



### Energy Efficiency

#### Introduction

Energy efficiency entails using advancements in technology to provide the same or better level of energy service<sup>1</sup> to a consumer, while using less energy. Energy efficiency efforts in California have reduced energy demands, made businesses more competitive, and allowed consumers to save money, improve health, and increase comfort. Energy efficiency is a critical element of the state's energy policy that can reduce the need for new electricity generation. Established in 2003 by the state's principal energy agencies, the loading order policy directs that California's energy demands be met first by efficiency and demand response before new generation is considered. The loading order is a core component of diverse, reliable, low-carbon energy supplies. Highly efficient products and practices increasingly bundle with modern digital communication and control features, which promise to provide highly enhanced functionality for customers as well as valuable and much-needed grid flexibility. At sufficient scale, energy efficiency can reduce the need for both fossil and renewable generation, thus increasing system flexibility while lowering costs of all energy supply scenarios.

California has long been a leader in advancing appliance and building energy efficiency. Over the last 40 years, California has implemented cost-effective appliance and building energy efficiency standards that have saved consumers billions of dollars. Combining efficiency gains from standards and guidelines, efficiency programs, and market and price effects, the cumulative annual efficiency and conservation savings for electricity were estimated to surpass 95,000 gigawatt hours (GWh) by 2016, as shown in **Figure 1**.<sup>2</sup> This amount of energy savings is equivalent to the annual carbon dioxide emissions produced by more than 7 million automobiles and equivalent to the amount of energy produced annually by more than 31,500 MW power plants.

The Energy Commission's earliest efforts on energy efficiency focused on reducing the need for expensive and environmentally impactful power plants. The very first energy conservation standards for buildings and appliances in the nation were developed by the Energy Commission in the 1970s. Today, the Energy Commission builds on this foundation of balancing environmental and cost concerns to provide California citizens energy that is affordable and environmentally sustainable.

This document tracks the Energy Commission's progress of these efforts toward meeting energy efficiency targets and goals. Below is a description of the Energy Commission's efforts through appliance standards and guidelines, building energy efficiency standards, advancing energy efficiency in existing buildings, statewide commercial building benchmarking and disclosure, the Proposition 39 K-12 program, the Energy Conservation Assistance Act loan program, developing

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<sup>1</sup> "Energy service" includes all the ways people use energy, including for lighting, heating, and air conditioning.

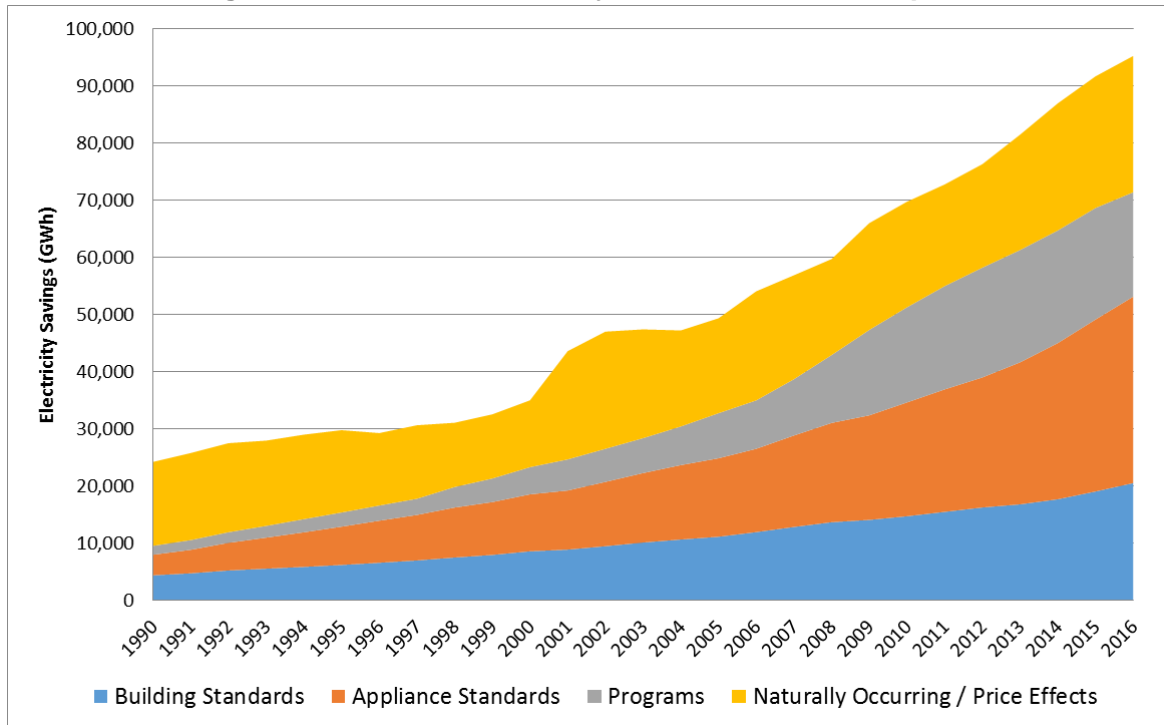
<sup>2</sup> These savings measure relative to conditions in 1975, before implementation of the first efficiency standards.



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and applying modern data resources, and extending benefits to low-income persons and disadvantaged communities.

**Figure 1: Statewide Efficiency and Conservation Impacts**



Source: California Energy Commission, Demand Analysis Office, 2015

### *The Governor and California Legislature Aim to Strengthen Energy Efficiency*

One of the most important drivers of energy efficiency in California is the commitment of the Governor and Legislature, who have put in place a set of ambitious mandates, policies, executive orders, and goals for reducing climate pollutants and improving the energy performance of California's economy. In his 2015 inaugural speech, one of the goals Governor Edmund G. Brown Jr. put forward was to double the efficiency of existing buildings and make heating fuels cleaner by 2030. Governor Brown's energy efficiency goal was codified in [Clean Energy and Pollution Reduction Act of 2015](#) (Senate Bill 350, De León, Chapter 547, Statutes of 2015), among other important provisions to help reduce greenhouse gases (GHGs) from California's energy system.

### *Senate Bill (SB) 350*

SB 350 calls for the Energy Commission to establish targets that will achieve a cumulative doubling of energy efficiency savings by 2030. Achievement of the savings targets called for by SB 350 will necessitate additional energy efficiency innovation in buildings and appliances—the historic focus of California's energy efficiency work—but will also require savings in industry and



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agriculture, areas that have received less attention but where additional potential may exist. SB 350 also directs that specific attention be paid to ensuring that the benefits of energy efficiency are felt by low-income Californians. SB 350 continues, enhances, and expands the existing building energy efficiency program established by [Assembly Bill 758 \(Skinner, Chapter 470, Statutes of 2009\)](#) and contained in the [Existing Building Energy Efficiency Action Plan](#). In January 2017 in response to SB 350, the [Low-Income Barriers Study](#) was adopted by the Energy Commission, which includes recommendations for improving access by low-income customers to energy efficiency and weatherization investments, including those in disadvantaged communities.

