and an overview timeline of the strategies.

Funding Implementation

State policy currently directs spending of roughly $1.1 billion[129] on energy efficiency annually, the vast majority of which is ratepayer funding. A near- and long-term phased transition will be required to move in a new direction for energy efficiency. Most of the recommendations in this plan are consistent with near-term changes to the portfolio considered by the CPUC. However, the current policy environment and the resulting suites of programs are not likely to achieve the necessary market penetration and will not unless critical gaps are filled and barriers removed.

The strategies in this plan anticipate leveraging current funding by putting in place more responsive, robust, and accessible informational resources, with the expectation that performance-based, industry-driven, and consumer-oriented approaches can take root and achieve scale.

The private investment market over the next 10 years must be considerably larger than it is today to achieve meaningful impacts. Average annual investment of at least $8 billion, the majority of which is private capital, is necessary to achieve the project flow and energy savings represented by California's goals for existing buildings.[130]

This action plan focuses on activating the market to scale operations, develop effective business models, and establish a clear value for energy efficiency to attract private capital.

Action Plan Monitoring and Evaluation

This plan is intended to serve as a framework for market activation and be a living document that is updated as market conditions evolve. The Existing Building Efficiency Collaborative will be formed and include lead and partner agencies and key market stakeholders to provide ongoing oversight. The collaborative will be informed by input from agency staff, the Energy Commission's *Integrated Energy Policy Report (IEPR)* process, and other forums representing a range of stakeholders. Evaluation of the plan will occur as part of the *IEPR* process and within the stakeholder process outlined in the following pages.

Progress on the strategies in this plan will be reported in each *IEPR* (every two years), and the plan will be updated as appropriate. Special focus will be placed on evaluating the success of voluntary strategies, and recommendations for mandatory actions will be made where needed to ensure that the vision and goals are realized.

Another important element of monitoring is the development of a 1–3-year work plan, which will detail the activities and specific tactics to be completed by the lead and partners for each strategy. This work plan will be updated annually and used by the collaborative agencies for their resource allocation and EBEE oversight.

Figure 4.1 is a timeline for the first phase of implementation to 2020 by year and by goal.

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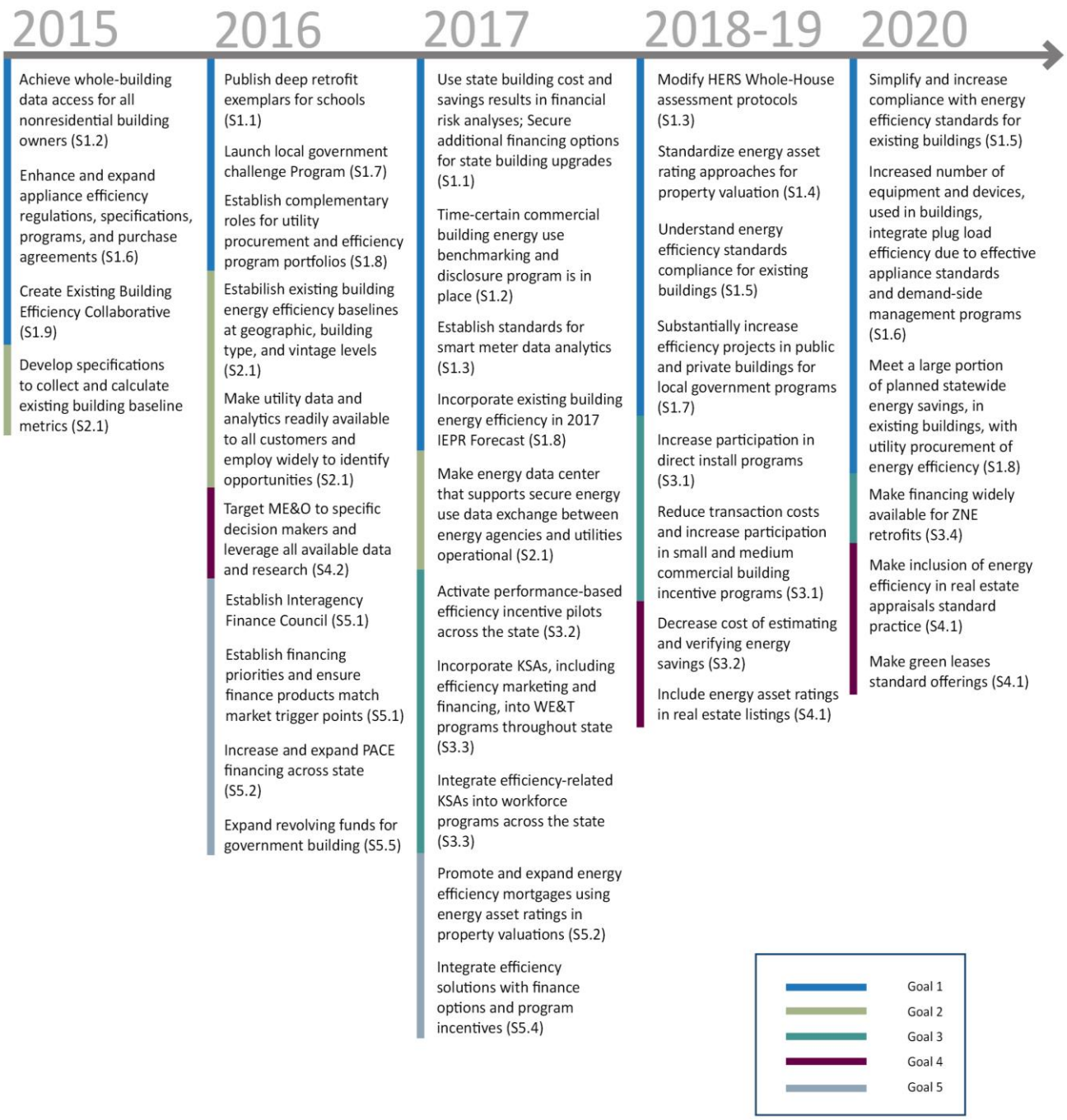
129 This figure includes the electrical program expenditures for the IOUs and POUs, as well as the IOU gas and low-income funding.

