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2016 Existing Buildings
Energy Efficiency Plan Update
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Abstract

The California Energy Commission adopted the *Existing Buildings Energy Efficiency Action Plan* (EBEE Action Plan) in September 2015. The 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. Soon after it was adopted in October 2015, Senate Bill 350 was signed into law by Governor Edmund G. Brown Jr. and called for the doubling of energy efficiency savings in electricity and gas retail end uses by 2030, based on this mid-case estimate of additional achievable energy efficiency savings, as contained in the *California Energy Demand Updated Forecast, 2015-2025*. The law lists various programs and strategies that may be deployed to achieve this goal, including the existing buildings energy efficiency program established by Assembly Bill 758 in 2009 (Section 25943 of the Public Resources Code). SB 350 requires that by or before January 1, 2017, the Energy Commission adopt an update to the program to achieve a cumulative doubling of statewide energy efficiency savings. This document (2016 Plan Update) is the first update to the *Existing Buildings Energy Efficiency Action Plan* in response to this requirement of SB 350.

To compile the 2016 Plan Update, the Energy Commission staff reached out to various stakeholders, including, but not limited to, the various strategy leads

and partners identified in the EBEE Action Plan, to collect feedback and information. Goals and strategies were updated to reflect new policy mandates as well as new initiatives that have launched since the adoption of the original EBEE Action Plan. The next update is anticipated to be on or before January 1, 2020.

Keywords: Assembly Bill 758, Senate Bill 350, Assembly Bill 802, 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, marketing, multifamily buildings, nonresidential buildings, property valuation, public buildings, public leadership, residential buildings, retrocommissioning, Title 24, water efficiency.

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Abbreviations and Acronyms

ARB	California Air Resources Board	ESA	Energy Savings Assistance
ARRA	American Recovery and Reinvestment Act	ESCO	Energy services company
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers	EUC	Energy Upgrade California
BEDES	Building Energy Data Exchange Specification	EUI	Energy use intensity
BEDR	Building Energy Data Repository	GHG	Greenhouse gas
BEES	Building Energy Efficiency Standards	GO	Governor’s Office
BOMA	Building Owners and Managers Association	GWh	Gigawatt-hour
BPI	Building Performance Institute	HCD	Housing and Community Development
BSC	Building Standards Commission	HERS	Home Energy Rating System
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority	HVAC	Heating, ventilation, and air conditioning
CALBO	California Building Officials	IEPR	<i>Integrated Energy Policy Report</i>
CaLEAP	California Local Energy Assurance Planning	ILG	Institute for Local Government
CalGreen	California Green Buildings Standards Code	IMT	Institute for Market Transformation
CAR	California Association of Realtors	IOU	investor-owned utility
CBSC	California Building Standards Commission	KSA	Knowledge skills ability
CCC	California Conservation Corps	LEA	Local education agency
CCxC	California Commissioning Collaborative	LG	Local government
CCCCO	California Community Colleges Chancellor’s Office	LGC	Local Government Commission
CDE	California Department of Education	LIEE	Low-income energy efficiency
Energy Commission	California Energy Commission	ME&O	Marketing education and outreach
CPUC	California Public Utilities Commission	MEL	Miscellaneous electric load
CSD	Community Services and Development	MF	Multifamily
CSI	California Solar Initiative	MLS	Multiple Listing Service
CSLB	Contractors State License Board	OPR	Office of Planning and Research
DAS	Division of Apprenticeship Standards	PACE	Property-assessed clean energy financing
DGS	Department of General Services	POU	Publicly owned utilities
DIR	Division of Industrial Relations	PRC	Public Resources Code
DOE	Department of Energy	RCx	Retrocommissioning
DOF	Department of Finance	RESNET	Residential Energy Services Network
DSA	Division of the State Architect	SCE	Southern California Edison
EBEC	Existing Building Efficiency Collaborative	SDG&E	San Diego Gas & Electric
EBEE	Existing Buildings Energy Efficiency	SEEC	Statewide Energy Efficiency Collaborative
EE	Energy efficiency	SEED	Standard Energy Efficiency Database
EEM	Energy efficiency mortgages	SEP	Strategic Energy Plan
EPA	U.S. Environmental Protection Agency	WAP	Weatherization Assistance Program
EPIC	Electric Program Investment Charge	WE&T	Workforce Education and Training
		WHPA	Western HVAC Performance Alliance
		WIB	Workforce Investment Boards
		ZNE	Zero net energy

Executive Summary

This 2016 Plan Update summarizes actions taken over the last year to implement the *Existing Buildings Energy Efficiency Action Plan* (EBEE Action Plan) adopted by the Energy Commission in September 2015. The 2016 Plan Update also summarizes forward-looking changes to energy efficiency strategies. This document does not replace the EBEE Action Plan, which continues to be the principal reference document for the state's existing building energy efficiency policies, objectives, and ongoing initiatives.

Policy Updates

This 2016 Plan Update summarizes recent legislation that expands the policy goals and requirements for energy efficiency in existing buildings. Several plan strategies are added and/or revised to address these new state goals and requirements, including:

- An expanded state policy leadership strategy to include the energy savings target setting expected from Senate Bill 350 (De León, Chapter 547, Statutes of 2015).
- Modified benchmarking and disclosure strategies to align with Assembly Bill 802 (Williams, Chapter 590, Statutes of 2015).
- New efficiency programs that leverage advanced metering infrastructure (AMI) data to verify realized energy savings, consistent with AB 802 and SB 350. (AMI is a system of smart meters, communications, and data systems that allows communication between utilities and customers.)
- Plans for efficiency programs that help residential and small-to-medium business customers use energy management tools and AMI data analytics to monitor energy use, as directed by Assembly Bill 793 (Quirk, Chapter 589, Statutes of 2015).
- An expanded emphasis on delivering energy efficiency programs to disadvantaged communities, as referenced in SB 350.

Strategy Updates

The Strategy section of this 2016 Plan Update includes the EBEE Action Plan's strategy tables for reference, with additions and edits shown in blue text.

The most notable updates to EBEE Action Plan strategies include:

- *Government Leadership* – State building owner leadership to implement the Governor's energy policy directions, Division of State Architects' practical demonstrations of opportunities to achieve zero-net energy (ZNE) in school buildings, accomplishments and plans for Building and Appliance Efficiency Standards, local government leadership examples; plans for a Local Government Challenge grant program, and the California Public Utilities Commission's (CPUC) progress on utility-specific energy efficiency procurement.
- *Data-Driven Decision-Making* – Actions taken by utilities across the state to provide customers energy usage data and efficiency-related audits and diagnostics; work initiated by the Energy Commission to develop building-specific identifiers for use in energy use disclosure and other policy-tracking programs; work initiated by the Energy Commission for data collection, organization, and analysis to support the state's energy policy tracking and reporting obligations.
- *New Opportunities for Efficiency Programs* – Recent CPUC decisions to expand the reach of efficiency programs into existing buildings, reduce administrative costs, and spur program innovations; utility program administrators' efforts to streamline program delivery and expand customer participation; and utility program administrators' plans to use normalized metered data to verify realized energy savings.
- *Workforce Alignment* – Expanded workforce strategies to partner more extensively with the principal education and training entities and the efficiency-related implementation industry to produce a workforce that aligns with the state's aggressive energy savings goals.

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- *Real Estate Engagement* – Activities to include clean energy-related data into real estate property listings.
- *Public Awareness* – A new strategy to develop and deploy a statewide public awareness campaign for building energy efficiency that mirrors recent successful messaging on the state's drought.
- *Financing* – Progress updates on the California Hub for Energy Efficiency Financing (CHEEF), Property Assessed Clean Energy (PACE) financing, and the California Lending for Energy and Environmental Needs (CLEEN) Center; plans for an alternative on-bill utility financing program; and a summary of low-income programs financed by multiple entities.

Vision and Goals Framework

The Vision and Goals Framework on page 23 of the *2015 EBEE Action Plan* has been updated.

Milestones and Outcomes

The Milestones and Outcomes discussion on pages 24 and 25 of the *2015 EBEE Action Plan* has been updated.

Implementation Timeline

The implementation timeline in the *EBEE Action Plan* has been modified in this update to reflect current plans for strategy implementations.

October 2016 Workshop and Stakeholder Comments

Staff held a workshop regarding the Draft 2016 Plan Update on October 17, 2016. At the workshop, staff provided an overview of the document, and stakeholders made comments. Staff received 15 sets of written comments subsequent to the workshop. The 2016 Plan Update is a high-level strategic overview document, and many of the verbal and written comments are relevant but are at a deeper or more detailed level than the update. Some of the stakeholder comments were incorporated. For other comments, the Energy Commission staff plans to work with stakeholders regarding these suggestions, as implementation of the strategies continues.

California's Existing Buildings Energy Efficiency Action Plan

Chapter I. Policy Update

Soon after the California Energy Commission formally adopted the *Existing Buildings Energy Efficiency Action Plan*¹ in 2015, three new laws were enacted, which significantly strengthen policy support for the plan goals and objectives.

Senate Bill 350 (2015)

The Clean Energy and Pollution Reduction Act of 2015 (Senate Bill 350, De León, Chapter 547, Statutes of 2015) continues, enhances, and expands the existing building energy efficiency program established by Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009), providing new direction, including periodic updating of the program to achieve a doubling of the state's energy efficiency savings potential. There are five energy efficiency mandates of SB 350:

- The Energy Commission, in collaboration with the California Public Utilities Commission (CPUC) and local publicly owned utilities, will establish annual targets for statewide energy efficiency and demand reduction that will achieve a cumulative doubling of statewide "energy efficiency savings in electricity and natural gas final end uses of retail customers" by January 1, 2030.²
- The Energy Commission, on or before January 1, 2017, and at least every three years thereafter, will update this plan to achieve a cumulative

doubling of statewide energy efficiency savings by 2030.

- The Energy Commission will adopt, implement, and enforce responsible contractor policies to ensure that retrofits meet high-quality performance standards and reduce energy savings lost or forgone due to poor-quality workmanship, and establish consumer protection guidelines for energy efficiency products and services.
- The Energy Commission will, by January 1, 2017, develop and publish a study on barriers for low-income customers to energy efficiency and weatherization investments, including those in disadvantaged communities, and make recommendations to increase access to these investments.
- Authorizes the CPUC to pursue market transformation programs to achieve deeper energy efficiency savings and pay for performance programs that link incentives directly to measured energy savings.

SB 350 directs that the EBEE Program promotes greater penetration of specific energy efficiency programs in disadvantaged communities, considering a broad range of implementation approaches, including workforce development and job training. SB 350 also directs maximization of savings in disadvantaged communities to be integral with the energy savings target setting and progress monitoring to achieve the state's goal of doubling energy savings by 2030.

Assembly Bill 802 (2015)

Assembly Bill 802 (Williams, Chapter 590, Statutes of 2015) establishes a new building energy use benchmarking and public disclosure program for nonresidential and multifamily buildings. AB 802 moves California forward as the first state to establish a statewide public benchmarking program. This new law provides explicit direction to utilities for aggregating energy use data to preserve confidentiality and provide whole-building data access

¹California Energy Commission. 2015. *Existing Buildings Energy Efficiency Action Plan*. Publication Number: CEC-400-2015-013-F. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN205919_20150828T153953_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf.

²The targets will be based on a doubling of the mid-case estimate of additional achievable energy efficiency savings, as contained in the *California Energy Demand Updated Forecast, 2015-2025*, extended to 2030 using an average annual growth rate, and the targets adopted by local publicly owned electric utilities under Section 9505 of the Public Utilities Code, extended to 2030 using an average annual growth rate, to the extent doing so is cost-effective, is feasible, and will not adversely impact public health and safety. Cal. Public Resources Code, Section 25310(c)(1).

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to building owners and their agents, including for multifamily buildings. It removes transaction-based disclosure requirements from the statute (originally included via Assembly Bill 1103, Saldana, 2007) and provides clear direction for the Energy Commission to implement regulations governing whole-building data access and public disclosure of energy use benchmarks.

AB 802 also directs the CPUC to authorize IOUs to provide customer financial incentives, rebates, technical assistance, and support to increase the energy efficiency of existing buildings. Specifically, AB 802 mandates that “existing conditions baselines” be used where appropriate to determine levels of ratepayer-funded assistance to utility customers. This will allow customers to gain assistance bringing older equipment and buildings up to current state building energy efficiency code requirements.

AB 802 further encourages the CPUC to oversee the design and evaluation of efficiency using meter-based savings approaches. Historically, the dominant form of efficiency savings determinations have been pre-calculated estimates derived from engineering models. AB 802 articulates the value of mining the recently available AMI data to measure savings directly from the meter.

Finally, AB 802 directs the Energy Commission, in consultation with the CPUC, to make all reasonable adjustments to its energy demand forecasts to account for these new existing conditions baselines deployed in efficiency programs. AB 802 also expands the Energy Commission's existing authority to collect data from utilities, fuels suppliers, and other market participants for energy program design, evaluation, forecasting, and planning.

The Energy Commission is committed to the successful implementation and appropriate interpretation of AB 802 and SB 350, as intended by the Legislature. In its energy efficiency policy role, the Energy Commission believes that it is critical for the state's efficiency programs to be at least twice as successful, in terms of achieving larger cumulative savings that persist over time. This plan update includes new strategies to implement the SB 350 and AB 802 objectives. Some

existing plan strategies are also refocused, clarified, and expanded to better accomplish the intent of these new policy directions.

Assembly Bill 793 (2015)

Assembly Bill 793 (Quirk, Chapter 589, Statutes of 2015) directs the CPUC to require the IOUs to provide incentives to residential and small to medium business customers for energy management technologies. Incentive amounts for this program, which should be developed no later than January 1, 2017, are to be based on savings estimation and baseline policies adopted by the CPUC. The IOUs must also develop a plan by September 30, 2016, to educate their customers about these new energy-saving opportunities. Furthermore, the IOUs must report annually to the CPUC on actual customer savings that result from these incentive programs.

Framework Update

Vision & Goals Framework

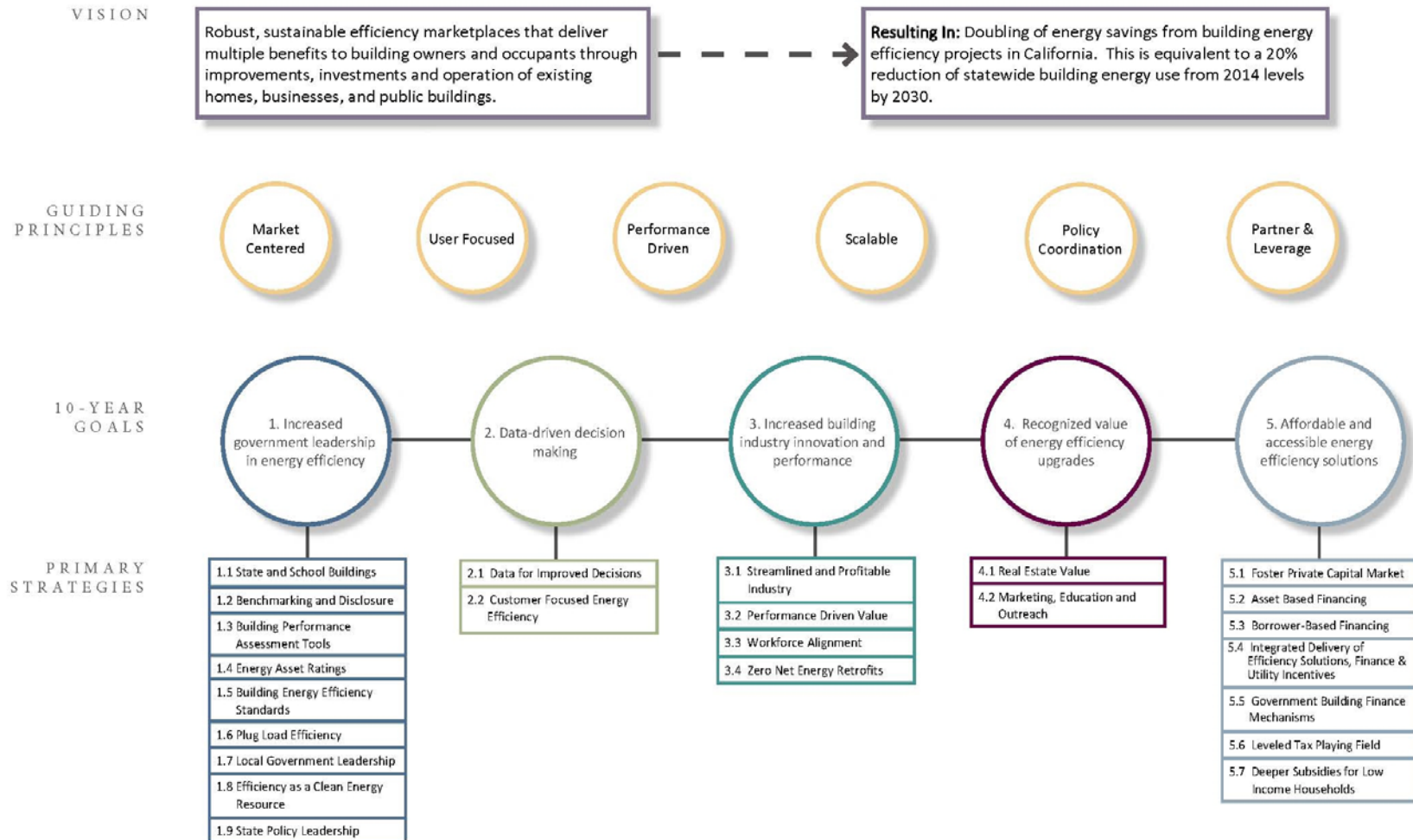


Figure 1. Vision and Goals Framework

Milestones and Outcomes

The following milestones and outcomes are unchanged from the *2015 EBEE Action Plan* – only the dates are changed to reflect current expectations. Figure 2 is an updated implementation timeline that includes strategies and outcomes summarizing the 2016 Plan Update. 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 to 2019, 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 2017, 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 2018, 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 Energy Commission, in conjunction with the partners identified in the EBEE Action Plan and 2016 Plan Update, evaluates plan progress and reports findings in the *Integrated Energy Policy Report*.
- By 2018 to 2019, energy asset ratings are considered in real estate appraisals and included in property listings.
- By 2018, establish baseline code compliance rate for residential heating, ventilation, and air-conditioning (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 drives private investment in energy efficiency and supports development of alternative, innovative business models to 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 California's energy efficiency industry.
- 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.