### *Assembly Bill (AB) 802*

[Assembly Bill 802 \(Williams, Chapter 590, Statutes of 2015\)](#) establishes a new statewide building energy use benchmarking and public disclosure program for commercial and multifamily buildings larger than 50,000 square feet. The Energy Commission’s statewide benchmarking and disclosure program regulations are proposed; formal adoption is expected in late 2017, with full program rollout in mid-2018. AB 802 also provides clear direction for California’s utilities to provide whole-building data access to commercial and multifamily building owners. The legislation removes previous transaction-based disclosure requirements put in place by [AB 1103 \(Saldaña, Chapter 533, Statutes of 2007\)](#).

AB 802 also requires “existing conditions baselines” be used where appropriate to determine levels of ratepayer-funded assistance to utility customers; oversight over the design and evaluation of efficiency using meter-based savings approaches; and reasonable adjustments to energy demand forecasts to account for new existing conditions baselines deployed in efficiency programs.

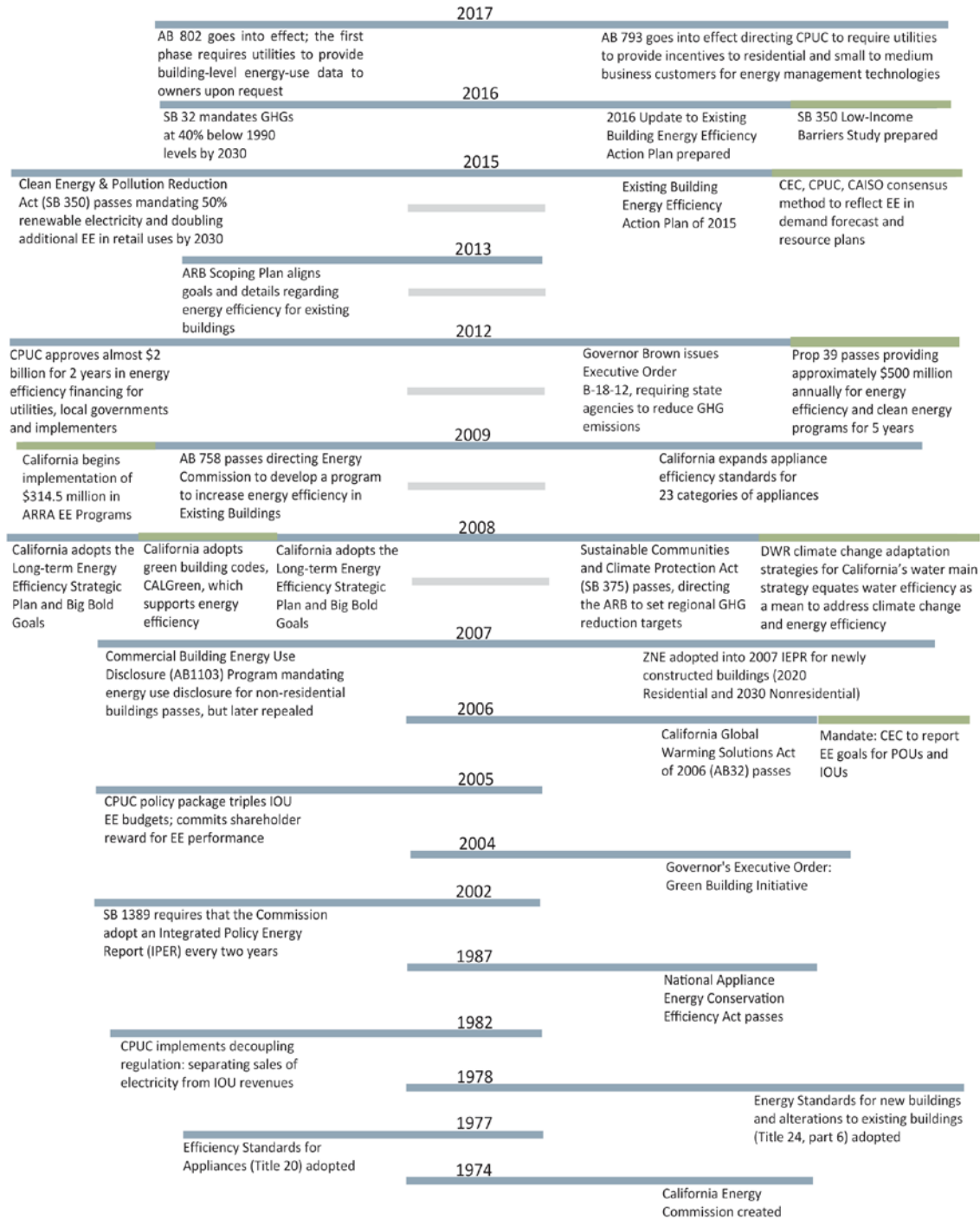
### *Other Policy Drivers*

**Figure 2** shows the timeline of major state policies from the 1970’s to date that address climate change in general and energy efficiency specifically.



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**Figure 2: Policy Timeline of Major Energy Efficiency Policy Measures**



Source: California Energy Commission, Existing Buildings Unit, January 2017



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### *Energy Efficiency Research Brings Innovation to Building and Appliance Efficiency Standards and to the Marketplace*

California's pursuit of a low-carbon future will hit a critical milestone in 2030. To reach the targets for energy efficiency and greenhouse gas reductions, the pace of technological progress will need to increase exponentially. This includes support for pre-commercial technologies and strategies at the applied lab level, large-scale demonstrations to reflect real life operating conditions, and finally market facilitation to support deployment and expand access to clean energy technologies.

At the applied and demonstration level, information on equipment and technology operations and test data are needed to help inform and justify the need for future building and appliance energy efficiency standards. Investment in research in this area has yielded enormous return for California ratepayers. For example, the Energy Commission invested \$27.8 million<sup>3</sup> leveraging \$7.4 million in match funds in building and appliance efficiency research that contributed to 15 code changes between 2005 and 2016, which will save ratepayers over \$10 billion by 2025. More than 90 percent of the energy savings during this period will accrue to electricity ratepayers. These savings will increase as California's economy continues to grow. Relative to the initial investment, energy efficiency research supported by funding from the Energy Commission's Public Interest Energy Research program is on track to generate an enormous return for California's electricity ratepayers. In fact for every \$1 in research and development funding, Californians will gain over \$350 in cost savings.<sup>4</sup>

Several technologies developed through the Energy Commission's research program are now available in the market place including adaptive lighting controls, aerosol duct sealing, building performance controls, data center cooling, and tartrate removal from wine. These technologies were demonstrated and shown to have substantial savings as a result of funded research. Future research will continue to focus on technology advancements to drive cost and performance improvements of energy efficiency components that aim to<sup>5</sup>:

- Accelerate the adoption rate of energy efficiency upgrades in existing buildings and facilities.
- Increase cost effective options for energy efficiency in future buildings.
- Electrify traditionally non-electric appliances and equipment.
- Improve the energy efficiency of the industrial sector.

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<sup>3</sup> This is the nominal figure consisting of research funded in consumer electronics and lighting and mechanical systems that helped inform building and appliance standards between 2005 and 2016.

<sup>4</sup> ten Hope, Laurie, 2017, Fostering Energy Innovation, Senate Energy Utilities and Communications Committee Staff Briefing.