130 Based on calculations identified in *Energy Efficiency Financing in California*. Harcourt Brown & Carey, July 2011. Appendix B, page 66.

Figure 4.1: Implementation Schedule



Source: California Energy Commission

Specific Implementation Priorities

The following is an overview of the key priorities for each sector, critical dependencies for success, and the stakeholders who will be engaged in ongoing implementation.

Government Leadership

Government should both lead by example and provide consistent policy direction to promote market adoption of energy efficiency in existing buildings. Government at all levels must find a balance in interaction with the energy efficiency marketplace, by removing barriers to innovation while engaging with industry and the market sufficiently to ensure policy adapts to changing conditions.

Priority Strategies and Roles	Milestones	Decision-Maker
Existing Building Efficiency Collaborative (S1.9)	Existing Building Efficiency Collaborative established and coordinated implementation with sustained urgency at the highest levels put the *EBEE Action Plan* in the best position to achieve its goals.	CEC, CPUC/ARB, GO
Implement Executive Order for State Buildings (S1.1)	Expanded financing options are available for state building upgrades.	Treasurer's Office, DGS, DOF/CPUC, POUs
Data access and analytics for customers, investors, industry, and policy makers (S2.1)	Data provision requirements established for all utilities.	CEC, CPUC/utilities
Nonresidential energy use disclosure (S1.2)	Benchmarking data infrastructure in place for all commercial customers.	CEC/utilities, US EPA
Minimum standards for residential assessment tools (S1.3)	Home Energy Rating System (HERS) regulations updated to enable industry innovation and consumer protection.	CEC/CPUC, POUs
Energy asset ratings for property valuations (S1.4)	Pilots to determine proper balance of technical rigor and implementation ease; review of national asset rating tools.	CEC/US DOE
Streamlined and effective building energy efficiency standards for existing buildings (S1.5)	Staff resources and industry engagement sufficient to address market needs.	CEC/CPUC, POUs
Expanded impacts from appliance efficiency regulations and other plug load efficiency programs (S1.6)	Staff resources, state and federal government partnerships, expanded ME&O, and incentives for consumer behavior modifications.	CEC/CPUC, POUs
Local government leadership (S1.7)	Ongoing funding source and program development.	LGs, CEC/CPUC, POUs
Energy efficiency procured as a clean energy resource (S1.8)	Procurement rules and verification protocols established.	CPUC, CEC/utilities
Targeted marketing, education, and outreach to decision makers (S4.2)	Funding and program development.	CPUC, POUs/CEC

Existing Building Efficiency Collaborative Organization

The Existing Building Efficiency Collaborative will be the primary organization to ensure effective implementation of this plan. Staff across the two energy agencies will coordinate around the priorities of the plan and provide ongoing accountability and budget management. Primary staffing will fall to the Energy Commission, given that AB 758 legislation provides 10 dedicated staff to the Commission for EBEE implementation.