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Figure 2. Implementation Timeline

Chapter II. Strategy Update

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

State Building Owners Lead by Example

The State continues to show strong commitment toward achieving greater water and energy efficiency throughout the state portfolio. State agencies have appropriately responded to the Governor's Executive Order B-18-12 to achieve significant water and energy use reductions in state buildings³ and plan to continually meet the performance targets by collaborating on effective strategies. The *Green Building Action Plan*, intended to provide guidance on how best to implement the Governor's executive order, directs all state-owned buildings greater than 50,000 square feet to complete the Leadership in Energy and Environmental Design (LEED) certification for existing buildings⁴. The sidebar highlights directives provided to all state building facility managers to ensure ongoing energy-related building operations are as efficient as possible.

The Department of General Services, Office of Sustainability, leads a working group to continue this effort and provide resources and guidance for agencies. An important part of this effort includes benchmarking the energy and water use of state facilities to establish a reference point for performance tracking or facility comparison. The State has successfully benchmarked approximately 1,539

facilities. The Department of General Services also administers a water conservation grant for certain agencies and district agricultural associations. The projects funded by this grant ranged from typical fixture replacements to smart irrigation controls. This work is estimated to save 300 million gallons of water per year. Compiled updates on the current efforts are available on a public Web page: greenbuildings.ca.gov. Collectively, agencies have reduced energy use by about 17 percent measured from a 2003 base year and water use by 40 percent measured from a 2010 base year.

Moreover, the state's Energy and Sustainability Program has 90 state building retrofit projects in various stages of completion. These significant efforts and associated savings should continue to further communicate commitment and leadership to the market. Updates on state building ZNE retrofits are included in Strategy 3.4.

Efficient Operations in State Buildings

- ENERGY STAR® equipment purchases
- Optimum use of outside air to meet and/or reduce cooling demands
- Window operations to maximize passive cooling and minimize infiltration
- Best practice HVAC system maintenance
- Optimum use of occupancy sensors and daylight controls
- Task-appropriate lighting levels
- Replacement of incandescent light sources
- Participation in utility demand response programs

³ Executive Order B-18-12 calls for a 20 percent reduction in grid-based energy use by 2018 using a 2003 baseline in state-owned buildings and a 20 percent reduction in water use by 2020 using a 2010 baseline in state-operated facilities. It also calls for aggressive actions to design, build and retrofit state buildings to ZNE levels. Available at <https://www.gov.ca.gov/news.php?id=17508>.

⁴ https://www.gov.ca.gov/docs/Green_Building_Action_Plan_B.18.12.pdf.

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On October 10, 2014, DGS issued a directive to all state agencies regarding energy efficiencies in data centers and server rooms. This directive uses power usage effectiveness (PUE) as a measure of data center or server room efficiency, which is best practice. PUE measurements are required to be reported annually to the Department of Technology, and data centers exceeding a PUE of 1.5 must reduce the PUE by a minimum of 10 percent per year until they achieve a PUE of 1.5 or lower.

The DGS directive also calls for state agencies to consider virtualization options when refreshing equipment or increasing data server capacity. *Virtualization* is the creation of a virtual rather than a physical version of something such as an operating system, a server, a storage device, or network resources. For example, if server virtualization is implemented, one physical server could be partitioned into multiple virtual machines capable of running respective operating systems. This could be a significant area of energy savings in state buildings as more data are housed in data centers.

Clean Energy Jobs Act

The Energy Commission continues to administer the K-12 portion of the Clean Energy Jobs Act (or Proposition 39 K-12 Program), which has been operating for 28 months as of August 2016. As of August 2016, more than 1,042 applications and more than \$731 million have been approved for eligible energy measures. Representing more than 4,000 project sites, the Proposition 39 K-12 Program has an estimated annual energy cost savings of more than \$57 million. Estimated annual savings from the approved energy expenditure plans are summarized in Table 1:

Electricity Savings	275,025,162 kWh
Natural Gas Savings	1,740,696 therms
Propane Savings	81,143 gallons
Fuel Oil Savings	67,046 gallons

The calculated GHG reductions and monetary savings are about 192 million pounds of carbon dioxide and 46 million dollars, respectively. The K-12 Program provides a new level of data transparency for publicly

funded program information, with several ways to view detailed program information. Launched on June 30, 2016, the Proposition 39 Publicly Searchable Database is a simple-to-use, interactive database that provides quick searches for Proposition 39 K-12 and Community College District program metrics. The searchable database is at <http://prop39publicsearch.energy.ca.gov/>.

Also available are the more detailed K-12 Program Research Data providing clean energy project site information reported by LEAs and includes the utility-reported school energy consumption and billing data for each school site within an LEA. The data is accessible at <http://www.energy.ca.gov/efficiency/proposition39/data/>.

The California Community Colleges Chancellor’s Office (CCCCO) administers the community college districts’ portion of the Proposition 39 program. In the first two years 593 energy projects were funded and 135 projects completed. The completed projects on 69 community college campuses will result in an annual savings of 17.4 million kilowatt-hours (kWh) of electricity and 230,000 gas therms – enough energy to power more than 3,000 homes. The remaining 458 energy projects will result in further savings of 42.6 million kilowatt-hours of electricity and over 1,000,000 gas therms.⁵

The California Conservation Corps (CCC) is playing a pivotal role in the implementation of the Clean Energy Jobs Act⁶. Corps members have surveyed thousands of school buildings and collected the data needed to understand opportunities for energy savings. In the process, corps members have gained valuable experience in energy auditing, consistent with the state’s goals to build a workforce that can serve expanded needs for energy efficiency-related jobs.

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http://www.energy.ca.gov/efficiency/proposition39/citizens_oversight_board/documents/2015-01-12_CCCCO_Report.pdf.

⁶ For more on the CCC’s Energy Corps, see <http://www.ccc.ca.gov/work/programs/prop39/Pages/default.aspx>.

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Deep Retrofit Exemplars for K-12 Schools

The Division of the State Architect envisions the future with seven inspirational case studies that include innovative ideas and examples of deep retrofits to help California's existing schools conserve energy and water. The principal objective of *7x7x7: Design Energy Water* is to encourage California's 1,000-plus school districts to develop energy- and water-use reduction master plans for their campuses while improving the quality of educational spaces.⁷ DSA's fundamental goal is to promote the achievement of ZNE for existing kindergarten through 14 (K-14) buildings by 2030. Incorporating sustainability into the design and construction of new school buildings and campuses in California has become the norm. But for every new sustainable school building constructed, there are thousands of existing buildings with plenty of life left in them that have the potential to be far more energy- and water-efficient. Seven campuses, representative of typical building types from different eras constructed across California's varied climate zones, were studied by seven architectural firms to move these existing campuses toward ZNE with innovative solutions for water and energy reduction.

The website (www.7x7x7designenergywater.com) was updated in summer 2016 to include resources, a summary of the findings, and cost estimates from the case studies.

⁷ "7x7x7" means 7 architects, 7 schools, 7 innovations.

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Strategy	Metrics/Time Frame	Lead/Partners
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 and Multifamily Benchmarking and Public Disclosure

Assembly Bill 802

AB 802 promotes whole-building energy usage data access, benchmarking, and disclosure for large commercial and multifamily buildings. AB 802 removes the barrier that building owners with separately metered tenants have dealt with for years. Building owners previously lacked the data necessary to manage the energy usage of their buildings, assess and finance efficiency investments, and properly size investments like solar panels.

The new access to whole-building energy use will result in improved conditions for tenants and building owners in multiple ways. Public disclosure of building energy performance will allow tenants to compare buildings as they search for appropriate space, and provide prospective buyers with information to support investment decisions. Building owners will be aware of how a building is performing as a system and can make decisions to improve the efficiency of their buildings. This was previously not possible. Building owner access to whole-building energy use data will lead to previously inaccessible efficiency improvements, which results in better property conditions for tenants and more affordable energy expenses.

Whole-building energy usage information is also very important for affordable multifamily buildings, with these data used for prerequisites to participate in financing, grant, and incentive programs. The ability to accurately calculate utility allowances to offset costs for subsidized housing residents is a promising new opportunity for California's affordable multifamily housing.

AB 802 repealed the prior Nonresidential Benchmarking and Disclosure law mandated by AB 1103. This policy change from transaction-based disclosure (AB 1103) to time-certain public disclosure (AB 802) does not mean there is no value in providing energy performance information at time of sale. Transaction-based disclosure is coming into the market through real estate listing services and other private sector initiatives. These market information services are ideally positioned to deliver the publicly disclosed benchmarking information to potential buyers and leases, earlier and more consistently than what was

achievable by AB 1103. The Energy Commission will encourage and promote these voluntary practices, in concert with local benchmarking programs.

AB 802 includes a utility account "aggregation threshold" (i.e., a minimum number of utility accounts) at which utility customer confidentiality is deemed protected, thus reducing a historical barrier to building energy use data access for building owners. In conjunction with the statutory requirement for the utilities to provide building-level energy use data upon the owner's or owner's agent's request, the Energy Commission's proposed draft regulations require the utilities to provide these data based on a building address. This means the utilities will need to know which utility accounts belong to which building address. Currently, most utilities are unable to ascertain building energy usage based on a building address. Therefore, utilities have required building owners to provide additional information, such as account numbers and/or meter numbers at the time of data request, making building benchmarking more cumbersome, time-consuming and therefore costly for the building owner.

Proposed Regulations

In November 2015, the Energy Commission collected public comments to determine the scope of the whole-building data access, benchmarking, and public disclosure program. Subsequently, in 2016, Energy Commission staff held two pre-rulemaking workshops to develop and present staff's proposed draft regulations, which include two major sections, one on whole-building energy use data access, and one on mandatory benchmarking and public disclosure. This pre-rulemaking draft proposes public benchmarking and disclosure to apply only to buildings above 50,000 square feet. Further, as envisioned in the original EBEE Action Plan, reporting to the Energy Commission for commercial buildings is proposed to begin in 2018 and every year thereafter. Owners of multifamily residential buildings would report to the Energy Commission in 2019 and every year thereafter. Per the current proposal, for each building sector, building-level public disclosure would begin in the second reporting year, that is, 2019.

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The regulations are anticipated to go into effect in the second half of 2017.

Local Benchmarking Programs

The energy use data access provided by AB 802 will allow local jurisdictions to implement benchmarking and public disclosure programs without needing to separately negotiate data access with utilities. Energy Commission staff is working with local jurisdictions. The intent is that building owners in those jurisdictions need report only to the local jurisdiction, and that data collection mechanisms will be streamlined and

integrated between state and local systems. Local programs could also encourage and support building owners’ taking the next steps to improve their building energy performance by assisting in efficiency project development with technical advice and financing, for example.

Strategy	Metrics/Time Frame	Lead/Partners
<p>1.2 Statewide Nonresidential and Multifamily Benchmarking and Public Disclosure: Establish a statewide energy benchmarking program with eventual public disclosure for commercial, public, and multifamily buildings above 50,000 sf gross floor area.</p>	<p><i>Phased, 2015 - 2021. State buildings beginning 2016.</i></p>	<p><i>CEC/CPUC, Utilities, Pacific Coast Collaborative (PCC)</i></p>
<p>1.2.2 Time-Certain Benchmarking and Disclosure Rulemaking:</p> <ul style="list-style-type: none"> • Provide process for access to whole-building energy use data for building owners. • Work with utilities to map building addresses to meters. <p>Determine program structure, requirements, high-level process, and timeline.</p>	<p><i>Prerulemaking and Rulemaking in 2016; new regulations effective 2017</i></p>	<p><i>CEC/PCC, Utilities, DOE, LG’s, IMT</i></p>
<p>1.2.3 Benchmarking and Reporting Infrastructure Development:</p> <ul style="list-style-type: none"> • 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 U.S. Environmental Protection Agency (EPA) to ensure the seamless integration of Portfolio Manager and California’s benchmarking and disclosure database. 	<p><i>2016- 2018</i></p>	<p><i>CEC/DOE, EPA, LGs, PCC</i></p>
<p>1.2.4 Implement Statewide Program:</p> <ul style="list-style-type: none"> • Monitor and facilitate compliance with the benchmarking and disclosure regulations. • Establish clear metrics to evaluate effectiveness. • Encourage and support actions to improve building energy benchmarks over time. 	<p><i>Phased 2017 – 2022</i></p> <p><i>Ongoing</i></p> <p><i>2018 and ongoing</i></p>	<p><i>CEC/CPUC, Utilities, LGs</i></p>
<p>1.2.5 Potential Mandatory Programs:</p> <ul style="list-style-type: none"> • Review the benchmarking and disclosure programs to determine whether they motivate improvements and result in sufficient savings. • Establish the criteria and performance metrics needed for mandatory upgrade programs, based on AB 802 benchmarks. • Determine whether the program should be extended to smaller buildings. 	<p><i>Evaluation of disclosure policy effectiveness within 2 –5 years of implementation for each sector</i></p> <p><i>2020</i></p>	<p><i>CEC, CPUC/GO, Legislature</i></p> <p><i>CEC</i></p>

Strategy 1.3 Minimum Standards and Best Practices for Building Performance Assessment Tools

Home Energy Rating System (HERS) II

The Energy Commission plans to update the HERS II whole-house regulations to distinguish asset rating and energy assessment activities. As stated in the 2015 EBEE AP, asset ratings have a role in residential property valuations that is different than the role that home energy assessments play in homeowner decisions to make energy efficiency improvements. Asset ratings are derived from site measurements and building energy models, while energy assessments follow best practice industry protocols.

Minimum Standards for Smart Meter Data Analytics

The Energy Commission, in collaboration with industry stakeholders, is working to establish eligibility criteria and evaluation methods for products that deliver energy efficiency data analytics. Currently, this “AMI data analytics test bed” is limited to the residential sector. In 2017, a plan will be complete for a residential data analytics test bed. Test bed development and pilots will follow. (A test bed is a platform for conducting testing of computational tools, including software and hardware.)

Energy Audit Tools for Small and Medium Nonresidential Buildings

Achieving broad-scale adoption of comprehensive energy efficiency retrofits in the state's building stock requires a market transformation of the existing service model. UC Davis is developing a consortium of private and public sector stakeholders seeking to

transform the market for building retrofits of small and medium-sized commercial buildings (SMBs).

The UC Davis Energy Efficiency Center (EEC) leveraged the successful model deployed for the Proposition 39 Clean Energy Jobs program, where California Conservation Corps (CCC) members were used to audit K-12 school buildings. EEC is working with community colleges and university and high school students to expand and standardize the process for training and development of an “entry-level” workforce able to deliver basic energy audits and promote retrofits at scale with a very low cost or no cost to the customer.

The EEC has recently developed a cloud-based, end-to-end audit solution to streamline data collection for auditing of building energy efficiency, analysis of audit data, and report generation for stakeholders and decision makers. The Building Energy Performance Auditing Tool (BEPAS) is tablet-based, making auditing easier, faster, and more accurate by using streamlined forms that are focused on the most important data. The tool will be available at no cost on the EEC website, once fully developed and piloted. The first pilot is expected to be with the Office of Naval Research (Figure 3).