<sup>5</sup> California Energy Commission, 2017. *The Electric Program Investment Charge: 2018 – 2020 Proposed Triennial Investment Plan*, Staff Report. Publication Number: CEC-500-2017-023-SF.



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### *Appliance Efficiency – Standards and Guidelines*

Drawing on its research and development work in energy efficiency, California continues to lead in setting the most aggressive appliance energy and water efficiency standards in the nation and globally. California appliance standards often become the de-facto national standards ahead of other states and the federal government. Over time, appliance standards have achieved the most energy savings, more than the building energy standards, utility and public agency efficiency programs, and naturally occurring savings, as shown in **Figure 1**.

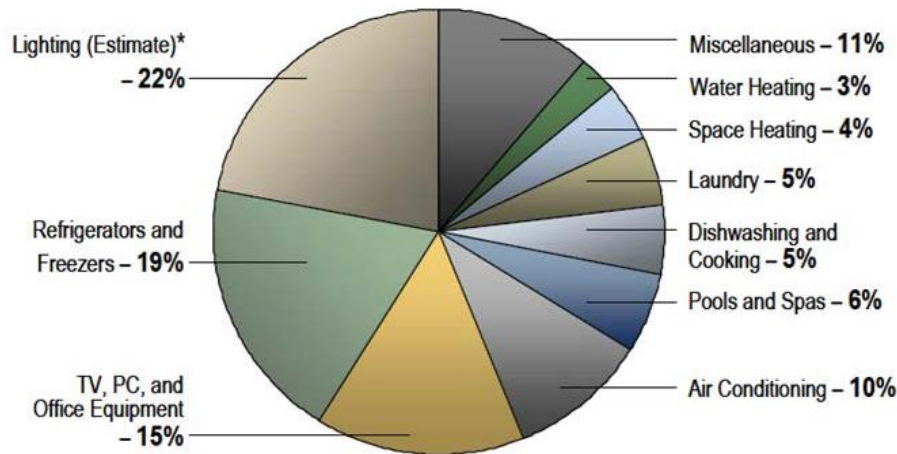
Title 20 of the California Code of Regulations includes the appliance efficiency standards, and these regulations cover most major residential and commercial appliances sold or offered for sale in California. The Energy Commission sets minimum efficiency levels for both energy and water consumption in many types of products, including consumer electronics, such as computers, televisions, and networking equipment; household appliances such as refrigerators and clothes washers; and plumbing equipment, such as toilets and faucets.

As **Figure 3** below indicates, appliance efficiency standards are a key tool to reducing the energy consumption from products inside the home. The goal of these standards is to shift the marketplace toward more efficient products, providing significant, cost-effective energy savings to California consumers without affecting the utility or functionality of the products.



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**Figure 3: Statewide Average Electricity Use per California Household (5,914 Kilowatt-Hours [kWh] per Household)**



Source: *California Energy Efficiency Strategic Plan Update*, January 2011

**Table 1** lists all products regulated under both state and federal standards.

**Table 1: Full List of Products Regulated Under State or Federal Appliance Standards**

| Category                     | Appliance                             | Type                         |
|------------------------------|---------------------------------------|------------------------------|
| Air Filters                  | Air Filters                           | Regulating Entity            |
| Central Air Conditioners     | Computer Room Air Conditioners        | State- & federally regulated |
|                              | Evaporatively Cooled Air Conditioners | Federally regulated          |
|                              | Large & Very Large Air Conditioners   | Federally regulated          |
|                              | Small Air-Cooled Air Conditioners     | Federally regulated          |
|                              | Water-Cooled Air Conditioners         | Federally regulated          |
| Central Heat Pumps           | Gas Fired Heat Pump                   | Federally regulated          |
|                              | Geo Heat Pump                         | Federally regulated          |
|                              | Heat Pump Water Heating Packages      | State-regulated              |
|                              | Large & Very Large Heat Pumps         | Federally regulated          |
|                              | Small Air-Source Heat Pump            | Federally regulated          |
| Cooking and Washing Products | Clothes Dryers                        | Federally regulated          |
|                              | Clothes Washers                       | Federally regulated          |
|                              | Commercial Cooking                    | State-regulated              |
|                              | Dish Washers                          | Federally regulated          |
|                              | Residential Cooking                   | Federally regulated          |



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| Category                                | Appliance  | Type                                    |
|---|--|---|
| <u>Electronics</u>                      | <u>Consumer Audio &amp; Video</u>                      | <u>State-regulated</u>                  |
|   | <u>External Power Supplies</u>                         | <u>Federally regulated</u>              |
|   | <u>Large Battery Chargers</u>                          | <u>State-regulated</u>                  |
|   | <u>Small Battery Chargers</u>                          | <u>State-regulated</u>                  |
|   | <u>Televisions</u>                                     | <u>State-regulated</u>                  |
| <u>Fans and Dehumidifiers</u>           | <u>Ceiling Fans</u>                                    | <u>Federally regulated</u>              |
|   | <u>Dehumidifiers</u>                                   | <u>Federally regulated</u>              |
|   | <u>Whole-House Fans &amp; Residential Exhaust Fans</u> | <u>State-regulated</u>                  |
| <u>Heating Products</u>                 | <u>Boilers</u>   | <u>State &amp; federally regulated</u>  |
|   | <u>Combination Space/Water Heater</u>                  | <u>State-regulated</u>                  |
|   | <u>Duct Furnaces &amp; Unit Heaters</u>                | <u>State-regulated</u>                  |
|   | <u>Furnaces</u>  | <u>Federally regulated</u>              |
|   | <u>Gas Space Heaters</u>                               | <u>Federally regulated</u>              |
|   | <u>Infrared Heaters</u>                                | <u>State-regulated</u>                  |
| <u>Lighting Products</u>                | <u>Ballasts</u>  | <u>Federally regulated</u>              |
|   | <u>Ballasts for Residential Recessed Luminaires</u>    | <u>Federally regulated</u>              |
|   | <u>Ceiling Fan Light Kit</u>                           | <u>Federally regulated</u>              |
|   | <u>Compact Fluorescent Lamps</u>                       | <u>Federally regulated</u>              |
|   | <u>Deep-Dimming Ballasts</u>                           | <u>State-regulated</u>                  |
|   | <u>Emergency Lighting</u>                              | <u>Federally regulated</u>              |
|   | <u>High-Efficacy LEDs for Title 24</u>                 | <u>State-regulated</u>                  |
|   | <u>Lamps</u>   | <u>State- &amp; federally regulated</u> |
|   | <u>Lighting Controls</u>                               | <u>State-regulated</u>                  |
|   | <u>Metal Halide Luminaires</u>                         | <u>State- and federally regulated</u>   |
|   | <u>Portable Luminaires</u>                             | <u>State-regulated</u>                  |
|   | <u>Torchieres</u>                                      | <u>Federally regulated</u>              |
|   | <u>Traffic Signals</u>                                 | <u>State- &amp; federally regulated</u> |
| <u>Under-Cabinet Luminaires</u>         | <u>State-regulated</u>                                 |   |
| <u>Motor Products</u>                   | <u>Electric Motors</u>                                 | <u>Federally regulated</u>              |
| <u>Non-Central AC &amp; HP Products</u> | <u>Evaporative Coolers</u>                             | <u>State-regulated</u>                  |
|   | <u>PT Air Cond &amp; PT Heat Pumps</u>                 | <u>Federally regulated</u>              |
|   | <u>Room Air Co. &amp; Heat Pumps</u>                   | <u>State-regulated</u>                  |
|   | <u>Spot Air Conditioners</u>                           | <u>State-regulated</u>                  |
| <u>Plumbing Products</u>                | <u>Plumbing Fittings</u>                               | <u>State- and federally regulated</u>   |
|   | <u>Plumbing Fixtures</u>                               | <u>State-regulated</u>                  |