Ongoing Coordination With Stakeholders and Partner Agencies

The Existing Building Efficiency Collaborative will lead and promote ongoing dialogues with the following stakeholders:

Federal Government

California will continue its role as a leader in energy efficiency while working closely with federal and other state efforts to learn and exchange best practices. California will work closely with the U.S. Department of Energy and Environmental Protection Agency to leverage existing tools, including ENERGY STAR's Portfolio Manager and a database infrastructure such as SEED for use in California.

State Government

AB 758 requires the Energy Commission to work with other state agencies when implementing the strategies in this plan, including the California Public Utilities Commission, Air Resources Board, Department of Real Estate, Department of Planning and Research, and Department of Housing and Community Development. The Existing Building Efficiency Collaborative will continue existing dialogues and work closely with each of these agencies to initiate and coordinate program components, avoid duplication of effort, and ensure programs are well-integrated. The CPUC and ARB will be close partners in the implementation of the plan to ensure alignment with the *Long Term Energy Efficiency Strategic Plan* and the *Climate Change Scoping Plan.*

Utilities

Utility partnerships with state, local, and regional governments must align with and complement other local and regional efforts for existing buildings to be upgraded at the scale needed to achieve the state's energy efficiency goals. Utilities can also play a key role in enhancing demand-side initiatives by providing customer information to program implementers and through marketing, education, and outreach.

Local Government

Local governments play an integral role at the regional and municipal level and will be engaged to participate in new programs as well as to become leaders and advocates working closely with the State.

Environmental and Advocacy Groups

Statewide and local environmental groups will be engaged and relied upon as new policies are developed and refined. These key groups will be essential in securing legislative, regulatory, and funding opportunities (that is, Global Green, Sierra Club, The Utility Reform Network [TURN], the Natural Resources Defense Council [NRDC], The Energy Coalition, CSE).

Appliance Manufacturers

Appliance efficiency is critical to meeting the state's long-term goals. Establishing and building relationships with key manufacturers to inspire innovation and discuss approaches to high efficiency are essential (such as Honeywell, Nest, GE, Johnson Controls, and others).

Financial Providers and Representatives

The California Public Utilities Commission, Energy Commission, and Alternative Energy and Advanced Transportation Financing Authority will continue to establish statewide finance policy and initiatives and engage financial institutions and third-party providers at the state and national level in the development and expansion of a robust financial market for energy efficiency in California.

Single-Family (up to 4 units) Market

The objective for the single-family market is to build demand for energy efficiency upgrades by providing easily accessible, customer-specific information, making clear the value of efficiency. This will be coupled with reliable and performance-oriented services that enable customers to reduce energy and water consumption. Flexible programs and a highly knowledgeable contractor workforce will support improvements at the level appropriate for each homeowner.

Photo: Grupe Homes, 2009, Energy Star with Home Performance Retrofit

Priority Strategies and Roles	Milestones	Decision-Maker
Easy-to-access data and analytics (S2.1)	Homeowners and tenants have access to online energy use data and tools to understand opportunities for improvement.	Utilities/CPUC, CEC
Targeted marketing, education, and outreach (S4.2)	Local government leaders are established as advocates for energy efficiency and show leadership in their communities.	EUC/ LGs, CPUC, POUs
Minimum standards for assessment tools (S1.3)	Home Energy Rating System (HERS) regulations clarify the minimum requirements for assessment tools.	CEC/ Existing Residential Building Industry
Streamlined and profitable building energy efficiency industry (S3.1)	The contractor community adopts best practices for home energy upgrades, including high levels of code compliance. Renovation requirements in building standards are streamlined and effective.	Contractors, existing residential building industry
Accessible and affordable financing mechanisms (S5.1, 5.2, 5.3, 5.4, 5.7)	A range of financial products allow homeowners to finance upgrades at lower interest rates and are easier to access.	CPUC/CAEATFA/financial markets
Transition to customer-focused energy efficiency (S2.2, 3.1)	New approaches to energy efficiency upgrades are adopted within the efficiency program portfolios.	CPUC, POUs
Real estate value (S4.1)	Uniform energy asset rating approaches are adopted for use in property valuations.	CAR, NAR, Appraisal Institute, real estate listing services
Plug-load efficiency (1.6)	Expanded behavior programs and additional appliance efficiency regulations are implemented.	CPUC, POUs, CEC

Single-Family – Ongoing Coordination With Stakeholders and Partner Agencies

The following organizations are examples of stakeholders who will be involved in partnership activities and help provide feedback and input on plan implementation. This is a representative list and is not intended to be all-inclusive.