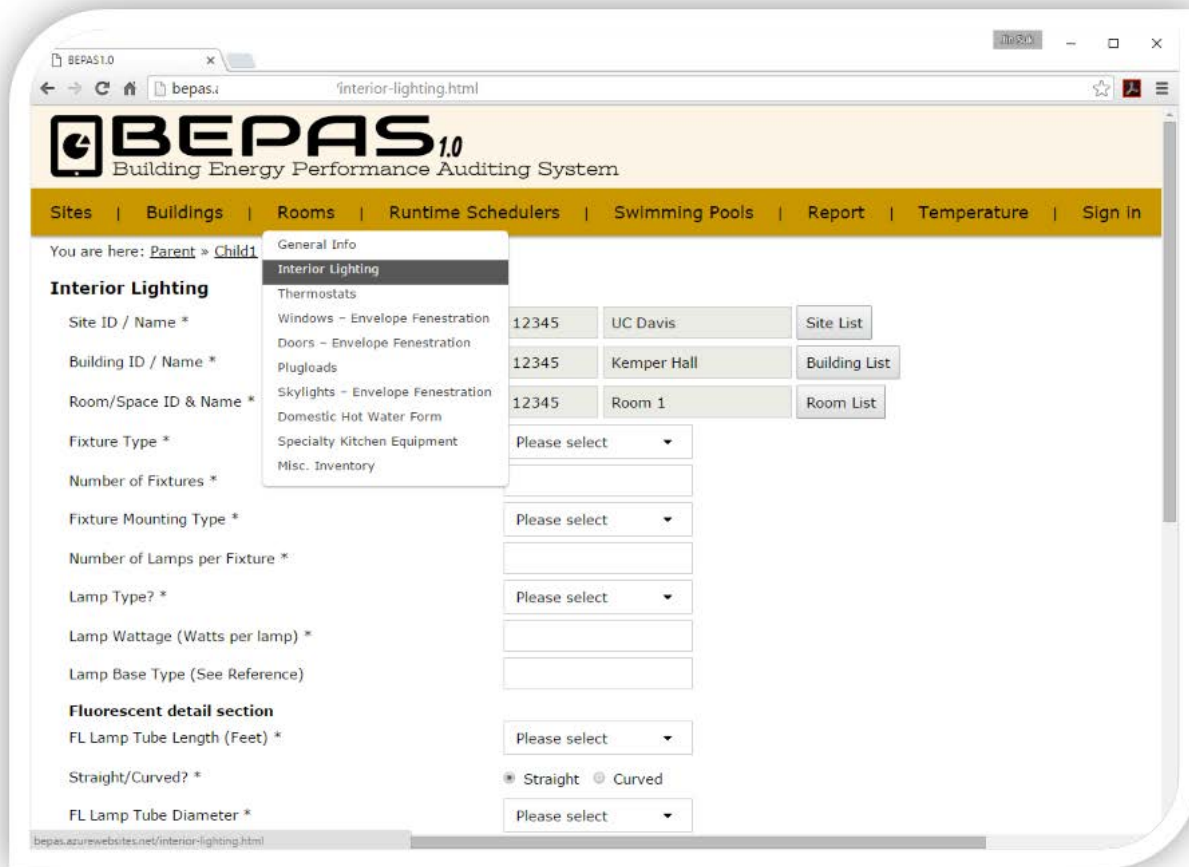


Figure 3. Building Energy Performance Auditing System

Strategy	Metrics/Time Frame	Lead/Partners
<p>1.3. Minimum Standards and Best Practices for Assessment Tools</p> <p>1.3.1 Home Energy Rating System (HERS) II: Use the HERS II rulemaking and modifying the HERS II whole-house assessment protocols to align with current home upgrade program practices and other relevant industry protocols</p> <p>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.</p> <p>1.3.3. Promulgate Best Practices for Nonresidential Building Energy Audit Tools</p>	<p>2018</p> <p>Completed by 2017</p> <p>2016 and ongoing</p>	<p>CEC/CPUC, program implementers</p> <p>CEC/CPUC, program implementers</p>

Strategy 1.4 Uniform Energy Asset Ratings to Compare Building Properties

Residential Building Energy Asset Ratings

The upcoming HERS II Whole House rulemaking will also address consumer concerns regarding the time, effort, and cost to produce an asset rating for an existing home. The Energy Commission intends to propose, discuss, and possibly adopt an alternative HERS asset rating approach to address this market acceptance barrier. This alternative approach will deliver an asset rating to consumers with much less time and effort. The Energy Commission will complete the initial analysis needed to ultimately propose this alternative asset rating approach in early 2017.

In late 2015 the Energy Commission began working with the Residential Energy Services Network (RESNET), a national organization promoting asset ratings, to address the inconsistencies between the RESNET HERS asset rating and California HERS II energy performance rating methods. This effort resulted in the Energy Commission promulgating an "Energy Design Rating" (EDR)⁸ for the 2016 California Green Building Standards (CalGREEN) that is consistent with the RESNET Std 301-2014 in several ways. The most impactful changes are that the energy efficiency and fuel type specified in the reference home are consistent between California's Energy Design Rating and RESNET. The result is that asset ratings for newly constructed homes are now very consistent between CA HERS and RESNET HERS. In mid-2016, the Energy Commission began a similar partnership with RESNET to develop existing home rating methods that are easier and less expensive to complete, while maintaining consistency with asset ratings for newly constructed homes. As stated in the 2015 EBEE AP, the Energy Commission envisions having the same scale for asset ratings for existing as well as newly constructed buildings, to avoid market confusion and to keep sight of future ZNE goals for existing buildings. In addition, to continue the ongoing partnership with RESNET, the Energy

Commission plans to consider adding water efficiency considerations and/or metrics to CA HERS ratings, which may include landscape irrigation.

Nonresidential Building Energy Asset Ratings

Energy Commission staff plans to review available asset rating methods for use in California commercial and high-rise multifamily property comparisons and undertake the steps set forth in Substrategy 1.4.2.

⁸ See p. 83 in the following document for a detailed explanation of the Energy Design Rating:

<http://www.energy.ca.gov/2015publications/CEC-400-2015-024/CEC-400-2015-024-CMF-REV2.pdf>.

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Strategy	Metrics/Time Frame	Lead/Partners
<p>1.4 Adopt Uniform Asset Ratings to Compare Building Properties:</p> <p>1.4.1 Standardize Home Energy Asset Rating Approach: Establish the specifications for residential building energy asset rating calculations.</p> <ul style="list-style-type: none"> • Review 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 homes that rates property assets at a reasonable cost. • Clarify role of third-party green building rating programs. <p>1.4.2 Standardize Commercial Building Energy Asset Rating Approach: Establish the specifications for commercial building energy asset rating calculations.</p> <ul style="list-style-type: none"> • Review 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. 	<p><i>Uniform asset rating approaches specified by 2018</i></p>	<p><i>CEC/DOE, RESNET, green building rating programs</i></p> <p><i>CEC/DOE, ASHRAE, green building rating programs</i></p>

Strategy 1.5 Building Efficiency Standards Development and Compliance

Improve Clarity and Ease of Use

As a part of the 2019 rulemaking to update the Title 24 Part 6 Building Energy Efficiency Standards, the Energy Commission will review the existing language of the standards for clarity, consistency, and logical organization. The Commission will pay particular attention to requirements for addition and alteration projects and consider if any requirements need modification or removal.

Review BEES to Confirm Cost-Effectiveness

California's stock of existing buildings is incredibly diverse, and retrofit projects that are easily performed for some buildings may prove challenging in others. The Energy Commission will examine more types of buildings in the cost-effectiveness analysis for the 2019 Standards with the goal of creating more comprehensive and more nuanced sets of requirements for addition and alteration projects.

The Energy Commission will also consider whether it is appropriate to use a different discount rate and/or period of analysis for existing building alterations than those used for new buildings, when determining the life-cycle costs of current and/or future standards requirements for existing building alterations. Stakeholders have suggested that efforts to revise, clarify, and simplify existing building requirements in the building standards should consider using a discount rate and period of analysis that better reflect building owner and/or tenant investment decision making.

Training and Communication

The Energy Commission continues its outreach and education to local building departments and officials regarding how to comply with the *2013 Building Energy Efficiency Standards*. The Commission is transitioning to outreach and education activities on the *2016 Building Energy Efficiency Standards*. These activities include participating in the Education Weeks held by the California Building Officials;⁹ preparing

⁹ California Building Officials. "Education | Nor Cal Ed Weeks." 2016. <http://www.calbo.org/education/edweek/>.

guidance documents, fact sheets, and *Blueprint* newsletter articles for the building community; and providing continuing education as a preferred provider for the International Code Council and its local chapters.¹⁰ The Energy Commission's Title 24 Call Center remains active and available to help building officials, contractors, architects, and the public with questions or concerns about compliance with requirements for efficiency in existing buildings.

Multiple IOU and Regional Energy Network programs are developing project-specific checklists and other helpful guidance to support the building industry. One example is a San Diego Gas and Electric Company (SDG&E) program implemented by the Center for Sustainable Energy to provide a "code coach" to the City of Chula Vista.¹¹ The code coach is an expert who is available to the public at the city's permit department to provide guidance on BEES.

Water End-Use Efficiency

On April 1, 2015, and in response to the state's historic drought, Governor Brown issued Executive Order B-29-15, authorizing the Energy Commission to adopt emergency regulations establishing standards that improve the efficiency of water appliances for sale and installation in new and existing buildings. Within seven days of the Governor's executive order, the Energy Commission adopted standards for toilets, kitchen and lavatory faucets, and urinals. These standards are projected to save 10.3 billion gallons of water, 30.6 million therms of natural gas, and 218 gigawatt-hours (GWh) of electricity each year after the regulations are in effect. Over 10 years, the regulations will save an estimated 730 billion gallons of water.

On August 12, 2015, the Energy Commission amended its lavatory faucet standards and adopted tiered showerhead standards. The showerhead standards will

¹⁰ International Code Council Preferred Education Provider. *Preferred Providers Directory*. 2016.

http://ppp.iccsafe.org/index.php?option=com_icppp&view=users&layout=providersdirectory&Itemid=112.

¹¹ <https://energycenter.org/case-study-chula-vistas-sustainable-communities-program>.

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save 38 billion gallons of water annually once all existing stock is replaced.

These appliance efficiency standards were subsequently adopted by the California Building Standards Commission (CBSC) to improve related aspects of the California Building Code.

The CBSC is working with the Department of Water Resources, the California Public Utilities Commission, the State Water Resources Control Board, and the California Department of Food and Agriculture on implementing Executive Order B-37-16, issued to create lasting water conservation policies in light of the continuing drought. In July 2016, the Energy Commission adopted an order instituting informational proceeding to gather information on how the CBSC can certify water conservation and water loss detection and control technologies that also increase energy efficiency. The Energy Commission is also investigating efficiency standards for irrigation emitters and will begin gathering information on potential standards for irrigation controllers, with adoption expected in late 2019.

The standards include provisions for compact design of hot water distribution systems in residential construction; however, these provisions are optional and are not always achievable, if the water heater is in the garage or outside the home. To remedy this, the Energy Commission will review and consider enhancing the compact distribution system requirements to expand the application and ensure that projects with garage-installed water heaters and roof-mounted solar water heaters are able to receive credit for designing an appropriately compact distribution system.

Understand the Compliance Shortfall

The Energy Commission will maintain close relationships with the California Business Properties Association, the California Building Industry Association, the California Building Officials, the Western HVAC Performance Alliance (WHPA), and other stakeholders outside the standards development process and will be proactive in inviting their feedback during implementation of both the 2016 and 2019 Standards, with the goal of identifying and remedying circumstances that increase the difficulty of complying with the standards or that lead to noncompliance.

The WHPA has been working on compliance strategies and related issues for years. One milestone in this effort was that WHPA held a charrette, or a meeting of stakeholders, in the summer of 2016 to develop recommendations on how best to implement the *EBEE Action Plan* strategies related to HVAC code requirements, compliance and enforcement.¹² The sidebar summarizes several WHPA recommendations that focus on improving code compliance. The Energy Commission will continue to engage with WHPA to develop such implementation ideas and programs.

¹² WHPA Existing Buildings Energy Efficiency Action Plan Committee. *Western HVAC Performance Alliance Recommendation Input for CEC's Existing Buildings Energy Efficiency Action Plan (EBEE-AP) 2017 Update*. Western HVAC Performance Alliance, 2016.
<http://www.performancealliance.org/Portals/4/Documents/Committees/Cross-Cutting/WHPA%20Interim%20WP%20-%20Final%20Draft%20EBEE-AP%202017%20Update%20Input%20to%20CEC%208-26-16.pdf>.

Excerpts of Western HVAC Performance Alliance Recommendations to Improve Building Energy Efficiency Standards Compliance:

1. Create online BEES resource clearinghouse – consider expansion of EnergyCodeACE*.
2. Simplify reporting processes and clarify owner, contractor, and engineer responsibilities.
3. Use quick response codes to track HVAC equipment through distribution, installation, and permitting processes.
4. Deploy a single statewide permit for all HVAC equipment replacements.
5. Add a BEES compliance option for contractor self-verification if installed equipment includes onboard fault detection and diagnostics.
6. Launch a pilot program with distributors to verify contractor Title 24 training certification.
7. Develop unique energy efficiency compliance value propositions for building departments, manufacturers, distributors, contractors, and consumers.

**The Energy Code Ace program is developed and provided by the California Statewide Codes & Standards Program, which offers free energy code training, tools, and resources for those who need to understand and meet the requirements of Title 24, Part 6 and Title 20.*

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<p>1.5 Realize the Full Benefits of the Building Efficiency Standards for Existing Buildings:</p> <p>A. Improve BES as Applied to Existing Buildings</p> <p>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, clarifying code requirements, and using expert systems or other navigation tools.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>B. BES Compliance Improvement For Existing Buildings</p> <p>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.</p> <p>1.5.6 Pilot Programs:</p> <ul style="list-style-type: none"> 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. <p>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.</p> <p>1.5.8 Serial Number Tracking: If indicated as a critical resource for compliance improvement, establish HVAC equipment serial number tracking database.</p>	<p><i>CEC initiates code redesign in 2017 for the 2019 cycle</i></p> <p><i>2017 – 2019</i></p> <p><i>2017 - 2018</i></p> <p><i>Ongoing</i></p> <p><i>2017 – 2020</i></p> <p><i>2015 - 2018</i></p> <p><i>2016 – 2017</i></p> <p><i>2017 – 2018</i></p> <p><i>2017 - 2019</i></p>	<p><i>CEC</i></p> <p><i>CEC/CPUC, program implementers</i></p> <p><i>CEC</i></p> <p><i>CEC, CPUC/program implementers</i></p> <p><i>CEC/HCD/BSC</i></p> <p><i>CEC, CPUC/OPR, LG, CSLB</i></p> <p><i>CEC, CPUC/OPR, LG</i></p> <p><i>CEC, OPR/LGs, CSLB</i></p> <p><i>CEC</i></p>

Strategy 1.6 Plug-Load Efficiency

Standards Lead to Technical Advancements

New and Enhanced Appliance Standards

The Energy Commission is considering energy efficiency standards for computers, computer monitors, and signage displays through its Title 20 authority. Such standards would reduce the average energy use for a typical computer and computer monitor without affecting functionality or performance, using available, off-the-shelf technologies. The focus of the computer standards in particular is to reduce idle-mode consumption by taking advantage of efficient sleep states available in new processor technologies.

Looking forward, the Energy Commission is considering additional plug-load efficiency standards for appliances such as televisions, game consoles, imaging equipment, set-top boxes, servers, and network equipment. The Energy Commission is also beginning to investigate the potential for standards on standby and power factor that would apply to all state-regulated appliances. The Energy Commission continues to pursue efficiency standards for other types of appliances found in existing buildings, such as lighting and commercial clothes dryers. Further, the Energy Commission is considering how best to incorporate demand response capability into more appliances and devices.

The Energy Commission is committed to developing innovative solutions to plug-load challenges through its Electric Program Investment Charge (EPIC) research and development program. In the fall of 2015, the Energy Commission issued two solicitations to address plug loads. The first, titled "Developing a Portfolio of Advanced Efficiency Solutions: Plug Load Technologies and Approaches for Buildings (GFO-15-310)," will fund the development of next-generation plug-load efficiency technologies and strategies for the building sector. The other solicitation is titled "Reducing Costs for Communities and Businesses Through Integrated Demand-Side Management and Zero Net Energy Demonstrations, (GFO-15-308)." The purpose is in part to develop novel controls and sensors or energy management systems for heating, ventilation, and air conditioning (HVAC); lighting; plug loads; and other energy-using systems. The Energy Commission

approved multiple awards resulting from these solicitations throughout 2016.

Enforcement (SB 454)

The Energy Commission adopted regulations in July 2015 to establish fines for violations of the appliance efficiency regulations. The Energy Commission has since approved settlements with battery charger manufacturers for violations of the appliance efficiency¹³ and continues to investigate all complaints and leads regarding violations of its efficiency standards for other appliances. The Energy Commission maintains a publicly accessible Web page of all its post-enforcement settlement agreements.¹⁴

Advocacy and Technical Support

The Energy Commission has continued to participate in federal appliance efficiency rulemakings to drive stringent, cost-effective, and technically feasible efficiency standards nationwide. Related specifically to plug loads, the Energy Commission provided comments with technical analysis to the U.S. Department of Energy to support significantly more stringent battery charger standards than were proposed in the Department of Energy initial notice of proposed rulemaking. This participation culminated in a "final rule," published June 13, 2016, that adopts standards as or more stringent than California's standards for battery chargers nationwide.

Federal rulemakings also provide the Energy Commission an opportunity to advocate for improved efficiency measures where the State is preempted from setting its own standards. The Energy Commission recently participated on two working

¹³ See, for example, *Settlement Agreement: CALIFORNIA ENERGY COMMISSION and iRobot*. 2015. http://energy.ca.gov/business_meetings/2015_packets/2015-11-12/Item_05-iRobot/Item%205_iRobot%20Corporation%20Settlement%20Agreement.pdf.

¹⁴ California Energy Commission. "2016 Case Settlements." 2016. <http://www.energy.ca.gov/commission/enforcement/litigation/index.php?rsort=case&getPage=2016>.

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groups established through the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) that reached consensus on federal efficiency standards for central air conditioners and heat pumps and for dedicated-purpose pool pumps. The Energy Commission has also submitted comment letters in U.S. Department of Energy rulemakings for general service lamp standards and commercial water heater standards to encourage the Department of Energy to move forward with appliance standards that will drive additional energy savings in California.

Market Transformation Efforts

Energy-Smart Product Marketplaces

Some California utilities have created online appliance and consumer electronics marketplaces where their customers can review products, learn about potential energy savings, and apply for rebates (Figure 4).¹⁵ Partnering with Enervee, a software-as-a-service energy efficiency information provider, these utilities are providing company-branded marketplaces with multiple potential benefits. (See sidebar.) There is also the potential for policy makers to access the consumer product market data behind these online stores, to better track the diversity of products and the associated efficiency improvements over time.