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| Category                      | Appliance                                | Type                                    |
|-------------------------------|--|---|
| <u>Pool Products</u>          | <u>Heat Pump Pool Heaters</u>            | <u>Federally regulated</u>              |
|                               | <u>Gas/Oil Pool Heaters</u>              | <u>Federally regulated</u>              |
|                               | <u>Residential Pool Pumps</u>            | <u>State-regulated</u>                  |
|                               | <u>Portable Electric Spas</u>            | <u>State-regulated</u>                  |
| <u>Refrigeration Products</u> | <u>Commercial Refrigerators</u>          | <u>Federally regulated</u>              |
|                               | <u>Automatic Ice Makers</u>              | <u>Federally regulated</u>              |
|                               | <u>Noncommercial Refrigerators</u>       | <u>Federally regulated</u>              |
|                               | <u>Ref. Beverage Vending Machines</u>    | <u>Federally regulated</u>              |
|                               | <u>Walk-in Coolers and Freezers</u>      | <u>Federally regulated</u>              |
|                               | <u>Water Dispensers</u>                  | <u>State-regulated</u>                  |
|                               | <u>Wine Chillers</u>                     | <u>State-regulated</u>                  |
| <u>Transformer Products</u>   | <u>Transformers</u>                      | <u>Federally regulated</u>              |
| <u>Water Heater Products</u>  | <u>Booster Heaters</u>                   | <u>Federally regulated</u>              |
|                               | <u>Heat Pump Water Heaters</u>           | <u>Federally regulated</u>              |
|                               | <u>Hot Water Dispenser</u>               | <u>State-regulated</u>                  |
|                               | <u>Large Electric Water Heaters</u>      | <u>Federally regulated</u>              |
|                               | <u>Large Gas &amp; Oil Water Heaters</u> | <u>Federally regulated</u>              |
|                               | <u>Mini-Tank Electric Water Heaters</u>  | <u>State-regulated</u>                  |
|                               | <u>Small Electric Water Heaters</u>      | <u>State- &amp; federally regulated</u> |
|                               | <u>Small Gas &amp; Oil Water Heaters</u> | <u>State- &amp; federally regulated</u> |

Source: California Energy Commission, Appliances and Outreach & Education Office, 2017

Appliance efficiency regulations adopted for computers and computer monitors, small diameter directional lamps, general purpose light-emitting diode lamps, and battery chargers are estimated to save 2,332 GWh/year, 1,600 GWh/year, 2,194 GWh/year, and 2,187 GWh/year in electricity consumption after stock turnover statewide, respectively. Together, that is a reduction of 8,313 GWh per year in electricity consumption, equivalent to meeting the total electricity needs of Ventura and Monterey Counties in 2015. Lower electricity consumption results in reduced GHG and criteria pollutant emissions, primarily from lower generation in hydrocarbon-burning power plants, such as natural gas power plants. Future appliance efficiency regulations provide an opportunity to address the growing percentage of energy attributed to plug loads and miscellaneous electric loads in California.

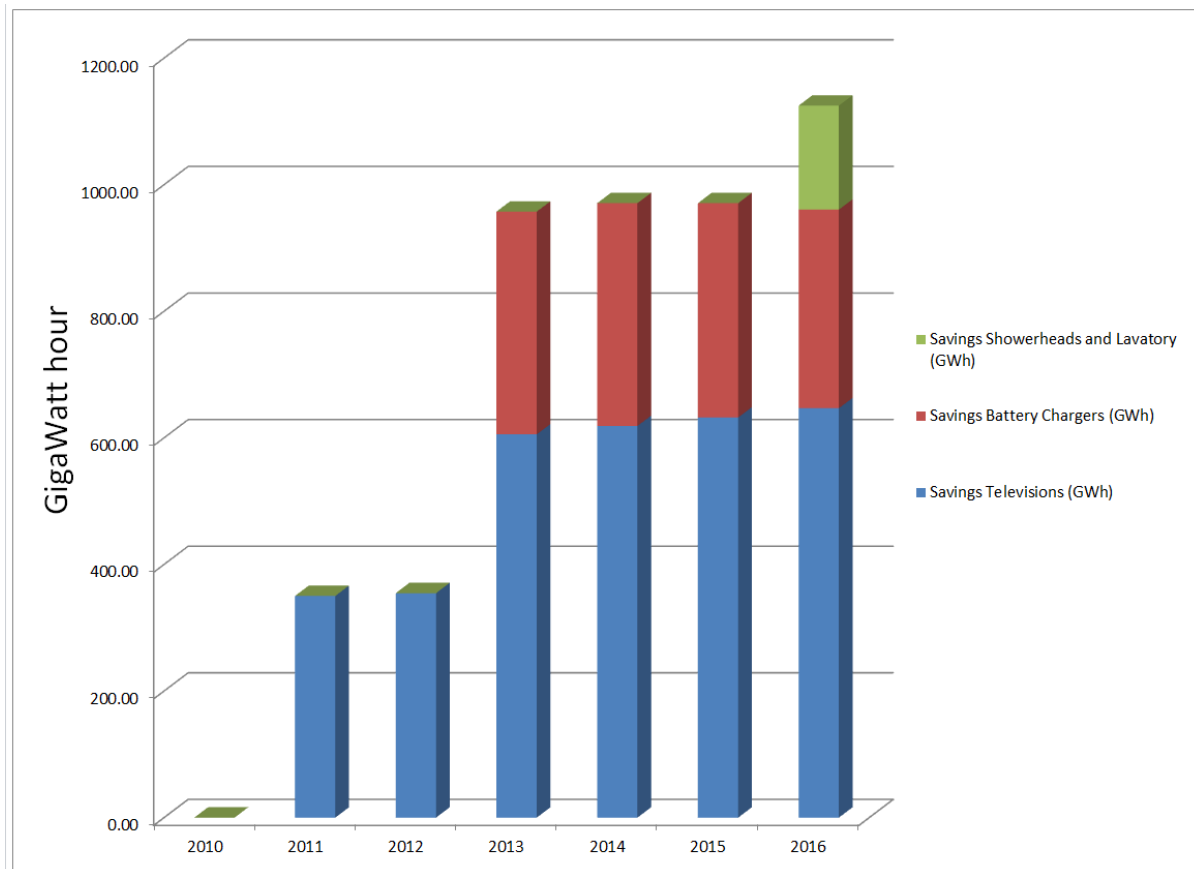
Recently adopted appliance standards from 2011-2016 have yielded the greatest energy savings to date and will be realized over many years to come. **Figure 4** below shows annual savings predicted at the time of the appliance rulemaking. Savings are based on engineering estimates of savings and shipments replacing assumed stock at the time of the rulemaking. Savings from televisions increase slightly from 2013 to 2016 because shipments for both new and replacement televisions exceeded existing stock. The savings from battery chargers appear to dip slightly from



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2014 to 2016 because the assumed baseline stock changed (cell phone chargers to universal serial bus [USB] chargers to large battery chargers).