- Residential real estate brokers, Appraisal Institute, appraisers and real estate trade organizations (CAR/NAR)
- Industry trade organizations/representatives (i.e., California Building Industries Association, Western HVAC Performance Alliance, Efficiency First California, BPI, CalCERTS, Balance Comfort, ACCA, IHACCI, Affordable Comfort Institute)
- Other building industry leaders/implementers/consultants
- Third-party real estate listing services: Zillow, Trulia, and others
- Third-party software providers (Green Button, Home Energy Analytics [HEA], Chai, OPower)
- Manufacturers of home appliances and energy efficiency elements
- Local government organizations (regional energy networks, California Association of Councils of Governments, Southern California Association of Governments, Local Government Coalition, Local Government Sustainable Energy Coalition, Green Cities Coalition)
- Residential program managers (IOUs, POUs, CCAs, third-party implementers)

Multifamily (5 or more units) Market

The multifamily sector requires a portfolio approach (that is, addressing multiple properties at a time) targeted to the largest property owners and/or buildings in climate zones with high energy and water savings potential. Engaging cohorts of owners can streamline and reduce upfront barriers to upgrades if supported technically, strategically, and financially. These projects will benefit from products designed for and targeted to multifamily properties, and an activated and informed rating and assessment workforce.

Photo: W. Charles Perry, Lauriedale Apartments, San Mateo, CA, Comprehensive Energy Efficiency Assessment, 2007.

Priority Strategies and Roles	Milestones	Decision-Maker
Building cohort approach (S2.2)	New approaches to energy efficiency upgrades respond to the unique needs of multifamily property owners and tenants.	CPUC, POUs
Easy-to-access data and analytics (S2.1)	Property owners and tenants have access to online energy use data and tools to understand opportunities for improvement.	Utilities/CPUC, CEC
Targeted marketing, education, and outreach (S4.2)	Local government leaders are established as advocates of energy efficiency and show leadership in their communities.	EUC/LGs, CPUC, POUs
Minimum standards for assessment tools (S1.3)	Home Energy Rating System (HERS) regulations clarify the minimum requirements for assessment tools.	CEC/existing multifamily building industry
Streamlined and profitable building energy efficiency Industry (S3.1)	Multifamily raters and auditors establish relationships with property owners for both low-income and market-rate housing help guide and direct upgrade plans.	Contractors, existing residential building industry, MF raters
Scalable and reproducible upgrade solutions (S3.1)	Bundled measures approach developed for like buildings to create scalable and less costly upgrade options, ideally with simplified permitting.	Utilities LG Compliance
Accessible and affordable financing mechanisms for low-income multifamily properties (S5.7)	Increase financing mechanisms for low-income property owners and tenants to offset upgrade costs.	CPUC, CAEATFA/financial markets

Ongoing Coordination With Stakeholders and Partner Agencies

These are examples of stakeholders who will be involved in partnership activities and provide input on strategy implementation. This is a representative list and is not intended to be all-inclusive.

- Local government organizations (regional energy networks, LGSEC, StopWaste.org, CHPC)
- Multifamily utility program managers (IOUs and POUs)
- Real estate management companies and brokers, appraisers and real estate trade organizations (CAR/NAR)
- Multifamily raters and auditors
- Multifamily industry trade organizations (BOMA, CALBO, California Association of Building Energy Consultants, WHPA, Efficiency First CA, IHACCI, Benningfield Group, Build It Green, Redwood Energy)
- Affordable housing developers (such as Enterprise Community Partners, Mercy Housing)
- State finance agencies (California Tax Credit Allocation Committee, and California Debt Limit Allowance Committee)
- Property-owner organizations (that is, apartment owner associations, real estate investment trusts, Non-Profit Housing Association of Northern California)
- Multifamily property management companies

Commercial Sector

Small and medium-size commercial buildings represent a large and diverse portion of California's buildings and have proven relatively challenging to reach. A cohort approach will reach property owners as efficiently and effectively as possible. This effort will be supported by energy centers/hubs and the development of strategic energy plans, and informed by data analytics. Regular assessment and disclosure, where applicable, will provide information to owners about opportunities for improvements.

Large commercial buildings will continue to play a key demonstrative role in defining cost-effective building energy improvements and management.