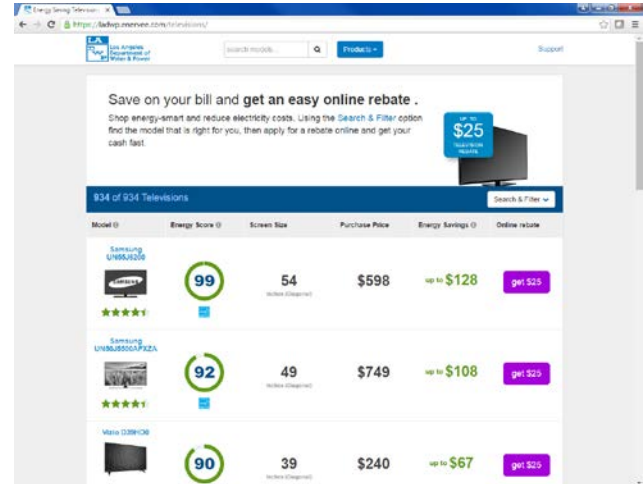


Figure 4. Utility-Branded Marketplace

The California 2016-2019 Retail Products Platform (CA RPP) is a pilot initiative to encourage retailers to stock and sell more efficient appliances and consumer electronics. Partnering with U.S. EPA’s ENERGY STAR program, other utilities, and efficiency alliances across the nation, the CA RPP pilot program will help align energy efficiency programs at a national level with retailers’ business models to transform specific product markets.

AB 793 utility programs will launch on January 1, 2017. “Smart thermostats” will be offered initially, and utilities plan to offer their residential customers additional energy management options in the future, including AMI data analytics services.

Utility-Branded Marketplaces

- Eliminate barriers to energy-smart shopping
- Simplify shopping experiences
- Establish ongoing customer relationships

Key Features

- Full market coverage
- State-of-the-art comparison shopping
- Energy score making efficiency visible
- Personalized energy bill savings
- Ongoing digital engagement
- Integrated incentives

¹⁵ For more information, see San Diego Gas & Electric. “SDG&E Marketplace.” 2016. <https://marketplace.sdge.com/>.
Pacific Gas and Electric. “PG&E Marketplace.” 2016. <https://marketplace.pge.com/>.
Los Angeles Department of Water & Power. “LADWP Marketplace.” 2016. <https://ladwp.enervee.com/>.

Purchase Agreements

The Department of Community Services and Development Department (CSD) administers the Low-

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Income Weatherization Program (LIWP) using a portion of the state’s Greenhouse Gas Reduction Funds. Since CSD’s current energy efficiency providers operate relatively small-scale programs, CSD will continue to investigate how planning and cooperation with other entities can enhance collective purchasing power and influence the market. CSD is researching opportunities to leverage buying power for both

single-family and multifamily projects, including with the Department of General Services and the cooperative purchasing arm of the National Association of State Procurement Officials that aims to foster best value, innovation, and competition in the marketplace.

Strategy	Metrics/Time Frame	Lead/Partners
<p>1.6 Efficiency of Plug-In Loads</p> <p>A. Standards Lead to Technical Advancements</p> <p>1.6.1 Pursue New and Enhanced Appliance Standards: Encourage expanded application of leading technologies, such as mobile power management, interoperability, demand response, and low idle-mode consumption, through new updates to appliance standards.</p> <p>1.6.2 Enforcement (SB 454): Finalize and apply the Energy Commission’s enforcement regulations under SB 454.</p> <p>1.6.3 Advocacy and Technical Support: Support enhanced federal standards and participate in proceedings of the federal government and neighboring countries (Mexico, Canada).</p> <p>B. Market Transformation Efforts</p> <p>1.6.4 Strategic Planning: Partner with other states to leverage research, resources, and standards across larger regions. Develop roadmaps regarding appliances to improve efficiency ahead of mandatory appliance efficiency standards.</p> <p>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.</p> <p>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.</p> <p>1.6.7 Purchase Agreements: Use large organization purchasing power to increase the efficiency of equipment and devices (lighting, appliances) 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.</p>	<p><i>Ongoing</i></p> <p><i>2015 and ongoing</i></p> <p><i>As needed</i></p> <p><i>Ongoing</i></p> <p><i>Ongoing</i></p> <p><i>Ongoing</i></p> <p><i>Ongoing</i></p>	<p><i>CEC</i></p> <p><i>CEC</i></p> <p><i>CEC/CPUC, program implementers, advocates</i></p> <p><i>CEC/PCC, CPUC, OPR, NRDC</i></p> <p><i>CPUC/program implementers, CEC (EPIC)</i></p> <p><i>CEC, CPUC/program implementers, CEC (EPIC)</i></p> <p><i>DGS, LGs/large portfolio property managers, CSD, utilities-LIEE</i></p>

Strategy 1.7 Local Government Leadership

Local Government Challenge

The Energy Commission's Local Government Challenge program would leverage the close and trusting relationships that local governments share with their constituents to promote innovative local agency policies and programs that advance the state's climate, energy, and code adherence goals. The program would promote performance-based efficiency improvements with grant payment amounts tied to actual energy savings achieved. Eligible project areas would include, but not be limited to, comprehensive efficiency upgrades for public buildings, early implementation of nonresidential benchmarking and disclosure programs, innovation in building permitting and code enforcement procedures, and data-driven community-wide energy programming.

Any California city, county, or special district would be eligible to participate in the challenge program. Successful project selection criteria would be structured to allow smaller and less affluent jurisdictions a dedicated share of the funding. Meanwhile, larger government entities would have their proposals considered on the basis of innovation and a commitment to share all program implementation tools and infrastructure.

The Energy Commission's Local Government Challenge would have two parts. The Small Government Leadership Challenge program would make available dedicated funding to disadvantaged communities with populations fewer than 150,000 through technical assistance and grant funding for citywide energy efficiency improvements that advance goals in adopted climate or energy action plans. The Energy Innovation Challenge program would focus on new innovative energy efficiency deployment that would not happen otherwise.

With this new resource made available by the Local Government Challenge program, local governments may facilitate more energy efficiency upgrades, demonstrate leadership by accomplishing deep energy retrofits in government buildings, and become the resource for businesses, homeowners, property managers, and other decision makers looking for energy and water efficiency solutions.

CPUC-IOU Local Government Partnerships

The CPUC supports some 50 IOU-administered LGPs across California, spending about \$67M per year. Beginning in 2016, SCE is introducing a new approach to administering its LGP nonresource projects that support the state's strategic plan goals. The new method relies on a consistent set of scoring criteria that tie funding amounts and project complexity to past record of performance, demonstrated need and competency, and local commitment to carrying out the tasks proposed in a local agency's strategic plan support project application. SCE has carved out a portion of its \$1m annual strategic plan support budget (up to 20 percent or \$200,000 annually) to promote high-performing and high-capacity LGPs to compete for "innovation driver" projects that test new concepts, policies, and delivery models.

The CPUC has also commissioned the IOUs to overhaul reporting and tracking for their LGP nonresource projects to encourage local agencies across the State to share best practices. The IOUs have completed studies to better understand their LGP programs, which can now be shared across local agencies.

Cool California City Challenge

The Cool California City Challenge is a competition that pits city against city as residents take steps in their homes to reduce their carbon footprints. Energy Upgrade California®, the CoolCalifornia.org program at the California Air Resources Board (ARB), and the Cool Climate Network at the University of California, Berkeley's Renewable and Appropriate Energy Laboratory are partnering on the challenge. More than 20 participating cities engaged nearly 3,200 households in the 2016 competition to save 5,638 metric tons of carbon dioxide. All participating cities received a portion of a \$150,000 prize based on points earned during the competition. ARB hopes to continue the partnership with Energy Upgrade California. The next competition would likely begin in spring 2017 and wrap up in fall 2017.

Voluntary "Reach" Standards

Local governments have adopted green building rating systems and/or the California Green Building Standards (CALGreen) Code Tiers as mandatory at the

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local level to achieve GHG emission reductions. Voluntary “reach” standards, also known as “tiers” for energy efficiency and other measures, were revised as part of the 2016 CALGreen code update. Tiers apply to new construction and major renovations of existing buildings. Beginning in January 2017, ARB will continue to track local government adoption of “reach” standards.

Berkeley Building Energy Saving Ordinance

The City of Berkeley has adopted the first Residential Energy Assessment and Disclosure policy in California. The 2015 Building Energy Saving Ordinance (BESO) eliminates the former energy and water efficiency requirements and replaces them with a requirement for property owners to conduct and publicly disclose an assessment of the energy efficiency of a building.

The ordinance mandates that single-family homes that undergo a sales transaction must obtain a Home Energy Score, or equivalent rating. The assessment serves as a basis for actionable recommendations to the homeowner that identify cost-effective opportunities, rebates and incentives, and health, comfort, and safety benefits of energy improvements.

A key goal of the new law is to make building energy use information more transparent to owners and prospective renters or buyers, and ultimately catalyze investment in energy upgrades. Policies designed to support recognition of energy-efficient homes at the time of sale are a promising way to drive consumer demand for energy efficiency (Figure 5).

In addition to reducing greenhouse gas emissions, the BESO aims to address other policy objectives, including reducing utility costs; creating a more comfortable, durable building stock; and fortifying the local “green” workforce.



Figure 5. Home Energy Score Flyer

Climate Action Planning

As part of Strategy 7.1.3, the Energy Commission is providing better building energy-use information and related policy scenarios into regional government climate action planning. Sonoma County is using Urban Footprint to study the varied impacts of GHG reduction policies. Urban Footprint is a Web-based software platform that supports land-use, policy, and resource planning across multiple sectors. Scenarios can be used to model variations in land uses as well as changes in policy or technology applied over current or future conditions. Urban Footprint produces estimates of the fiscal, public health, transportation, water, energy, and emissions impacts of scenarios. The Energy Commission is sponsoring the technical work to include building energy efficiency scenarios into the Urban Footprint analysis platform. In Figure 6, the Building Energy Explorer within Urban Footprint summarizes Sonoma County’s nonresidential building stock by floor area, vintage and energy use. It also indicates potential energy savings from an energy efficiency scenario applied to the building stock.

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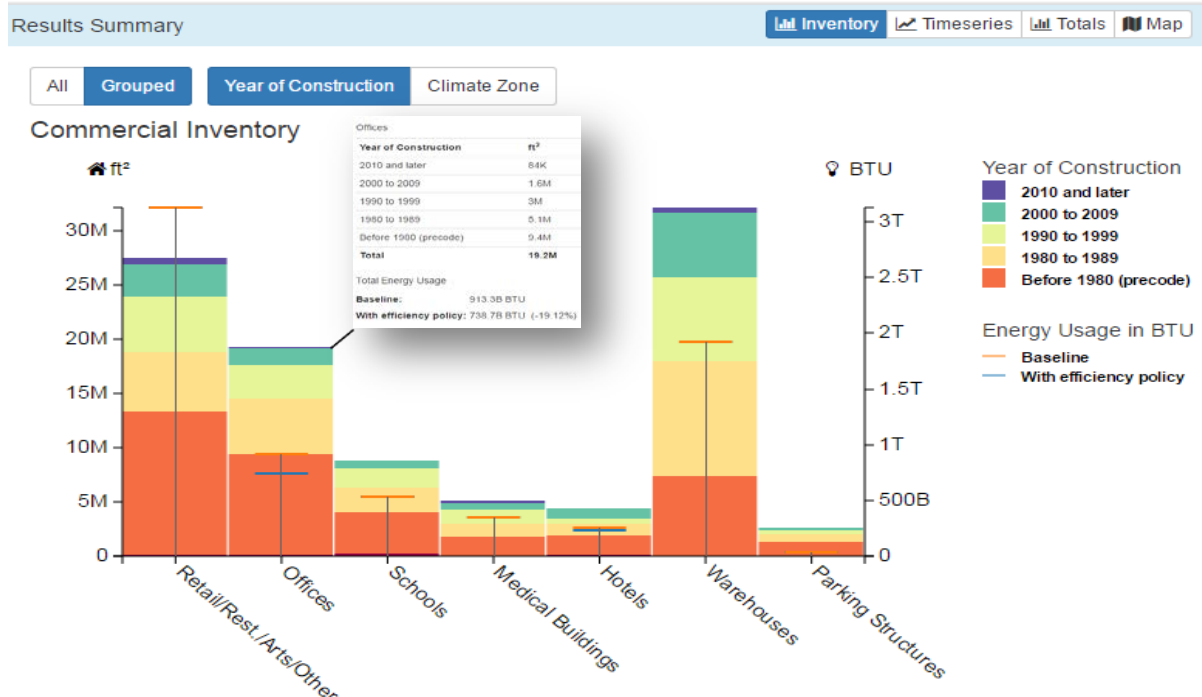


Figure 6. Example Results From the Building Energy Explorer

Using Energy Efficiency for Air Quality Mitigation

The California Air Pollution Control Officers Association (CAPCOA) is working to establish formal GHG reduction protocols for existing home energy retrofit projects. The goal is to create a means to secure GHG emission reductions that can qualify as credits in the CAPCOA GHG Exchange to be used for California Environmental Quality Act (CEQA) project mitigation and/or other voluntary GHG reduction actions. This statewide energy efficiency retrofit protocol will include provisions to ensure the emission reductions are real, quantifiable, validated, enforceable, permanent, and surplus relative to other measures being implemented throughout the State. Once established, air quality districts throughout the State can use home energy retrofits as mitigation strategies for new project developments covered by CEQA. The South Coast Air Quality District has already used home energy efficiency as such a mitigation strategy. (See sidebar.)

Coachella Valley Project

The Coachella Valley Project stems from the South Coast Air Quality Management District’s request for proposal issued for emissions mitigation projects. An organization called *Add Insulation* worked with Johns Manville to propose a “utility-scale” energy efficiency retrofit project. This project was initially awarded \$2.35 million, and the funds were later increased to roughly \$4 million. The basic efficiency retrofit consists of attic air sealing and increasing attic insulation to R-38. Two thousand homes are expected to be retrofitted by the end of 2016, resulting in GHG emission reductions of 1,630 tons and PM_{2.5} reductions of 90 lbs annually.

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Strategy	Metrics/Time Frame	Lead/Partners
<p>1.7 Local Government Leadership: Engage and recruit LGs to demonstrate leadership in energy efficiency through various programs, activities, and mechanisms.</p> <p>1.7.1 Challenge Program: Transition ARRA-funded local and regional financing programs to a grant process aimed at both innovative jurisdictions 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.</p> <ul style="list-style-type: none"> Local governments apply in a competitive process. Encourage projects that focus on disadvantaged <i>communities</i> and give them incentive <i>points</i>. 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. <p>1.7.2 Local Government Partnerships: Coordinate utility LG partnerships with the action plan goals and strategies to minimize duplication; share data to simplify LG jurisdictional activities to maximize energy-saving opportunities.</p> <p>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, <i>ARB Scoping Plan Update</i>).</p> <ul style="list-style-type: none"> Ensure access by land-use and climate action planners to better building energy use baseline data and location-specific estimates of energy savings potentials. 	<p><i>Seed funding available by 2016 and program launch in 2017</i></p> <p><i>2016 and ongoing</i></p> <p><i>2016 and ongoing</i></p>	<p><i>CEC, LGC/OPR</i></p> <p><i>CPUC, POU/program implementers</i></p> <p><i>LG/ARB, OPR-Strategic Growth Council, CEC</i></p>

Strategy 1.8 Energy Efficiency as a Clean Distributed Energy Resource

Utility Procurement

In 2013 the CPUC authorized SCE to launch an all-source bidding procurement framework that included the ability for energy efficiency resources to compete against conventional and renewable supply resources, as well as storage and demand management (Decision D.13-02-015). In that solicitation, SCE selected 136.2 MW of energy efficiency from three successful lead bidders, to be accomplished across 32 contracts. The CPUC approved these contracts in 2015 and 2016. All the efficiency resources were required to be “incremental” to the amount of EE contained in the Energy Commission’s additional achievable EE per the IEPF forecast. (The total selected bids for all sources amounted to 2,220 MW of resources. Thus, efficiency comprised 6 percent of the selected resource offers.¹⁶)

PG&E’s proposed Diablo Canyon settlement includes the retirement of the Diablo Canyon nuclear power plant and plans for replacement energy resources. The settlement includes the procurement of 2,000 GWh of energy efficiency to be installed by January 1, 2025. PG&E’s proposed procurement will result in “new” efficiency efforts that are incremental to its ratepayer-funded efficiency programs and that use an existing conditions baseline and normalized metered energy savings estimates, where feasible and appropriate. Funding for this procurement activity, about \$1.3 billion, may be authorized in the Diablo Canyon Settlement Application proceeding.

Integrated Distributed Energy Resources

In its rulemaking R.14-08-013, the CPUC oversees the IOUs’ distribution grid needs assessments that determine upgrade requirements and alternatives. A second rulemaking (R.14-10-003) establishes a procurement framework for selecting alternative distributed energy resources (DERs), that may include energy efficiency, once the needs assessment determines that DERs may offer the potential to offset

traditional capital and operating expenditures for distribution upgrades. In 2016, the latter rulemaking embarked on developing a competitive solicitation framework focused on these distribution alternative solutions. A working group report with recommended approaches to the framework was submitted on August 1, 2016. It is expected that by the end of 2016, the CPUC will consider and/or modify the framework to be used, consistent with the needs assessment findings.

Several challenges and new business model considerations will face potential EE bidders, including:

- Proof that EE offerings are incremental to the Energy Commission’s IEPF forecast that forms the “baseline” of distribution grid planning.
- Ability to target resources to the distribution resource specifications of timing, place, duration, and value.
- The willingness of EE bidders to accept performance assurance requirements, nonperformance penalties, and other risk considerations.
- The ability to compensate EE providers for the full value of energy efficiency, including the avoided generation and transmission resources, if business models require an “all-in” compensation structure.