**Figure 4: Annual Savings From California Appliance Rulemakings From 2011-2016**



Source: California Energy Commission, Appliances and Outreach and Education Office, 2016

### **Building Energy Efficiency Standards**

The Warren-Alquist Act, enacted in 1974, requires that the Energy Commission create and periodically update Building Energy Efficiency Standards (energy standards) for California. These energy standards address newly constructed buildings and additions/alterations to existing buildings. The standards have, in combination with appliance efficiency standards and utility-sponsored incentive programs, substantially contributed to California's per capita electricity consumption levels remaining relatively flat since the mid-1970s. California's energy standards are crucial to reducing GHG emissions of the electricity and natural gas sectors and to lowering the costs of energy to consumers. The Energy Commission updates the energy standards every three years.

The 2013 *Building Energy Efficiency Standards* are roughly 25 percent more stringent than the 2008 Energy Standards; compliance with the 2013 standards will contribute an additional \$1.6



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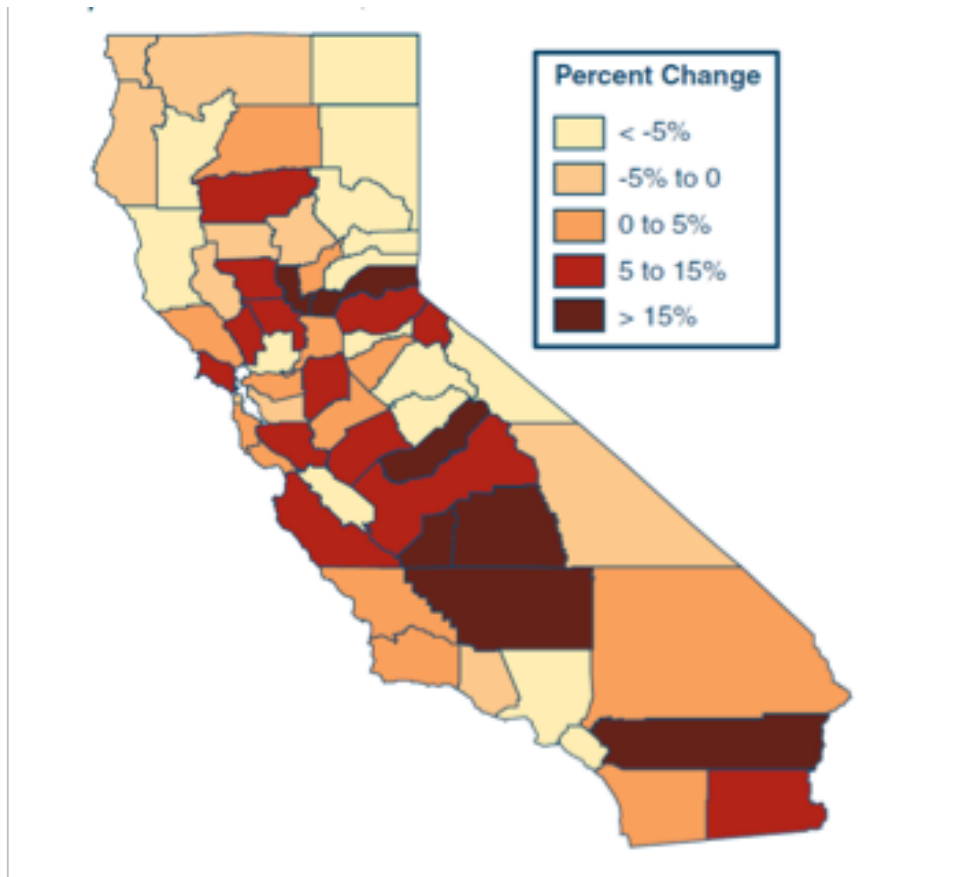
billion in energy savings to the California economy over the next 30 years. Existing buildings are required to comply with the standards as well, when these buildings undergo renovation, addition, or major equipment replacement. More than 55 percent of existing residential buildings and more than 40 percent of existing nonresidential buildings were built before the energy standards were established, and most of those buildings perform at a level far below what current efficiency standards would require. The current standards are applied only when projects trigger (and comply with) local permitting rules that verify adherence with them.

Average energy consumption for California households is 62 million British thermal units (Btu) per home, which is less than 31 percent of the 2009 national average of 89.6 Btus per home. This lower average consumption results in energy bills that are 30 percent less in California compared to the national average. Average site electricity consumption in California households is among the lowest nationally, as the mild climate in much of the state leads to less reliance on electricity for air conditioning and heating. Spending on electricity by California households is closer to the national average due to higher electricity prices in the state.

The 2013 and 2016 standards updates included significant increases in building energy efficiency, effective July 1, 2014, and January 1, 2017, respectively. Four major measures move homes closer to zero net energy (ZNE), including high-performance attics, high-performance walls, instantaneous water heaters, and high-efficacy lighting with controls. Both the 2013 and 2016 revisions targeted the shift in California population growth from heating-centric coastal and mountain climates to cooling-centric central valley climates as shown in **Figure 5**.



**Figure 5: California Population Growth Fiscal Years 2005-06 to 2015-16 (K-12 Enrollment Trends Vary Greatly by County)**



Source: *Cal Facts*, Legislative Analyst's Office, 2011

As California's population growth has shifted, so too has California's new construction. Accordingly, updates to the *Building Energy Efficiency Standards* have gradually shifted focus from developing new space and water heating requirements to establishing and enhancing space cooling requirements, including solar heat gain requirements for windows and solar reflectance requirements for roofs. Understanding the location of new construction in California is essential both for identifying efficiency opportunities in newly constructed buildings and for determining where, and in what amount, on-site renewable energy generation is both technically feasible and cost-effective for the consumer.



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### *Zero-Net-Energy Goals for New Buildings*

The *Building Energy Efficiency Standards* are on a path toward ZNE for newly constructed buildings. The Energy Commission, in concert with the California Public Utilities Commission (CPUC), has articulated goals that new residential buildings achieve ZNE by 2020 and new commercial buildings by 2030. These goals have shaped efficiency efforts over the last decade in myriad ways, for example, in the design of ratepayer-funded ZNE support programs and pilot projects, development and piloting of advanced building shells and mechanical systems, integration of self-generation into building projects from the commencement of design, and research into optimal ZNE strategies. The pursuit of ZNE is a prime example of state policy and marketplace working in complementary ways toward a defined goal.

The *Building Energy Efficiency Standards* establish minimum standards for newly constructed buildings and are thus an important tool for enabling high-performing buildings. The Energy Commission adopted a definition of ZNE in the [2015 Integrated Energy Policy Report \(IEPR\)](#), and the Energy Commission is adopting a tiered approach to enabling and encouraging ZNE construction. The base tier will be the traditional mandatory standard that increases in stringency with each code cycle; by statute, the Commission must show these mandatory minimum requirements to be cost-effective. For 2019, this base tier will increase building efficiency to the highest level ever and will include mandatory self-generation for the first time.