Photo: Pinnacle Building, Burbank, CA, LEED Existing Buildings and Operations

Priority Strategies and Roles	Milestones	Decision-Maker
Statewide nonresidential disclosure policy (S1.2)	Effective data access allows for ease of benchmarking, particularly for multiple-metered buildings, labeling protocols help provide consistent comparative tools to distinguish high achievers; third-party assistance and innovative approaches reduce costs.	CEC/LGs, utilities
Easy-to-access data and analytics (S2.1)	Businesses have access to online energy use data and tools to understand opportunities for improvement.	Utilities/ CPUC, CEC
Targeted marketing, education, and outreach (S4.2)	Data- and research-driven ME&O target small and medium-size commercial buildings.	EUC/CPUC, POUs
Building cohort approach (S2.2)	Cohort pilots targeting a portfolio of small and medium buildings are expanded and further developed.	CPUC, POUs
Strategic energy plans (S2.2)	Energy centers for owners of small and medium-size commercial buildings provide technical assistance and help create and implement strategic energy plans.	LGs/Nonprofits/program implementers
Streamlined and profitable building energy efficiency industry (S3.1); performance-driven value (S3.2)	Industry partner programs remove key barriers; performance-based contracting extends to small and medium commercial buildings.	Contractors, commercial building industry/CPUC, POUs, CEC
Green leases (S4.1)	The costs and benefits of energy efficiency investments between property owners and tenants are aligned.	CPUC, POUs/ EUC
Real estate value (S4.2)	Financial underwriters and brokers understand, accept, and incorporate energy efficiency measures into property value and leases.	Underwriters/ appraisers
Targeted marketing, education, and outreach (S4.1)	Local government leaders are established as advocates of energy efficiency and show leadership in their communities.	EUC/ LGs, CPUC, POUs
Accessible and affordable financing mechanisms (S5.1, 5.2, 5.3, 5.4, 5.6)	A range of financial products allow businesses to finance upgrades at lower interest rates and pay back loans with energy savings.	CPUC/CAEATFA/Financial Markets

Ongoing Coordination With Stakeholders and Partner Agencies

- Building owners
- Building portfolio managers
- Corporate sustainability executives and decision makers
- Architecture and engineering firms
- Contractors (building, HVAC, electrical)
- California Small Business Association, state and local chambers of commerce, California Downtown Association, business improvement districts, Building Owners and Managers Association, Commercial Properties Association, California Association of Realtors, Commercial Real Estate Development Association
- United States Green Building Council chapters
- Commercial utility program managers
- Gas and electric equipment manufacturers and distributors
- Property management organizations
- Trade organizations
- Energy service companies

Public Building Sector

The public sector can and should lead by example, enabling state and local governments to upgrade state, county, and city buildings as a model to the rest of the industry.

Governor Brown established state leadership by issuing Executive Order B-18-12, which promotes the State's leadership in making state-owned buildings more energy efficient. Schools constitute a significant portion of public buildings in California and will continue to be supported. K-12 and community colleges are currently served by the Clean Energy Jobs Act (Proposition 39), though this funding is not sufficient for all needs. Colleges and universities have embraced sustainability as a practice, serve an important demonstrative role, and drive innovation through their education mission.

Oakland City Hall Energy Efficiency Upgrade Photo by Yuri Krasov

Priority Strategies and Roles	Milestones	Decision-Maker
Local government leadership (S1.7)	Funding is available to support initiatives.	Legislature/CEC/CPUC
Targeted marketing, education, & outreach (S4.2)	Focused outreach is available to municipal and regional decision makers.	CEC/CPUC
Data access and usage (S2.1)	Improved access to accurate, relevant information for policy making and program development.	CEC/CPUC
Local government finance mechanisms (S5.5)	Accessible and feasible funding for all jurisdictions.	LG/CPUC/State/CEC
Standards compliance task force and research (S1.5)	Local government buy-in and established value of building energy efficiency standards.	LG
State buildings aggressively implement E.O. (S1.1.1)	Financing and other funding is available.	DGS, Governor's Office, Agencies

Ongoing Coordination with Stakeholders and Partner Agencies

The following are key stakeholders for public buildings:

- California Department of General Services
- Local government at all levels (decision makers, building departments, planning departments)
- Local Government Associations (League of California Cities, California Downtown Association, Local Government Coalition, Local Government Sustainable Energy Coalition, California Association of Special Districts)
- Local Government Partnership Utility and Implementer leads
- Public K-12 schools, colleges, and universities
- California Division of the State Architect