Once competition reveals parameters on price and value possibilities, the CPUC and utilities in the future may consider other forms of DER procurement, including bilateral contracts, tariffs, and/or “programs” with fixed compensation terms. Coordination among state agencies and stakeholders will be necessary to ensure alignment of priorities and processes to address increasing needs for energy efficiency. For example, greenhouse gas reduction goals and grid reliability requirements drive needs for increased energy efficiency.

¹⁶ See contract award details at: Southern California Edison. “Local Capacity Requirements (“LCR”) RFO.” 2016. <https://www.sce.com/wps/portal/home/procurement/solicitation/lcr/>.

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Strategy	Metrics/Time Frame	Lead/Partners
<p>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.</p> <p>1.8.1 Utility Procurement of Energy Efficiency: Further develop the utility procurement model for energy efficiency, building on the SCE Preferred Resources Pilot, the PG&E proposal for the Diablo Canyon settlement, and the California Public Utilities Commission’s Distributed Energy Resources Action Plan.</p> <p>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.</p> <ul style="list-style-type: none"> • Understand the phenomenon of code shortfall in existing buildings and mobilize projects to close any gaps. • Revisit administration of market transformation efforts. 	<p><i>2016 and ongoing</i></p>	<p><i>CPUC, POU/IOUs, CEC</i></p> <p><i>CPUC/CEC, program implementers</i></p>

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Strategy 1.9 State Policy Leadership

Strategy 1.9 is now expanded to reflect the relevant energy efficiency-related initiatives that impact existing buildings, require state policy leadership, and are not addressed elsewhere in this plan. The intent of these additional policy strategies is to capture activities that will significantly influence energy efficiency in existing buildings, so that progress can be tracked and issues addressed within the policy reporting mechanisms integral to the successful implementation of this plan.

Climate Change Planning

ARB is updating the *AB 32 Scoping Plan* to chart the path toward achieving the 2030 target and the 2050 limit of 80 percent below 1990 levels. On April 29, 2015, Governor Brown issued Executive Order B-30-15, establishing a midterm target for California to reduce GHG emissions to 40 percent below 1990 levels by 2030. ARB was directed to update the *AB 32 Scoping Plan* to reflect the 2030 target. Senate Bill 32 (2016) codified the 40 percent reduction. GHG emission reduction opportunities are being examined across sectors that include energy, transportation, industry, water, waste, natural and working lands, agriculture, and green buildings. The *Scoping Plan Update* is being developed using a public process, involving coordination with state agencies such as the Energy/Green Building Interagency Working Group, engagement with the Legislature, consultation with the Environmental Justice Advisory Committee, and multiple opportunities for stakeholder engagement. The *2030 Target Scoping Plan Update* is examining how to harness synergies across the sectors in the context of the Governor's five climate change pillars, which includes a doubling of the energy efficiency savings from existing buildings. The *Scoping Plan Update* process kicked off in October 2015 and is expected to be completed by March 2017.

Doubling the Energy Savings from Efficiency

The Policy Update section of this plan introduces SB 350, which requires the Energy Commission, in collaboration with the CPUC, to establish annual targets for statewide energy efficiency and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings by 2030. The

Energy Commission identified a set of foundational questions that need to be answered to establish the framework for this energy savings target setting and proposed a schedule for completing both the target setting framework and establishing the ultimate targets by November 2017.

California Energy Efficiency Coordinating Committee (CAEECC)

This new organization was created by a 2015 CPUC decision to provide a forum where stakeholders can provide early input into the development of the business plans that IOU ratepayer program administrators must file in early 2017. The goals of the CAEECC are to:

1. Support high-quality efficiency programs in line with state climate and energy goals that respond to customer needs and market dynamics.
2. Improve collaboration and communication among parties and with CPUC staff.
3. Reduce differences in positions through informal discussions, narrowing the issues that need to be addressed by the CPUC.
4. Increase speed of CPUC review of filings.
5. Provide greater opportunities to leverage industry expertise.
6. Increase transparency and enable a deeper understanding of offerings and long-term strategic vision.
7. Provide meaningful and useful input during early stages of design and during augmentation of efficiency business plans and other relevant planning documents.
8. Help achieve the state's climate and energy objectives.

California Technical Forum (Cal TF)

Cal TF was created in 2014 by a broad group of stakeholders and is funded by participating utility ratepayer efficiency program administrators. It is a collaborative of experts who review and issue technical guidance to help program administrators implement California's energy efficiency programs.

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One of the principal areas in which Cal TF has been active, in collaboration with CPUC staff and its technical support contractors, is to streamline the CPUC’s proposed program review process (known as the “ex ante” process). Throughout California’s long history implementing ratepayer-funded energy efficiency programs, program implementers have relied on an *ex ante* framework to provide essential savings estimates and other parameters for energy efficiency measures. Cal TF is proposing a new statewide electronic technical reference manual that can host all efficiency measures and the associated documentation for each assumption and parameter in a single digital repository. (See sidebar.)

Cal TF Proposal:

Electronic Technical Manual (eTRM)

The eTRM will:

- Establish a process for consistent, thorough, and transparent documentation and review of efficiency measure savings assumptions.
- Consolidate measures to reduce unnecessary complexity.
- Adopt open source modeling software to increase transparency and reduce costs of model-based savings estimates.
- Provide clear, easily applied guidelines for energy efficiency measure development.
- Support consensus building and rigorous documentation requirements for all technical assumption.
- Provide the foundation for a collaborative and transparent technical update framework that California can continue to rely on.

Long-Term Energy Planning

The Energy Commission and CPUC staff continue to coordinate forecasting and integrated resource planning processes to assure that efficiency in several forms and sources is appropriately considered as committed, planned, or potential resources. With the passage in 2015 of AB 802 and SB 350, these coordinated activities will be sharpened and fine-tuned.

Energy Efficiency Collaborative – Statewide Agency Leadership

The Energy Commission plans to develop a collaboration structure that incorporates the active engagement of key agencies, coordinates across relevant rulemakings, and maintains consistency with agency roles and authorities. This Energy Efficiency Collaborative will 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. The Energy Commission plans to consider adding an advisory committee, consisting of agency staff, stakeholders, and experts to advise and take direction from the Energy Efficiency Collaborative.

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Strategy	Metrics/Time Frame	Lead/Partners
<p>1.9 State Policy Leadership</p> <p>1.9.1 2030 Target Scoping Plan Update: Engage stakeholders and sister agencies in planning processes to publish goals, objectives, and strategies to reduce GHG emissions to 40 percent below 1990 levels by 2030.</p> <p>1.9.2 California Energy Efficiency Coordinating Committee: Provide guidance to CPUC energy efficiency program administrators on 2017 business plans; review and discuss ultimate implementation plans consistent with approved business plans.</p> <p>1.9.3 California Technical Forum: Develop, pilot, deploy, and maintain an electronic technical manual for use by California utilities and other efficiency program administrators to estimate savings from efficiency efforts.</p> <p>1.9.4 SB 350 Energy Efficiency Targets: Establish the framework for setting targets to double energy efficiency savings; adopt annual savings targets to achieve a doubling in energy efficiency by 2030; monitor and report on progress over time</p> <p>1.9.5 Long-Term Energy Resource 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 using consumption data for forecasting and related program evaluation.</p> <p>1.9.6 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.</p>	<p><i>2016, 2017</i></p> <p><i>2016 and ongoing</i></p> <p><i>2016 and ongoing</i></p> <p><i>2017 and ongoing</i></p> <p><i>2016 and ongoing</i></p> <p><i>2016 and ongoing</i></p>	<p><i>ARB, CEC, CPUC</i></p> <p><i>CPUC, CAEECC</i></p> <p><i>Cal TF, CPUC</i></p> <p><i>CEC, CPUC, Program Administrators</i></p> <p><i>CEC, CPUC, ISO</i></p> <p><i>CEC, CPUC/ARB, ISO, GO, other agencies, as needed</i></p>

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

The Energy Commission continues to focus its efforts on these data-related plan strategies. Good progress has been made, but there is much more planned in the coming months and years.

Data Exchange Protocols

The Energy Commission has developed standard data terms and relationships for multiple building energy-related programs over the last eight years. This standard data dictionary (SDD) has data structures and properties for defining all components of a building that are evaluated in assessing its energy efficiency. The SDD is consistent with the Department of Energy's Building Energy Data Exchange Specification, and BEDES terms are mapped to SDD terms, where appropriate.

For exchanging SDD-based data between programs or outside vendors, an Extensible Markup Language (XML) schema using the XML Schema Definition Language (XSDL) was chosen to take advantage of the benefits for expressing and validating data exchange format and content. The SDD is used to generate products for different Energy Commission programs including:

- XML schema for Title 24 residential compliance document registration.
- XML schema for Proposition 39 utility energy usage and cost data collection.
- Software data model and documentation for Title 24 nonresidential compliance.

Future programs developed at the Energy Commission will leverage SDD and allow infrastructure to share data across various programs. SDD structure will also be made available on the Energy Commission website for the public and third-party programmers to use.

Meter-to-Building Mapping

The rollup of physical meter data to building-level performance information may be difficult. The Energy Commission has initiated a working group with utilities, the CPUC, and other organizations familiar with the process of matching meters to buildings. With the passing of AB 802, this step is critical to ensuring the success of whole-building data access and disclosure. Fortunately, there are many good examples from around the nation that the Energy Commission intends to leverage. For example, portals for energy use data access have been made available to help promote effective meter-to-building address mapping.

Statewide Building Identification

Managing data for physical buildings is challenging due to the various addresses that can be associated with a building. A complex logic check needs to be completed to understand if multiple addresses refer to the same building. The creation of a statewide building identification number can remedy this. The Energy Commission is exploring opportunities to leverage geospatial and other relevant data to develop unique building identifiers. Ideally, this identifier can be assigned permanently to the building, even if addresses change. Similar to a vehicle identification number, a building identifier will allow various datasets to interconnect. As part of its Building Data Accelerator project, DOE's Building Technologies Office is undertaking a scoping study to chart the best way forward to implement a standardized option. By summer of 2017, a pilot will assign unique identifiers to buildings being benchmarked by select cities, states, and counties through the SEED Platform Collaborative. (See sidebar.)

Building Identification Number

A statewide building identification number will be beneficial for buildings to be compared across multiple datasets. Matching based on latitude/longitude or street address alone is not sufficient.

Creating a statewide building identification number will require the following activities:

- Compile or create existing building footprint using geographic information systems
- Create and assign unique identification numbers to those footprints with input from local governments and DOE
- Post the information in an open-source format that all parties can use and build on.

DOE recognizes a global unique identifier (GUID) system should be designed and implemented to provide a framework that can provide a unique identifier to a given structure or part of a structure at a given moment in time. Rather than assigning GUIDs to all known structures as they exist, a decision-making framework will be developed that is accessible by any market player and designed to generate GUIDs on a need-by-need basis through the established mechanism.

AMI Data Availability

Each of the investor-owned electric utilities that has deployed AMI to its residential customers has also enabled customer and authorized third-party data access:

- PG&E – Share My Data
- SCE – Green Button – Third Party Connection
- SDG&E – Green Button Connect My Data

California utilities continue to make progress toward providing online energy management services to their customers as part of their ongoing efforts to help customers access and manage their utility bills. For example, SDG&E offers its residential customers a loaner home area network device to provide in-home displays of near real-time energy use, with estimated energy costs. (Figure 7.)



Figure 7. SDG&E Loans Out In-Home Display Devices

Another example is SCE's Energy Efficiency Audit Tool, an online audit that helps customers understand energy use in their homes and/or small businesses.

PG&E is developing several programs that leverage Share My Data to meet energy efficiency goals and broaden the participation of customers for both financing and claiming savings, such as pay for performance and financing programs (for example, on-bill repayment).

Some of the state's publicly owned utilities have also deployed AMI to their customers. For example, SMUD and Burbank Water and Power have completed full deployments, and LADWP's deployment is in progress. However, none of the publicly owned utilities have joined the Green Button Alliance. The Green Button Alliance is a non-profit organization supported by the federal government and stakeholders to make access to AMI energy usage data easier for utility customers. Efforts to provide AMI data access to POU customers should be accelerated.

Standardized Rates Information

In April 2016, DOE, in collaboration with NREL, launched a national working group with the goal of standardizing utility rate data, thereby making it more accessible (Utility Rate Data Working Group: URDWG). The working group will evaluate standard formats for a machine-readable structure to collect and transfer utility rate data. Pilot projects with participating utilities will test the standard data formats for integration into the Utility Rate Database (URDB). URDB is an existing national database produced by NREL for DOE's Solar Energy Technologies Program and includes more than 39,000 rates for more than

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3,700 utilities. Rather than create a new tool, California will encourage, support, and leverage this federal effort.

Public-Facing Energy Efficiency Program Information

The California Energy Efficiency Statistics Website¹⁷ produces efficiency program tracking data sets and, when available, evaluation updates for program years 2010-2015. Figure 8 is an example of the efficiency program statistics available from EE Stats. The CPUC has developed a new online data processing and program filing platform known as the California Energy Data and Reporting System (CEDARS). The modular design of the CEDARS platform enables development of complementary data standardization and processing features over time, such as work papers and evaluation data sets. Filings and claims submitted through CEDARS will drive publicly facing data beginning in 2017.

Integrated Database for Low-Income Programs

In September 2015, the CPUC and the California Department of Community Service and Development (CSD) entered into a nondisclosure agreement that authorized the transfer and sharing of residential customer usage data between the agencies. Later, in May 2016, the CPUC approved a \$15,000 expenditure to authorize the use of public purpose program funds to develop a database of past ratepayer-funded low-income measure installations, by location, coupled with customer usage data to be used by CSD for program reporting, planning, and coordination.

CSD's objective, in addition to better program coordination, has been to obtain data needed for its customer energy usage reporting obligations to its federal funding agencies and to the Air Resources Board (ARB) with respect to the Low-Income Weatherization Program (LIWP) funded by California Climate Investments.

CSD, working collaboratively with its partners, will develop a comprehensive plan and negotiate agreements to address CSD's immediate data needs and will work toward more comprehensive long-term

solutions to the data challenges faced by all stakeholders, including the development of a statewide database.

Energy Consumption Baselines

CPUC is working with the Energy Commission on an agreement to securely provide a 10- year history of IOU customer consumption data collected for evaluation. The Energy Commission plans to use this data in multiple ways, including, but not limited to, the following:

- Energy Commission staff will develop macroconsumption models based on the previous work with data sponsored by the CPUC.¹⁸ The macroconsumption models will be used to estimate the reductions in energy use attributable to California's energy efficiency policies. The usage data obtained from the CPUC will be used along with weather, econometric, demographic, and efficiency program participation data to develop statistical models of energy consumption. These models will then be used to establish baselines, track energy savings over time, and, to the extent possible, attribute these savings to energy efficiency policies.
- The Energy Commission intends to publish weather-normalized distributions of electricity and natural gas usage by customer segment and

¹⁸ See CPUC-sponsored data at

Horowitz, Marvin J. *Macro Consumption Metrics White Paper*. Demand Research LLC, 2011.

http://www.calmac.org/publications/HOROWITZ-MacroConsumptionWhitepaper-Final-8-24-11_Public.pdf.

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[http://www.calmac.org/publications/Cadmus_Memo_on_MCM_Preliminary_Saving_Estimates_\(updated\)_08_22_2012_-_final_\(formatted\)ES.pdf](http://www.calmac.org/publications/Cadmus_Memo_on_MCM_Preliminary_Saving_Estimates_(updated)_08_22_2012_-_final_(formatted)ES.pdf).

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¹⁷ California Public Utilities Commission. "California Energy Efficiency Statistics." 2016. <http://eestats.cpuc.ca.gov/>.

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geography. For example, not just average (50 percent quartile) usage, but also 25 percent and 75 percent quartiles, or 10 to 90 percent deciles. These “expectations” of energy usage can be valuable to many energy efficiency stakeholders. Consumers can better understand how their energy usage compares to others like them. Energy service providers can understand consumer trends to inform their business models. The Energy Commission’s large commercial and multifamily energy benchmarking and disclosure program will use the relevant usage distributions in its disclosure communications. These statistical representations of usage will not include personal identifying information.

- The Commission will review the 10-year record of monthly electricity and natural gas utility customer usage to determine if this level of data is appropriate for the Energy Commission to collect on an ongoing basis through its Title-20 data collection regulations. The Energy Commission proposes that monthly sales data are appropriate for the Commission’s future demand forecasting needs, and this historical record will be used to

validate or repudiate this preliminary determination.