Additional tiers will be voluntary and represent a "reach" standard for even more advanced levels of energy efficiency, increased self-generation capacity, and grid harmonization tools such as demand response controls and various forms of energy storage. The intent of the advanced, voluntary tiers is to provide the industry, marketplace, and local governments with a framework for differentiating and promoting high-performing buildings. Experience with advanced building features helps developers optimize installation, reduce cost, and educate the construction workforce in advanced construction techniques. The market insight from this voluntary process helps the Energy Commission develop additional measures for inclusion in future mandatory standards. In this way, the *2019 Building Energy Efficiency Standards* will take cost-effective building performance to new heights, and at the same time will open clear pathways to apply mature, code-compliant ZNE construction practices.

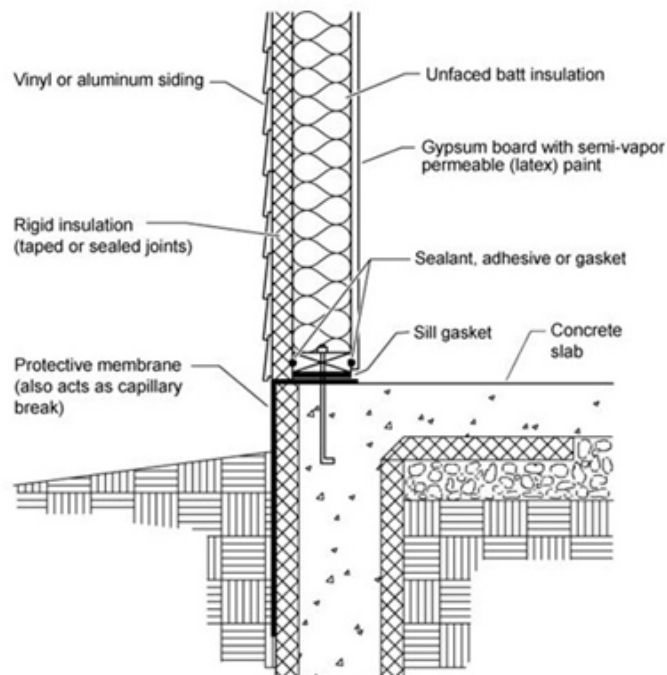
Creating a better building envelope is a central part of achieving ZNE goals by minimizing the energy consumption of homes. The high performance attics and walls measures in the 2016 Energy Standards are at the core of creating a better building envelope. High-performance attics and walls acknowledge and incorporate several advances in construction practices that increase the efficiency and performance of residential buildings. For attics, moving the insulation from the ceiling to the roof deck impedes and rejects heat before it is able to concentrate in the attic space. This results in less heat reaching the interior of the home and benefits any attic ducting that would otherwise be exposed to elevated temperatures. Several techniques exist for insulating at the roof deck, and builders have the option of simply moving or enclosing the ductwork into conditioned space.



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High-performance walls possess an improved U-factor (a measure of how well heat is transferred by the entire window into or out of the building), with multiple implementation approaches. The most common strategy is a transition from 2x4 studs that are 16 inches apart to 2x6 studs spaced 24 inches apart. This transition has the dual benefit of allowing more room for insulation and creating fewer thermal bridges between the exterior and interior of the home. Alternatively, high-performing continuous insulation products and newer, more effective spray insulation products also achieve these new performance targets and improve both the efficiency and comfort of the indoor environment, as shown in **Figure 6**.

**Figure 6: High-Performance Attics and High-Performance Walls**



Source: *2016 Residential Compliance Manual*, California Energy Commission, 2015

### **Advancing Energy Efficiency in Existing Buildings**

California's existing buildings represent a large reserve of untapped energy savings. However, inducing building owners and tenants to make energy efficiency upgrades in existing buildings can be difficult. The existing building energy efficiency action plan, adopted in 2015 and updated in 2016, provides a 10-year roadmap to activate market forces and transform California's existing residential, commercial, and public building stock into high-performing and energy-efficient buildings. The results of this effort will be accelerated growth of energy efficiency markets, more effective targeting and delivery of building upgrade services, improved quality of occupant and investor decisions, and vastly improved performance of California's existing buildings. Equally important, this effort will deliver substantial energy savings and GHG emissions reductions,

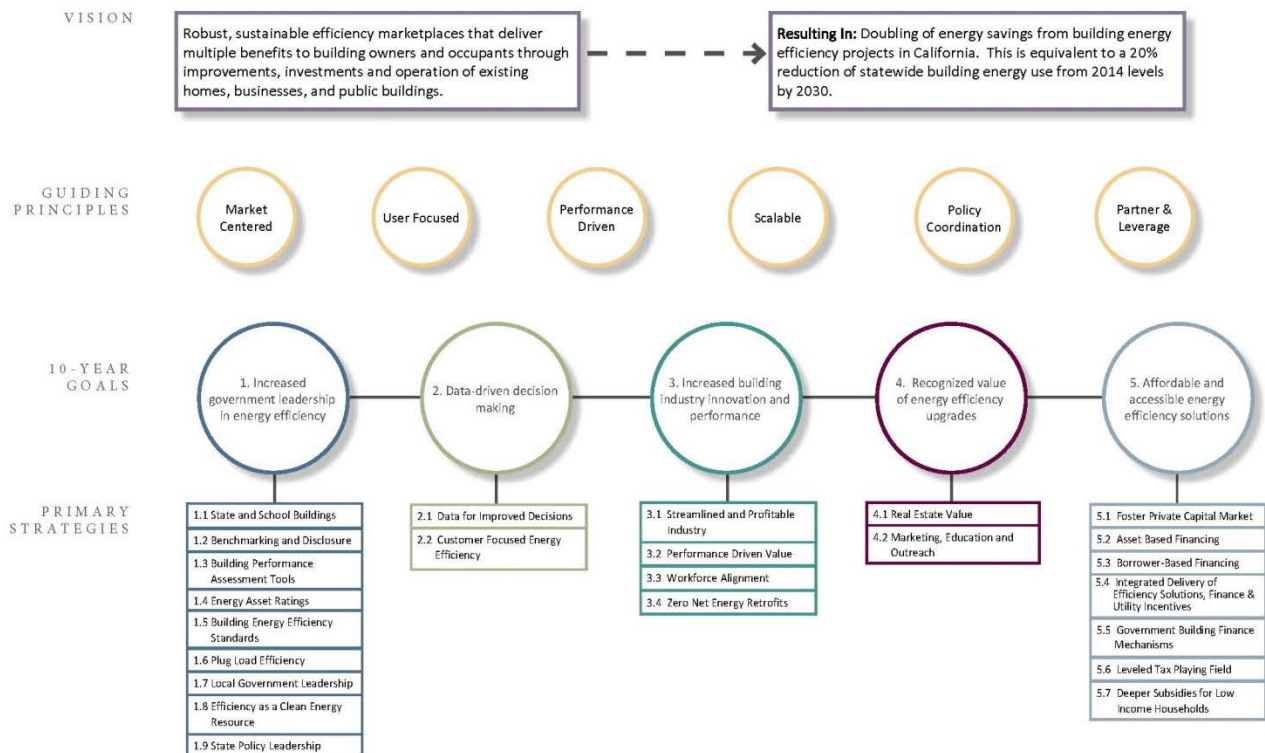


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contributing to the collective goal of reducing the impacts of climate change while improving the resilience of the state’s built environment and economy.

The action plan strategies are summarized in **Figure 7**, which shows the five core goals and overall objectives that guide this plan, with highlighted strategies that are particularly important.

**Figure 7: Vision and Goals Framework**



Source: California Energy Commission. *2016 Existing Buildings Action Plan Update*, p.6, Dec. 2016, Publication Number: CEC-400-2016-023SD

The Energy Commission adopted the [2016 Existing Buildings Energy Efficiency Plan Update](#) in December 2016, which summarizes progress on the original action plan strategies. Here are a few highlights:

- Increasing energy efficiency in state-owned buildings through the Department of General Services, Division of State Architect’s demonstration of opportunities to achieve ZNE in public school buildings through the [7x7x7: Design Energy Water](#) pilot program.
- Awarding Local Government Challenge grants to small local governments for climate action planning and large local governments for innovative energy efficiency projects.
- Developing *2019 Building Energy Efficiency Standards* to move closer to ZNE, and expanding standards and guidelines for regulated appliances and equipment.



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- Planning an energy data repository for data collection, organization, storage, and analysis to support the state’s energy policy development, tracking, and reporting obligations.
- Making financing affordable and accessible through the [California Alternative Energy and Advanced Transportation Financing Authority](#) (CAEATFA) by way of CPUC decision and support.

The action plan recognizes that the state’s energy efficiency goals cannot be met through state and utility programs alone, significant private investment is also fundamental. The *2015 EBEE Action Plan* documented that private capital investments in the energy efficiency efforts on the order of \$10 billion were needed. With the SB 350 mandate to double statewide efficiency savings, financing needs will be larger. It will be critical to develop mechanisms that can help spur private investments in energy efficiency.

### ***Statewide Commercial and Multifamily Building Benchmarking and Disclosure Program***

AB 802 authorizes, among other things, the first-in-the-nation statewide building energy use benchmarking and public disclosure program. The law requires that utilities provide energy use data for covered buildings to building owners upon request, and that the Energy Commission establish a building energy use benchmarking and public disclosure program for certain covered buildings, in coordination with local benchmarking and disclosure programs.

Access to whole-building energy usage data removes barriers for building owners who have tenants with separate meters, enabling benchmarking itself and allowing them to manage energy usage, assess and finance efficiency investments, and properly size measures. Building owners will have access to better information to understand building-as-a-system performance to compare their buildings to others of similar type, and to make decisions to improve their performance.

Public disclosure of building energy performance will allow tenants to compare buildings as they search for lease space, and provide both owners and prospective buyers with information to support investment decisions. Whole-building energy usage information is also important for affordable multifamily buildings, with these data used as prerequisites to participate in financing, grant, and incentive programs. Under both data access and public disclosure, the building owner using common energy metrics can perform building benchmarking.

Progress under the statewide benchmarking and disclosure program includes the following:

- As of January 1, 2017, utilities provide aggregated energy use data to buildings owners of covered buildings for the prior 12 months, within four weeks of the request of building owner.
- Energy Commission’s statewide benchmarking and disclosure program regulations are proposed, and adoption is expected in late 2017, with the first reporting to the Energy Commission due June 1, 2018.

### ***Clean Energy Jobs Act***





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The [California Clean Energy Jobs Act](#) (Proposition 39 K-12 program) provides funding for planning and installing energy efficiency upgrades and clean energy generation measures at public K-12 schools. The [initiative](#) allocates revenue to the Clean Energy Jobs Creation Fund for five years, beginning July 1, 2013, through June 30, 2018, with two additional years to implement projects (June 30, 2020), and one final year to report project data to the Energy Commission (June 30, 2021).

The Energy Commission is primarily responsible for administering the Proposition 39 K-12 program, which includes eligible local educational agencies (LEAs) such as public school districts, charter schools, county offices of education, and state special schools. LEAs submit Energy Expenditure Plan applications with proposed eligible energy measures to the Energy Commission for review. Upon approval, the Energy Commission notifies the [California Department of Education](#) (CDE) to disburse the allotted funds to LEAs to implement cost-effective energy efficiency and renewable energy generation projects.

For fiscal year 2015-2016, CDE reported 2,136 LEAs as eligible to apply for Proposition 39 K-12 program funding. This funding affects schools with fewer than 10 students to districts with nearly 650,000 students.

Since February 2014, the Energy Commission approved more than 1,160 applications, funding \$857 million of energy measures, at 4,329 project sites (as of December 27, 2016). More than 75 percent of LEAs (1,646) requested and received energy planning funds totaling \$154 million. Estimated annual energy and cost savings from approved energy expenditure plans are shown in **Table 2**.

**Table 2: Estimated Annual Energy and Cost Savings From Approved Energy Expenditure Plans (as of December 2016)**

|                              |              |
|------------------------------|--------------|
| Electricity Savings (kWh)    | 316,053,555  |
| Natural Gas Savings (therms) | 1,877,796    |
| Propane Savings (gallons)    | 66,980       |
| Fuel Oil Savings (gallons)   | 94,281       |
| Annual energy cost savings   | \$64,904,048 |

Source: California Energy Commission, Local Assistance and Financing Office, December 2016

The Proposition 39 K-12 program provides opportunities to collect project data from program participants and utilities and report that information to others. These data are critical to respond to the Governor, the Legislature, and public inquiries; track and monitor program progress; and identify opportunities for efficiency in existing buildings via improved *Building Energy Efficiency*



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*Standards* and appliance standards and guidelines. Under this initiative, the Energy Commission is developing an energy data repository to better use and analyze these data.

Proposition 39 K-12 program metrics and data may be viewed in several ways:

- [Proposition 39 Publicly Searchable Database](#) is a simple-to-use, interactive database that provides quick searches for program information at the school site level.
- [K-12 Program Research Data](#) provides energy project site information reported by LEAs and energy consumption and billing data reported by utilities.
- [State of California Climate Investment Map](#) provides Proposition 39 K-12 program data summaries searchable by Senate district, Assembly district, address, or city to show funding and estimated energy savings by school site.

### *Energy Conservation Assistance Act Loan Program*

The Energy Commission has a long history of providing the public sector with financing to conduct energy efficiency and clean energy generation projects. The [Energy Conservation Assistance Act](#) (ECAA) loan program provides local governments, K-12 schools, colleges and universities, special districts, and public hospitals with below-market interest loans (0 percent or 1 percent) to implement energy projects. Since 1979, the ECAA program has periodically received funding from other sources, creating additional ECAA subaccounts, such as ECAA-Education (ECAA-Ed) from Proposition 39 funds and ECAA-ARRA, from the American Recovery & Reinvestment Act of 2009.

In 2016, the ECAA program funded 10 loans totaling nearly \$18 million to cities, counties, school districts, and special districts for lighting upgrades, lighting and HVAC controls, and solar PV projects. Annually, these projects will save an estimated \$1.2 million in energy costs, reduce electricity usage by 11,591,995 kWh, natural gas consumption by more than 7,779 therms, and reduce 3,016 tons of carbon dioxide equivalent GHG emissions.