Data Lake Repository

In mid-2016 the Energy Commission committed to planning, developing, and governing a multipurpose data infrastructure to store, analyze, and visualize building energy and efficiency information for the State. Leveraging the SDD architecture introduced above, the Data Lake Repository will be piloted with the following data collection, analysis, and reporting use cases:

- AB 802 Building Energy Use Benchmarking and Disclosure
- Proposition 39 schools energy use and efficiency project analysis and reporting
- Granular building energy use baselines (supported first with CPUC-shared historical consumption time series, then later with Title 20 data collection regulations)

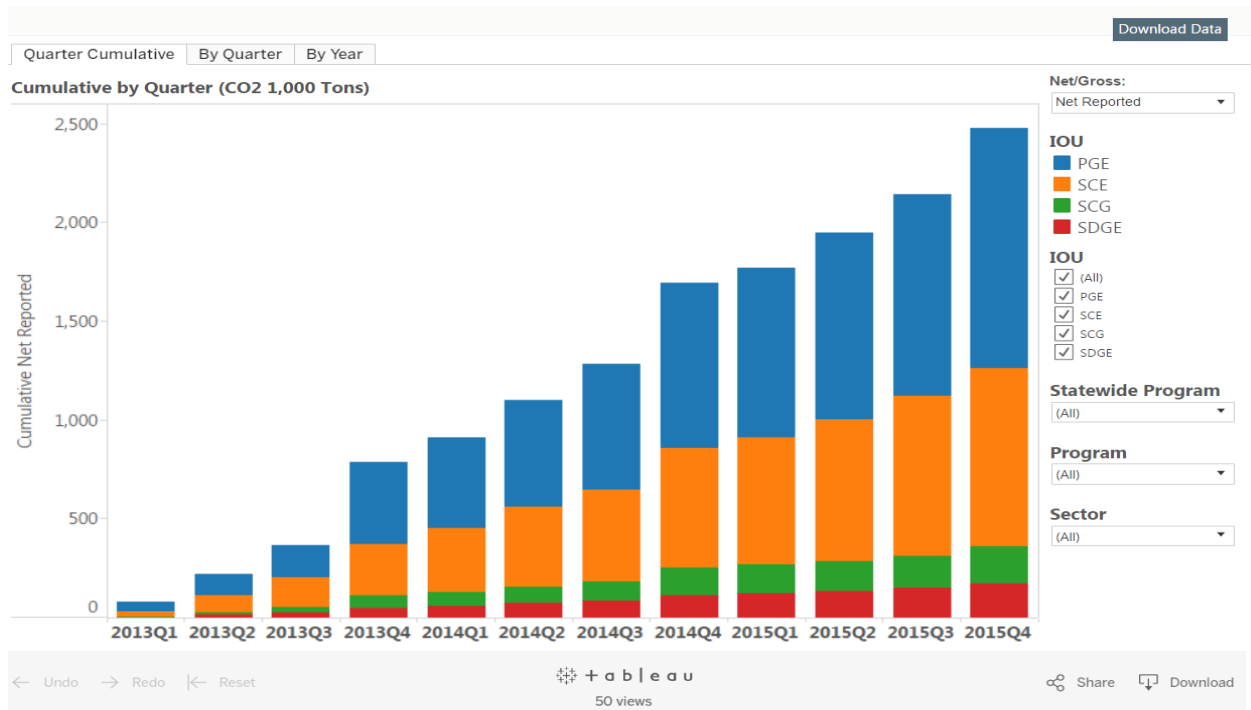


Figure 8 2013-2015 GHG Reductions From IOU Programs

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Strategy	Metrics/Time Frame	Lead/Partners
<p>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.</p> <p>2.1.1 Data Exchange Protocols: Adopt and align common data exchange protocols to ensure streamlined collection, effective management, and security.</p> <ul style="list-style-type: none"> 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. <p>2.1.2 Benchmarking Data Infrastructure: Map meters to physical buildings and upload whole-building consumption data to Portfolio Manager, as needed.</p> <p>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.</p> <p>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.</p> <p>2.1.5 Standardized Rates Information: Expand the national Utility Rate Database to include California utility tariffs.</p> <p>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).</p> <p>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 Energy Savings Assistance databases as a step toward alignment of cost-effectiveness methods and streamlined delivery of energy efficiency services to low-income Californians.</p>	<p><i>Ongoing and as needed; P39 protocols completed by 2016</i></p> <p><i>Ongoing; all utilities 2017</i></p> <p><i>Ongoing; statewide by 2018</i></p> <p><i>Ongoing; as requested by LGs</i></p> <p><i>2016-2021</i></p> <p><i>2017</i></p> <p><i>Ongoing</i></p>	<p><i>CEC, CPUC/utilities, research institutions</i></p> <p><i>Utilities/CEC, CPUC</i></p> <p><i>Utilities/CEC, CPUC, HUD</i></p> <p><i>Utilities/CPUC, CEC/LG</i></p> <p><i>Utilities/DOE, NREL, /CEC, CPUC</i></p> <p><i>CPUC, CEC/utilities, program implementers</i></p> <p><i>CPUC, CSD, utilities</i></p>

California’s Existing Buildings Energy Efficiency Action Plan – 2016 Update

Strategy	Metrics/Time Frame	Lead/Partners
<p>2.1.8 Encourage Independent Energy Data Decision Support: Continue to provide nonconfidential data access to researchers and others for use in local and regional energy efficiency decision support. Example: UCLA’s <i>Energy Atlas</i>.</p>	<p><i>Ongoing</i></p>	<p><i>CPUC/IOUs,POUs, , CEC</i></p>
<p>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. <i>Make energy data publicly available as appropriate to preserve customer confidentiality. Use the CEC’s upcoming data repository (2.1.11) to store, analyze, and appropriately publish these consumption baselines.</i></p>	<p><i>2015 - 2017</i></p>	<p><i>CEC, CPUC, POU</i>s</p>
<p>2.1.10 Local Area Load Forecasting Method: Develop data collection protocols, forecasting methods, and tools for <i>localized consideration</i> of efficiency within the California Demand Forecast.</p>	<p><i>2017-2019</i></p>	<p><i>CEC, CPUC, ISO, POU</i>s</p>
<p>2.1.11 Building Energy Data Repository: Plan, develop, pilot, and populate an energy data repository for data tracking and policy analysis.</p>	<p><i>2017 and ongoing</i></p>	<p><i>CEC, CPUC, CSD, utilities</i></p>

California's Existing Buildings Energy Efficiency Action Plan – 2016 Update

Strategy 2.2 Consumer-Focused Energy Efficiency

Easing Efficiency Program Participant Burden

Program administrators for California IOU ratepayer programs have taken strides over the last two years to reduce the time and process requirements for customer participation. Examples of efforts to reduce transaction costs include:

- Turnaround times for customer eligibility reviews that have been reduced by large margins.
- Electronic signatures that are used to simplify loan processing, which also reduce project approval times.
- Quicker, more cost-effective processing of trade professional applications, which reduces overhead and carrying-costs for contractors.
- One-stop shops provided via online marketplaces, where product purchasing and rebate processing are streamlined.

Further efforts to ease and expand consumer participation in efficiency programs are described in updates to Strategy 3.2 Performance Driven Value and Strategy 5.4 Integrated and Streamlined Delivery of Efficiency Solutions, Finance, and Utility Incentives.

Targeting Customers for Program Participation

Program administrators are also providing information and other support to trade professionals and energy service providers to facilitate these industry partners' promotion and engagement of customers in rebate, incentive, and technical assistance programs. For their larger customers, utilities' account executives work closely with their customers to identify efficiency opportunities and programs.

Local government partnerships and statewide institutional partnerships (with University of California/California State University, California Community Colleges, State of California, California Department of Corrections) provide targeted attention, including the availability of financial and technical assistance to these entities.

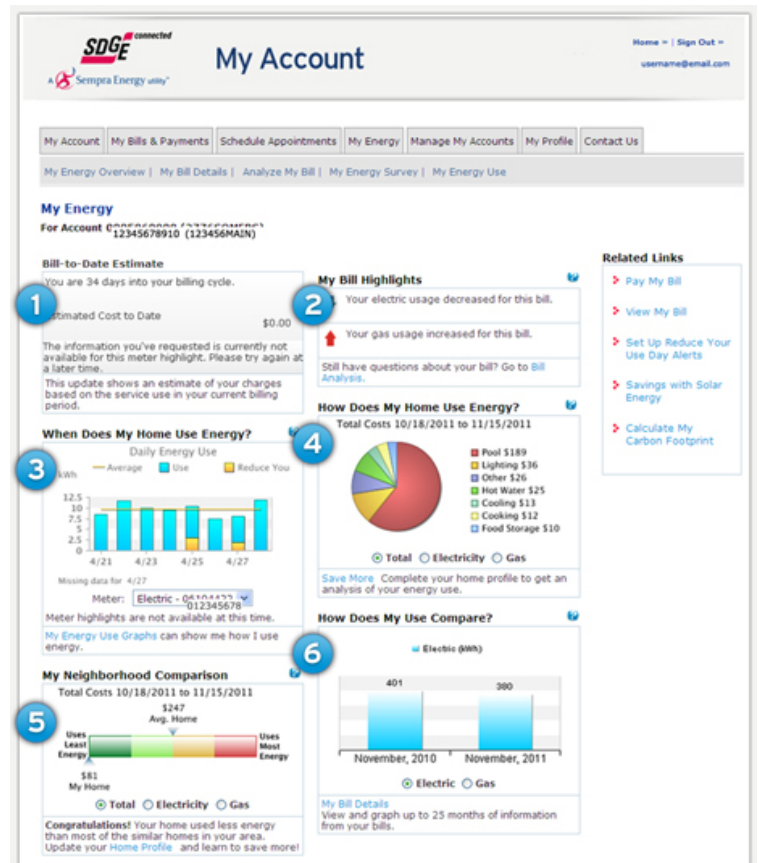
Additional efforts are planned to engage retail businesses to offer rebates and increase customer awareness of efficiency opportunities. SDG&E also plans to launch a new welcome experience for residential customers in the process of moving, where customers will be introduced to behavioral programs

and other efficiency opportunities relevant to their new home and locale.

Behavioral Savings

Over the last several years, California utilities have increased behavioral savings programs for their residential customers. Through increased levels and types of information, competitions, and rewards, residential consumers are encouraged to make effective changes to how and when they use energy. (See Figure 9 and sidebar.)

Figure 9. Example of Customer Engagement to Encourage



Behavioral Savings

California’s Existing Buildings Energy Efficiency Action Plan – 2016 Update

Strategy	Metrics/Time Frame	Lead/Partners
<p>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.</p> <ul style="list-style-type: none"> • 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. 	<p><i>2016 and ongoing</i></p>	<p><i>CPUC, POU's/program implementers, LGs, EUC</i></p>
<p>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.</p> <ul style="list-style-type: none"> • Evaluate effectiveness of working with corporations to address energy use for a portfolio of buildings. • Develop asset-based classes for investor-ready projects. 	<p><i>Expand cohort program in 2016</i></p>	<p><i>CPUC, POU's/program implementers, LGs, EUC</i></p>
<p>2.2.5 Strategic Energy Planning: Develop multiyear, sector-specific energy plans to implement energy and water efficiency improvements for property owners. <i>(Align with Strategy 1.7.)</i></p> <ul style="list-style-type: none"> • 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. 	<p><i>SEPs are systematically incorporated into programs beginning in 2016, phased by sector</i></p>	<p><i>LGs/program implementers, HUD</i></p>

Goal 3. Increased Building Industry Innovation and Performance

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

Strategy 3.1 Streamlined and Profitable Industry

Energy Efficiency Rolling Portfolios

In August 2016, the CPUC published a final decision providing direction to IOU ratepayer-funded efficiency program administrators¹⁹. This policy decision moves several plan strategies forward by streamlining the ratepayer-funded efficiency program delivery mechanisms, increasing levels of program innovation, and expanding consumer participation. Among the provisions of the decision are the following:

- The default baseline policy will be existing conditions rather than current codes and/or standards, with a number of exceptions.²⁰
 - All upstream, midstream, and market transformation programs will be deployed consistently across all IOU service territories and overseen by a single lead administrator.²¹
 - Additional statewide programs must be piloted for at least four downstream programs, with the direction to deploy 25 percent of each utility administrator's portfolio through statewide programs.
 - Third-party programs are defined as those that are proposed, designed, implemented, and delivered by nonutility personnel.
 - A minimum of 20 percent of utility administrator portfolios must consist of third-party programs in 2017, and utility administrators must plan for a transition to 60 percent third-party programs by 2020.
- New working groups will address standard practice estimates, savings attribution, and related items, leveraging existing collaborative groups when appropriate.

Hard-to Reach Populations

Utility customers are judged to be "hard to reach" based on business size, household income, primary language, renter/owner status, and geography. Direct install (DI) programs are designed to provide hard-to-reach consumers with enhanced technical assistance and project design services for energy efficiency improvements to help reduce operating costs and energy use. In addition to a financial incentive that typically covers most project costs, DI programs offer educational support and quality installation verification. Residential customers of low and moderate income typically receive no-cost efficiency improvements through DI programs.

The challenge with DI programs is delivering them cost-effectively, and this severely limits their expansion to hard-to-reach population. Considering the breadth of non-energy benefits that accrue to these consumers from efficiency upgrades might help decision makers determine that these programs are worth the ratepayer investments²².

SB 350 directs the Energy Commission to produce a report describing the barriers to low-income and disadvantaged communities' adoption of energy efficiency and clean power technologies and practices. The barriers report should be adopted by the Energy Commission by January 2017, and the recommendations in this report will guide future efforts to increase participation and address inequities in efficiency efforts across the state. Future *EBEE Action Plan* updates will incorporate recommendations and developments on this topic.

¹⁹ California Public Utilities Commission, 2016. *Decision Providing Guidance for Initial Energy Efficiency Rolling Portfolio Business Plan Filings*. R. 13-11-005.

<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M166/K210/166210225.PDF>.

²⁰ Several exceptions to the existing conditions baseline are also delineated in this CPUC decision.

²¹ "Statewide" in this plan section refers to the CPUC definition of the term, which covers all IOU planning areas. A complete definition can be found in the August 2016 CPUC decision, reference #12.

²² Non-energy benefits typically include comfort, health and safety.

California’s Existing Buildings Energy Efficiency Action Plan – 2016 Update

Strategy	Metrics/Time Frame	Lead/Partners
<p>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.</p> <p>3.1.1 Sustainable and Effective Program Delivery: Enhance program portfolios to reduce transaction costs and dramatically increase effects in hard-to-reach sectors. <i>Streamline program requirements and operational procedures. Expand statewide programs with uniform designs.</i></p> <p>3.1.2 Industry Partners Programs: Develop partner programs with trade organizations and industry agents to address key market barriers and promote industry innovations (by sector and/or end use).</p> <ul style="list-style-type: none">• 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, CEEIC).	<p><i>2016 and ongoing</i></p> <p><i>Ongoing</i></p>	<p><i>CPUC, POU, CEC/program implementers, LGs</i></p> <p><i>CPUC, CEC, POU/industry groups, program implementers, LGs</i></p>

Strategy 3.2 Performance-Driven Value

readily informing where program improvements are needed.

Performance-Based Program Designs

The CPUC, in response to AB 802, developed a “high opportunity programs or projects” (HOPPs) framework through which programs and projects that use a normalized metered consumption validation approach and embedded evaluation measurement and verification strategies could be reviewed and approved by the CPUC.²³

Seven proposals have been approved to date for large and small commercial and residential applications, and two more are in review. In each proposal, performance-based incentives are a focal point in the measurement-driven program designs. Several more proposals are expected before the end of the year. The proposed programs are being developed and launched, and CPUC staff will monitor how well they perform compared to other program models in the portfolio. Table 2 summarizes the HOPPs programs that have been proposed to the CPUC as of October 2016.

Many stakeholders expect significant cost savings relative to traditional rebate programs when meter-based savings approaches are integrated into program implementation. By paying for measured performance, the hope is that the market will seek, find, and provide the most cost-effective efficiency solutions.

Integrating measurement and verification into the program delivery can enable customer, contractor, and program implementer to obtain feedback for ongoing program effectiveness. As HOPPs efforts expand and transition to existing baselines, more feedback approaches and methods will help identify best practices. This will potentially lead to automation of some M&V activities, reducing overall costs, providing better market engagement, and more

²³ California Public Utilities Commission, 2015. *Administrative Law Judge's Ruling Requesting Comments on Commission Staff White Paper Regarding "High Opportunity Programs or Projects,"* R. 13-11-005.

<https://static1.squarespace.com/static/53c96e16e4b003bdba4f4fe/t/563bd8e6e4b05423ff8adff2/1446762726153/CPUC+Staff+Whitpaper.PDF>.

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IOU	Market Sector	Efficiency Scope – Link to Plan
PG&E	Cross-Cutting (Non-Res, MUSH, MF)	On Bill Financing Without Rebate https://www.pge.com/notes/rates/tariffs/tm2/pdf/ELEC_4812-E-A.pdf
SoCalGas	Commercial Food Service	Commercial Restaurant Retrofit Program https://www.socalgas.com/regulatory/tariffs/tm2/pdf/4948-A.pdf
SDG&E	Nonresidential	Retro-commissioning http://regarchive.sdge.com/tm2/pdf/2864-E-A.pdf
SDG&E	Multifamily	Direct Install http://regarchive.sdge.com/tm2/pdf/2865-E-C.pdf
SoCalGas	Multifamily	Comprehensive Multifamily Building Solution (CMBS) Program https://www.socalgas.com/regulatory/tariffs/tm2/pdf/4965-A.pdf
PG&E	Residential	Pay for Performance https://www.pge.com/notes/rates/tariffs/tm2/pdf/ELEC_4813-E-A.pdf
SoCalGas	Public Partnerships with Universities & Colleges	Metered and Performance-Based Retrofits (MPBR) Program https://www.socalgas.com/regulatory/tariffs/tm2/pdf/4956-A.pdf
SCE (in review)	Public Buildings	Performance-Based Retrofit Program https://www.sce.com/NR/sc3/tm2/pdf/3460-E.pdf
SCE (in review)	Commercial HVAC	Pay for performance and rebate https://www.sce.com/NR/sc3/tm2/pdf/3463-E.pdf

Table 2. High Opportunity Projects and Programs

Open Energy Efficiency Meter

The Open Energy Efficiency Meter (OEEM) is an open-source public tool that provides meter-based energy savings feedback based on a standardized, data-driven approach²⁴. The platform is built on existing open industry tools including HP-XML, Green Button, and the DOE Standard Energy Efficiency Data Exchange (SEED) Platform. PG&E is using OEEM in its residential pay-for-performance HOPPs initiative.

²⁴ www.openeemeter.org.