### *Using Data to Generate Knowledge*

Modern analytical tools can provide powerful support for decision making at all levels, from state policy-making to local markets. The increasing availability of reliable energy-related data opens tremendous possibilities for detailed assessment of consumption trends, improved program design and targeting, more accurate and timely reporting, and nuanced insight into energy efficiency program outcomes, to give just a few examples. Real-time data help the CPUC and utilities manage programs effectively, and provide consumers and building owners with information necessary to make educated decisions about building energy efficiency upgrades.

The Energy Commission has committed to creating an energy data repository, initially collecting, organizing, and processing data for four pilot projects. The Energy Commission has already developed standard data terms and relationships for multiple building energy-related programs. This Standard Data Dictionary (SDD) has data structures and properties for defining components of a building energy evaluation and assessment. Standardization of foundational tools and protocols such as the SDD is of paramount importance for their widespread adoption; indeed, the



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SDD is consistent with the Department of Energy’s Building Energy Data Exchange Specification (BEDES). Future programs developed at the Energy Commission will leverage SDD to enable data-sharing and aggregation across programs. The Energy Commission’s website will provide the SDD information for public and third-party programmer use.

Utilities across the state are to provide customers with energy usage data and efficiency-related audits and diagnostics. Each of the IOUs that has deployed advanced metering infrastructure<sup>6</sup> (AMI) data to its residential customers has also enabled customer and authorized third-party data access. The Energy Commission is working to develop building-specific identifiers for use in energy use disclosure and other efforts to understand and positively influence building energy usage over time.

In 2016, the Energy Commission committed to planning, developing, and governing a multipurpose data infrastructure to store, analyze, and visualize energy data. The energy data repository will initially include the following data use cases: (1) Proposition 39 K-12 program and utility energy use data, (2) AB 802 statewide building benchmarking and disclosure program, (3) residential building compliance data for newly constructed buildings and alterations/additions, and (4) California Commercial End-Use Survey (CEUS) data.

### *Extending Clean Energy to Low-Income Persons and Disadvantaged Communities*

In response to the direction of Governor Brown and the California Legislature, the state has taken groundbreaking actions to transition the state to a clean energy economy delivering the benefits of energy efficiency and renewable energy to California citizens. Environmental equity and environmental justice demand that these benefits also extend to California’s low-income populations and to disadvantaged communities. SB 350 expressly calls for prioritized attention to increasing opportunities for access to these benefits and to reducing barriers to that access.

This renewed direction calls for fresh approaches to understand and resolve the various socioeconomic barriers that inhibit the availability of clean technologies to low-income families and in disadvantaged communities. These barriers are highly variable and contextual and can prevent the adoption of practices and technologies that might otherwise be assumed feasible through mere extension of program initiatives that have found traction in higher-income settings.

The Commission adopted the [Low-Income Barriers Study](#) in December 2016. The recommendations of the study related to energy efficiency include coordinating efforts of all state agencies administering low-income programs, focusing especially on multifamily buildings and tenants, streamlining workforce development programs, creating finance programs that facilitate access to low-income customers, and establishing common metrics across all program delivery

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<sup>6</sup> Advanced metering infrastructure refers to the full measurement and collection system that includes meters at the customer site; communication networks between the customer and a service providers, such as an electric, gas, and water utility; and data reception and management systems that make the information available to the service provider. (See <http://www.energy.ca.gov/glossary/glossary-a.html>.)



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channels. At a September 13, 2016, Energy Commission workshop, Jean Clinton, the Governor's appointed Energy Efficiency Advisor at the CPUC (now retired), provided order-of-magnitude estimates of the scale of investments needed to advance access to energy efficiency and clean technologies for low-income households. Assuming an estimate that there are 5 million low-income households in California, she noted that spending \$2,000 in energy efficiency investments in each low-income household would amount to a \$10 billion investment; spending \$5,000 per home, which she noted "is certainly imaginable", would amount to a \$20 billion investment.

In parallel to the development of the Low-Income Barriers Study, the Energy Commission approved the [2016 Existing Buildings Energy Efficiency Plan Update](#) in December 2016. The action plan update highlights the SB 350 directive by increasing attention on achieving energy efficiency in low-income households and in disadvantaged communities. The action plan update urges the Energy Commission, CPUC, and the Department of Community Services and Development to coordinate programs by using common metrics, sharing data, developing a shared database, aligning methods for streamlined delivery of services, and providing clean energy jobs for those living in low-income communities.

As recommendations from the Low-Income Barriers Study and the *2016 Existing Buildings Energy Efficiency Plan Update* are implemented, progress reports will be updated.

### Additional References:

- Energy Efficiency Programs, see <http://www.energy.ca.gov/efficiency/>
- Appliance Standards, see <http://www.energy.ca.gov/appliances/>
- Building Energy Efficiency Standards, see <http://www.energy.ca.gov/title24/>
- Online Resource Center, Building Standards, see <http://www.energy.ca.gov/title24/orc/>
- Existing Buildings Energy Efficiency Program, see <http://www.energy.ca.gov/ab758/>
- Building Benchmarking and Disclosure Program, see <http://energy.ca.gov/benchmarking/>
- Clean Energy Jobs Act (Proposition 39 K-12 Program), see <http://energy.ca.gov/efficiency/proposition39/>

### Contacts:

- Energy Efficiency Programs: Dave Ashuckian, [Dave.Ashuckian@energy.ca.gov](mailto:Dave.Ashuckian@energy.ca.gov)
- Appliance Standards: Kristen Driskell, [Kristen.Driskell@energy.ca.gov](mailto:Kristen.Driskell@energy.ca.gov)
- Building Standards: Christopher Meyer, [Christoper.Meyer@energy.ca.gov](mailto:Christoper.Meyer@energy.ca.gov)
- Online Resource Center: Chris Olvera, [Chris.Olvera@energy.ca.gov](mailto:Chris.Olvera@energy.ca.gov)
- Existing Buildings: William Dietrich, [William.Dietrich@energy.ca.gov](mailto:William.Dietrich@energy.ca.gov)
- Benchmarking and Disclosure Program: William Dietrich, [William.Dietrich@energy.ca.gov](mailto:William.Dietrich@energy.ca.gov)
- Proposition 39 K-12 Program: Elise Brown, [Elise.Brown@energy.ca.gov](mailto:Elise.Brown@energy.ca.gov)
- ECAA Loan Program: Elise Brown, [Elise.Brown@energy.ca.gov](mailto:Elise.Brown@energy.ca.gov)



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### Hotlines:

- **Appliance Standards (Title 20) Compliance Assistance (MAEDBS)**  
(888) 838-1467 Toll-free in California  
(916) 651-7100 Outside California  
[Appliances@energy.ca.gov](mailto:Appliances@energy.ca.gov)
- **Energy Standards (Title 24)**  
(800) 772-3300 Toll-free in California  
(916) 654-5106 Outside California  
[Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)
- **Proposition 39 K-12 Program**  
(855) 380-8722 Toll-free in California  
(916) 653-0392 Outside California  
[Prop39@energy.ca.gov](mailto:Prop39@energy.ca.gov)

### Next Update:

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