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Strategy	Metrics/Time Frame	Lead/Partners
<p>3.2 Performance-Driven Value: Provide new tools and compensation arrangements to allow building professionals to expand their services and pursue additional work.</p> <p>3.2.1 Performance Assurance: Confirm energy savings outcomes using performance-based validation methods.</p> <ul style="list-style-type: none"> • 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.) <p>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.</p>	<p><i>Energy savings are predictably estimated and verified at substantially lower costs by 2019</i></p> <p><i>Pilots begin with utility 2016 programs</i></p>	<p><i>CPUC, POUs/program implementers</i></p> <p><i>CPUC, POUs/program implementers</i></p>

Strategy 3.3 Energy Efficiency Workforce Alignment

This plan update expands Strategy 3.3 to include the key elements of improving workforce performance, expanding energy efficiency workforce opportunities, and aligning education and training with industry priorities that will be needed to meet California’s aggressive energy efficiency savings goals. Education and training are included but now integrated into an overall landscape where workforce interventions are aligned with California’s energy efficiency related policies. These updates reflect the recommendations in the UC Berkeley Labor Center’s 2014 report to the CPUC: *Workforce Issues and Energy Efficiency: A Plan for California’s Utilities*.²⁵ (See sidebar.)

***Workforce Issues and Energy Efficiency:
A Plan for California’s Utilities***

High-level recommendations to the IOUs:

- Incorporate contractor and workforce standards into the energy efficiency program requirements.
- Redesign WE&T programs to align with, leverage, and influence California’s main training and education institutions.
- Create an inclusion program to broaden opportunities for workers from disadvantaged communities.

Workforce Alignment

This plan update recommends a focus on a fully integrated workforce alignment system that breaks down silos among market actors and creates synergistic initiatives shared by industry, education, and government. This focus will assure common agendas and consistent initiatives among all actors, bridging performance gaps via investments in workforce programs that are evidence-based,

replicable, and scalable. New plan strategies are added to include the following activities:

- Create an industry-led forum to break down silos and cultivate long-term relationships that align workforce performance with state mandates and improve energy efficiency investment returns. The industry-led forum should engage utilities, building owners and managers, contractors, developers, community colleges, registered apprenticeship programs, workforce development boards, community-based organizations, and government agencies.
- Identify and prioritize those occupations that are expected to have the most significant effect on meeting SB 350 mandates.
- Quantify supply and demand gaps where additional WE&T investments need to be made.
- Map workforce performance issues created by current knowledge, skills, and abilities (KSAs) to gaps in building performance as a means to drive investment into updated KSAs.
- Identify industry priorities for workforce standards—credentials that are accredited and employer-valued—as benchmarks for entry-level and incumbent worker programs.
- Align WE&T programs with the primary competencies of each education and training providers to maximize performance outcomes of each priority occupation.
- Cultivate research, innovation, development, experimentation, and refinement of evidence-based models as the basis for replicating and scaling transformative workforce system changes.

Streamlined career pathways are required for priority occupations. Employers are expected to have a prominent role in promoting job opportunities in priority occupations. Employers can work with community colleges, registered apprenticeship programs, workforce development boards, the utilities, and community-based organizations to attract students who are likely to complete their education and training and receive an accredited and employer-

²⁵ <http://laborcenter.berkeley.edu/workforce-issues-and-energy-efficiency-programs-a-plan-for-californias-utilities/>.

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valued credential. Employers should be offered incentives on a broad scale to engage incumbent workers in formal skills upgrade training, extensively using program funding like the Employment Training Program (ETP) and Workforce Investment and Opportunity Act (WIOA).

To provide new skills for incumbent workers, investment in technology-enabled learning is required. Courses and associated labs that could be accessed remotely at any time would allow for continuous skills development over the careers of workers in priority occupations. The industry-led forum should regularly update educators on evolving technologies informing curriculum to achieve system installation, operations, and maintenance required for high-performance buildings. Based on the foregoing, sector strategies should be developed and executed on the basis of priority occupations, technologies (HVAC, lighting controls, and others), and building type.

Current and Ongoing WE&T

Utilities across the STATE continue to offer education and training programs at no or reasonable cost to the public. The utilities have been responsive to this plan and other policy guidance by offering training on marketing energy efficiency programs, financing efficiency projects, retrocommissioning to enhance building performance, as well as specific high-performance certification programs. Examples of ongoing WE&T offerings through utility training centers include:

- Financial analysis of EE projects.

- “Finding Your Next Customer”: lead generation and other marketing strategies.
- Efficiency sales professional training.
- Building operator certification (BOC) training Levels One and Two and new BOC for multifamily buildings.
- BPI building analyst certification offered as of September 2016.
- HERS residential alterations certification.
- BPI’s building science principles online certificate.

Feedback from utility training participants has been positive and constructive, while identifying the need for more role-based or technology/project focused offerings. Moving forward, and in greater support of this plan, IOU WE&T programs see the value of including a wider array of building maintenance professionals, contractors, and technicians across various trades, and other key market actors, for targeted training efforts intended to reach a broader base of end-use customers. Participants need assistance in leveraging best practices that support their business models and the ability to effectively communicate and translate the value proposition of the work they are doing for the specific end user. These targeted efforts, along with others throughout the whole-building energy efficiency value chain, will assist the IOUs in developing comprehensive whole-building energy efficiency program and project sales training offerings.

Strategy	Metrics/Time Frame	Lead/Partners
<p>3.3 Energy Efficiency Workforce Alignment: Integrate efficiency-related education and training into an overall landscape where workforce interventions are directly mapped to state energy policy.</p> <p>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.</p>	<p>2015 - Obtain consensus on prioritized targets for workforce development, using 2013-2014 California WE&T Needs Assessment as a base.</p>	<p>Program implementers, community colleges, trade/ apprenticeship programs</p>

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Strategy	Metrics/Time Frame	Lead/Partners
<p>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.</p> <p>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.</p> <ul style="list-style-type: none"> Expand learning pathways to include online programs, intensive courses, and other formats and content that support both incumbent and new trade workers and professionals. <p>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.</p> <p>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.</p> <p>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.</p> <ul style="list-style-type: none"> Retrocommissioning (RCx): Work with the California Commissioning Collaborative (CCxC) to integrate retrocommissioning curricula into core WE&T training and education programs. Building Operator Certification: Integrate energy efficiency into building operator and property manager certification programs. <p>3.3.7 Identify Workforce Competencies That Must Be Developed to Meet a Doubling of Energy Efficiency by 2030: Use the state’s primary workforce education and training institutions to engage the building industry, map industry priorities for efficiency to major occupations that will provide services, identify workforce competency gaps, and quantify the work needed to build a workforce to implement high-quality efficiency projects at scale.</p>	<p><i>Incorporate KSAs into utility WE&T and state WE&T programs by 2016.</i></p> <p><i>Establish schedule and process by 2017 Curriculum adopted and standardized in 2018</i></p> <p><i>Address once curriculum improvements made in 2018</i></p> <p><i>2015 - 2018</i></p> <p><i>QA programs are standard practice by 2020 in all sectors</i></p> <p><i>RCx is standard practice for buildings 25,000 sf and bigger by 2020</i></p> <p><i>At least 50% of the commercial floor space is managed by certified operator/managers by 2020</i></p> <p><i>2017 - 2018</i></p>	<p><i>Employers, community colleges, DIR/DAS, WIBs, program implementers state universities, program implementers, WIBs, BOMA</i></p> <p><i>Same as above</i></p> <p><i>CEC (EPIC), CPUC, POU/WE&T programs</i></p> <p><i>Employers, WE&T programs/CPUC, POU, CEC</i></p> <p><i>CCxC, BOMA, trades organizations, utility WE&T programs, BOMA and other real estate owner/manager organizations</i></p> <p><i>CCCCO, Apprenticeship programs, WE&T programs/CPUC, POU, CEC</i></p>

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<p>3.3.8 Industry Action Plan: Create an industry-driven action plan that identifies activities needed to bridge competency gaps in the incumbent workforce, to upgrade education and training to entry-level workers, and to align the capacities of training entities to WE&T needs.</p>	<p><i>2017-2018</i></p>	<p><i>CCCCO, Apprenticeship programs, WE&T programs/CPUC, POUs, CEC</i></p>
<p>3.3.9 Engagement of Skilled and Trained Workforce: Ensure that a high-performing workforce will deliver energy efficiency retrofits in existing buildings, thereby transforming efficiency incentive work from a low-cost bidder framework to a lowest-cost qualified bidder framework.</p>	<p><i>2017 and ongoing</i></p>	<p><i>CPUC/IOUs/POUs, DGS, CEC</i></p>
<p>3.3.10 Ensure Energy Efficiency Work Provides Opportunities to Workers From Disadvantaged Communities: Ensure that minority, low-income, and disadvantaged communities are provided pathways to careers in the efficiency retrofit industry.</p>	<p><i>2017 and ongoing</i></p>	<p><i>CCCCO, Apprenticeship programs, WE&T programs/CPUC, POUs, CEC</i></p>

Strategy 3.4 Zero-Net-Energy Retrofits

The New Buildings Institute, sponsored by the CPUC, publishes a ZNE watch list²⁶ that publicizes zero and ultra-low energy performance buildings. (See sidebar.) The *Spring/Summer 2016 ZNE Watch List* includes more than 40 buildings across the education sector that are either verified as ZNE or are in the process of becoming so. With Proposition 39 funding for clean energy retrofits, more education buildings may soon be on the path to zero net energy. (See sidebar.)

ZNE State Buildings

The Governor's Executive Order B-18-12 sets an aggressive goal of retrofitting half of the state's existing building stock to ZNE levels of energy performance by 2025. Because it is best practice in ZNE buildings to achieve high levels of energy efficiency before meeting remaining energy needs with a renewable source, the Department of General Services (DGS) is working on guidelines for ZNE levels of energy use intensities (EUIs) for existing buildings. Given the wide variety of building types, occupancies, and uses of state buildings, the DGS guidelines will likely include EUI thresholds that are building type and business use specific.

Zero-Carbon Buildings in California: A Feasibility Study

ARB is funding a research project to assess the practicality and appropriate time frame for a zero or near-zero carbon building state policy or program, which can put California on track to achieve long-term climate goals. This research project will assess the feasibility of building-scale transportation, water, and waste management strategies to supplement existing ZNE goals. The research team will quantify GHG reduction in zero-carbon buildings, as much as possible.

California's ZNE Watch List
Zero Energy & Ultra-Low Energy Buildings

“California leads the country in both policy and projects that are laying the path to a zero net energy (ZNE) future. Leading design firms and owners have already recognized the real estate and occupancy advantages of these high performance buildings and today California has 108 commercial buildings either verified (17) as ZNE or emerging (91) toward that target.”

Source: New Buildings Institute, Spring 2016.

²⁶ New Buildings Institute. “Spring/Summer 2016 California ZNE Watchlist.” 2015. http://newbuildings.org/wp-content/uploads/2016/07/CA_ZNE_Watchlist_SpringSummer2016.pdf.

Strategy	Metrics/Time Frame	Lead/Partners
<p>3.4 Scale Up Zero-Net-Energy Retrofits: Exponentially increase the number of ZNE retrofit projects completed in California.</p> <p>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. <i>Where possible, establish energy use intensity (EUI) targets for ZNE buildings, both newly constructed and retrofit.</i></p> <p>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.</p> <p>3.4.3 Provide Incentives and Other Financing Mechanisms: Make financing widely available for ZNE retrofits.</p>	<p><i>2017 and ongoing</i></p> <p><i>State building EUI targets - 2017</i></p>	<p><i>CPUC, POU's, DGS, DSA, CEC/program implementers</i></p> <p><i>CPUC, POU's, CEC (EPIC)/program implementers</i></p> <p><i>CPUC, POU's/program implementers, financial institutions</i></p>

Goal 4. Recognized Value of Energy Efficiency Upgrades

Objective: Building values reflect energy performance and associated benefits.

Strategy 4.1 Real Estate Value

Increasing Engagement in the Real Estate Market

The year 2016 saw the development of utility companies’ efforts to increase the role of energy efficiency in the real estate market. Working groups and studies, funded through the Statewide Codes and Standards Program, highlighted the potential for increasing awareness of and creating market demand for energy efficiency during real estate transactions. The preliminary results of a survey conducted by Build It Green in collaboration with Oakland-Berkeley Association of Realtors and the California Regional Multiple Listing Service revealed that 70 percent of Realtors® are interested in using energy efficiency or green features as a selling point. The survey results also identified a lack of understanding of home performance and difficulty in confirming seller’s claims

as the top challenges facing the market for green homes.²⁷ It will be important to encourage voluntary disclosure protocols and other strategies that value efficiency features based on the associated realized energy-saving benefits, so that consumers and their agents can make informed real estate decisions.

SDG&E offers training for real estate professionals on the value of energy efficiency in homes and is engaging home appraisers to include energy efficiency as part of the criteria for the value of a home. An emerging best practice, SDG&E includes an energy efficiency audit as part of area home inspections, so that buyers may be compelled to request that sellers include upgrades for less efficient homes.

²⁷ Build It Green, 2016. “Statewide Realtor Survey.” Discussion at Green Real Estate Working Group. Meeting Summary via email. September 15, 2016. Facilitator: StopWaste.org

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Energy Asset Ratings With the Real Estate Industry

The Real Estate Standards Organization (RESO), U.S. DOE, and multiple listing services (MLSs) across North America are well-equipped to integrate energy efficiency data into real estate listings. However, the following challenges remain:

- Few existing properties have performance rating data for the home appraiser to review for “comparables,” making it difficult to ascertain the market value of the home.
- The existence of multiple rating systems makes it difficult to compare properties.
- Sellers hesitate to spend money to obtain a rating as the market demand for energy-efficient properties has not yet scaled sufficiently.

Standardization of performance ratings continues to be important, and making the rating data available to both MLS and assessor tax databases is critical to promoting data flow into the market. There is a need to create and embed tools within MLS databases to cross-map disparate ratings. Development of such tools is recognized as a new strategy in this update.

Regarding home energy asset ratings, RESNET is developing a rating standard for water use. As discussed under Strategy 1.4, the Energy Commission plans to consider adding water efficiency considerations and/or metrics to California HERS ratings.

The U.S. DOE's Home Energy Information Accelerator is designed to expand the availability and use of reliable home energy information at relevant points in residential real estate transactions. California's 79 accelerator partners will develop replicable approaches to make energy related information available through MLS and other reports.²⁸ The aggregation of solar installation data is a promising

example of how bringing existing data into real estate databases can increase the understanding of value.

Energy and Water Cost Savings

Another segment of clean energy data that will need to be brought into the MLS databases is energy storage, that is, demand for properties that store locally generated energy or take advantage of off-peak energy costs. Information on air quality and water efficiency are also valuable and will require standardized data terms for effective communications within real estate markets.

The CPUC developed and approved a water-energy cost calculator that estimates embedded energy in water to support water-energy nexus programs. Improvements to the calculator are planned for late 2016. The CPUC is considering several pilots that will maximize the use of smart meter data to provide customer feedback for both water and energy usage in one platform. The water-energy nexus is a priority topic in Energy Upgrade California's marketing materials.

Green Leases

National advocacy organizations are working to broaden understanding of the benefits of green leases²⁹ in the commercial market as well. The sidebar summarizes work by the Institute for Market Transformation and the Rocky Mountain Institute in this area³⁰.

²⁸ U.S. Department of Energy. “Home Energy Information Accelerator.” 2016. <http://energy.gov/eere/buildings/downloads/home-energy-information-accelerator>.

²⁹ Vaughn, Kelly. “IMT and RMI's New Green Lease Tools Help Tenants Compare Building Performance.” *RMI Outlet*, Rocky Mountain Institute, 2016. http://blog.rmi.org/blog_2016_08_08_IMT_and_RMIs_New_Green_Lease_Tools_Help_Tenants_Compare_Building_Performance#.

³⁰ http://blog.rmi.org/blog_2016_08_08_IMT_and_RMIs_New_Green_Lease_Tools_Help_Tenants_Compare_Building_Performance.

Green Lease Questionnaire and Calculator

In September 2016, the Institute for Market Transformation, in partnership with the Rocky Mountain Institute, launched the green lease questionnaire and calculator for prospective and current tenants to understand, negotiate, and implement green leases. These first-of-a-kind tools aim to better assess “soft benefits” of high-performance buildings such as improved employee health, productivity, and retention, which are often overlooked because they are difficult to quantify.

Strategy	Metrics/Time Frame	Lead/Partners
<p>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.</p>	<p><i>Energy efficiency is integrated into all real estate transactions by 2018</i></p>	<p><i>CEC, appraisal industry/CPUC, POUs</i></p>
<p>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.</p> <ul style="list-style-type: none"> • 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. 	<p>2017</p>	<p><i>CEC, CAR, LGs, Appraisal industry/IMT</i></p>
<p>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.</p>	<p>2016 - 2017</p>	<p><i>CEC, CPUC/program implementers</i></p>
<p>4.1.3 Energy Efficiency Appraisals: Work with industry agents to advocate and expand the inclusion of the value of energy in appraisals.</p> <ul style="list-style-type: none"> • 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. 	<p><i>Energy efficiency in appraisals is standard practice by 2020 and accepted by financial institutions</i></p>	<p><i>CEC, CAR, LGs, Appraisal industry/IMT</i></p>

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Strategy	Metrics/Time Frame	Lead/Partners
<p>4.1.4 Property Listings: Incorporate energy efficiency into property and lease listings. Work with MLS boards to make reliable home energy information available at various transaction points. Include energy asset ratings as soon as is practical.</p> <p>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.</p> <ul style="list-style-type: none"> • Collaborate with real estate industry to develop and 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. <p>4.1.6 Compare rating systems across each other: Develop tools and methods that allow translation between different rating systems existing in the marketplace to eliminate market confusion. Embed such tools into the MLS databases.</p>	<p><i>Third-party real estate listings include energy as a standard feature in 2017</i></p> <p><i>Green lease clauses are standard by 2020 for commercial and multifamily buildings</i></p> <p><i>2017-2018</i></p>	<p><i>DOE/MLS boards, Local listing services, CAR</i></p> <p><i>LGs, commercial leasing agents, real estate data companies</i></p> <p><i>CEC/MLS boards, CAR</i></p>

Strategy 4.2 Marketing, Education, and Outreach

Targeted Data- and Research-Driven ME&O

Energy Upgrade California is well-established as a marketing platform for all demand-side programs in California. According to a recent evaluation, the program has an aided awareness rate of 20 percent—meaning 20 percent of Californians recognize the brand once given cues about it. The EUC brand is characterized by “Bear,” who comes off the California flag to give consumers tips on energy savings in marketing materials and at events. The use of this iconic *ursus* (i.e., bear) is meant to connect energy management and savings with a sense of California pride.

In 2016, the CPUC has been working to take EUC to the next level. According to the CPUC, ME&O should play a significant role in meeting the state's ambitious greenhouse gas reduction goals. To that end, the CPUC has selected a program administrator to continue implementing EUC. The CPUC will work with the program administrator to create an integrated five-year ME&O roadmap that will encompass marketing strategies for EUC and other program administrators. Inputs to the five-year roadmap include this *EBEE Action Plan*, the energy efficiency business plans, the marketing plan being developed for time-of-use rates, and other demand-side proceedings. One-year action plans are being developed that will provide detail to the five-year ME&O roadmap.

A challenge for EUC is contributing to SB 350's goal of doubling efficiency. Currently, the statewide program is separate from the utility ME&O programs due to the geographic limitations of the IOU service territories. Efforts need to be integrated to create a more seamless presence in the market.

Public Awareness Campaign

Stakeholders have encouraged the Energy Commission and the CPUC to include a public education and awareness campaign in statewide ME&O efforts. Similar to what drew public attention to the drought, Californians need to be exposed to clear messages from multiple media channels that communicate the urgency of the role that energy efficiency plays in combatting climate change. This campaign should inform and demonstrate that saving energy is smart,

cost-effective, and beneficial for them, the State, the country, and the world. The campaign, which should be developed with input from stakeholders, must be a simple, understandable message that will lead to consumers directly to utility programs in their local area.

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Strategy	Metrics/Time Frame	Lead/Partners
<p>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.</p> <p>4.2.1 Establish Statewide Market Transformation Entity</p> <ul style="list-style-type: none"> Solicit for and select an organization to implement market transformation in coordination with other energy efficiency initiatives. <p>4.2.2 Align Statewide ME&O Efforts With EBEE Action Plan:</p> <ul style="list-style-type: none"> Assign Existing Building Efficiency Collaborative oversight of Energy Upgrade California brand activities. <ul style="list-style-type: none"> Determine the extent of alignment and coordination of <i>Action Plan</i> programs with use of the Energy Upgrade California brand. Encourage behavior and operational marketing messages by Energy Upgrade California in line with plan goals. <p>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.</p> <ul style="list-style-type: none"> 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 CaLEAP³¹ 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. <p>4.2.4 Energy Upgrade California: Align energy efficiency elements of Energy Upgrade California ME&O with action plan and determine relationship to programs.</p> <ul style="list-style-type: none"> 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. <p>4.2.5 Create and Promulgate a Public Awareness Campaign: Broadly disseminate messages through multiple media channels to communicate the urgency of increasing energy efficiency to combat climate change.</p>	<p>2016</p> <p>2016 and ongoing</p> <p>Marketing plan complete by 2017; activities begin in 2017</p> <p>2016 and ongoing</p> <p>2017 and ongoing</p>	<p>CPUC, CEC</p> <p>CPUC/EUC, POU, LGs, CEC, EUC partners</p> <p>CPUC, POU, LGs</p> <p>EUC/CPUC, POU, CEC, EUC partners</p> <p>EUC/CPUC, POU, CEC, EUC partners</p>

31 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 Solutions

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

The 2015 EBEE Action Plan documented the need to achieve a private capital investment in the state's energy efficiency efforts on the order of \$10 billion.³² With the SB 350 mandate to set targets to double statewide efficiency savings, financing needs will be larger yet. It is unreasonable to expect ratepayers to incur rate increases large enough to provide subsidies for the needed energy efficiency investments. Traditional finance mechanisms (for example, home improvements loans, consumer credit cards, small business loans and leases) have mobilized only a small fraction of the cost-effective potential for energy efficiency.

There is a need to mobilize large amounts of private capital, through mechanisms and transaction structures that present scale economies and with lower interest rates and/or longer payback periods (years) than have been traditionally offered through conventional lending products. Attracting private capital will require some protections against lender losses. Developing energy efficiency performance data streams hopefully will enable financing terms to become more attractive for efficiency investments.

Database of Finance Payment and Project Performance Histories

The California Hub for Energy Efficiency Financing (CHEEF), funded by IOU ratepayers and administered by CAEATFA, is expected to establish a database framework to record energy savings and loan repayment performance data on all transactions handled by the CHEEF. Transactions data collection would be required of all lender and contractor participants in CHEEF-supported finance pilot programs. The database might also be extended to include more limited information about PACE transactions enrolled in the CAEATFA PACE loss-

reserve guarantee initiative, local government programs, and on-bill financing.

IOU Financing Pilots

CAEATFA CHEEF received budget authorization commencing in the 2014-15 fiscal year to administer a set of pilots to attract private capital-market funds for energy efficiency transactions. The finance pilots under development by IOUs and CAEATFA encompass multiple sectors (single-family, multifamily, small, and large nonresidential) and multiple finance products (loans, leases, energy services agreements). The pilots will include the option for lenders to use alternative credit criteria such as utility bill payment history. Credit enhancements are also being offered to lenders to encourage lending in energy efficiency at more competitive terms.

As of July 2016, the single-family pilot, Residential Energy Efficiency Loan (REEL) Assistance Program has been launched, targeting low- to moderate-income households. The remaining pilots relying on on-bill repayment functionality are anticipated to launch in 2017.

Start-up for this complex set of functions is proving to be challenging among the various stakeholders and their regulatory frameworks (IOUs and private capital) within a state government budget, recruitment, and operational structure.

As directed by the Legislature, CAEATFA, together with the CPUC and a formal advisory board, prepared a recommended evaluation approach in 2016 to compare the results of the pilots with Property Assessed Clean Energy (PACE) and traditional utility on-bill financing methods of supplying capital for efficiency improvements.

PACE Progress

Residential PACE transactions in California have exceeded \$2 billion in the last three years, primarily in the single-family residential market. There are a half-dozen program administrators, mostly private, working in collaboration with local governments or joint action collectives. Transactions encompass

³² 2015 Existing Buildings Energy Efficiency Action Plan, p. 3: http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN206015_20150904T153548_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf.

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energy efficiency, solar, and water efficiency improvements. There is no statewide compendium to profile the allocation of funds across types of improvements.

In 2014, CAEATFA initiated a loss reserve mechanism to protect all first-mortgage lenders from any direct losses associated with first-priority PACE liens on residential properties in California. As of March 2016, more than 56,000 residential PACE financings with an outstanding value of more than \$1.2 billion have enrolled in the program, representing origination activity through December 31, 2015. To date, no claims have been made against the loss reserve.

In July 2016, the White House announced that FHA- and VA-issued or insured mortgages would accept PACE lien transactions structured akin to customary property tax liens. This opened some of the federally supported mortgage market to eligibility for PACE transactions. However, Federal National Mortgage Association backing still does not accept mortgages with PACE liens if the liens are "senior" to the insured mortgage.

Key Barriers to Commercial Efficiency Investments

The University of California at Berkeley and the University of California at Los Angeles, with funding from Bank of America, convened a forum last year of finance, building performance, utility, government, and environmental experts. The forum explored how to tap the efficiency potential in existing commercial buildings. Much of the discussion focused on ways to attract and unleash capital to surmount both split incentives and short-term investment horizons witnessed in the commercial sector. A forum report released in March 2016 recommended four types of solutions:³³

- Utility efficiency programs using pay-for-performance structures
- Pilot efforts to use normalized metering technologies to inform performance

- Rate designs, tariffs, or other mechanisms that encourage "bundled" solutions—efficiency, solar, demand response, storage
- Workforce development to support performance-driven business models

After the forum, private businesses involved in financing capital transactions for commercial buildings have been exploring with PG&E how to test new contractual arrangements to deliver energy management on a performance basis and leverage private capital to overcome barriers.

Integrated and Streamlined Delivery of Efficiency Solutions, Finance, and Utility Incentives.

In 2016, PG&E received approval of its High Opportunity Programs or Projects (HOPP) proposal to test a modified on-bill financing (OBF) program for nonresidential buildings that relies upon a market-based project origination and savings validation process developed by the Investor Confidence Project³⁴. This includes meter-based energy savings tracking and eschews paying traditional utility financial incentives to the building owner. PG&E's alternative on-bill financing program (OBF AP) will not require a preinstall review by PG&E, saving time and allowing contractors and customers to get started when they are ready. If the contractor and customer choose to forego the preinstall review, they will also avoid the need for a loan modification agreement at the post-install stage, saving additional time. Since OBF AP is not being paired with a rebate/incentive, payment to the customer can be made as soon as postinstall documents have been received and approved. There is no need to wait for separate rebate/incentive processing.

Several private firms, including Noesis and Joule Assets, have formed their business models around supporting contractor-initiated energy management transactions to expedite and close higher percentages of transactions for small and medium business establishments.

³³ Berkeley Law, Center for Law, Energy & the Environment and the Emmett Institute on Climate Change and the Environment, UCLA. *Powering the Savings: How California Can Tap the Energy Efficiency Potential in Existing Commercial Buildings*, March 2016.

³⁴ The Investor Confidence Project was introduced in the 2015 EBEE Action Plan and details can be found here: <http://www.eepformance.org/>.

Government Building Finance Mechanisms

Government buildings continue to be eligible for zero-interest on-bill financing loans from IOUs at higher maximum loan amounts than offered to private businesses.

In 2015, the California Infrastructure Bank initiated its California Lending for Energy and Environmental Needs (CLEEN) Center.³⁵ The CLEEN Center offers financing to state and local governmental subdivisions and certain nonprofit entities for projects that help the State meet GHG reduction goals or result in other environmental benefits within California. Eligible projects may include energy efficiency, renewable energy, water efficiency, clean transportation projects, energy storage, and other alternative technologies and fuels. The first transaction was a \$7.7 million lease arrangement to the City of Huntington Beach for a project to convert street lighting to LEDs.

Establish Deeper Subsidies for Full Participation by Low-Income Households

In August 2016 the CPUC issued alternative proposed decisions to guide expenditures for the IOU low-income Energy Savings Assistance (ESA) program. A final decision is expected in late 2016. The CPUC decision is expected to address modifications to implementation rules on eligible efficiency measures; coordination across multiple programs and leveraging funds under various regulations; decisions on what expenditures are allowable for common areas of multifamily buildings with low-income households; and direction for achieving improved program effectiveness.

Cap-and-Trade Funds

About \$75 million has been appropriated in each of the last two fiscal years to fund the installation of energy efficiency and renewable energy projects in single- and multifamily low-income housing units within disadvantaged communities. In 2015, CSD

launched its Low Income Weatherization Program (LIWP), which is funded by the California Cap-and-Trade Program. The first operationalized components of LIWP were designed to provide weatherization and energy efficiency services to single-family and small multifamily buildings, as well as single-family solar photovoltaic systems to residents living in disadvantaged communities³⁶.

LIWP's initial single-family and small multifamily weatherization program relied heavily upon leveraging federal Low-Income Home Energy Assistance Program (LIHEAP) funds to provide assessment, diagnostics, and health and safety measures to qualified homes. It also used LIWP funds solely to install energy GHG-reducing measures. Because LIHEAP funds are available to only a limited number of community-based organizations and public agencies, CSD is redesigning LIWP to broaden the pool of energy weatherization providers that may compete to provide services under the 2015 to 2016 LIWP allocation. This pool may include utility contractors that can participate and potentially leverage both ESA program funding and low-income energy usage information that will help target services to homes where energy efficiency measures can be installed to optimize energy and GHG reduction.

³⁵ For details on the CLEEN Center, see: California Infrastructure and Economic Development Bank. *Criteria, Priorities, and Guidelines for the Selection of Projects*. 2015. http://www.ibank.ca.gov/Portals/1/cleen/Criteria_%20Priorities_%20and%20Guidelines%20for%20the%20Selection%20of%20Project-s-CLEEN%20...pdf.

³⁶ Defined by CalEPA's CalEnviroScreen 2.0 tool.

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Strategy	Metrics/Time Frame	Lead/Partners
<p>Strategy 5.1 Foster Private Capital Market Establish a robust financing market infrastructure that will attract large private capital.</p> <p>5.1.1 State Finance Council: Establish a unified state council to shepherd clean energy capital offerings and identify priority needs.</p> <p>5.1.2 Database: Develop a unified database of finance payment and project performance histories.</p> <p>5.1.3 Pilots: Assess IOU financing pilots (credit enhancements, on-bill repayment) alongside PACE and other finance products.</p> <p>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.</p> <p>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).</p>	<p><i>TBD</i></p> <p><i>Database contract to start 2016</i></p> <p><i>Evaluation findings in phases 2016 - 2017</i></p> <p><i>TBD</i></p> <p><i>TBD</i></p>	<p><i>Infrastructure Bank</i></p> <p><i>CPUC/CAEATFA, LGs</i></p> <p><i>CPUC and CAEATFA, LGs</i></p> <p><i>Interagency Council, LGs</i></p> <p><i>Interagency Council, LGs</i></p>
<p>Strategy 5.2 Asset-Based Financing Foster the development of easy-to-access financing mechanisms tied to building asset.</p> <p>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.)</p> <p>5.2.2 PACE: Support the implementation of property assessed clean energy financing (PACE) for residential and commercial properties.</p> <p>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.</p>	<p><i>Ongoing</i></p> <p><i>Ongoing</i></p> <p><i>Ongoing</i></p>	<p><i>CEC/CA Mortgage industry; CAR, DOE, EPA, Nat’l mortgage orgs regulators</i></p> <p><i>CAEATFA/ LGC,SEEC,ILG, LGs, private PACE administrators (for-profit)</i></p> <p><i>CPUC/utilities, multifamily and commercial real estate leaders, POUs, LGs</i></p>

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Strategy	Metrics/Time Frame	Lead/Partners
<p>Strategy 5.3 Borrower-Based Financing Obtain attractive terms and broader eligibility for unsecured (residential projects < \$25K, equipment replacement) owner/occupant loans.</p> <ul style="list-style-type: none"> • 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. 	<p><i>CPUC/CAEATFA pilot evaluations (2016+)</i></p> <p><i>2016 - 2019</i></p>	<p><i>CPUC, CAEATFA, LGs</i></p>
<p>Strategy 5.4 Integrated and Streamlined Delivery of Efficiency Solutions, Finance, and Utility Incentives</p> <p>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.</p> <p>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.</p> <p>5.4.3 Alternative Models: Explore alternative capital sources and/or turnkey efficiency services, where invested capital is repaid via (e.g.):</p> <ul style="list-style-type: none"> • “Preferred resource” utility procurement mechanism (See Strategy 1.8). • Owner/occupant energy service tariff. 	<p><i>Phased implementation 2014 - 2016 during CAEATFA pilots</i></p> <p><i>Pilots evaluation 2016/ CPUC guidance for 2017+ programs/ POU consider on own</i></p> <p><i>SCE local procurement CPUC proceeding 2015 - 2016</i></p> <p><i>TBD for tariff concept</i></p>	<p><i>CPUC, program implementers, LGs</i></p> <p><i>CPUC / CEC</i></p> <p><i>CPUC, CAEATFA, LGs, utilities (IOUs and POU)</i></p>
<p>Strategy 5.5 Government Building Finance Mechanisms Ease funding mechanisms to support special needs of government energy efficiency improvements. (See Strategy 1.1.1.)</p> <p>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.</p> <p>5.5.2 Energy Service Agreements: Develop and promote energy service agreements (similar to solar power purchase agreements) as hybrid of utility bill plus energy improvement repayment.</p>	<p><i>Assess need, volume, credit qualities by 2015</i></p> <p><i>Ongoing</i></p> <p><i>2015 and ongoing</i></p>	<p><i>Infrastructure Bank</i></p> <p><i>Infrastructure bank/ESCOs, Legislature, capital markets, CPUC, utilities ESCOs, utilities, LGs</i></p>
<p>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.</p>	<p><i>TBD</i></p>	<p><i>CEC/NASEO, USDOE</i></p>

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Strategy	Metrics/Time Frame	Lead/Partners
<p>Strategy 5.7 Establish More Effective Capital Mobilization for Full Participation by Low-Income Households</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p><i>Revised programs in place by 2016</i></p> <p><i>CPUC 2014 directive to low income proceeding, CPUC pending decision may expand capital deployment on multi-family low income. New direct install and/or financing for MF authorized via HOPPs in 2016 for all incomes. CHEEF pilot for MF affordable housing anticipated to launch 2017. Effective for 2016</i></p> <p><i>Limited progress during 2015 - 2016 cycle low-income programs and budgets. Pending CPUC decision may spur more innovation 2017 and beyond.</i></p>	<p><i>CPUC/utilities/ program implementers, LGs</i></p> <p><i>CSD/ ARB/CPUC, LGs</i></p> <p><i>CPUC/IOUs, POUs on own, LGs</i></p>

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